Sea Around Us

Search through our entire 15 years!

In this edition, we have collected the entire 15 year's worth of *Sea Around Us* newsletters. Issues 1 through 83 are included, in a searchable format. Readers will therefore be able to easily navigate through our issues to find articles by author name (e.g., Jackie Alder), species (e.g., salmon), geographical area (e.g., Indonesia), or topics of interest (e.g., marine protected area).

Here are some tips for our readers. In your pdf viewer, use the 'find' field at the top of your screen to input any query. Alternatively, if you press the *f* key while holding down the *ctrl* key, you will access this search tool. If you are searching for articles for a specific author, use that author's full name. If only the last name is searched, all references to that last name, including citations within articles not written by that author will, come up. After you type your search query and press enter, two icons will come up beside the 'find' field. These enable you to move to the next, or the previous, reference to your query. In this way, you can search through this entire volume to find all articles relevant to your search criteria.

We hope you find this edition useful, and thanks for your continued interest in, and support of *Sea Around Us*.

The *Sea Around Us* Newsletter
Cumulative Edition
Issues 1 - 83, 1999-2014

Sea Around Us

"Sea-ing Around Us"

The 'Pew Project' is Underway

By Nancy Baron

Daniel Pauly wants to save the world – or at least the oceans. Pauly, Tony Pitcher and their UBC Fisheries Centre team were recently granted $3 million Canadian (about $2 million US) by the Pew Charitable Trusts to reel in the facts on fishing's ecological impacts.

That Pew, a powerful US foundation and a leader in marine conservation, has taken this gamble on the UBC Fisheries Centre is a big deal. When other scientists reviewed Pauly's proposal to try to unlock the besieged state of world fisheries, most said it couldn't be done. Nevertheless Pew has stepped forward to support the first phase of "The Sea Around Us" project, and as Pauly is the first to acknowledge, "my head is on the block."

The reason Pew is betting on Pauly is because, despite what sceptics may think, he has a track record of taking on gargantuan tasks against enormous resistance. Pauly is famous for his ability to look at mountains of data and to see things that no-one else has seen before. Feeding at the very top of the food chain of scientists, Pauly devours and synthesizes other people's research.

Pauly's own life has convinced him of the validity of fighting against the odds. A war baby, the son of a black man from Arkansas and a French mother, Pauly grew up poor.

"Statistically I was doomed," he grins. He would have never made it to university but for a scholarship from a church in Germany where he had worked helping the mentally handicapped. But once he started, he took off, surging through undergrad and masters degrees in four years. Then concerned about issues of poverty and overfishing, he started working in tropical countries, inventing simple methods for stock assessments so communities could manage their own fisheries.

In an interview in his tiny office in the UBC Fisheries Centre, he whirls from desk to computer in a pair of fish slippers. Prone to jumping up and illustrating his points on a white board by his desk, he answers the incessantly ringing phone switching from French to German to Spanish as he talks to colleagues from around the world.

Pauly seems not the least bit daunted by the enormity of the task he has taken on. "Right now all we do is say, 'save the sea,'" he says. "Well big deal. How do you go about it? You need the specifics." Still, he's the first to admit, "My imagination has always been ahead of my ability to implement things rigorously. I'm not a number cruncher." His approach is to develop a team and to create an environment in which the people and project can thrive and then he works with them to fit the pieces together. "Its not so much that the track record convinces other people, it's the track record that

Continued on page 2 – Pauly

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convinces yourself you can do it. Otherwise you wouldn't dare... Yes, its huge. But it's like the pyramids, it's one rock at time."

In 1998 Pauly sent shock waves around the world when he and a team of colleagues published proof in the prestigious journal *Science,* that globally, we are "fishing down the food web". Taking 45 years worth of the United Nations annual global catch statistics they showed where overfishing is taking us. Commercial fisheries exhaust big fish-eating fish first, then move to lower plankton-eating fish and invertebrates. This prevents the top fish from ever recovering because we begin competing with them for their food. So having systematically wiped out the large fish at the top of the food web, "we're now eating bait," says Pauly, "and we're headed for jellyfish".

So having systematically wiped out the large fish at the top of the food web, "we're now eating bait," says Pauly, "and we're headed for jellyfish".

Serial depletion of species is grinding marine ecosystems towards collapse. Pauly is critical of the government's new and highly subsidized 'diversification programs', a euphemism for trying to find something else once you've exhausted the previous fishery.

Many people including fisheries scientists, managers and politicians are in denial about what's happening in the oceans, and so Pauly, Pitcher and their UBC team, in partnership with a global network of scientists want to show what's going on. This three million dollar grant over two years is only the seed money for what – if they succeed – will be an on-going initiative to provide the research needed to transform fisheries policies and management practices around the world. The first step is to study the North Atlantic fishery (eastern Canada, the US and Europe) which, explains Pauly, "is the biggest challenge because that is where fisheries science emerged. Everything is more stuck there. If we can convince the North Atlantic world our vision is legitimate, then we will have taken a big step because in other parts of the world there will be less resistance."

The team's analysis of all the biological, economic, and social data related to fisheries over the past 50 years will show how much the oceans *have* changed and provide an irrefutable case for the profound changes necessary to current fisheries policies and practices. Because as Tony Pitcher says, "When it comes to oceans, sustainability is the wrong goal because you are only sustaining the present misery."

These scientists believe we must allow the oceans to rebuild to their historic levels of productivity. Pauly reckons only one-tenth or less of the fish in the oceans still survive, but the good news is, the abundant past could also be our future. The energy to rebuild the web of life is still being regenerated. On land, once you take away the habitat and build on it, the wildlife are often gone forever. But in the oceans the habitat is still there, it's just that the fish aren't. Nature can and will replenish the wealth of the seas – if we give her half a chance.

Now some of the brightest and biggest thinkers on the global scene are converging at the UBC Fisheries Centre to pull in the pieces. Besides Pauly and Pitcher, the team includes Villy Christensen and Carl Walters, who along with Pauly have designed a computer program called Ecopath which roughly simulates how marine ecosystems work. Like an accounting system that uses energy as its currency, Ecopath tells you how much fish you can extract from an ecosystem based on its productivity while taking into account the interactions between various animals within the system. It serves as a test to see if the pieces add up.

Reg Watson is the team's chief detective uncovering unaccounted fisheries catches such as bycatch and the subsistence fisheries. In many countries, the catch of boats below 10 metres is not registered. Nor are sports fisheries usually included. "Now here I expect a stunning effect—we will surprise people with these numbers," says

Continued on page 4 – Pauly

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The Sea Around Us website may be found at www.seaaroundus.org, and contains up-to-date information on the project.

Who's Who in the Sea Around Us

Staff at the Fisheries Centre:
Project Leader – Daniel Pauly

Chair, Project Steering Committee – Tony Pitcher

(Principal) Research Associate – Villy Christensen

(Senior) Research Associate – Reg Watson

Project Co-ordinator – Nigel Haggan

Post-Doctoral Fellows – Sylvie Guénette, Lore Ruttan, Dirk Zeller

Research Associate – Rashid Sumaila

Webmaster – Felimon (Nonong) Gayanilo

Newsletter Editor – Melanie Power

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Administrative Assistant – Maureen White

Collaborators from outside of the Fisheries Centre:
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Nancy Baron
Alida Bundy
Rattana (Ying) Chuenpagdee
Paul Fanning
Rainer Froese
Paul Hart
Steve Mackinson
Jean-Jacques Maguire
Gordon Munro
Leif Nøttestad
Bill Parker
Hreidar Valtysson

Welcome to the Sea Around Us Project!

Notes from the Editor

Welcome to the first issue of the new Sea Around Us project newsletter! As many *FishBytes* readers already know, this new Fisheries Centre partnership with Philadelphia's Pew Charitable Trusts was formally announced in July of this year. (See *FishBytes* vol. 5 (4), July/August 1999.) Since then, the always bustling Fisheries Centre has been caught up in an even greater flurry of excitement. Renovations on our home, Hut B-8, have been planned, and renovations in one of the neighbouring huts have begun. Blueprints decorate the Fisheries Centre's main office, and workers sporting hardhats have been spotted in the hallways. Even the exterior of B-8 is getting painted – although the onset of Vancouver's rainy season has temporarily halted that effort.

All of this activity so as to accommodate the many researchers flocking to the Fisheries Centre to become part of this project. In fact, people are being recruited from all corners of the globe to serve in various capacities on the project.

And of course, to broadcast the efforts of the project team and developments within the project, we are launching this brand-new newsletter. Included with *FishBytes*, this serial will be distributed every second month for a total of six issues per year. Unlike *FishBytes*, with its broad mandate and focus, this particular newsletter will centre entirely on this project and all that it entails.

In this first issue, we highlight a modified version of an article which first appeared in the *Vancouver Sun*, written by freelance journalist Nancy Baron. Through this particular article, you will be introduced to some of the members of the project team and given an overview of the Sea Around Us project. Just as this article focuses on Daniel, future issues of this newsletter will highlight other team members and the work that they are doing.

But not wanting to leave anyone out, in this issue we have included a reference list of who's who in the team. More information on the Sea Around Us project and team can be found on the projects website, www.seaaroundus.org. Be sure to check the site regularly for up-to-date information.

So, welcome. And thank-you for joining us as we work to save the world's fisheries!

Continued from page 2 – Pauly

Daniel Pauly, reflecting on the state of the world's fisheries.

Pauly.

Tony Pitcher and Dave Preikshot and have designed RAPFISH, a multidisciplinary rapid evaluation method for the status of fisheries and Rashid Sumaila, an economist, has designed a new economic methodology that will allow people to evaluate the ecological, economic, social and cultural benefits of rebuilding. Pauly's role is to put it all together and to bring forward the results and recommendations.

These multiple layers of data will be analysed and cross validated to show how overfishing can be controlled and the damage reversed. The team will post all their data and analysis on the project's website so that the path to their conclusions is clear.

By the end of the first two years Pauly hopes to have succeeded in convincing colleagues, managers and policy makers that there is legitimacy in the approach of looking at the past to set fisheries goals for the future.

One of the major problems in fisheries management is the rift between fisheries scientists and conservation biologists. Fisheries scientists tend to be aligned with government and industry. Conservation biologists tend to sit "outside the tent" with the environmental NGOs. Pauly is trying to create a new system for data collection to integrate the two groups and encourage their collaboration on solving problems. "The two groups may be working on similar things but they don't talk to each other, they don't read each other's work and worst of all, they don't respect each other," explains Pauly. The problem of two groups of scientists generating evidence for different audiences is part of what this project is meant to overcome.

By the end of the first two years Pauly hopes to have succeeded in convincing colleagues, managers and policy makers that there is legitimacy in the approach of looking at the past to set fisheries goals for the future. "What we want to do is calculate the benefits that go to the different players and identify for the fisheries of the North Atlantic – not pie in the sky, but practical solutions that are good for the fish, good for the ecosystem and good for the fishery itself."

For example, the scientists are using horsepower as the unit of efficiency to contrast the costs and benefits of different fisheries. Small scale local fishers consume less fuel oil, less fish, destroy less habitat, reduce bycatch and generate more benefits to more people, both locally and afar. The alternative – the industrial fishers – travel from place to place, mess up the fishing ground through destructive practices like trawling, throw away the bycatch, and employ seasonal workers who have no connection to the places where they fish. Industrial fishers tend to be heavily subsidized and ignore environmental destruction. "It's an old habit, so we tolerate it," explains Pauly, "Similar to perhaps cigarettes. But it's crazy."

Pauly's vision is to largely phase out the large scale fisheries and to freeze the small scale fisheries to alleviate enough pressure that the stocks could rebuild. "Look at the cod. The small scale fisheries were catching 200,000 tons a year, while for 10 years the industrial fisheries got up to 800,000. How many years do you need of total depletion to undo that so-called gain?" Up to 1998 the Atlantic cod collapse has cost at least $4.5 billion and untold wretchedness. "You could have continued with just the small scale fisheries and overall the gains would have been much bigger," says Pauly. "So the hard-nosed numbers, the realism is not with the subsidy driven large scale fishery that leads to overfishing. Phasing out the heavily subsidised industrial fisheries will cost money, but it will ultimately provide *more* jobs and fish. So go do it. The fisheries world should be able to see themselves that they are doing things that are absurd. And so holding up a mirror to this and showing how that can be perceived by looking at it from a different angle is going to be helpful, I hope."

Pauly firmly believes their work will show how our self-made fisheries crisis *can* be solved. The much larger challenge will be dealing with the politics.

This article is adapted from an article which first appeared in the Vancouver Sun, November 5, 1999, page A29. It is the first in a series that will profile scientists and their research in the Sea Around Us project.

Nancy Baron is a Vancouver biologist and freelance journalist with an interest in biodiversity issues. Previously, Nancy authored "The Straits of Georgia", an article about the Fisheries Centre's pilot "Back to the Future" project, which appeared in Vancouver's Georgia Straight, v. 32 (1602), September 3-10, 1998.

Sea Around Us

Ecosystems of the North Atlantic: some definitions

By Daniel Pauly, Reg Watson, Dirk Zeller, and Villy Christensen

There is a broad consensus, among scientists, that fisheries research, somehow, should be ecosystem-based, but very little agreement as to what this means (NRC 1999). Clearly, the first task when dealing with the issue of putting fisheries in an ecosystem context is, as in all science-based approaches to a problem, to define and classify the object(s) at hand. Here, these are the marine ecosystems within which fisheries are embedded.

As it turns out, establishing a consensus on such classification may be relatively easy, given the compatibility, so far never highlighted, of the two major classificatory schemes so far proposed. These are (1) the system of 'biochemical provinces' developed by Longhurst (1995) and (2) the list of Large Marine Ecosystems (LME) of K. Sherman and colleagues, recently discussed by Sherman and Duda (1999).

Longhurst's classification, based on satellite maps of plankton pigments, and verified by analysis of over 20,000 oceanographic stations, starts at the level of 'domains', or 'biomes', of which four are identified: (1) Polar; (2) Westerlies; (3) Trades; and (4) Coastal Boundary. These domains are large entities with similar climate, spanning all three oceans, and they are subdivided into 56 homogenous 'provinces', described in great details in Longhurst (1998), and called 'Longhurst Areas' in Pauly (1999).

Most of these provinces fit within one or the other ocean, the exceptions being five circumglobal (boreal and Antarctic) provinces. Overall, Longhurst's scheme makes lots of sense, and has been used to stratify the world ocean in two major studies, pertaining to the global distribution of primary production and tuna catches (Longhurst et al. 1995; Fonteneau 1998), with more forthcoming (Platt and Sathyendranath 1999). Also, as part of the collaboration between the Sea Around Us and FishBase projects (Froese and Pauly, 1998), the world's marine fishes (about 15,000 species; see www.fishbase.org) have been assigned to Longhurst's biochemical provinces, if tentatively in a few cases (R. Froese, pers. comm.).

However, these provinces are too large for most purposes of fisheries management, even on an international basis. Here, systems in the order of 200,000 km^2, i.e., the size of Sherman's LME seem more appropriate. Fortunately, it turns out that Longhurst's provinces fall into two groups, i.e., offshore and coastal (Figure 1 - page 3). The latter can easily be

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Defining Ecosystems - Continued from page 1

divided into 'sub-provinces' congruent with the mostly coastal LME identified by K. Sherman and collaborators.

Figure 2 (page 4) illustrates, for the North Atlantic, how Sherman's system of LME was 'mapped' onto Longhurst's classification of ocean provinces, with LME split into components (e.g. Southern and Northern) when they straddled two provinces, and new LME added where appropriate.

This synthesis provides, we believe, the elements that had been lacking within each of the systems thus rendered compatible. For Longhurst Areas, we identify sub-provinces that are pragmatically defined to serve as framework for fisheries and other applied work. As for the LME, they obtain, via their incorporation into Longhurst's scheme, the rigorous physical definitions they had so far been lacking, including borders that allow GIS-based computation of system properties.

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Another consideration is that our synthesis can be used as ecological complement to the coarse stratification scheme used by the Food and Agriculture of the United Nations (FAO) to present global marine fisheries data, and which relies on 18 FAO statistical areas (7 for the Atlantic, 3 for the Indian and 8 for the Pacific Ocean). To facilitate comparisons between catch data stratified by these two schemes, we have split the five circumpolar provinces into ocean-specific segments, treated here as LME (lower level of Figure 2). This procedure enables 'closure' of each ocean and thus will allow direct comparisons, at least at ocean-level scale, between catch data stratified within our new system, and the FAO catch data.

Our next task, in this context, is to assign the catches in the global FAO data set to provinces and sub-provinces (=LME), pending their gradual replacement, starting with the North Atlantic, by locally-derived data sets. Further, we are in the process of assigning Ecopath models of the North Atlantic to the ecological stratification scheme described here, with the purpose of deriving basin-level estimates of production patterns and ecosystem state variables.

Acknowledgments:

We thank Drs Alan Longhurst and Ken Sherman for the exchanges that have led to the work described above, and Dr Trevor Platt for sending us a file defining biological provinces. Also we thank Dr Rainer Froese and the FishBase team for their collaboration.

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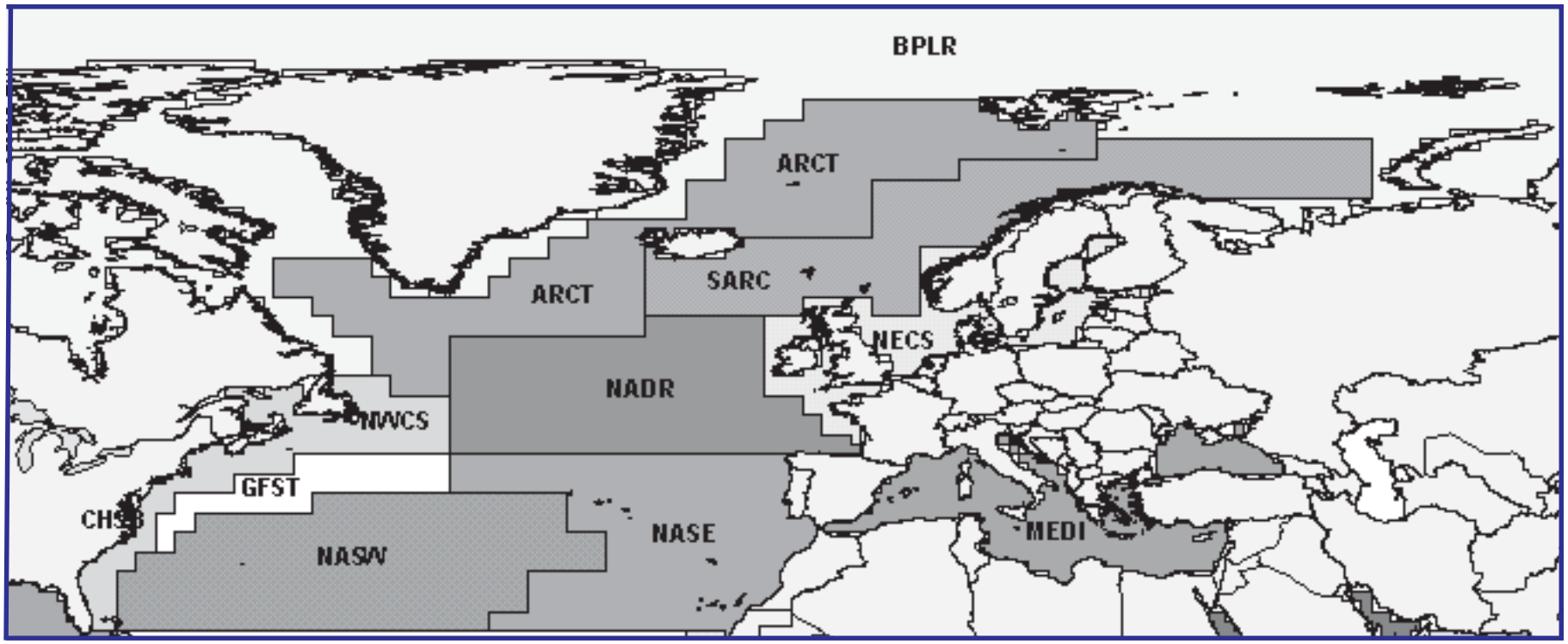

Figure 1: *Biochemical provinces of the North Atlantic described by Longhurst (1995). Figure 2 shows the LMEs so far identified for each province.*

ARCT *(Atlantic Arctic Province)*
CHSB *(Chesapeake Bay Province)*
NADR *(North Atlantic Drift Province)*
NASW *(North Atlantic Subtropical Gyral Province)*
NWCS *(Northwest Atlantic Shelves Province)*
BPLR *(Boreal Polar Province)*
GFST *(Gulf Stream Province)*
NASE *(North Atlantic Subtropical Gyral Province)*
NECS *(Northeast Atlantic Shelves Province)*
SARC *(Atlantic Subarctic Province)*

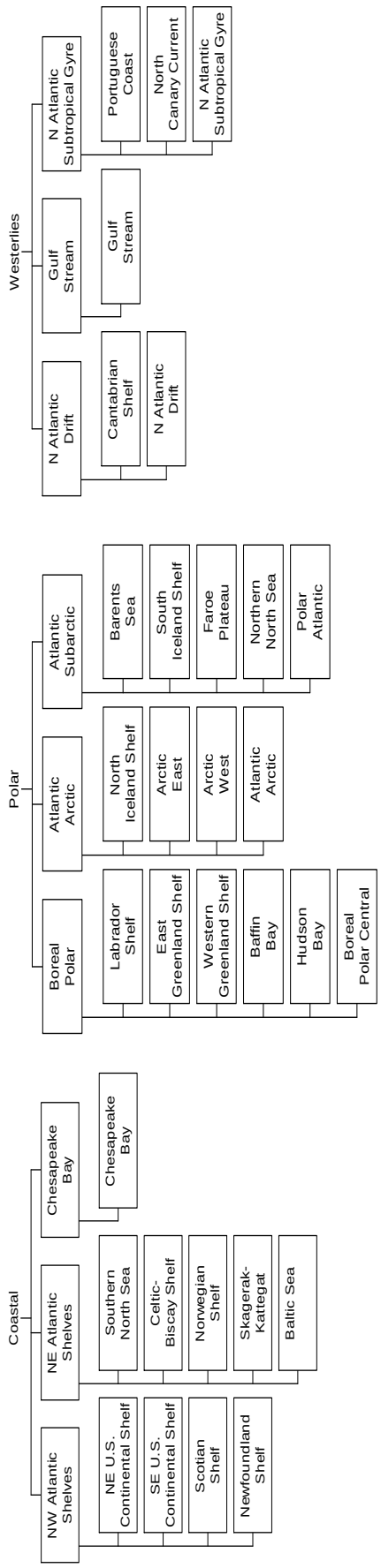

Figure 2: Result of 'mapping' K. Sherman's and other LMEs into the biochemical provinces described by Longhurst (1995) for the North Atlantic (see also figure 1). Note hierarchy, from the 'domain' level (Coastal, Polar, Westerlies) to the province (N.W. Atlantic Shelves, etc.), and the LME (N.E. US Continental Shelf, S.E. US Continental Shelf, etc.). A similar breakdown is now available for the rest of the world's oceans. Also note that further breakdown (i.e., addition of LME) will probably be required for detailed description of various provinces.

Sea Around Us

Assessment and Mitigation of Fisheries Impacts on Marine Ecosystems

By Daniel Pauly and Tony Pitcher

Below is the abstract of: Pauly, D. and Pitcher T.J. (2000) Assessment and Mitigation of Fisheries Impacts on Marine Ecosystems: A Multidisciplinary Approach for Basin-Scale Inferences, Applied to the North Atlantic. In Pauly, D. and Pitcher T.J. (eds) Methods for assessing the impact of fisheries on marine ecosystems of the North Atlantic. Fisheries Centre Research Reports 8(2): (in prep).

The aim of the Sea Around Us Project is to quantify, in ecological and economic terms, the impact of fisheries on the marine ecosystems of the North Atlantic, and to evaluate the costs and benefits of various scenarios of mitigation, such the status quo, rebuilding of depleted resources and implementation of closed areas. Dealing with these issues requires a methodological package related to, but different from, that typically used in fisheries management, notably because of its ecosystem focus and the much larger temporal and spatial scales, relative to standard fisheries assessments. This paper summarises the methodology deployed by the project by introducing a suite of papers in which the rationale and details are provided.

First, we review the relationships between scale and methodology choices in marine science. Then, the principle modules of the Sea Around Us project methodology are described as follows:

1) The North Atlantic as study area, where we report a new ecosystem classification scheme that is compatible hierarchically with previous work and with all statistical divisions;

2) North Atlantic fisheries catches in time and space, where we present the project's catch and effort database, discuss the problems in estimating total extractions, and outline methods used to overcome them;

3) Fish distribution transects, where the biology and migrations of key commercial North Atlantic species are used to link catches by shallow-water and offshore fisheries;

4) Bio-economic analyses of fisheries sectors, where the effect of competition between small and large – scale fisheries are quantified using multi-species, multi-gear yield per recruit and a bio-economic Nash equilibrium analysis;

5) Ecosystem modelling, discussing the use of ECOPATH with ECOSIM and ECOSPACE to represent present and past North Atlantic ecosystems with their embedded fisheries, to evaluate ecosystem status, and to simulate likely response to change;

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Sea Around Us Project: Methodology Review Workshop

By Nigel Haggan

...the project team has been in a ferment of creative writing, with no less than 11 review papers in the last stages of gestation as this goes to press....

The Sea Around Us Project methodology workshop will be held at Dunsmuir Lodge on Vancouver island during the first week of May. This is a key contract stipulation. Reviews of the original project proposal were harsh, indeed sceptical due to the newness of the approach. Rather than abandon a concept that the Pew Charitable Trusts saw as valuable, it was agreed that the North Atlantic pilot project would include a rigorous methodology review in year one.

Accordingly, the project team has been in a ferment of creative writing, with no less than 11 review papers in the last stages of gestation as this goes to press. (The abstract on pages 1 and 3 of this issue briefly presents the papers.) Each paper will be reviewed by a minimum of two international experts. The papers and comments will then be addressed singly, and in the context of overall project objectives, at a May 1-6 workshop at Dunsmuir Lodge on Vancouver Island. We will be helped in this by five visiting scientists, Dr Lee Alverson, former Director of the National Marine Fisheries Service Northwest and Alaska Fisheries Center, Dr Kevern Cochrane, United Nations Food and Agriculture Organization, Mr Poul Degnbol, Director, Inst. for Fisheries Management, North Sea Centre, Denmark, Dr Paul Fanning, Director, Stock Assessment, Fisheries and Oceans Canada and Dr Richard Grainger of FAO. We will also be joined by Jay Maclean, a science writer from Manila who, we hope, will assist with the major project report in year two.

In all, some 23 participants will converge on Dunsmuir Lodge, some by air from distant parts of the globe, the rest of us by water, entrusting ourselves to the tender mercies of the BC Ferry Corporation. The plan is to arrive in time for a welcoming (and welcome) dinner on the evening of April 30. After that, the work begins in earnest, with three papers reviewed per day.

Day one opens with a presentation on the 'Overview paper' by the Principal Investigator. All reviews will follow a standard format: lead authors get 20 minutes to present, co-author(s) have a further 20 to present referee comments. Content and comments are then addressed in a 90 minute panel discussion. Evenings will be 'free' for authors to incorporate comments and for rapporteurs Amy Poon and Yvette Rizzo to catch up on the day's questions and discussion.

The final product, due by June 30, will be a Fisheries Centre 'Blue Book' report edited by Daniel Pauly and Tony Pitcher. (See page one of this issue for the bibliographic details.)

The workshop agenda and a list of attendees will be posted on the website http://fisheries.com/projects/saup/INDEX.HTM as soon as our Webmaster returns from his travels in the Philippines and Indonesia.

One way or another, it'll be a busy little week.

Nigel Haggan is a researcher at the Fisheries Centre and Project Co-ordinator for the Sea Around Us project.

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How Many Fish Have Been Taken from the Sea?

By Sylvie Guénette

What is the real catch of fish from the Sea? In the Sea Around Us project we have to estimate the total fish extractions so that the impact on marine ecosystems can be fully evaluated. But where do we get the data from?

The Fisheries Centre is very pleased to announce that Sea Around Us project and the Department of Fisheries and Oceans (DFO, Halifax, Nova Scotia) have signed a Memorandum of Agreement to collaborate on reconstructing the total extractions from Canadian waters. Dr Paul Fanning, (Bedford Institute of Oceanography), our contact at DFO, is facilitating access to their databases. He is also contributing his vast knowledge of the database and the fisheries system in Canadian waters.

In the last few months, we have assembled the catches of all species for the years 1960-1998, using two database sources, NAFO (Northwest Atlantic Fisheries Organisation) and DFO Zonal Interchange File (ZIFF). The most time-consuming process was to encode and verify for data consistency, especially for rare species and gears that are infrequently used. Compatibility with on-board vessel observer data was taken into account in building the new database structure. The observer data is now being analysed to estimate discard rates for each type of fishery, e.g. groundfish trawl, pelagics midwater trawl. Changes in skippers' behaviour and hence discard rates in the absence of on-board observers would likely be the next source of adjustments.

Sylvie Guénette is a post-doctoral fellow with the Fisheries Centre's Sea Around Us project.

The SAU Puzzle

In this issue, the Sea Around Us project proudly presents our new logo (shown opposite, on page 2, in the information box). The new logo, designed by Ms Mary Boone (who also designed the Fisheries Centre logo, shown on the back page of *FishBytes*), consists of three segments representing marine life - fish, mammals/reptiles, and plants. The fish segment is moving toward the other three puzzle pieces, and the counterclockwise motion represents rebuilding.

In full colour, the fish segment is in UBC Gold, as a metaphor for the lasting value of fish. The remaining segments are in marine blue. These colours are also present in the Fisheries Centre's logo.

Methods - Continued from page 1

6) Evaluating alternative ecosystem-based management regimes to quantify the benefits of different ecosystem-based management scenarios;

7) Energy consumption and the ecological footprint of North Atlantic fisheries, to contrast the energy incorporated in landed fishes to that required to catch them;

8) Rapid interdisciplinary appraisal of fisheries status and compliance analyses using RAPFISH, to compare and characterise North Atlantic fisheries in terms of their sustainability (in ecological economic technological and social fields), analysis of their ethical status, and to score their compliance with the FAO Code of Conduct for Responsible Fisheries, together with the compliance of North Atlantic countries vis-à-vis their internationally agreed commitments.

9) Mapping the fate of fisheries landings from the North Atlantic, to identify possible pressure points for intervention by fish product consumers;

We anticipate that the synthesis to emerge from integrating the results of these modules will contain many surprises, both in terms of the ecological damage and economic waste presently generated by the North Atlantic fisheries, and in clarifying the foregone benefits that could be regained, were these economic and ecological issues to be addressed.

Figure 1 (page 4) presents a schematic of the approach being taken in the Sea Around Us project.

Daniel Pauly is Project Leader for the Sea Around Us Project. Tony Pitcher is Chair of the project's Steering Committee.

We anticipate that the synthesis to emerge from integrating the results of these modules will contain many surprises...

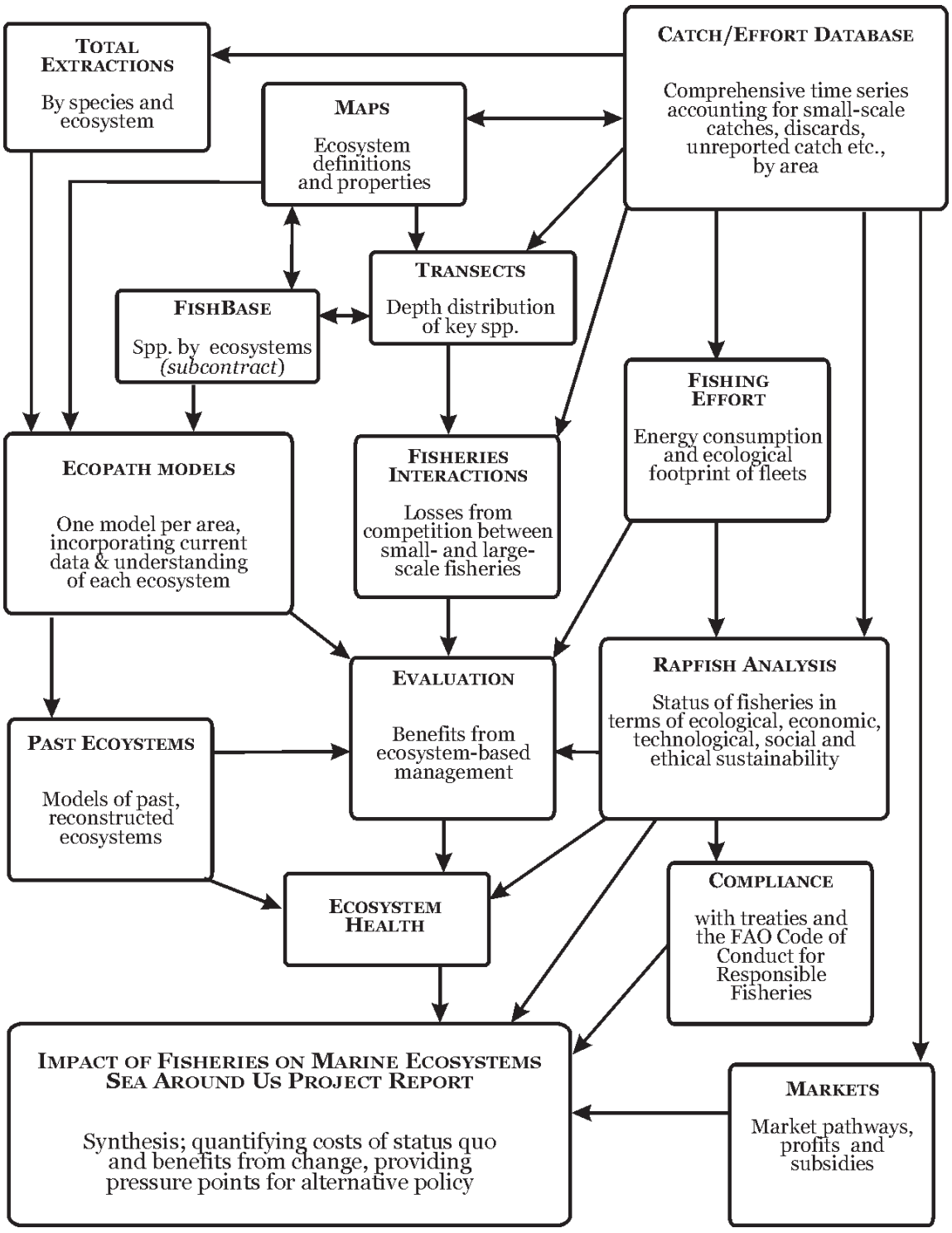

Figure 1 - Key elements of the Sea Around Us project, with basic data on top, and derived elements further down.

Sea Around Us

Retreat at Dunsmuir Lodge: A successful and productive methodology workshop

By Amy Poon

On Sunday, April 30, 2000, those from the Fisheries Centre who are involved in the Sea Around Us Project (SAUP) gathered at Dunsmuir Lodge, near Vancouver Island's Swartz Bay, for the welcome dinner (the first of the legendarily divine meals at Dunsmuir) to the SAUP Methodology Workshop. They were joined by six reviewers whom they invited as external auditors to give insights and validity to their work.

The workshop proper, which lasted from Monday, May 1 to Friday, May 5, allowed those involved in the SAUP to get an idea of how their own project fit into the larger scheme of things, as well as get feedback from those who have not worked on the projects on an intimate level. The visitors each brought a different perspective to the proceedings. Lee Alverson (President, Natural Resources Consultants Inc., and Professor of Fisheries , University of Washington) brought with him his extensive experience with fisheries management. Paul Fanning (Fisheries and Oceans Canada, Halifax) and Poul Degnbol (Director, Institute for Fisheries Management and Coastal Community Development, Denmark) had perspectives from the two sides of the Atlantic. Kevern Cochrane and Richard Grainger (both of the UN Food and Agriculture Organisation in Rome) had insights into international standards, and Jay Maclean (freelance writer and editor) kept the focus on the project's objective. With the added supply of contact names, advice, and suggestions from the visitors, the SAUP's already impressive arsenal was improved.

Because time constraints and lack of personnel were the recurring concerns about the project, some rearrangement of priorities of the SAUP was necessary. Two projects were moved from the SAUP to be picked up later as Fisheries Centre projects. Data analysis would be done on varying levels, where detailed models will come out of locations in the North Atlantic where data is rich, whereas more general and robust models that could be applied worldwide will come out of locations where data is poor. These, along with other useful suggestions, came out of the visitors' insights.

Although some of the reviewers were intially hesitant about the scope and purpose of the SAUP, they were soon won over. The project was lauded for its holistic and broad approach, its leadership, and its innovation. Concerns such as potential gaps in data, target audience for the reports, and degree of depth, were also addressed.

There is less than a year to go on the SAUP. As the clock ticks, the participants will feel the time crunch more keenly. However, their tasks will be aided by the ideas and suggestions that came out of this workshop.

Amy Poon is an M.Sc. student at the Fisheries Centre, and, along with Yvette Rizzo, acted as rapporteur at the SAUP workshop.

The Sea Around Us Project Newsletter

Issue 4 – May/June 2000

How life history patterns and depth zone analysis can help fisheries policy

By Dirk Zeller and Daniel Pauly

This is a summary of: D. Zeller and D. Pauly (2000) How life history patterns and depth zone analysis can help fisheries policy. In: Pauly, D. and Pitcher, TJ. (eds) Methods for assessing the impact of fisheries on marine ecosystems of the North Atlantic. Fisheries Centre Research Reports 8(1): (in prep).

The stocks of an exploited fish species may be utilized by more than one fishery sector during different stages in the species life history. Often, scientists and managers alike view life history patterns as a multi-dimensional problem, with complex interactions between components defined by ecology, time and oceanography. Often this complexity has made it difficult to assimilate effects of multiple fishery sectors on a species and the industry it supports. This may be either due to the perception of multi-dimensional complexity thought to be intractable, or because of an oversight of basic patterns.

The life-history patterns of fish species are complex. But much of this complexity can be captured in simple diagrams of coastal transects, where juveniles usually occur inshore in large numbers, while adults are often in deeper, offshore waters. Here we argue that this multi-dimensional complexity can be reduced to a simpler, two-dimensional life history pattern, while still capturing the essential information. Both Charles Darwin and Alexander von Humboldt used the method of reduced dimensionality to focus ones attention to the key issues while capturing most of the significant information concerning the topic at hand. For example, after reviewing much literature, Darwin concluded that "latitude is a more important element than longitude" for explaining the distribution of organisms (Barrett *et al.* 1987). It was Humboldt, however, who first used a transect technique to visualize the advantage of reduced dimensionality in explaining observed patterns in distribution (Gayet p. 2284-2287 in Tort 1996). In fisheries science, a classic example of data suitable for reduced dimensionality was presented by Garstang (1909) for the North Sea plaice (*Pleuronectes platessa*, Figure 1 - page 3). Heincke (1913) re-expressed this as a 'law' wherein water depth and/or distance from shore explained most of the observed life history distribution patterns.

The life history characteristics of many species and stocks show generalized two-dimensional patterns, involving water depth and/or distance from shore. For example, FAO (1972) used this approach for many species in their *Atlas of the Living Resources of the Seas*. It is recognized that an inshore/offshore axis may better convey information on structure and processes than an alongshore axis or general geographic map view (Pauly and Lightfoot 1992). A good example of this is demonstrated by comparison of Garstang's map-view of plaice size distribution in the North Sea (Figure 1) with our representation of the same information for the same

Continued on page 4 - Life Histories

The ***Sea Around Us*** project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

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The Sea Around Us website may be found at www.fisheries.ubc.ca/Projects/SAUP/index.htm, and contains up-to-date information on the project.

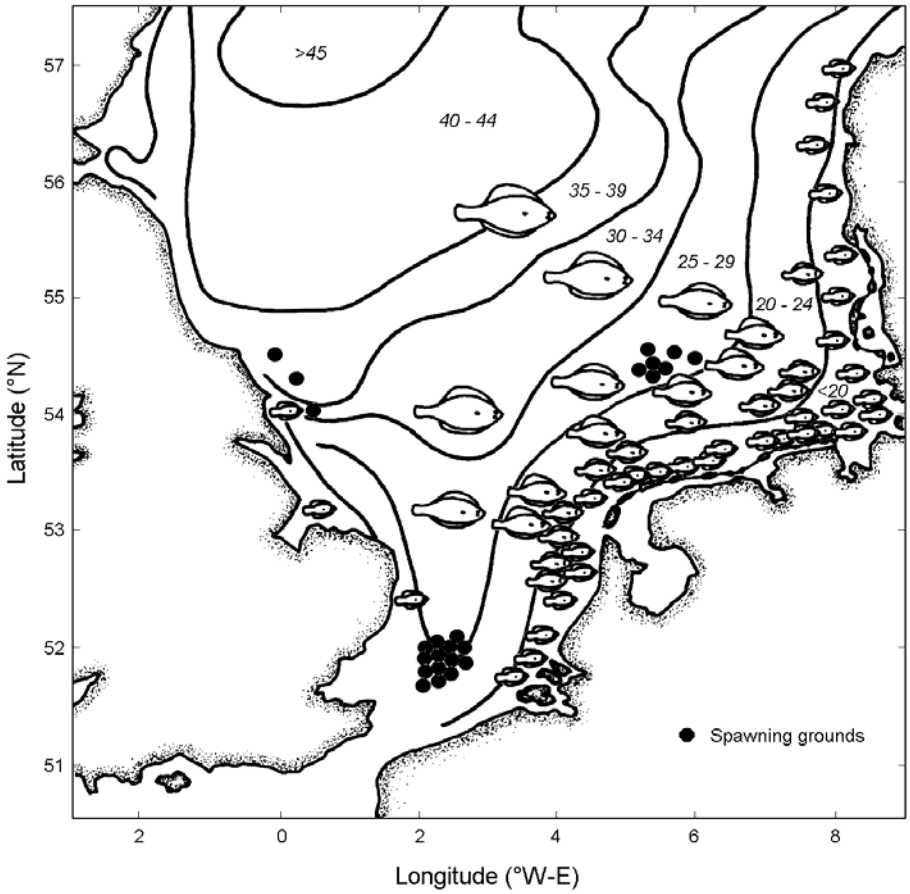

*Figure 1: Schematic representation (geographic map view) of the distribution of plaice (*Pleuronectes platessa*) in the North Sea. Mean sizes (cm TL) are given for each depth isobar (modified after Garstang 1909)*

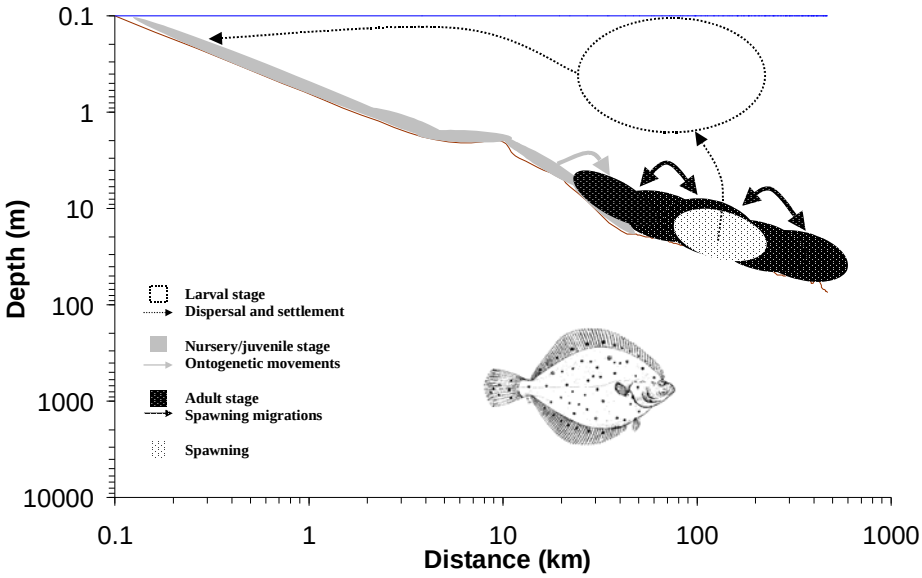

*Figure 2: Generalised life history pattern by depth zone for plaice in the North Sea (*Pleuronectes platessa*). Depth transect from 53.8°N, 8.6°E to 56.9°N, 3.5°E.*

Life Histories - Continued from page 2

species and area (Figure 2 - page 3). Such a transect approach allows the use of icons for key processes, and permits standardization of axis (e.g. log scale), which enables most species or stocks to be directly compared across extensive depth and distance scales. Application of this transect method in the context of the *Sea Around Us Project* will require drawings of similar transects for all important commercial species of the North Atlantic.

The visualization of two-dimensional life history patterns is clearly only a small part in our evaluation of ecosystem effects of fishing (see issue 3, *Sea Around Us* newsletter). Firstly, we will use these transect distributions to help assign catch data to areas such as those described in the classification systems of Large Marine Ecosystems (Sherman and Duda 1999) and 'biogeochemical provinces' (Longhurst 1995). A consensus synthesis approach to these classification systems is being considered by the *Sea Around Us Project* (see Issue 2, Jan/Feb 2000). Secondly, the depth and distance from the coast of major fish population components determines their relative vulnerability to coastal (often small-scale) and offshore (often large-scale) fishing gear and hence potential interactions and conflicts between these different fishery sectors. We will be super-imposing the various scales of operation of each fishery sector onto the life history illustrations of each species concerned. Thus, coastal transects of fish distributions will show different species 'connect', through their life history patterns, different fisheries sectors, such as small with large scale fisheries.

We consider the present approach useful for visualizing the existence, interaction and potential conflicts between different fishery sectors for species or stocks whose life history patterns illustrate the need for improved integration of management of the different fishery sectors. This may apply in particular to rationalization of overcapitalized fisheries. The proposed visualization may be used by management to incorporate the concept of life history interconnectivity between different fishery sectors and may assist in the formulation of more informed policy options for ecosystem-based management of North Atlantic fisheries.

Acknowledgements:

We would like to thank the Environment Project of The Pew Charitable Trusts for their funding of the Sea Around Us Project. Thanks also to Drs Tony Pitcher, Reg Watson and Lore Ruttan for assistance with the depth transects and for comments on an earlier version of this article.

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Dirk Zeller is a post-doctoral fellow with the Sea Around Us project. Daniel Pauly is Project Leader.

Sea Around Us

An Intern's-eye view of the Sea Around Us Project

by Emilie LeBlond

Travel broadens the mind. And in my case, it broadens knowledge too!

When Tony Pitcher and Nigel Haggan told me in an e-mail, "yes, we have work for you in the Fisheries Centre", I said to myself that a new page was about to be turned!! At this time I was a student of one of the five French National Schools of Agronomist Engineers, and my fourth year of study was drawing to a close. There are a great many fields encompassed by Agronomy, including fisheries and the marine environment, and they are the fields I especially chose to study. So having an internship in those fields was a really good means to round off my studies.

Jacques Moreau, a teacher of mine at the ENSAT (*Ecole Nationale Superieure d'Agronomie de Toulouse*), had already told me about the Fisheries Centre and its activities. Subsequently I tried my luck, submitting my application for a summer job to Tony Pitcher. The Fisheries Centre was going to give me an opportunity to work for a research organisation, to learn through contact with specialists, to put my competences in the service of research and of course, to visit Vancouver for the first time of my life, the famous town I had been told so much about!

I had an offer from Jackie Alder to work on a project she was coordinating to assess the sustainability and FAO Code of Conduct compliance of North Atlantic fisheries using Rapfish. As some French fisheries were going to be included in the analysis, she suggested setting up a project whereby I would assess a range of those fisheries and undertake the analysis. That project seemed very interesting to me and even fitted exactly what I was looking for: it was a excellent means to acquire a good background to work in with French fisheries and to enrich my knowledge. I expected to learn a lot about the running of French fisheries and all their aspects. *A priori* I was more interested in the ecological aspects but it turns out that all the aspects are worth knowing and studying, especially when some connections can be established between them.

I have been working on this project for just one month, yet it soon became apparent that it was difficult to study French fisheries without encompassing all the fisheries of Europe – it's common fish stocks and common fisheries policies! Despite the fact that each country has its own perspective of the situation and despite fishermen and governments who tend to behave according to the country's culture. That's why I find the project particularly motivating and captivating: there are plenty of aspects and

Continued on page 3 - Internship

The Sea Around Us Project Newsletter

Issue 5 – July/August 2000

Progress Reports from the

By Dirk Zeller

The life-history depth profile work is continuing (see Zeller & Pauly, Sea Around Us Project Newsletter Issue 4), with life-history depth information gathered for another four species. The list of target species is (slowly) shrinking! Major thanks to Shawn Booth, who is putting a lot of effort and good work into the gathering and assimilating of large volumes of literature and data. I am sure this ability will benefit him in his future as a graduate student at the Fisheries Centre. The associated depth-profile graphics will be generated over the next month, while the depth information is used directly by Reg Watson and his database team to help assign catch data to areas.

With regards to geographic areas and efforts to gather regional catch data to supplement our official databases, a minor societal hick-up is happening at the moment. Our collaborations with colleagues in northern Europe is progressing, although for the time being at a reduced pace. This can be attributed to a phenomenon called "summer", with symptoms that can only be described as "a merry mass-departure to locales sunnier and warmer than northern Europe"!! Despite this seasonal migration, progress has been made. A preliminary dataset from Iceland has been received (thank you Hreidar), and the Faroe data is being assembled as I write this article. Both regions appear to have good data records, and Peter Tyedmers looks set for another two examples to use for his fishing fleet analysis.

Progress has also been made with the building of ecosystem models. Eny Buchary is updating the ecosystem model for the Icelandic area first compiled by Asberr Mendy in 1997. During the FAO sponsored workshop on "The use of ecosystem models to investigate multispecies management strategies for capture fisheries" held at UBC in July, Katia Freire and I completed a preliminary model for the Faroe Island area. Simulations initiated during this workshop, however, indicated that better location specific data is required for the

Continued on page 3 - Zeller

By Reg Watson

The databases for the Sea Around Us project continue to swell with data from around the North Atlantic. Meanwhile plans develop for making estimates of unreported, misreported and discarded catches. A recent visit by Dr Paul Medley provided insights that can be adopted for the estimation of discards. We hope to work with Paul on this and other topics in the future. More recently Dr Guy Fontenelle brought with him fishing catch and effort data from French ports to enrich our database. As in other cases, there seem to many opportunities for rewarding future collaborations. Hreidar Valtysson brought with him a wealth of Icelandic fisheries data going back to the turn of the century. The project expects to receive several additional datasets from consultants over the coming months.

Our work has attracted interest from Ken Sherman's group in NOAA who are responsible for organizing data associated with the world's large marine ecosystems. A recent visit by Cdr Peter Celone provided interesting discussion which demonstrated many common interests. With this and other groups there has been an exchange of spatial data expanding the Project's geographical information system archives.

Reg Watson is Senior Research Associate with the Sea Around Us Project.

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Sea Around Us team

By Sylvie Guénette

At the April methodology workshop, responsibilities were reallocated on geographic basis. As a result, I am now responsible for obtaining catch data and constructing ecosystem models for the southern section of the Eastern Atlantic (France, Portugal, Azores, Spain, Canaries, Morocco). We intend to obtain the total extractions, including discards and unreported catch, in short, any catch that is not included in the ICES catch record. At the moment, important things like vacations and field work are slowing down the process. Nevertheless we have established fruitful collaborations with several countries. For example, the Moroccan catch data has been assembled and Dr Baddyr and I are starting to write a report describing the Moroccan fishery for the period 1950-1998.

Three different ecosystem models are under construction: the Azores Arquipelago, the Bay of Biscay and the Moroccan coast. This tremendous work would not be possible without the help of a dedicated team. The Azores model will be completed soon (I hope) and presented for discussion with biologists of that region this fall. Cam Ainsworth, Bridget Feriss and Emilie Leblond are working on the Bay of Biscay model which should be finished by September. A new student, Richard Stanford, has just undertaken the Moroccan model. Other collaborators will join us during the fall.

Sylvie Guénette is a Post-Doctoral Fellow with the Sea Around Us Project.

Zeller - Continued from page 2

model to be representative. Currently we are in the process of updating model parameters in collaboration with scientists from the Faroe Islands.

Dirk Zeller is a Post-Doctoral Fellow with the Sea Around Us Project.

Internship - Continued from page 1

questions to consider – much more than I had expected!

What seemed really interesting too in the Rapfish project was the possibility of comparing all the countries fishing in the North Atlantic. A lot of people in France asked me, "Do you really need to go as far as Vancouver only to study FRENCH fisheries?" It turns out that the Fisheries Centre is one of the few places where fisheries are studied in a way that encompasses the whole North Atlantic. This is the one of those unusual places where I had the opportunity to take part in such a project.

When I leave the Fisheries Centre at the end of my internship in late August, I will have acquired an overview of the north Atlantic fisheries and especially French fisheries. That's why my training period here is going to be an excellent experience, which will be very useful for my future career! Thus I would like to thank Tony Pitcher, Nigel Haggan and Jackie Alder for allowing me to have this great experience, as well as Bridget Ferriss and Dorothy Schreiber for their invaluable help.

Emilie LeBlond is a student at France's Ecole Nationale Superieure d'Agronomie de Toulouse

LARGE MARINE ECOSYSTEMS

By Daniel Pauly and Reg Watson

In recent years, the formerly generic term 'Large Marine Ecosystem' (LME) has become specific, and is now mainly used for regions of ocean space encompassing coastal areas out to the seaward boundary of continental shelves and the outer margins of coastal current systems. As such, LMEs are regions of the order of 200,000 km2 or greater, characterized by distinct bathymetry, hydrography and productivity patterns (Sherman 1994; Sherman and Duda 1999).

The 50 LMEs (see Figure 1, page 4) identified by Sherman and Duda (1999) are the source of about 95% of the world's annual marine fisheries yields. Also, most of the global ocean pollution, overexploitation, and coastal habitat alteration occur within these 50 LMEs. They provide, therefore, a convenient framework for addressing issues of natural resources management. Moreover, given that most of them border developing countries, LMEs also provide a framework for addressing issues related to issues of economic development.

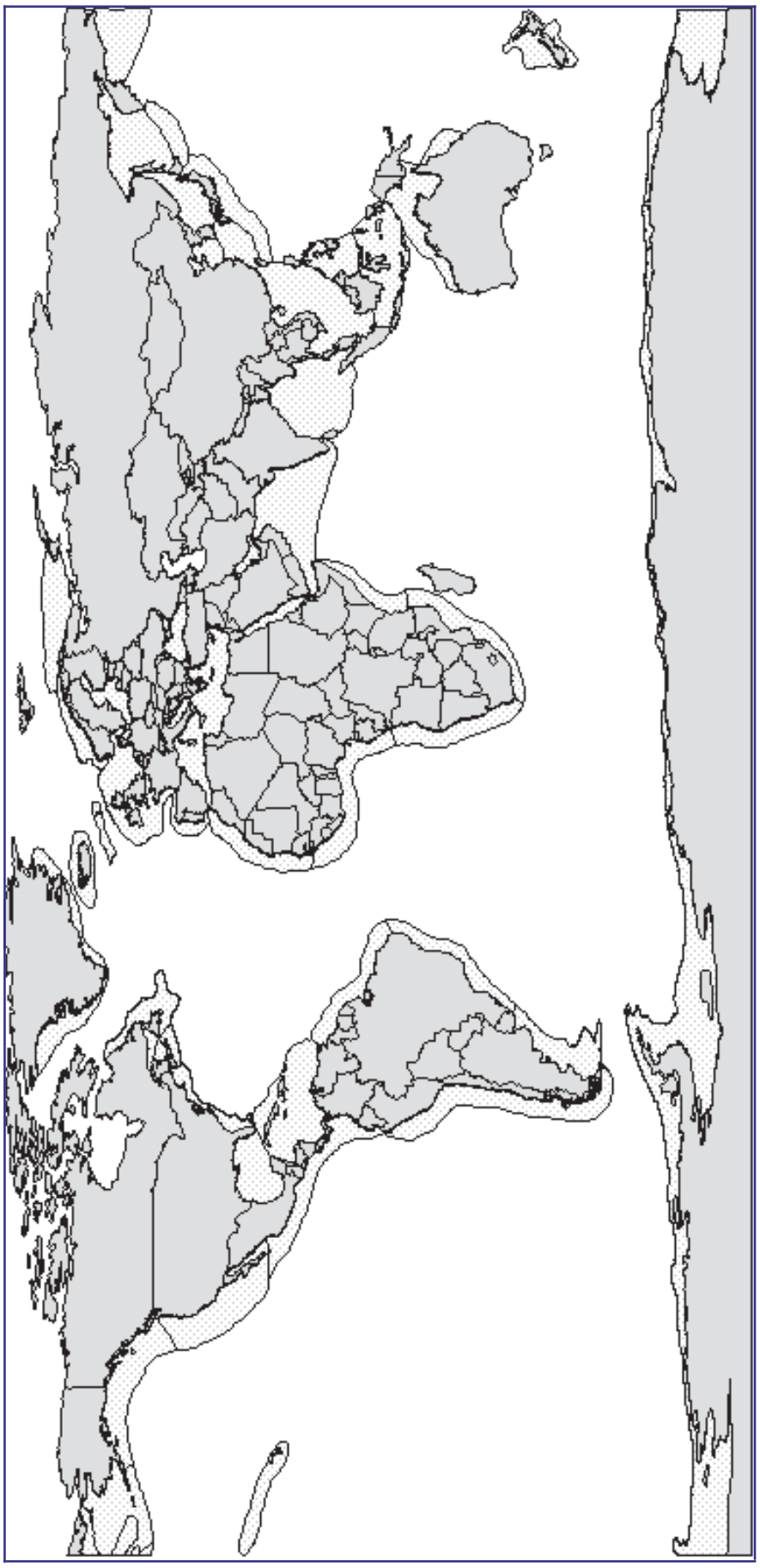

Figure 1: Large Marine Ecosystems shown are areas of the ocean characterised by distinct bathimetry, hydrography, productivity and tropic interactions. For more information visit www.edc.uri.edu/lme

Sea Around Us

Energy Consumption By North Atlantic Fisheries

By Peter Tyedmers

As a result of rising fossil energy prices, we have all been reminded in recent months that western industrial society is profoundly dependent on the availability of cheap, abundant energy. Unfortunately, the world's major industrial energy resources are not only finite, but globally their per capita availability has been in decline since the late 1970s. Furthermore, it is now widely recognised that the scale of humanity's industrial energy use contributes to major environmental problems including global climate change and biodiversity loss.

Like all human activities, commercial fishing entails the dissipation of energy in support of their primary activity, the harvesting of aquatic organisms. And although energy consumption by fisheries receives less attention than the direct impact that fishing has on targeted stocks and associated marine ecosystems, it is precisely the availability of abundant energy that enables most contemporary fisheries to continue even when stocks are in decline. In addition, from a management perspective, energy consumption provides a means of comparing fishing effort between diverse fisheries, and changes in effort over time within fisheries.

Not surprisingly, most research into the energy consumed by commercial fisheries followed the oil price shocks of the 1970s. The results of this and more recent research indicate that:

- Direct fuel inputs to fisheries typically account for between 75 and 90% of total industrial energy inputs. The remaining 10 to 25% are typically comprised of direct and indirect energy inputs associated with vessel construction and maintenance, the provision of fish gear and ice, and labour.
- The energy intensity of a fishery, or the amount of energy consumed per kilogram of fish or shellfish landed, is affected by both biological factors, such as resource abundance and distribution and by the technological aspects of a fishery. For example, the type of fishing gear employed, and to a lesser extent the size of vessel used, can influence the energy intensity of a given fishery. In general, trawling and longlining tend to be more energy intensive than seining, purse seining or more passive techniques, such as gillnetting and trapping.

As part of the *Sea Around Us Project* at the University of British Columbia, I have undertaken an analysis of the energy intensity and total energy consumed by contemporary North Atlantic fisheries. In addition, where data permits, I am also evaluating changes in

Continued on page 2 - Energy

The Sea Around Us Project Newsletter

Issue 6/7 – September-December 2000

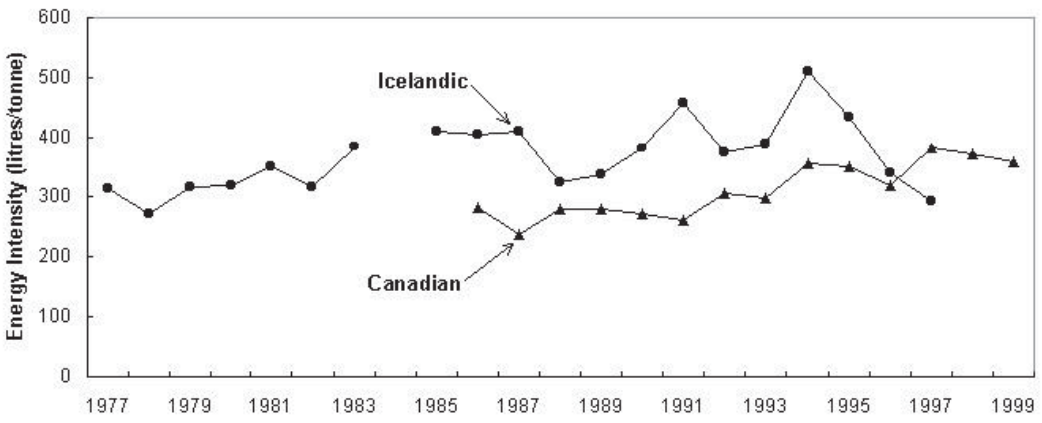

Figure 1: Energy intensity of Icelandic and Canadian scallop dredge fisheries.

Energy - Continued from page 1

energy consumption over time for specific fisheries. As direct fuel inputs account for the lion's share of energy inputs, and because indirect inputs to vessel construction, fishing gear, etc., are difficult to quantify, this analysis is focussing exclusively on fuel inputs.

Two methods are being used to quantify the fuel consumed by fisheries. The first entails soliciting fuel consumption, fishing effort, vessel characteristics and catch data directly from fishing companies. While this method yields robust results, it is a relatively slow, labour intensive process. As a result, a second technique is being employed that uses data provided by fishing companies to establish generic fuel consumption rates, in terms of litres of diesel burned per horsepower•sea-day of effort expended, for various gear sectors. These generic fuel consumption rates are then used to estimate total fuel consumption and energy intensity for fisheries for which fleet-wide catch, average fleet horsepower and total days at sea data are available through the efforts of *Sea Around Us Project* collaborators and consultants from around the North Atlantic.

Using both of these techniques, to date I have estimated the energy intensity and total fuel consumed by approximately 50 North Atlantic fisheries. Taken together they account for almost 5.5 million tonnes (live weight) of fish and shellfish landed annually and range from the high-tonnage purse seine fisheries for Atlantic menhaden, and capelin, to mixed stock groundfish trawl fisheries, to high-value trawl and dredge fisheries for shrimp, lobster and scallop. Notably, for almost half of the fisheries analysed, time series estimates of energy intensity and total fuel consumption have also been possible for periods ranging up to 20 years. For example, Figure 1 illustrates recent changes in energy intensity of both Icelandic and Canadian scallop fisheries.

Peter Tyedmers is a Research Consultant with the Sea Around Us Project. He recently received his Ph.D. in Resource Management and Environmental Studies at UBC.

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Presenting the Sea Around Us Approach

By Daniel Pauly and Reg Watson

Two international conferences, the Annual Science Conference of the International Council for the Exploration of the Sea (ICES), held in Bruges, Belgium, from Sept 27-30th, and the IX Annual PICES (North Pacific Marine Science Organization) meeting, held in Hakodate, Japan from October 20-28th, recently provided opportunities for presenting the concepts underlying the Sea Around Us project, as also described in our recently released 'Methodological Report' (Pauly and Pitcher 2000). (See Page 5 for the table of contents of the report.)

The first of these two ICES presentations was the invited 'Open Lecture' entitled "Fisheries and Conservation: a Program for their Reconciliation", given by the senior author.

This presentation, which started by contrasting the key features and 'clients' of fisheries biology and conservation biology, went on to outline the enormity of the challenge caused by relentless overexploitation of fisheries resources, and their impacts on ecosystems, both culminating in 'fishing down marine food webs'.

The elements of reconciliation between fisheries and conservation biology were then outlined. They included recognizing the legitimacy of the key tenets of each (that fishing should remain a viable occupation; that the ecosystems and their biodiversity are allowed to persist).

This presentation – the first time conservation issues were addressed in the context of an Open Lecture – was apparently very well received, and provided a neat starting point for the mini-symposium that followed up on that lecture, devoted to biodiversity issues, to which several speakers, notably Dr Jake Rice, referred to, suggesting that ICES should give far more attention to this than it has so far.

The ICES governing body, composed of national delegates from around the North Atlantic decided, two days after these events, to create a new, high-level Advisory Committee on Ecosystems (ACE), on par with its fisheries-orientated Advisory Committee on Fisheries Management. It tempting to believe that the contents of this year's Open Lecture nudged a few delegates toward this positive, potentially very important decision.

We also used the opportunity at the ICES Annual Science conference to present another contribution, outlining our vision for a consensus taxonomy of the world's marine ecosystems (Pauly et al. 2000). The goal of this taxonomy is to bring together the extensive information and expertise available in the fields of oceanography and in fisheries science into a compatible framework to produce the synergism required to tackle pressing global issues of over-fishing and other impacts on marine ecosystems. The joint paper was presented by Dr Ken Sherman, the main architect of the Large Marine Ecosystems (LME) (Sherman et al., 1990; Sherman and Duda 1999) which are now defined for most of the world shelf and adjacent oceanic areas, and whose integration with the system of 'Biogeochemical Provinces' (BGCP) developed by A. Longhurst, T. Platt and S. Sathyendranath (Longhurst, 1998) form the core of this paper.

This presentation deepened the interactions between Ken Sherman's group and the FC, and the commitment to develop compatibility of global LMEs where possible with the BGCP of Longhurst and colleagues. This collaboration was strengthened by a recent visit by Peter Celone from NOAA.

It is very pleasing to see the interest that has been expressed in forming a framework for describing marine areas which can hopefully transcend what have been traditional boundaries between research fields.

Thanks to support by PICES, and in particular Dr Ian Perry, Dr Reg Watson had the opportunity to present an invited paper entitled "Mapping fisheries onto marine ecosystems: regional, oceanic and global integrations" at PICES IX in Japan. This paper presented our proposals for

Continued on page 4 - Conferences

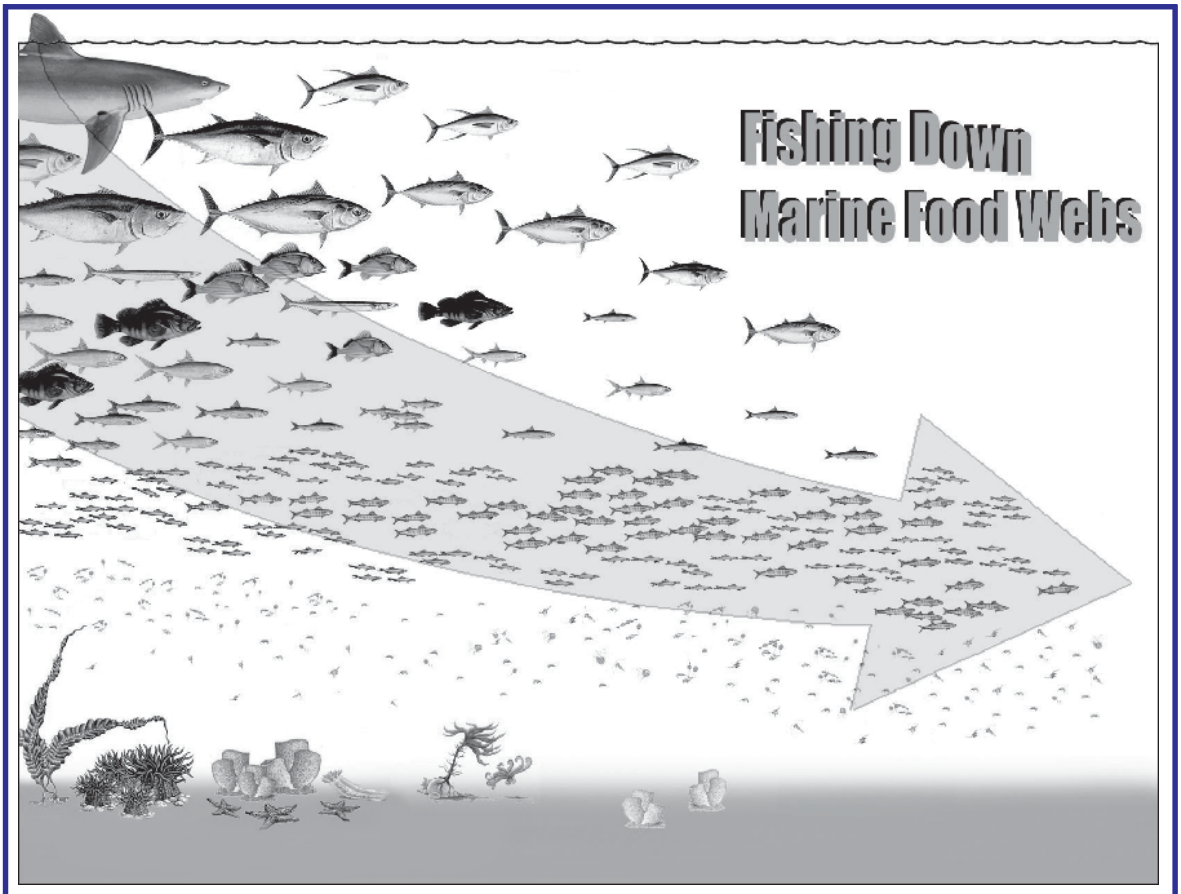

Fig 1. Schematic representation of 'fishing down marine food webs' as presented at the ICES 2000 Open Lecture. The horizontal axis represents both time and the sea bottom, the vertical axis the trophic level; the arrow represents global fishing, which increasingly concentrates on organisms of lower trophic levels, and depletes the large, long-lived species. Based on a colour drawing by Ms Aque Atanacio.

Conferences - Continued from page 3

harmonising the boundaries used by BGCP and LME areas. The talk was well attended and seemed of considerable interest to participants, particularly those involved with coordinating global studies combining oceanography and fisheries such as the GLOBEC program.

It is very pleasing to see the interest that has been expressed in forming a framework for describing marine areas which can hopefully transcend what have been traditional boundaries between research fields. Collaborations made possible by a common data basis will greatly strengthen value work on marine ecosystems.

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Dr Daniel Pauly is Project Leader and Dr Reg Watson is a Senior Research Associate for the Sea Around Us Project.

The SAUP Methodology Report

The Fisheries Centre is pleased to announce that a new report in the Fisheries Centre Research Report series has been published. Edited by Daniel Pauly and Tony Pitcher, *Methods for Evaluating the Impacts of Fisheries on North Atlantic Ecosystems* presents the methodology in use in the Sea Around Us Project.

To order, contact the Fisheries Centre's Events Officer, phone (604) 822-0618, fax (604) 822-8934, or email events@fisheries.ubc.ca. The full citation is: Methods for Evaluating the Impacts of Fisheries on North Atlantic Ecosystems. Fisheries Centre Research Report 2000, Vol. 8 (2), 195 pp, $20.

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Appendices

An Overview of Spatial Mapping of Fishing Grounds of Marine Fisheries

By Ahmed A. Gelchu

My career as fisheries biologist started back in 1992 in Ethiopia. I worked in inland fisheries on Ethiopian rift valley lakes as well as on man made lakes. After serving there for four years I went to Norway for further studies and did a masters degree in Fisheries Biology and Fisheries Management at the University of Bergen. Finally, I immigrated to Canada in 1999 and joined the Fisheries Centre soon afterwards, with the hope of eventually beginning doctoral studies.

Having explained how I came to join the Centre, let me take you directly to the topic of my work here: Spatial Mapping of the Fishing Grounds of Marine Fisheries.

The rationale behind mapping fishing grounds comes from the very fact that all marine species have geographic limits to their distributions. The distributions can be relatively wide in geographic range or restricted as dictated by combinations of factors such as the biology of the fish, and oceanographic, ecological, and climatic barriers. The knowledge of these distributions, and the geographic locations of the fishing areas within the distribution ranges, are of a paramount importance. It helps to relate any changes in fisheries to the peculiar characteristics of each geographic locality, and hence helps to define the ecosystems. Defining the ecosystems in turn enables scientists to see changes in fisheries in light of ecosystem context that would help to bring about effective stock status assessment and make suitable management policies that would maintain the health of the entire ecosystem.

To this end, a primary focus of the *Sea Around Us Project* is to find where the main marine fisheries of the world are taking place. The geographic information is then stored using standard GIS (Geographic Information Systems) techniques, providing an excellent tool to analyse and display spatially-distributed data. The aim is to develop a comprehensive database that will include, among others, the exact address of each economically important fishery in oceans of the world within the systematic hierarchies of various oceanic classification schemes (Domains, LMEs, EEZs, and FAO areas) previously designed. Dr Reg Watson, a scientist in charge of the mapping unit of the project, is developing suitable software for this purpose.

So far, on a global scale, we have identified 61 top species, important in that they account for a significant portion of total world marine catches. Geographic information regarding the fishing grounds (distribution map) has been digitized and registered to common co-ordinate system.

In the coming weeks and months, the task of identifying fishing grounds of the remaining important species will be finished, and eventually most marine species for which there is an important fishery will be included in the database. After this phase is completed, the catches of the world marine fisheries will be allocated to their respective places of origin in the oceans.

We will then be in a better position to address questions of a spatial nature; questions in which the location of one fishery in relation to another, or its specific environment, is the centre of focus.

Hopefully, in the near future, I will be continuing in these areas with emphasis on re-mapping the total catches and effort of global marine fisheries by applying a GIS-based analysis using historical time series of catch and effort statistics for my doctoral thesis. I will work to trace back in time the catches and effort of marine fisheries as far as the availability of data will allow, to visualize how fisheries have been responding to exploitation schemes over space and time, and come up with explanations as to what possible factors were involved in generating the observed trends in each geographical area.

Ahmed Gelchu is a Research Assistant with the Sea Around Us Project.

Sea Around Us

Finding solutions to global fisheries woes in the Galapagos

Thomas A. Okey and Dirk C. Zeller

Of all the marine ecosystems of the world, no two are exactly alike. Indeed marine ecosystems and their characteristics can vary considerably from place to place. This is also true of fisheries within these ecosystems. Perhaps no setting illustrates these differences so profoundly as the Galapagos Islands, approximately 1000 km west of the mainland coast of Ecuador.

The Galapagos are geologically-recent volcanic islands, and the prevailing oceanic currents and wind patterns allowed precious few groups of terrestrial organisms to colonise the islands. For example, large terrestrial predators never arrived, thus enabling the persistence and evolution of a unique fauna and flora including terrestrial and marine iguanas, giant tortoises, and prickly-pear cacti that grow very tall – out of reach of the hungry tortoises. It was a unique assemblage of finches that made the Galapagos world-famous by catching the eye of the young naturalist Charles Darwin, and helping him to develop the theory of evolution by natural selection.

The marine environment of the Galapagos Islands, on the other hand, is characterised by a high level of mixing from diverse ecosystems. One can find components of coral reef ecosystems right next to more temperate water species. Where else in the world can you dive and look at coral reef fish while sea lions and even penguins swim by? This uniqueness is driven by the fortunate circumstances of the location of the islands at the intersection of several water currents, which permit marine organisms from the South American coast, the tropical Central American coast as well the Central Pacific equatorial environments to disperse and settle in this island group. The Galapagos Islands are truly a special place, below as well as above the water surface.

The Charles Darwin Research Station on the Galapagos Islands was an ideal venue at which a group of marine and fisheries scientists from the Americas, Europe, Asia and Africa recently met for an international conference organised by Dr Villy Christensen (UBC Fisheries Centre) and supported by the European Commission and the North Sea Centre, to try and find solutions to fisheries and marine ecosystem problems in the different areas in which these scientists work. Most of the participants presented the results of ecosystem-based research using the food web and fisheries modelling approach Ecopath with Ecosim (EwE). Four representatives of the Fisheries Centre attended the conference (Daniel Pauly, Villy Christensen, Tom Okey, and Dirk Zeller). Among other presentations and an exciting pre-launch of Daniel Pauly's book on 'Darwin's fishes', significant findings from the 'Sea Around Us' project were presented. For example, Dirk Zeller presented the results of spatial ecosystem modelling of the use of closed areas as a fisheries management tool in the Faroe Islands in the north-east Atlantic; Tom Okey presented a framework for

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Unfortunately, like in many other cases before, fishing interests succeed in pressuring decision makers to increase allowable catches beyond those recommended by scientists.

investigating the shading effects of coastal nutrient enrichment on continental shelf ecosystem structure, with special reference to the West Florida Shelf; and Villy Christensen provided an excellent comparison between EwE results and Multi-species Virtual Population Analysis for the North Sea.

Like most of the world's ecosystems, the Galapagos Islands are ecologically degraded to some extent, as the result of large populations of humans finding food, and otherwise making a living. Although the Galapagos Islands are globally unique, many of the pathologies of human activities that affect them are generally similar to those affecting other areas in the world. For example, continuous introductions of alien species and historical removals and extinctions of native species (e.g., giant tortoise) have wreaked havoc on the terrestrial ecology of the islands. Another immediate and dramatic example of the similarities of Galapagos degradation to other settings is the recent violence perpetrated by the lobster fishermen on the islands.

The Galapagos is in the midst of a virtually uncontrolled human migration from mainland Ecuador, as the natural resources along Ecuador's coasts continue to degrade. One effect of this migration has been a considerable increase in the number of fishers trying to make a living on the islands. Like elsewhere, local stocks such as the highly-priced lobster have limits to the amount of fishing pressure they can sustain, and like most places scientists attempt to estimate the amount of removals the individual stocks can maintain before severe depletion or catastrophic collapse of the population occurs. Unfortunately, like in many other cases before, fishing interests succeed in pressuring decision makers to increase allowable catches beyond those recommended by scientists. In the case of the Galapagos, the lobster fishers physically assaulted employees and ransacked facilities of the Ecuadorian National Park Agency and the Charles Darwin Research Centre. For many of the scientists attending the meeting, this local conflict in the Galapagos exemplified similar resource conflicts happening around the world.

Consensus was reached at this international meeting that the ecosystem-based focus of the EwE approach can help to identify and hopefully alleviate the types of conflicts exemplified by the violence that greeted us in the Galapagos. This approach not only enables us to gain insights into the indirect ecological and economic effects of a particular fishery, but it also allows us to analyse the optimisation of different combinations of objectives, be they economic, social, ecological, or legal. Before such grand plans come to fruition, however, a considerable amount of work must be done to refine our knowledge of the systems being analysed. This meeting helped to clarify the work that needs to be done in order to accomplish the goal of ensuring the integrity of ecosystems while allowing for utilisation of marine ecosystems in a long-term sustainable manner.

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Sea Around Us

What we did: A very preliminary report of the first two years of the Sea Around Us Project

By Daniel Pauly

The existence of the *Sea Around Us* project, as for other large projects of this kind, is the results of a gamble by two groups of players: (1) the members of the project, betting that they *can* do what they said they will, and (2) the decision makers of the funding agency, betting that the project members *will* do what they said they can.

The *Sea Around Us* project held its second major workshop from April 22-27 2001 in Nanaimo, Vancouver Island, to evaluate how our part of our gamble worked out. The Pew Charitable Trusts, which funds our project, had nominated several participants to also assess how their part of the gamble worked out.

This is to report that everybody's gamble worked out: the Project did achieve its goal of quantifying the large-scale impacts of fisheries on North Atlantic ecosystems, and the only job still at hand now is to complete the documentation of these impacts through various outlets that the workshop helped to identify.

As argued in the proposal that led to the implementation of the *Sea Around Us* project, evaluating fisheries impacts on the North Atlantic as a whole, i.e., at basin-wide scale, is not matter of assembling a number of illustrative case studies from sites deemed representative of the entire basin. (Many such compilations already exist, and they tend to be dismissed, as one can always argue that the examples are not representative.) Rather, the job is to identify key data sets capable of being 'mapped' at large scales, similar to the data-rich weather maps which, while covering entire continents, still allow direct prediction of the likelihood of sun or rain at any specific locality.

One year ago, the *Sea Around Us* project held a workshop to review, with the help of our partners at FAO and in other institutions, the conceptual toolkit that we thought would help us generate the required maps. (The contributions included in this report are available online at www.fisheries.ubc.ca)

During this year's workshop, we got to look at our first set of freshly produced maps (all with a resolution of ½ degree latitude and longitude). These were:

1) Maps of fisheries catches, for the world as a whole, and the North Atlantic in particular;

2) Maps of North Atlantic catch values;

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3) Maps of fish biomass in the North Atlantic

4) Maps of dietary overlap between North Atlantic marine mammals and the fisheries.

...everybody's gamble worked out: the Project did achieve its goal...

The catch maps were generated using a rule-based algorithm developed by Reg Watson, running on FAO statistics and other data assembled by Ahmed Gelchu and other members of the *Sea Around Us* team. They allow immediate identification of complex patterns, be they due to problems in the underlying database of catch series, or due to forcing by biological, physical or other natural processes. Though they were very well received, we are still a bit coy at showing these maps (and hence this article will not present any), as they still need some improvements before they are submitted to peer-reviewed journals.

Multiplying catches by their price allows the values of fisheries to be estimated, and these can also be mapped. However, the work required to produce such maps can be daunting. Still such maps did emerge for presentation at our workshop, based on price information assembled by project economist Rashid Sumaila. We expect these maps, once published, to provide a richly patterned, visual complement to the time series commonly used to assess the economic state of fisheries.

Maps of fish biomass are not frequently used to evaluate the status of fish populations, though acoustic, bottom trawl and plankton surveys methods exist which generate spatially structured biomass data. Villy Christensen, assisted by Carl Walters, thus undertook to 'spatialize' the 18 Ecopath models of North Atlantic ecosystems so far available, either produced by earlier projects, or by international teams of project collaborators led by Sea Around Us postdocs Sylvie Guénette and Dirk Zeller. (While covering only about ¼ of the North Atlantic, these models cover over ¾ of the shelf areas in the North Atlantic, and hence the bulk of the fishable biomass).

An elaborate regression model was produced which predicted biomass by trophic level for any ½ degree square in the North Atlantic (since 1950) based on a relationship between established Ecopath models, mapped catch data and other factors such as distance from the coast, depth, year, water temperature, presence of ice, etc. The resulting, rather spectacular maps, document a decline of fish biomass in the North Atlantic, for the period from 1950 to the late 1990s, notably at high trophic levels, and thus provide an illustration, in space, of the 'fishing down marine food webs' phenomenon.

The fourth set of maps we discussed were developed by Kristin Kaschner with assistance from R. Watson, V. Christensen and others; they identify the areas where the food (type, quantity) taken by marine mammals (cetaceans or pinnipeds, or subgroups thereof) overlaps with fisheries catches, and thus leads to competition. (The reason for the increasingly frequent sightings of emaciated marine mammals.)

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SAUP 2001 Workshop – A Milestone

By Yvette Rizzo

In the last week of April the *Sea Around Us Project* (SAUP) team, other fisheries scientists and others from a number of North American conservation-oriented NGOs met in Nanaimo on Vancouver Island to wrap up the first two-year phase of the project. The principal theme was communication – or now that the science is done, how do we send the *Sea Around Us* message to the world?

This was the second meeting on the island since the Fisheries Centre launched this Pew funded venture in August 1999. It was also the second time Amy Poon and myself were rapporteurs together for the SAUP. The methodology review workshop held in May 2000 marked the end of the first year of the project - a year devoted to developing new tools for ecosystem management and assessment of fisheries that would be applied to the North Atlantic in the second year. In last year's workshop the methodology package central to the SAUP was presented to a group of external scientists.

This year, Jay Maclean, the project's scientific writer, worked hard until late the night before departure-day to finish the first draft of *In a Perfect Ocean*. The book will be published by Island Press early next year. It will put together the main findings of the first phase of the project and translate the science into an illustrated narrative of the environmental consequences of half a century of intensive fishing in the North Atlantic. The principle target audience is the conservation community. However, it should also be of interest to fisheries scientists, managers and policy makers as well as that part of the general public interested in environmental affairs. The idea for the workshop was for the environmentalists to help the scientists make *In a Perfect Ocean* an effective tool that would be used by the conservation community worldwide to demand major changes in fisheries policy. The task was entrusted to Carl Safina, Vice President for marine conservation in the National Audobon Society, Ms. Nancy Baron from Seaweb, Ms Lisa Speer, a senior policy analyst from the Natural Resources Defense Council and Dr David Allison, President of Fish Forever and co-chair of the Marine Fish Conservation Network. Also present at the workshop were Jay Nelson from the Pew Charitable Trust, fisheries scientists Richard Grainger and Kevern Cochrane from FAO, and Dr Andy Rosenberg from the University of New Hampshire. By bringing together fisheries scientists and environmentalists in this way, the workshop addressed one of the key goals of the Sea Around Us project – promoting integration of and collaboration between these two groups that are too often on opposing sides.

...now that the science is done, how do we send the Sea Around Us *message to the world?*

Participants arrived in Nanaimo on Sunday evening for a welcome

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Other, equally important project results were presented by Tony Pitcher and Jackie Alder (evaluating the sustainability of North Atlantic fisheries, and the performance of international fisheries management bodies), by Gordon Munro and Rashid Sumaila (evaluating the magnitude and effects of subsidies to the fisheries sector, and the relative performance of small and large scale fisheries), and by Peter Tyedmers (estimating the fuel consumption of North Atlantic fishing fleet). These studies either presented data that will later be mapped, or concepts that will help interpret these new maps.

We leave it to forthcoming issues of this newsletter to announce the uses and outlets that will be found for these products. What we can already anticipate, however, is that the 'mapping approach' developed by the *Sea Around Us* project should have a strong influence on the way fisheries are perceived to impact marine ecosystems, and on the identification of the scale at which these impacts are best studied.

Daniel Pauly is Principal Investigator of the Sea Around Us Project.

...SAUP has a powerful message that ranks as strong as global climate change...

SAUP Milestones
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dinner. The workshop took off the next morning with a welcome address from the project chair, Tony Pitcher. Jay Maclean then introduced the draft version of *In A Perfect Ocean,* which had been distributed to all participants. In the first three days, the principal investigators of the SAUP presented a summary of the methods and results of the major studies for the North Atlantic. The focus of the workshop was on Wednesday morning with a discussion among all present on the main issues concerning the what, how, when and where of the publication process. Most of the external visitors left soon after that, except for David Allison who stayed on until the end ("This is too much fun!"). The final day of the workshop was an internal team meeting to define the logistical details for the wrapping up of the first phase of the SAUP. The debate concerned the 'rollout' procedure for the book, how to finish the science, publication of the relevant blue reports, that is Fisheries Centre Research Reports, and scientific papers in primary journals.

After the meeting, which lasted well into the afternoon, we all had a fabulous dinner at a Lebanese restaurant – highly recommended to any visitor in Nanaimo particularly for the delicious rose-water pudding – and prepared to leave for the mainland early next morning, a day earlier than originally planned.

This workshop gave me an insight of what the Sea Around Us Project is all about and I really enjoyed the feeling of being part of a groundbreaking event that prevailed throughout the week. Because what emerged from the workshop was that the SAUP has a powerful message that ranks as strong as global climate change. It is the first scientifically-based picture, changing in time and space, of the fundamental changes in the marine ecosystems of the North Atlantic that have happened as a result of fishing pressures. It is a concept that can be applied to the world oceans. Just like climate change, the causes are deeply embedded in our material culture. To reverse the trend, as we must, a change in our philosophy of life is required – patchwork solutions won't work.

We hope that the publication of *In a Perfect Ocean* will help.

Yvette Rizzo is a PhD student at the Fisheries Centre, and, along with Amy Poon, she served as Rapporteur at the April Sea Around Us workshop.

Putting Faces to the Names: Some of the Sea Around Us team

Dr Daniel Pauly
Principal Investigator

Mr Nigel Haggan
Project Co-ordinator

Dr Tony Pitcher
Chair, Project Steering Committee

Dr Villly Christensen
Senior Research Fellow

Dr Rashid Sumaila
Senior Research Fellow

Dr Reg Watson
Senior Research Fellow

Sea Around Us

The Sea Around Us: Some activities planned for 2001-2002

By Daniel Pauly

The first two years of the Sea Around Us Project (July 1999 to June 2001) are completed, and so - largely - is our coverage of the North Atlantic, which led to rather impressive results. The reason why these have not been noticed by more than those colleagues who participated at meetings where they were presented orally, is that it takes some time for just-completed reports and journal articles to be published. Thus, it is only in the next months that our quantitative analyses of the impact of fisheries on North Atlantic ecosystems will become widely available.

Also, some highlights from our work will be presented in the form of a mini-symposium on "Fisheries-Induced Changes in Marine Ecosystems" to be held in Boston, on February 16, during the 2002 meeting of AAAS.

In the meantime, the project staff are retooling (see e.g., article by Sumaila, on fish trade), and getting ready to tackle the regions to be covered in year three of the project, viz. the Central and South Atlantic, the former including the Gulf of Mexico and the Caribbean in the West, and North West Africa and the Gulf of Guinea in the East, while the latter is to cover the rest of the Atlantic all the way to Antarctica.

Our studies will include among others (i) the spatial integration of ecosystem studies previously conducted in the Gulf of Mexico; (ii) the reconstruction of deficient catch time series in the Caribbean and West Africa; (iii) the establishment of a sound baseline to evaluate changes in the status of West African ecosystems; (iv) the inclusion of biomass time series in Ecosim analyses of the pelagic ecosystems off South America and South America; and (v) an examination, using Ecopath with Ecosim, of the interactions between key elements of the Antarctic ecosystem.

The results of these studies will feed into the global fisheries catch and other maps that we have begun to develop (watch the Fisheries Centre web site this fall).

This is a lot of work, and it is obvious that it can be tackled only in collaboration with a vast number of local and regional colleagues, whom we have begun to identify and contact. One of the first fruits of these interactions is the planning, recently initiated, of an international symposium on "Marine fisheries, ecosystems and societies in West Africa: half a century of changes" to be held in June 2002 in Dakar, Senegal, West Africa.

The symposium's goals are to examine how the shelf ecosystems, modes of exploitation, and governance of fisheries in West Africa (Morocco to South Africa) have changed as a result of the widespread increase in fishing pressure from the 1950s to the present. All contributions are expected to address long-term

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2001 Oscar E. Sette Award Recipient

On August 20, 2001, the Sea Around Us PI, Dr Daniel Pauly, was awarded the 2001 Oscar E. Sette Award. This award for outstanding lifetime contribution has been presented annually since 1991 by the Marine Fisheries Section of the American Fisheries Society. Past award winners include, among others, Lloyd Dickie, Douglas Chapman, Saul Saila, William C. Leggett, William E. Ricker, and Edward D. Houde.

Congratulations to Dr Pauly from everyone at the Sea Around Us Project!

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changes, contrast the present situation with earlier baselines, and, based thereon, to evaluate the impacts of fishing, interpret prevailing trends, and propose alternative policy scenarios.

For a number of practical reasons (notably having to deal with two languages without assured funding for simultaneous translations), the symposium will be divided in two parts: (1) a two day session dedicated to present the results of the 'SIAP' project, based in Conakry, Guinea, funded by the European Commission (EC), and devoted to the analysis of ecosystem changes in Cape Verde, Gambia, Guinea, Guinea Bissau, Mauritania and Senegal), and conducted in French; and (2) a three-day session for presentations from other parts of West Africa, and global perspectives relevant to the West African experience, to be conducted in English.

The participants will be invited researchers, fishery managers, and representatives of non-governmental organizations (NGOs), notably of conservation-orientated NGOs. The Symposium's Local Organizing, Coordinating and Scientific Committees are composed, among others, of representatives of the following institutions: SIAP project; Sub-Regional Commission of Fisheries (CSRP, Dakar, Senegal); Centre for Oceanographic Research of Dakar-Thiaroye (CRODT), Dakar, Senegal; Institute for Research and Development (IRD), France; Fisheries Committee for the Central-eastern Atlantic (CECAF), Accra, Ghana; and The Sea Around Us Project.

External support will be sought to help fund various elements of the symposium (translations, rentals, publications) and to subsidise participants' travelling expenses. Various means of diffusing the symposium's results will be explored, in addition to a complete set of proceedings; and a special issue of a scientific journal.

Another related activity recently initiated by the *Sea Around Us* Project is the re-encoding of data from the famous Guinean Trawling Survey, conducted in 1963-64 on the West African shelf, from Gambia in the Northwest to Congo in the Southeast This will make available to West African and other researchers a dataset that had been inaccessible for decades, but also to provide a baseline for evaluating changes in ecosystems that were then largely unexploited.

Contact us if you are interested.

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How global is world fisheries trade?

By Ussif Rashid Sumaila

The extent to which the market for fish and fish products have been globalised has been so far investigated mainly by comparing the prices of a given type of fish in different parts of the world. For instance, Ashe and Hannesson (in press) compared the prices of different forms of whitefish in Europe and North America. They found that prices of the same product of whitefish are 'co-integrated' not only among European countries but also across the North Atlantic, to North America. They therefore concluded that the market for whitefish is global, thus confirming a preliminary analysis by Hannesson (1999).

The degree of globalisation in the trade for fish and fish products can be quantified by looking at fisheries trade flow data reported in FAO (2000). The basic hypothesis is that fisheries trade is not global if a large percentage of the value of landings in each region of the world remains within the region. The converse would imply that world fisheries trade is global.

FAO (2000) reports data on fishery trade flows for 1995 to 1997. Table 1 was extracted from the data therein, and presents: (i) the total traded value of fish caught in each of 18 regions of the world, (ii) the part of this value that remains within the region, and (iii) the percentage of the total traded value of catch that is exported out of the regions.

Overall, Table 1 shows that up to 77% of the total world traded value of fish between 1995 and 1997 were exported to regions outside of those that generated the catches. For all regions of the world except North America, Eastern Europe and the European Union (EU), over 90 percent of the values of catch are exported. The EU exports about 20 percent of their catch values, while North America exports just over 70 percent. The developing regions of the world, as expected, export very large percentages of their fish values. In the case of West Africa, for example, about 97 percent of fish values produced in the region are

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Table 1: Trade values (average 1995-1997) by region of the world (US$ Million)

	Traded value		% Outside region
Regions	**Total**	**Within region**	
Oceania (developing)	308	0.01	100
Northwestern Africa	914	0.13	100
Southern Asia	1,776	10.09	99
Central America	1,493	29.72	98
Western Europe (non-EU)	5,197	124.32	98
Eastern Africa	587	17.78	97
Western Africa	1,109	35.77	97
Caribbean	346	14.43	96
Central Africa	63	2.96	95
Oceania	1,430	97.86	93
China	4,978	364.68	93
South America	5,880	450.01	92
East and Southeast Asia	9,482	801.93	92
Near-East	344	35.88	90
Eastern Europe	311	40.75	87
Northern America	6,046	1,670.76	72
European Union	10,068	7,928.63	21
Other regions	4,552	174.16	96
Total	**50,332**	**11,626**	**77**

...to deal with fisheries problems in an effective and comprehensive manner, we need global level studies of fisheries to support global level fisheries management policies.

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exported. These numbers indicate clearly that the market for fish and fish products are global.

A comparison with a major food crop further stresses the point made here: only 4–5 percent of global production of rice was traded in the global market from 1980 to 1995 (Maclean 1997). The contrast with fish is glaring, even though the percentage for rice refers to tonnage, and the numbers in Table 1 to values.

This simple analysis shows that most of the values derived from fish caught from various regions of the world are exported. We interpret this to mean that the market for fish and fish products are highly global. The implication of this conclusion is that to deal with fisheries problems in an effective and comprehensive manner, we need global level studies of fisheries to support global level fisheries management policies. This if anything provides a reason for the broad geographical scope of the Sea Around Us project.

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Sea Around Us Principal Investigator briefs Pew Ocean Commission

The Pew Oceans Commission has been set up in 2000 to study and report on threats to living resources in US waters and the measures needed to restore and sustain the health of the marine environment. The Commission, composed of leaders from business, science, government, and the conservation and fishing communities, includes members from all of the coastal regions of the USA and federal, state and local governmental perspectives. The principal focus of the Commission will be its report to Congress containing the recommendations of the members that is scheduled for publication in February 2002.

In addition to preparing its formal report, the Commission also works to increase public understanding of the principal threats to marine biodiversity, and to educate the public about the importance of coastal resources to the US economy. This is accomplished through interim papers and reports issued by the Commission, extensive use of the Internet and other media, and through regional hearings.

One of these regional hearings, held in Rockland, Maine, provided an opportunity for Daniel Pauly, Principal Investigator of the Sea Around Us to present on June 12, 2001 recent project results, notably maps of fish biomass showing a broad and accelerating decline across the North Atlantic.

We hope that the Commission will succeed in reining in, at least for the USA, the excess fishing effort that is causing this decline.

Sea Around Us

The Sea Around Us Project: July 2001 to April 2002

By Daniel Pauly

Although still young - it started in July 1999 - the Sea Around Us Project (SAUP) is now having a strong impact on the fisheries science and marine conservation communities. During the first two years of the project, we developed a method for mapping global fisheries catches, which was meant to allow the visualisation of catch trends in a manner radically different from any previous attempt, and at a much larger scale (Pauly and Pitcher 2000). It was hoped that this mapping, combined with other innovative analyses of fisheries, would not only allow to gain new insights about their impact of the underlying ecosystems, but also allow communicating the resulting insights to a wide range of audiences.

Mapping global fisheries initially was a vision, outlined in the proposal that led to the creation of the project. Then it became a plan. In November 2001, it became reality when we published the first paper based exclusively on that methodology, entitled "Systematic distortions in world fisheries catch trends" (Watson and Pauly 2001). This study had a huge scientific and media impact (including e.g., an editorial in the New York Times), though opinions differ on how to interpret its key finding, i.e., that China over-reports its marine fisheries catches sufficiently for world catch trends to be distorted (going up in the 1990s, rather than down, as they did in reality). We have actively participated in this debate and we will continue to do so; interested readers might want to visit our web site (www.fisheries.ubc.ca/projects/saup) for a documentation in media such as television, radio, newspaper and magazines.

In the fall of 2001, we were informed, as well, that a proposal had been approved that we had submitted to the American Associations for the Advancement of Science (AAAS), suggesting that we hold a symposium devoted to 'Fisheries-induced changes in marine ecosystems' during the AAAS meeting held in Boston in mid-February 2002. As well, AAAS offered to organise a much-coveted 'press briefing' on our behalf (see article by Reg Watson, this issue). Jointly with a well-attended press briefing, this symposium generated yet another media outburst, this time about the status of the North Atlantic, whose fish biomass we showed to have been declining for the last fifty years. This finding, beautifully mapped in the presentation by Villy Christensen, was supported by other studies initiated by the SAUP, documenting declines in the fuel efficiency of the fishing fleets, massive level of subsidisation and other pathologies.

The strong evidence we presented, combined with the excellent collaboration with COMPASS (Communication Partnership for Science and the Sea), notably Ms. Nancy

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...a rather stunning butterfly, with beautiful colour maps on its wings...

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Baron, led a number of journalists, e.g., from *The Economist*, to pick up what they saw as a good story; thus, we even 'made' the cover page of the *Boston Globe* (see our webpage and *FishBytes* 8(3) (May/June 2002) for a documentation of the extensive coverage of these events). In addition to this broader outreach, much energy was devoted to targeted briefing of decision makers, notably the Pew Ocean Commission, the U.S. Ocean Commission and, on April 12, the US House of Representatives' Ocean Caucus. Other outreach activities include the start of work on a contribution to appear in *Scientific American* and other widely read magazines, and the completion and submission of a commissioned review of global fisheries to *Nature*, where it should appear as part of an 'insight' section devoted to issues of sustainability and food security. Also, the SAUP will participate in the work of the Millennium Ecosystem Assessment (MA), as this author has been invited to become one of the MA's 'Co-ordinating Lead Authors.'

Our analytic work on the North Atlantic, however, is gradually entering a new, calmer phase, where the contributions documenting our work and included in Fisheries Centre Research Reports (all of which can be downloaded from our website) are gradually turned into submissions for primary journals. Also a book entitled *In a Perfect Ocean: Fisheries and Ecosystems in the North Atlantic* by Daniel Pauly and Jay Maclean has been submitted for publication by Island Press. At the same time, project staff have begun working on the rest of the Atlantic, notably the Caribbean (see article by Dirk Zeller and Elizabeth Mohammed, this issue) and in West Africa, where an international symposium involving a number of African and European partners and initiated by the SAUP will be held in late June (see the SAUP website and *FishBytes* 8(3) (May/June 2002) for details).

Though the third year of the SAUP is not yet completed, we can already see that this will be later viewed as the year in which we metamorphosed from a drab, caterpillar-like research project, peacefully munching on the rich growth of marine fisheries data, into what I frankly think is a rather stunning butterfly, with beautiful colour maps on its wings.

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Our mailing address is: UBC Fisheries Centre, 2204 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Melanie Power, *Sea Around Us* Newsletter Editor.

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The Sea Around Us Project runs a successful marine symposium at AAAS

By Reg Watson

On February 16th of this year, the Sea Around Us Project (SAUP) organised a symposium at the annual American Association for the Advancement of Science in Boston. As part of the overall theme of 'Science in a connected world,' the SAUP symposium focused on 'Fisheries-induced changes in marine ecosystems.' Contributors came from around the North Atlantic, with most, however, having strong links with the Project. The symposium presented evidence of impacts of fishing on marine ecosystems as well as the means to mitigate these impacts, and to rebuild these systems. One of the overall aims was to identify management policies that reconcile the extraction of living resources for food with the conservation of biodiversity and the maintenance of ecosystem services. The symposium presented multidisciplinary scientific results on how to return marine ecosystems to healthy states which is vital to achieving sustainability in the global economy.

Daniel Pauly was the convener, and hence introduced the symposium and its contributors. The first talk was by Reg Watson, on "A rule-based approach to construction of fisheries catch distribution maps". This was illustrated with a number of maps showing changes in catches in the North Atlantic since 1900. Reg also presented a figure showing changes reductions in the amount of seafood per capita for the North Atlantic region since 1950 to the present (Figure 1, overleaf), a trend earlier demonstrated to occur on a global scale (Figure 2, overleaf). Reg also presented data from Peter Tyedmers' work (formerly at UBC and now at Dalhousie University in Halifax) showing reductions in the energy extracted from harvested seafood, compared to that required to harvest them. Reg also summarized key results of work by Rashid Sumaila and Gordon Munro showing the extent of subsidies in North Atlantic and explained how we allow failing fisheries to continue.

Alida Bundy from Canada's Department of Fisheries and Oceans' Bedford Institute of Oceanography presented "The ecosystem of northern cod: pre and post collapse". This included insights into changes in the ecosystems and diets of fishes which may explain this major fishery failure, a fact noted in a subsequent write-up by *The Economist* (21st February), which also commented on the issue of subsidies raised addressed in Rashid Sumaila's work.

Hreidar Thor Valtysson from the University of Akureyri in Iceland, a former student of Carl Walters at the Fisheries Centre, presented "A century of change of Icelandic fisheries and ecosystems". This talk demonstrated the wealth of data that Iceland has collected for more than a century but revealed that there are now problems with their important cod fishery, notably a clear trend of declining trophic levels, indicating that Iceland is not immune to 'fishing down marine food webs'.

Villy Christensen presented "Long-term fisheries-induced changes in vertebrate biomass in the North Atlantic". This talk, based on integrated ecosystem studies and modelling, presented graphic evidence of biomass changes in higher trophic level fishes in the North Atlantic since the 1900s, but also showed a huge increase in fishing mortality over the same time period.

[there was] ...considerable media interest in the findings of the symposium.

Rashid Sumaila presented a talk on the "Economics of overfishing and rebuilding North Atlantic ecosystems". He introduced a novel and very important insight into how discounting calculations can explicitly consider future generations when development and mitigation plans are evaluated.

Andy Rosenberg from the University of New Hampshire summarised most of the issues presented earlier in his "Ecosystem rebuilding: prospects for regional and national fisheries management plans". Andy was able to use his experience as a former senior manager with the U.S. National

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Marine and Fisheries Service to put changes in North Atlantic fisheries into perspective. He stressed that, unfortunately, some recent improvements in the status of a few stocks in the Northeastern US appear quite small compared to the long time decline that has preceded them.

Daniel Pauly then led a lively discussion period. Following the symposium Daniel, Andy and Reg attended a packed press briefing, expressing considerable media interest in the findings of the symposium. See the SAUP website for the resulting media coverage.

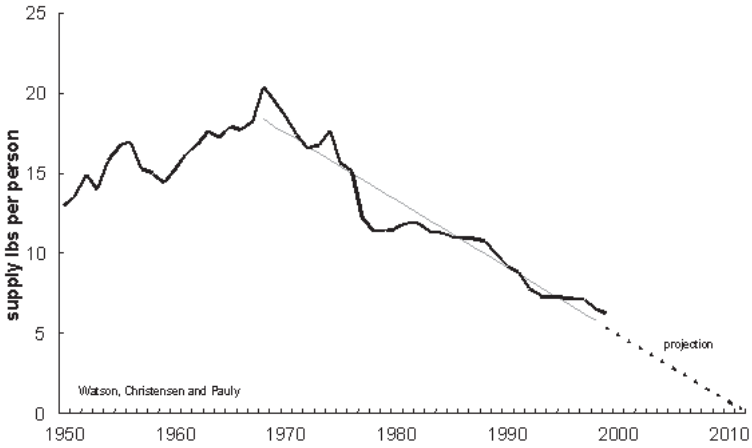

Figure 1. Supply of tablefish (finfish of trophic level 3.75 or higher) since 1950 for the North Atlantic basin based on FAO catch statistics and population projections from the U.S. Bureau of Census. These are the most sought after fish species and include cod, saithe, haddock, hake and tuna (This graph was part of the material distributed at the SAUP press briefing held February 16, 2001, during the AAAS Meeting).

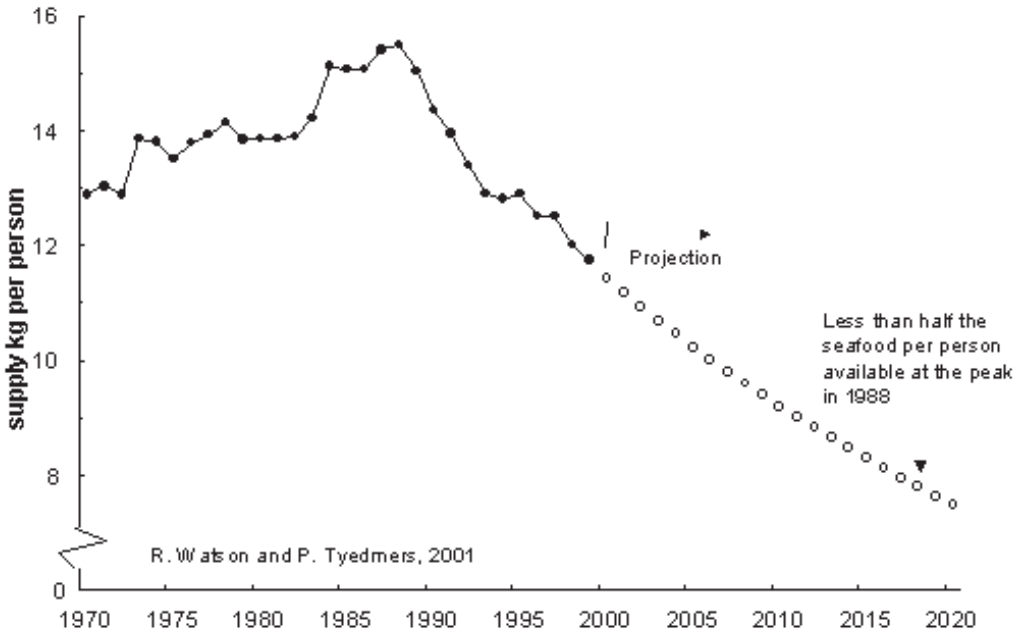

Figure 2. Global seafood per person since 1970 based on population projections by the U.S. Census Bureau and changes in fish landings (with Peruvian anchoveta) presented in Watson and Pauly in Nature *(November, 2001). This graph was part of the press release prepared by COMPASS in November 2001 to highlight the results in that contribution.*

The Sea Around Us project in hot water

By Dirk Zeller and Elizabeth Mohammed

The Sea Around Us project has now entered, among many other things, the hot waters of the Caribbean ('hot' compared to the generally frigid waters of the North Atlantic). With a background in tropical marine ecology and coral reef fisheries research Dirk Zeller is again feeling 'at home', coordinating the project's efforts in the Central Western Atlantic region (FAO Area 31) with the able assistance of Shawn Booth. Hailing from sunny Trinidad, Elizabeth Mohammed is pursuing research toward a PhD thesis on the history of the fisheries of the island chain of the southeastern Caribbean, including St Lucia, St Vincent and the Grenadines, Grenada, Barbados, and Trinidad and Tobago. Other countries in the region feature also prominently in the Caribbean area, among them Cuba, Venezuela, Columbia, Belize, the Turks & Caicos Islands, and Bermuda.

Several key collaborators in the region are associated with the project. In Cuba, Julio Baisre, the Director of Fisheries Management, Ministry of Fisheries, has been instrumental, by providing and assisting with the analysis of the outstanding long-term series of Cuban fisheries catches which have also formed the foundation for his FAO report chronicling Cuban fisheries catches from 1935-1995 (Baisre 2000). Furthermore, the excellent documentation on the 'Ecology of the Marine Fishes of Cuba' in Claro *et al.* (2001), has given us the opportunity to improve our accounting of shrimp fisheries by-catch. We are also exchanging ideas and data with Ian Joyce of Douglas College, Greater Vancouver, B.C., who works on the history and performance of the Cuban shelf fisheries (Joyce 1997, 1999). In Venezuela, we are working closely with Jeremy Mendoza, from the Universidad de Oriente, a long term Ecopath collaborator. Jeremy, having co-authored a volume on fisheries resources and catches in Venezuela (Novoa *et al.* 1998), is collaborating with us on the reconstruction and spatial allocation of Venezuelan fisheries catches. While the period since 1985 is well documented, we are in the process of extracting earlier time periods from local library and database sources. Camilo Garcia in Columbia has obtained independent national funding to reconstruct Columbian catch time series, and we are collaborating with his group in this endeavour. Murray Rudd, formerly of UBC and now working for the Canadian Department of Fisheries and Oceans, is authoring a report on fisheries in the Turks & Caicos Islands. Even Bermuda, located at the northernmost margin of both coral reef distribution and of FAO Area 31, presents an interesting case. Brian Luckhurst, from the Bermuda Fisheries Division, is providing us with interesting time series of catches going back to the 1970s.

Liz Mohammed is focusing her research on reconstructing fisheries catches and fishing effort for the island chain of the Southeastern Caribbean, from 1950 to the present. Using the reconstructed data the impacts of fishing on both the inshore (reef and shelf) and offshore (large migratory pelagic) resources are quantified. While the time coverage of available catch data is different for the respective islands, the reconstructed catches turn out to be very useful as input and validation time series to a marine ecosystem model for the region.

The primary data sources are the Fisheries Departments of the respective islands, and a large number of people are collaborating with Liz, e.g., Ann Marie Jobity (Director of Fisheries) and Christine Chan-A-Shing (Fisheries Officer) in Trinidad; Arthur Potts (Director of Fisheries) and Alexander Thomas (Data Collector) in Tobago; Stephen Willoughby (Ag. Director of Fisheries) and Christopher Parker (Fisheries Officer) in Barbados; James Finlay (Director of Fisheries) and Justin Rennie (Fisheries Officer) in Grenada; Leslie Straker (Fisheries Officer) and Cheryl Jardine (Data Manager) in St Vincent; Vaugh Charles (Chief Fisheries Officer) and Williana Joseph (Fisheries Officer) in St Lucia. General fisheries information useful for interpreting observed trends in reconstructed data was also available from Fisheries Departments, and additionally from people at various national and regional organisations and

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institutions: The Organisation of Eastern Caribbean States in St Lucia, Resource Management Unit: Peter Murray, Data Manager; The CARICOM Fisheries Resource Assessment and Management Program: Susan Singh-Renton, CARICOM Biologist, based in St Vincent; The University of the West Indies St Augustine and Barbados campus libraries; The National Archives of St Lucia, St Vincent and Trinidad; and the library of the Bellairs Research Institute in Barbados: Bruce Downey, Director. Specific individuals who have been helpful in providing information and direction to other information sources were Boris Fabres (former Fisheries Officer, Trinidad, now with the FishBase project, at ICLARM, and another collaborator); Keverne Cochrane (FAO, responsible for Area 31); Bissessar Chakallal (FAO Regional Fisheries Officer for the Caribbean, Barbados) and Robin Mahon, (Fisheries and Environmental Consultant, Barbados).

Many collaborations are continuing, and the output... is gathering pace.

However, despite all this new activity in the Central Western Atlantic, much work from the previous phase is still ongoing. Many collaborations are continuing, and the output, in the form of papers and reports is gathering pace. Dirk Zeller and Daniel Pauly have published a paper on the visualization of life history patterns of fishes in the journal 'Fish and Fisheries' (Zeller and Pauly 2001), based on the methodology developed for the Sea Around Us project during its initial phase (Zeller and Pauly 2000). Dirk also collaborated with a team led by Jackie Alder, resulting in a publication on management evaluation of marine protected areas (Alder *et al.* 2002). A major component of the documentation of the work done during the first years of the project is presented in the 250 page Fisheries Centre Research Report documenting catch, effort and regional datasets (Zeller *et al.* 2001). The ecosystem models built during that phase of the project have also been documented, with reports on the Faroe Islands (Zeller and Freire 2002), Norwegian Sea (Dommasnes *et al.* 2001), as well as West Greenland waters (Pedersen and Zeller 2001) now being available.

As the reader can see, the challenge continues, hot water or not.

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Sea Around Us

A Symposium with Results

by Daniel Pauly

The waters off West Africa, like most other productive parts of the world ocean have been, in the last decades, strongly exploited by coastal fisheries and by distant water fleets (DWF), but a controversy has long raged about the 'real' state of the resources. There were several reasons for this, one being the variability of some shorter-lived groups such as octopus and shrimps, which boomed when the biomass of the bottom fishes declined. Another obstacle to understanding was the competition between large national fisheries, often overgrown 'small-scale' fisheries, and DWF, whose different gear, mode of operation and especially origins made it difficult for some researchers to conceive that these fisheries have similar, and combined effects on the underlying resources. One final factor of confusion was the tendency among fisheries biologist working in West Africa to closely track fish population abundance, and in the process, to lose track of long-term change, a process that occurs throughout the world, and which I have elsewhere called the 'shifting baseline syndrome of fisheries.'

To address these and related issues, a group of researchers, representing institution from, or working in West Africa, teamed up two years ago to launch an international symposium on "Marine Fisheries, Ecosystems and Societies in West Africa: half a century of change", that would emphasize the impact of fisheries on West African ecosystems, and the downstream consequences on West African countries, and going back deep enough in time for major trends to emerge.

The main partners involved in the preparation of this symposium were the Fisheries Commission for the countries of the Northwest African 'subregion' ('Commission sous-régionale des pêches,' or CSRP, based in Dakar, and servicing Mauritania, Cape Verde, Senegal, The Gambia, Guinea and Guinea-Bissau, with Sierra Leone as a future member); the French Institut de Recherche pour le Développement (IRD, ex-ORSTOM); the EU-funded Fisheries Information and Analysis System project (FIAS), devoted to recovering data on the fish, fish catches and ecosystems of the CSRP countries, and the Sea Around Us Project. The interaction between these entities was straightforward, notably because the Principal Investigator of the SAUP, besides serving as the science advisor of the FIAS project, also chaired the symposium's scientific committee.

The symposium consisted of two components. The first 'subregional' component, lasting from June 24 to 25, was devoted to the results of the first two years of the FIAS project, i.e., to work conducted in the CSRP area, including two contribution by SAUP members (Sheila Heymans

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on fisheries-induced changes in the ecosystem off Sierra Leone Ecosystem, and Sylvie Guénette, on the ecosystem off Guinea). The second 'international component,' lasting from June 26 to 28, was devoted to accounts from other part of West Africa, and to syntheses. The SAUP contributions to this consisted of presentations by Reg Watson (subregional fisheries catch maps), Villy Christensen (biomass trend maps), Rashid Sumaila (presenting joint work with Jackie Alder, on the role of DWF in West Africa), Deng Palomares (Poster of CD-ROM documenting Northwest African ecosystems and fisheries; see Palomares, this volume) and Daniel Pauly (Trophic level change as indicators of fisheries impacts on marine ecosystems; and ecosystem impacts of fisheries in Ghana and Namibia, presented on behalf of absent colleagues). The full title of the SAUP and other presentations are documented on the symposium web page, more about which below.

Few conferences lead to a convergence of opinions, and even fewer conclude with a consensus statement. This one did ...

Few conferences, at least in this author's experience, lead to a convergence of opinions among their participants, and even fewer conclude with a consensus statement. This one did, and the full text of our consensus statement may be found on the symposium web site. Its major parts are:

1) "The reconstruction of long time series by the FIAS project has allowed demonstration, for the countries of the sub-region, that the biomass of bottom fishes has strongly declined, and that this is due beyond reasonable doubt to the impact of fishing;

2) A few short-lived species (e.g., cephalopods) have shown different trends [from those of longer-lived demersal fishes] but here as well, the impact of fishing is obvious, and overexploitation frequently occurs;

3) The present demersal fish biomass in the countries of the sub-region are well below levels that allow sustained high catches;

4) The demersal fisheries of the sub-region are so low as to render them highly sensitive to environmental effects;

5) The strengthening of sub-regional and international cooperation through the FIAS project has established these facts clearly and unambiguously."

This was seen as having the following implications:

6) "Overall fishing effort in the sub-region must be strongly reduced, in particular for demersal species, to re-establish high and sustainable catches, and to minimize the risk of environmental impacts;

7) We are aware of the socio-economic implications of such reduction [of fishing effort], but there is no doubt that it is necessary;

8) It is important to strengthen national capacity and sub-regional collaboration (as done by the FIAS project) in order to fill the scientific gaps that still exist;

9) This goal, and the maintenance and full utilization of the database assembled by the FIAS project require, among other things, that the capabilities of the sub-regional fisheries commission be strengthened."

The international component of the symposium elaborated on these nine points, and expanded them to cover the whole of West Africa, down to Namibia.

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Symposium with results

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Symposium with results
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Now some will say they knew all along that the fisheries resources of West Africa are overfished. However, this very point is regularly contested during negotiation between e.g., the European Union and West African countries, leading to ever more DWF exploiting what are now strongly depleted resources, thus endangering the long-term development prospect and food security of the West African countries in question.

To get that message across, the SAUP, in the person of its principal investigator, teamed up with the World Wildlife Fund for Nature (WWF) and a colleague from the University of Washington, whom we had invited to the symposium, Dr David Fluharty, who recently co-authored a contribution questioning the value, to West African countries, of the Fisheries Agreements they sign with the EU (Kaczynski and Fluharty 2001). This started right in Dakar, during a joint SAUP/WWF press conference held on June 28, in which the chief executive of the WWF, Mr Claude Martin, also participated. Fifteen journalists were in attendance, notably from Radio France International and the Pan African News Agency. The resulting coverage included three TV broadcasts, three radio broadcasts and one newspaper article in *Le Soleil*, Dakar's leading daily (text available from symposium web page - http://fisheries.ubc.ca/Projects/SAUP/Dakar/press.html).

David Fluharty and Daniel Pauly then flew to Madrid, where they presented on July 2 the results of the Dakar Symposium to Spanish colleagues, and WWF staff. On July 3, they visited the head of the 'International Fishing Agreement' section in the Spanish Ministry of Agriculture, Fisheries and Food, Mr. Rafael Centenera, who had just returned from the negotiations that lead to the latest round of agreements between the EU and Senegal, Angola and Mozambique. We were impressed by his tremendous knowledge of the minutiae of West African fisheries, and his formidable rhetorical skills, both of which go a long way in explaining the nature of some of the agreements thus negotiated. We also conducted interviews with a team from 'TV2,' specialized in agriculture and fisheries issues, with SER Broadcasting, and with *El País*, Spain's major daily.

Daniel Pauly speaks at the opening ceremony of the conference
Photo by Pierre Chavance

Then on to Brussels, via Paris, where we bought an issue of *La Recherche*, containing a just published paper (Pauly et al. 2002) that came in rather handy, given that it deals with overfishing in the North Atlantic, and the need to set up marine reserves, and was written in one of the main languages of the European Commission (EC). The EC's Directorate General for Fisheries (DG Fish) is presently struggling to get across its planned reform of the 'Common Fisheries Policy,' which includes strong reduction of European fishing fleets. Our presentation of July 4 to staff of DG Fish, on the impact of EU vessels on West African resources went well with those in the audience that were serious about the reforms, and the copies of the *La Recherche* paper we had quickly made were snapped up. But it was obvious that there are members of DG Fish who are still struggling to free themselves from the net the fishing industry threw over their heads.

Our presentation on the impact of EU vessels on West African resources went well with those in the audience that were serious about the reforms ...

On the other hand, our subsequent contribution to a joint WWF/European Policy Centre meeting on 'The Common Fisheries Policy: the case for radical reform' was clearly well received by its audience of about seventy journalists, embassy staff, representatives from European regional government and other "EU actors", as shown, notably, by the interviews we were invited to give to Reuters and *New Scientist*, among others.

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Symposium with results

Symposium with results
Continued from page 3

The high speed train that took us back to Paris on July 5 did not require our shoes to be x-rayed, and we still got there as fast as if we had flown. So we made it to a 'press breakfast' at the Café Marly, near the pyramid of the Louvre, where we made, again, the case for considering the state of West African resources when negotiating fisheries agreements, this time to journalists from *Les Echos*, *Le Figaro*, and the Agence France Presse. The day – and a rather hectic week – were completed at the French Ministry of Foreign Affair, where we reported on the Dakar Symposium (which they partly funded), and again discussed the agreements….

It is getting time to do something about overfishing, which is really turning into a global plague

Here are some lessons we learnt from, or that were confirmed by our successful symposium, and the post-symposium trip:

1) A well-prepared, focused scientific meeting can lead to a consensus on previously contentious issues, thus clearing the way for policy (at least we can't later be blamed for dithering);

2) Scientists working on environmental issues will find interested science journalists working in TV, newspaper and other media, given that they make an effort in addressing the 'so what' question that journalists cannot avoid in their work, even if we sometimes can;

3) It is getting time to do something about overfishing, which is really turning into a global plague.

We invite readers interested in the above meeting and/or its follow up to visit that part of the SAUP web devoted to the Dakar Symposium (www.fisheries.ubc.ca/projects/saup/Dakar/index.htm, where, pending the publication of full proceedings, and using generous funding from the Oak Foundation, we will make available the bulk of the material (Powerpoints, posters) presented at that symposium, along with related material published later.

Participants pose for a group photograph outside the conference venue
Photo by Pierre Chavance

Acknowledgments
My sincere thanks to J.M Vakily (FIAS project), P. Chavance (IRD) and Deng Palomares (SAUP) for the organization of the symposium and to WWF staff in Senegal, Spain Belgium and France for organizing a successful post-symposium tour. I also thank the Pew Charitable Trust, Philadelphia, for supplementary funding for the Dakar Symposium, and the Oak Foundation, Boston, for supporting its website.

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Perspectives on Dakar

by David Fluharty

It was a distinct pleasure to be invited by Daniel Pauly and the *Sea Around Us* Project to participate in the Dakar Conference. Having been involved in a number of visits as a consultant to some of the countries in the region, I was greatly impressed by the results of the FIAS Project teams. The consistently high level of sophistication and understanding represented in the presentation was remarkable and justifies the EU funding that made it possible. It attests as well to the soundness of the project design, implementation, and leadership. This project generated genuine collaboration on many levels.

As a consumer of scientific information as opposed to a producer, I found the ecosystem modeling approach as opposed to the rather desultory stock

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Perspectives on Dakar

Perspectives on Dakar
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assessment approach very enlightening. Given the huge deficits in fishery independent survey data, the fallibility of fisheries data and the limited capacities to translate results into policy, the broader approach leads to fairly clear understanding of the decrease in demersal species over time. This is undeniable.

Now the question becomes, "What can be done?" Each of the countries and its fishery management capacity is different. Common to all is involvement of the European Union in distant water fishing and, in some cases, shoreside investments. While other countries like China, South Korea, Russia and Japan are engaged selectively, the dominant external presence in the regional fisheries is Western European. This relationship is complex, long-standing and has advantages and disadvantages as seen from a coastal state perspective. My colleague, Vlad Kaczynski and I have sought to lay out some aspects of these relationships with respect to access agreements and their effects in the West African region (citation at end of Pauly report).

One of the key findings is that coastal states tend not to know the value of their own fishery resources. Secondly, they do not really know the actual harvests taken by fleets to which they grant access. Thus, these states are at a tremendous disadvantage in negotiating agreements and tend to accept less in access fees than they might otherwise demand. Even these lopsided agreements are not necessarily "bad" because they do represent the full benefits available but they equally, are not "good" because they interfere with development of domestic capacity to capture the value added in processing and marketing. There is a tremendous gap between arriving at the findings of the FSIA Project and using than information in management of domestic and distant water fishing efforts.

At Daniel Pauly's suggestion, I was also invited to join in the WWF sponsored informational campaign in Europe. I was impressed that WWF would let us "independent" resource persons speak candidly about our work without asking us to coordinate with the positions that WWF has developed over time. However, this is exactly the opportunity that we were afforded. Whether speaking with the policy experts in the DG Fish at the EU Headquarters or butting heads with the very impressive lead negotiator from Spain or answering tough questions from top reporters from *El País*, *Le Figaro*, *New Scientist*, *etc.* we had free rein to engage in substantive discussions of the significance of the scientific findings and the policy implications. Two things are clear to me. If the EU is to continue as a leading fishing entity in West African waters, as I believe it can and should, it must assume a much higher standard of conduct than it applies in its own waters. If West African coastal states are to benefit to the fullest extent from the valuable fisheries inside the EEZ, enormous improvements in the management of fisheries must be made and conditions for encouraging and securing domestic and foreign investment must be vastly improved.

A few thoughts about the Dakar Symposium

By Sylvie Guénette

During the Dakar symposium, a consensus was reached that most of the demersal resources have declined and some gravely depleted (see Pauly, this volume). Several stock evaluations showed the decline in biomass for several species in the last 50 years. Ecosystem modelling using Ecopath or a trophic flux model (D. Gascuel, Département Halieutique, ENSA-Rennes, France) showed the extent of the decline in the ecosystem. In response to this dismal situation, it was recommended that fishing effort be drastically decreased and that the fishing agreement took into account the state of the resource, assessed by joint African-European countries committees.

The overall goal should be to rebuild populations and ecosystems which have been considerably depleted

The overall goal should be to rebuild populations and ecosystems which have been considerably depleted. So how are we going to manage the fisheries in West Africa? In most cases the depletion of the resources call for severe reduction of exploitation by industrial boats and sometimes, by the artisanal sector as well. Besides reducing the effort, will we reduce the catch by implementing quotas? As we have seen in several countries over the last decades, it is difficult to assess stocks in a

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Thoughts about Dakar

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precise and timely manner and to implement quotas efficiently without overshooting more often then not. Given the success we had in so-called developed countries, we surely need to address the issues in more creative ways than we have in the past.

...we surely need to address the issues in more creative ways than we have in the past

Marine reserves were discussed on the last day of the symposium and generated quite a bit of heat due to classic objections of the type "we do not know" that they work in the first place (but see Guénette *et al.*, 1998). A good example of this is the banc d'Arguin National Park (Mauritania), a 12,000 km^2 reserve first set up in 1976 to protect the large number of seabirds using it as their breeding or wintering grounds (Campredon, 2000). It appears that the park in an important spawning areas for some sharks and rays. It is also possible that this area acts as a nursery ground for some bony fishes and a feeding area for others. Some of these species have distributions spanning the whole North-Western coast of Africa. However, the usefulness of the Banc d'Arguin is contested on the basis that there is no formal proof it helps maintaining the fish stocks while preventing fishers from accessing the much coveted resources, notably a small shark, the tollo (*Mustelus mustelus*).

Clearly the efficiency of such a reserve is a researchable topic. Already, the scientific literature on the subject is rapidly accumulating evidence on the rebuilding of exploited stocks (e.g. Bertelsen and Cox, 2001; Roberts *et al.*, 2001) and modification of ecosystem structure (e.g. Edgar and Barrett, 1999; McClanahan and Arthur, 2001) following the closures of previously exploited areas.

Moreover, as the interest about marine reserves is rising in the region and some people are worried that marine reserves would be perceived as a panacea the way ITQs have been for a while. I contend that no management measure should be expected to solve all our problems. No-take areas of appreciable size may however help us rebuild ecosystems and fish populations. A plan to introduce marine reserves in the region should clearly state the experimental and learning process that they should be based on, including the biological aspects and organisational structures for managers, biologists and fishers.

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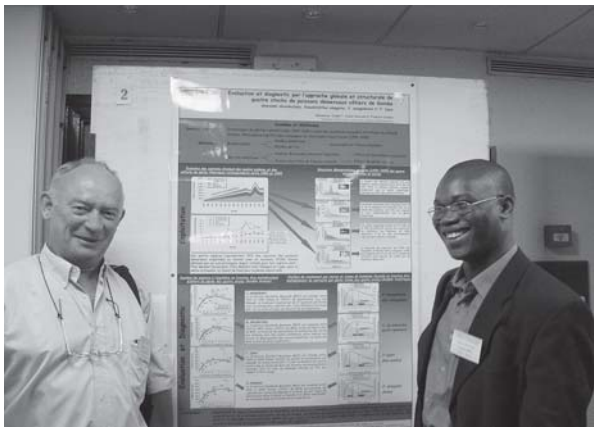
Thoughts about Dakar

And the winning posters are ...

By Maria Lourdes Palomares

The Symposium on *Marine fisheries, ecosystems, and societies in West Africa: half a century of change* held in Dakar, Senegal in June 24-28 2002 (see Pauly, this volume) hosted a poster session covering marine ecosystems (36%), resources (25%) and fisheries (39%). Some of these posters were of a double nature, i.e., covering multidisciplinary approaches and management tools. This was a well attended session, e.g., the Ministers of Fisheries of Mauritania and Senegal graced the opening of the session, taking time to peruse the contents and messages of each of the 36 posters presented (to view these, see http://fisheries.ubc.ca/Projects/SAUP/Dakar/posters.html).

The high quality, not only in presentation but also in content of these posters, made it difficult for the Best Poster search committee, headed by Cornelia Nauen (UE, Bruxelles) and whose members were Michael Vakily (IRC, Italie), Virginia Pires (CIPA, Guinea-Bissau), David Fluharty (Univ. Washington, USA) and Daniel Pauly (UBC, Vancouver, Canada), to pick the three most remarkable posters in terms of their pertinence to the theme of the Symposium, clarity and originality of presentation. Thus, instead of three, the committee



François Domain and Aboubacar Sidibé with their poster
Photo by Deng Palomares

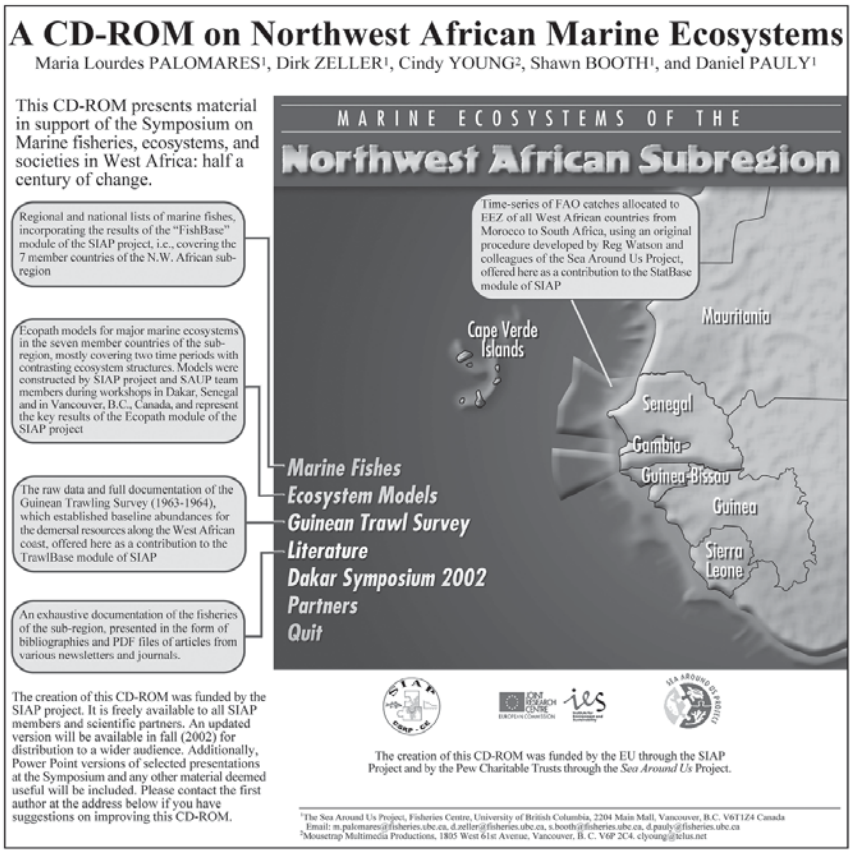


Figure 1. The poster presented by Sea Around Us team members at the Dakar Symposium

To the delight of many of the participants, the contribution from members of the Sea Around Us Project (see Figure 1) on the CD-ROM of Northwest African marine ecosystems was out of the competition, as it was (in this author's unbiased opinion) rather impressive. The CD-ROM, which provides an exhaustive documentation of the fisheries of the sub-region, was the culmination of many months' work by its authors, and was created using funding by the EU through the SIAP Project and by the Pew Charitable Trusts through the Sea Around Us Project. The beta version of this CD-ROM was distributed during the Symposium and an updated version is being prepared for distribution in November 2002 to a wider audience. This will contain, in addition

...instead of three, the committee came up with five winning posters ...

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Winning posters

came up with 5 winning posters (the first prize was funded by the *Sea Around Us* project while the four other prizes were funded by the EU), namely:

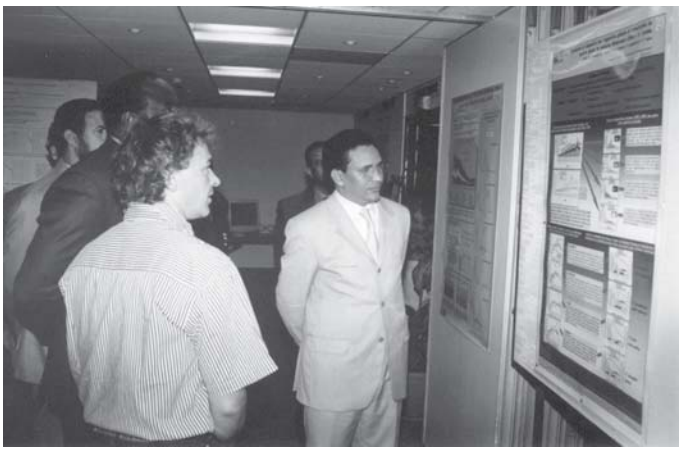
First prize (500 CAN$): Birane SAMB et Asberr MENDY. Poster #10 : *Dynamique du réseau trophique de l'écosystème Sénégambien*.

Second prize (100 Euros): Aboubacar SIDIBE, Didier GASCUEL, François DOMAIN. Poster #02 : *Évaluation et diagnostic par l'approche globale et structurale de quatre stocks de poissons démersaux côtiers de Guinée,* Galeoides decadactylus, Pseudolithus elongatus, P. senegalensis *et* P. typus.

Third prize (Book): Didier GASCUEL. Poster #05 : *Captures et biomasses par niveau trophique dans l'Atlantique Centre Est : analyse de 50 ans d'évolution et première tentative d'application du modèle écosystèmique de flux trophique*.

Fourth prize (T-shirt): Ph TOUS, R. VERNET, J.-F. SALIEGE. Poster #18 : *Cansado (presqu'île du Cap Blanc, Mauritanie) : un site de pêcheurs daté de 6700 ans*.

Fifth prize (T-shirt): Dario ÉVORA, Patrícia AMORIM, Carlos MONTEIRO, Oksana TARICHE et Kim A. STOBBERUP. Poster #43 : *The Cape Verde Archipelago : oceanography, resources and fisheries of an insular ecosystem*.



Mr Se Ahmedou Ould Ahmedou, Minister of Fisheries of the Islamic Republic of Mauritania (right), admiring the posters
Photo by Pierre Chavance

Thoughts about Dakar
Continued from page 6

We will not solve the question of the effectiveness of marine reserves through rhetorical arguments. We are at the stage where we need to experiment with closures, setting specific objectives and verifying whether or not we reached these objectives.

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Winning posters
Continued from page 7

to updated versions of the material it already contains (see Figure 1), the Power Point versions of selected presentations at the Symposium and other material deemed useful (see Pauly, this volume).

In order to help document the results of this Symposium, the structure and contents of the CD-ROM was also used to create the Symposium's web site (http://fisheries.ubc.ca/Projects/SAUP/Dakar/index.htm) which will be maintained by the *Sea Around Us* Project for post-Symposium communications and publications. The creation of this web site was made possible through funding from the Oak Foundation.

Fisheries Centre Research Reports on the web

We are pleased to announce the publication of three new reports, documenting the *Sea Around Us Project*'s work on North Atlantic Fisheries (*Fisheries Impacts on North Atlantic Ecosystems, FCRR* Volume 9, Issues 3-5). The reports, with the themes: Catch, Effort and National/Regional Data Sets (Vol 9(3)); Models and analyses (Vol 9 (4))); and Evaluations and Policy Exploration (Vol 9(5)), are available, free of charge, on the Fisheries Centre's website (http://fisheries.ubc.ca/Reports/fcrr.htm). Hard copies can also be purchased for $20 (please email: events@fisheries.ubc.ca).

Another article in *Nature*

The *Sea Around Us* Project is about to add to its growing list of high-profile publications. A team of authors from the Fisheries Centre has been commissioned by the prestigious journal, *Nature* to produce a seven-page report, as part of a special Insight section on the 'Future of Food'. The report, entitled "Towards sustainability in world fisheries" will be published in early August. Its abstract is reproduced below:

Fisheries have rarely been 'sustainable.' Rather, fishing has induced serial depletions, long masked by improved technology, geographic expansion and exploitation of previously spurned species lower in the food web. With global catches declining since the late 1980s, continuation of present trends will lead to supply shortfall, for which aquaculture cannot be expected to compensate, and may well exacerbate. Reducing fishing capacity to appropriate levels will require strong reductions of subsidies. Zoning the oceans into unfished marine reserves and areas with limited levels of fishing effort would allow sustainable fisheries, based on resources embedded in functional, diverse ecosystems.

Reference:

Pauly, D., V. Christensen, S. Guénette T.J. Pitcher, U.R. Sumaila, C.J. Walters, R. Watson and D. Zeller. Towards sustainability in world fisheries. *Nature*, August 8, 2002.

Sea Around Us

The Millennium Ecosystem Assessment: links with the *Sea Around Us* project

By Daniel Pauly

One of the conclusions that can be drawn from the recently concluded Earth Summit in Johannesburg is that there is still no clear perception, in the public at large, and among elected politicians, that the Earth's ecosystems are being degraded to such an extent and at such a rate that they will increasingly be unable to supply humanity with the services (*e.g.*, water supply) that have so far been taken for granted.

Global climate change posed a similar challenge a decade ago, but this was overcome by the Intergovernmental Panel on Climate Change (IPCC), which, through a consensus-based process involving thousands of scientists, managed to convince leading politicians in most of the world's countries that climate change is an issue that must be addressed.

A similar task awaits the Millennium Ecosystem Assessment, officially launched in April 2000 by the Secretary-General of the United Nations, Mr Koffi Annan with the statement that "it is impossible to devise effective environmental policy unless it is based on sound scientific information. While major advances in data collection have been made in many areas, large gaps in our knowledge remain. In particular, there has never been a comprehensive assessment of the world's major ecosystems. The planned Millennium Ecosystem Assessment, a major international collaborative effort to map the health of our planet, is a response to this need."

The Millennium Ecosystem Assessment (MA), the brainchild of Dr Walter V. Reid, its present director, is funded by a variety of foundations and international organizations, as reflected in its board and secretariat (see www.millenniumassessment.org) and is organized in a fashion similar to the IPCC. Its key job, *i.e.*, a thorough assessment of the world's ecosystems, is performed by four working groups (WG):

A WG of scientists devoted to defining the 'Framework' of the MA's global and regional assessments;

A WG on 'Condition,' to analyze the present states of ecosystems and historic trends in their delivery of services to humans;

A WG on 'Scenarios,' to assess the impact on service delivery in the coming decades, under different sets of intervention options (do nothing, reverse some of the worse trends, address environmental issues on a broad scale, *etc.*);

A WG on 'Responses,' to evaluate different responses that countries, and humanity as a whole may take to address the issues in (2) based on the scenarios in (3).

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... to provide an opportunity for a broad selection of members of the coastal and marine science communities to contribute

Millennium Assessment - Continued from page 1

Each of these WG will write a technical report, the last to be released in 2005, when the MA is due to conclude. These reports are drafted, as in the IPCC, by Coordinating Lead Authors (CLA), assisted by Lead and Contributing Authors (LA, CA), all drawn from different parts of the world such as to ensure a regional and gender balance, to ensure a consensus that takes account of a wide range of situations and experiences.

Progress by the four WG has been very uneven so far, though fortunately in terms of the logic of its task, it is the Framework WG which is most advanced. The MA meeting held in Frankfurt, Germany, on August 20-24, which this author attended, was, indeed, to work on a nearly complete draft of the 'Framework' report. Another imbalance is that between terrestrial and marine ecosystems, the former well represented by CLA with backgrounds in agronomy, forestry, hydrology, *etc.*, while no CLA had been identified for the ocean until a meeting held in April/May in Frascati, near Rome (yes, members of the MA get to travel to such neat places - though the virtues of the local wine were lost on me).

The MA now has two saltwater CLA, Dr Tundi Agardy for "Coastal Systems," defined as "the interface between oceans and the land, […] whose ecological determinants are largely governed by interactions with land […], for mapping purposes, 20 m above and 50 m below high tide level," and this author, for "Marine Systems," which are "dominated by fisheries, and comprise the productive shallow shelves surrounding the oceans, down to 200m, and the deeper oceanic waters of tropical, temperate and polar areas, in which fishing is the dominant force behind environmental change."

Tundi and I, with assistance from the MA secretariat have since identified a number of potential LA for the coastal and marine system chapters (including several members of the *Sea Around Us* project), who will be formally invited to join the 'Conditions,' 'Scenarios' and 'Responses' WG. Moreover, the MA accepted an invitation I extended, on behalf of the Fisheries Centre and of the *Sea Around Us* project, to host, in the first quarter of 2003, a coastal and marine MA workshop designed to provide an opportunity for a broad selection of members of the coastal and marine science communities to contribute to the MA.

There, the colleagues to be invited to this workshop will be asked to help finalize the draft of the 'Coastal' and 'Marine conditions' chapters that will have emerged until then, as well as to review other MA documents, notably those dealing with crosscutting themes such as the ecosystem services (biodiversity, food, esthetic value, *etc.*).

As well, this opportunity will be taken to present to the participants the methodology for mapping global fisheries catches and related attributes that was developed by the *Sea Around Us* project, which can be expected to be rather useful in the context of the coastal and marine assessments planned by the MA, and which may also turn out to be useful for the assessment of freshwater (inland) fisheries.

The ***Sea Around Us*** project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, 2204 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

The *Sea Around Us* project goes Down Under

By Dirk Zeller and Reg Watson

In August of this year, the *Sea Around Us* project went Down Under, with Reg Watson and Dirk Zeller attending the ***World Congress on Aquatic Protected Areas***, held in Cairns, Australia. Located next to the Great Barrier Reef World Heritage Area, Cairns was an ideal location for this important topic, drawing approximately 400 delegates from 10 countries. The annual meeting of the Australian Society of Fish Biology was held simultaneously which made for a busy gathering, with seven concurrent sessions over the three-day period.

Given the location, and the distance between Australia and the 'rest of the world', it was inescapable that much of this conference was dominated by Australian issues: tropical to temperate, and marine to freshwater. However, several of the keynote speakers were able to set and maintain large-scale and international perspectives: Elliot Norse (Marine Conservation Biology Institute, USA, "Why marine protected areas?"), Tundi Agardy (Sound Seas, USA, "Optimal design of individual marine protected areas and MPA systems"), Bill Causey (Florida Keys National Marine Sanctuary, USA, "Success factors in the implementation and management of aquatic protected areas"), Jon Day (Great Barrier Reef Marine Park Authority, Australia, "How good are aquatic protected areas – measuring their performance"), and Peter Cullen (University of Canberra, Australia, "The Heritage River Proposal – conserving Australia's undamaged rivers").

Both *Sea Around Us* presentations were well attended. Reg Watson talked about '***Multi-scale decision support for aquatic protected area placement***' in which he presented the large scale mapping approach and findings produced by the SAUP, including the over-reporting in Chinese catch statistics (Watson and Pauly 2001). There was considerable interest in this approach despite the difference in scale at which the SAUP works, compared to many other projects. While we look at whole ocean basins most projects study a single embayment or small collection of coral reefs.

Dirk Zeller gave a presentation entitled '***Marine reserves: time for a global perspective***' in which he outlined the current (unsustainable) state of world fisheries and their causes, and presented the options and potential solutions our project is calling for. These were also recently outlined in a SAUP authored insight review article in *Nature* (Pauly *et al.* 2002). Dirk was able to connect the small-scale, detailed work he has performed on the Great Barrier Reef Marine Park fauna with the global perspective needed to tackle problems of protected area placement in a meaningful way.

Both presentations have been submitted for consideration as full-length contributions in the conference proceedings. One interesting development we became aware of during this conference was the mapping work being conducted as part of Australia's National Oceans Policy. This has resulted in large scale, spatial datasets and databases on marine resources and uses for Australian EEZ waters. This work was presented by James [Larikin] Larcombe from Australia's Bureau of Rural Sciences, and is a development we will continue to watch with great interest. Reg Watson and James spent some time looking at possible collaborations as James' group plans to map all the marine resources of Australia and its impacts on coastal communities. In all, a great conference, Mate!

There was considerable interest in this approach, despite the difference in scale at which the SAUP works, compared to many other projects ...

References

Pauly, D., V. Christensen, S. Guénette, T. J. Pitcher, U. R. Sumaila, C. J. Walters, R. Watson, and D. Zeller. 2002. Towards sustainability in world fisheries. *Nature* **418**:689-695.

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CephBase and the *Sea Around Us* project

By Catriona Day

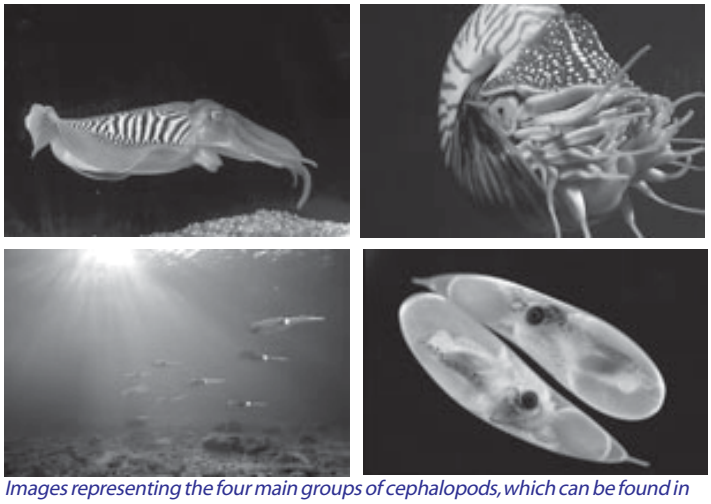
Cephalopods, throughout the world, are an important and valuable component of marine ecosystems. To accommodate a growing need for information on this group, an online database, CephBase (www.cephbase.utmb.edu) was created in 1998. CephBase is a dynamic, relational database-driven web site containing species-level data of all living cephalopods (786 species of octopus, squid, cuttlefish and nautilus). The purpose of CephBase is to provide taxonomic data, images, videos, geographical distribution maps (created in real-time), predator and prey data, scientific contact information and interoperability with other databases (*e.g.*, FishBase, www.fishbase.org) in an easy to access, user-friendly manner. CephBase is well recognized, and has been mentioned twice in *Science* (**282**:587 and **285**:2027).

The purpose of this collaboration is to improve the compatibility of CephBase with the Sea Around Us *project*

Most of the CephBase Team works at the National Resource Center for Cephalopods at the University of Texas Medical Branch, Galveston, Texas. However, as CephBase webmaster, I was previously based at Dalhousie University, Halifax, Nova Scotia. Following an invitation by Daniel Pauly, I am now at the Fisheries Centre, in order to collaborate more effectively with the *Sea Around Us* project.

The purpose of this collaboration is to improve the compatibility of CephBase with the *Sea Around Us* project database, and hence with FishBase and other databases. This consists, in particular, of allocating the geo-referenced, species-specific cephalopod occurrence records in CephBase to 18 FAO statistical areas, 64 Large Marine Ecosystems (LMEs) and the Exclusive Economic Zones (EEZs) of about 200 maritime countries and territories. Also, the geographical distributions of commercial species of cephalopods in Roper et al. (1984) are being mapped onto LMEs and EEZs using a GIS-based approach. This will be complemented by references reporting the occurrence of various cephalopod species in the waters of particular areas (*e.g.*, Voss and Williamson, 1971).

By the end of 2002, this information will have been incorporated into a searchable interface in CephBase, which will thus be able to create maps and lists of cephalopods by FAO areas, LMEs and countries. It is anticipated that this product, required for various analyses by the *Sea Around Us* project team, will also be found useful by other research groups, notably in developing countries.



*Images representing the four main groups of cephalopods, which can be found in CephBase's fully searchable image database. Clockwise from top left: cuttlefish (*Sepia officinalis*); nautilus (*Nautilus pompilius pompilius*); octopus eggs (*Octopus briarius*); and a school of Caribbean reef squid (*Sepioteuthis sepioidea*).* *Photos by James B Wood, courtesy of CephBase.*

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Sea Around Us

Bonaire: 90 million years, plus a few days to think

By Daniel Pauly

Bonaire began as an underwater boil of magma 90 million years ago but emerged 30 million years later, when it started to acquire a terrestrial fauna and flora, with many species soon evolving into endemics.

The island appears not to have been peopled prior to the arrival of Europeans. Of these, the Dutch were the most tenacious, incorporating Bonaire into the few specks of land that constitute the Netherlands Antilles, where diving tourism, and resource extraction (marine salt in Bonaire), or transformation (oil refining in Curaçao), have replaced the slave economy of old.

This year, the Pew Fellows in Marine Conservation had their annual meeting in Bonaire. As a member of the Pew Fellows Program's Advisory Committee, I had the privilege of spending a few October days on that isolated island, 80 kilometres north of Venezuela's coast (see map).

The tiny island of Bonaire is located 80 km north of Venezuela

After starting with a tribute to the late Robert Johannes (a 1993 Pew Fellow) and keynote lecture by Jeremy Jackson, based on his much-cited article in *Science* (Jackson et al. 2001), the meeting went on with four concurrent workshops:
1) "Maneuvering the maze of international treaties and agreements", organized by fellow Advisory Member Cyriaque Sendashonga, of the Secretariat of the Convention on Biological Diversity;
2) "Community-based fisheries management", by Kalli de Meyer of The Coral Reef Alliance (www.coral.org);
3) "Communication of results", by Nancy Baron of SeaWeb (www.seaweb.org); and
4) "Action for the ocean", run by Amanda Vincent of the Fisheries Centre (see this month's issue of *FishBytes*), and devoted to identifying potential joint activities by Pew Fellows.

Each of the workshop organizers had brought an interesting group of resource persons. For example, in workshop Number Three, which I attended, Nancy Baron had invited a stellar group of science journalists, including Cornelia Dean, Science Editor at the *New York Times*. It was quite a learning experience to hear the presentations and mock-interviews documenting how our prejudices as scientists, and our inability to see ourselves as others may see us (caveat-ridden and nerdic) often stand in the way of getting a worthy message across.

The plenary reports and discussions, held a day later, showed that the other three workshops had been worthwhile as well. Hence everybody's interest in the subsequent event, meant to address the relation between 'Science' and 'Advocacy.' The speakers featured Ray Hilborn, of the University of Washington's

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Even small fisheries can damage coral reefs ... but nothing of this sort can do the damage that EU fleets would

School of Aquatic and Fisheries Science, and three Pew Fellows including our own Carl Walters. This *séance*, in which we were warned of the perils of commitment, was, however, a bit of a letdown. Colleagues have been too often dismissed as 'advocates' because they were picking up inconvenient issues, while those in favor of the status quo tended to be presented as dispassionate proponents of the facts. One example of an outstanding and committed scientist given the treatment was Rachel Carson, the author of the book after which the *Sea Around Us* project is named. Thus, I am pleased to say that I did not participate in that specific discussion - it reminded me too closely of those debates where the first to employ the rhetorical ploy of calling the other "emotional" wins. This leaves the one so named to scream in rage that he or she is NOT BEING EMOTIONAL!!!

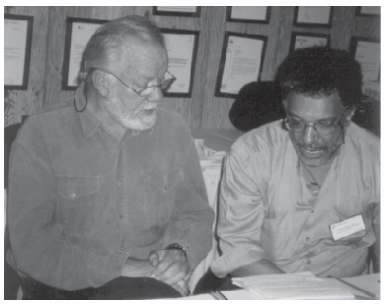
Rather, I joined a group of Pew Fellows who had offered to discuss, with our colleagues from Bonaire, the major issues facing the island's marine park and fisheries:

- The gradual erosion of the live coral cover and (large) fish abundance on the reefs, both key to the success of the SCUBA-diving dependent tourist sector; and
- The current negotiations between Bonaire's local government and the European Union, the result of an EU attempt to acquire access rights for Spanish fishing vessels.

It was a pleasure (but not a surprise) to see Pew Fellow Callum Roberts lay out the case for the creation of a marine reserve as a tool to address the first of these issues, although I must mention that I also made a convincing case for the need to estimate present catches from the reefs (no, the Bonaire Marine Park authorities do not know how much is presently taken out by the commercial and subsistence fisheries from the reefs and marine park surrounding the island, and by recreational fisheries further offshore).

The point is that, one fish at a time, even small fisheries can do great damage to coral reefs. Indeed, the feral goats and donkeys have done just that on land, through centuries of uncontrolled grazing, gradually turning Bonaire's flat countryside into a likeness of an inner-city vacant lot. Similarly, sport-fishing for billfish and marlin can deplete nearby fishing as surely as a commercial long line fishery, though it usually takes longer to get there.

However, nothing of this sort can do the damage that EU fleets roaming in the Bonaire Exclusive Fishing Zone would. The prospect of this happening may have been diminished a bit by Pew Fellow Rodrigo Bustamante's account of foreign fleet activities in the waters around the Galápagos Islands (another national park, by the way). My account of the effects of foreign fleets off West Africa may have also helped there, especially as it came with a



The late Bob Johannes, with Daniel Pauly, at last year's Pew Fellows Annual Meeting in Nova Scotia, and to whom this year's meeting in Bonaire was dedicated. Photo by Amanda Vincent

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Our mailing address is: UBC Fisheries Centre, 2204 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

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scary Powerpoint presentation featuring Villy Christensen's maps of declining fish biomass off West Africa (see Pauly 2002), and the key points of EU-West African agreements (extracted from Kaczynski and Fluharty 2001).

The people of Bonaire do not want EU fleets in their waters, and the information provided should help support their position in the next round of Bonaire-EU negotiations – which brings us back to the issue of the wall between science and advocacy. Clearly, scientists should not jump over it - there are lots of strong, nasty characters on the other side, and one of them, say Goliath, may decide to cut off our credibility and who knows what else. But nothing should prevent us from passing a few pebbles over to the occasional David. That much I learnt in Bonaire.

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Sea Around Us dances with Minister of Fisheries

By Dirk Zeller and Villy Christensen

During the first two-year phase of the *Sea Around Us* project (1999-2000), we focused extensively on the North Atlantic. While the project has since expanded its regional focus, our previous collaborative involvements in the North Atlantic region (Guénette et al. 2001; Zeller et al. 2001) continue to have interesting 'after-shocks'. Thus Villy Christensen and Dirk Zeller received an invitation from the 'Fiskirannsóknarstovan' (Fisheries Laboratory) of the Faroe Island government to participate in a fully sponsored workshop on ecosystem modelling of Faroese waters, held in the Faroese capital Tórshavn in September, 2002. A wide range of people were invited, including representatives from ICES/GLOBEC, Trondhjem Biological Station (Norway), Nansen Environmental and Remote Centre (Norway), University of Rostock (Germany), Station Zoologique de Villefranche-sur-Mer (France), and Department of Fisheries and Oceans (DFO, Canada). The purpose of the workshop was to bring together expertise on ecosystems, modelling, and on the Faroe marine environment. It was also an opportunity to present and discuss Faroese ecosystems, identify gaps in knowledge of importance for modelling the Faroese ecosystems and to formulate projects to fill these gaps.

The Faroes, located in the northeastern Atlantic between Scotland and Iceland, consist of a group of 18 islands inhabited by approximately 46,000 people and covering about 1,400 km^2. However, the Faroe Islands have responsibility for the marine resources in an EEZ of over 270,000 km^2. Fishing represents the major commercial activity, accounting for over 95% of exports and over 44% of GDP. Furthermore, both commercial and subsistence fisheries play a significant role in Faroese culture and society. The government utilizes a spatial- and effort-based system of management for their demersal fisheries, and explicitly incorporates ecosystem considerations in their policies. Given the importance of fishing to the Faroe economy and culture, considerable interest has been expressed in the evaluation of these management measures at the ecosystem level, and hence this event.

Commercial and subsistence fisheries play a significant role in Faroese culture and society

The workshop consisted of two days of presentations, followed by one day of working subgroup sessions and forum discussion. On the first day, local scientists presented general overviews of Faroese waters and their ecosystems, and the available data sets. These presentations covered topics ranging from physical oceanography, planktonic and benthic studies, through

Continued on page 4 - Faroe Islands

Faroe Islands - Continued from page 3

summaries of fish assemblages, all the way up the marine food web to seabirds and marine mammals (both of which are hunted for local consumption). On the second day, the invited experts gave presentations on their area of expertise, with emphasis on the Faroe Island ecosystems. These presentations included topics such as: fronts and frontal dynamics (Ken Drinkwater, DFO); primary production in the Nordic Seas (Egil Sakshaug, Trondhjem Biological Station); a review of modelling zooplankton dynamics to represent matter flow to higher trophic levels (Francois Carlotti, Station Zoologique); three dimensional modelling of zooplankton distribution (Wolfgang Fennel, University of Rostock); climate change in the Atlantic-Arctic region (Helge Drange, Nansen Environmental and Remote Center); review of ecosystem linkages that may matter in management (Jake Rice, DFO); and environmental influences on the Faroe cod stock and comparisons with other cod stocks (Keith Brander, GLOBEC). The *Sea Around Us* presentations focused on our use of and experience with *Ecopath with Ecosim* as an ecosystem modelling tool. Villy Christensen presented an overview of the use of *Ecopath with Ecosim* modelling approaches for ecosystem based management of fisheries, based on our work in the North Atlantic (Guénette et al. 2001; Christensen et al. 2002). Dirk Zeller presented his experiences in modelling the Faroe marine ecosystem using the *Ecospace* routine based on his collaborative work with the Faroe Fisheries scientist Jákup Reinert (Zeller and Freire 2001; Zeller and Reinert in review).

The local organizing committee undertook an excellent effort in exposing we visitors to as many local customs, delicacies and vistas as possible

Images from the Faroe Islands. The harbour at Torshavn (top) - small boats nearly outnumber the population on the Faroe Islands. The islands are renowned for dramatic landscapes such as this (bottom), with villages depending on a mix of fishing and farming. Photos by Villy Christensen

The outcome of this workshop was very positive from the perspective of the *Sea Around Us* project, as the Director of the Faroe Fisheries Laboratory, Hjalti Jákupsstovu, expressed a strong interest in continuing and possibly expanding a collaboration devoted to further refining the existing *Ecopath*, *Ecosim* and *Ecospace* model applications to the Faroe Islands.

Besides the interesting and diverse presentations and professional interactions among all participants, the local organizing committee undertook an excellent effort in exposing we visitors to as many local customs, delicacies (including whale meat!) and vistas as possible, through an excellent after-hours social program. Clearly, the social highlight of this workshop was a memorable dinner followed by lessons in traditional Faroe dances and songs, held in one of the oldest houses in the Faroes (dating back to well before 800 A.D.). This evening was well attended by participants and workshop sponsors, as well as the Faroe Minister of Fisheries. Indeed, rarely do scientists get the opportunity to dance traditional dances arm in arm with a cabinet member, especially one who can sing!

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Update on the Millennium Ecosystem Assessment

By Jackie Alder

In the last newsletter (Issue 13) Daniel Pauly introduced the Millennium Assessment (MA) and its activities. Needless to say it has not taken long for the *Sea Around Us* project to quickly involve itself in MA activities. The Second Global Scenarios Workshop for the Millennium Assessment was held in Bangkok from October 7 to October 11, with me attending on behalf of the *Sea Around Us* project. The workshop had an auspicious start with a deluge of morning rain combined with a king tide creating flood conditions around our hotel and reinforcing what might happen in the future if policy makers do not take action to maintain our ecosystems globally.

The "Scenarios" working group's role is to assess the impact on ecosystem service delivery in the coming decades, under different sets of intervention options. The second meeting was:
i) to define the different intervention scenarios;
ii) to identify the models that could be used to assess these scenarios; and
iii) to determine how these scenarios could be quantified using key indicators.

The three objectives of the meeting sound very daunting. However, the members of the group that assembled in Bangkok were experts in their fields and they came with a commitment to further the working group's efforts. The workshop broke into two major camps: the scenario-builders and the model-builders – with both camps exchanging ideas and discussing issues in plenary sessions. This proved to be a very efficient approach.

The number of scenarios was reduced to four, based on the time and resources available to members of the working group. The four scenarios represent the spectrum of plausible future storylines ranging from "Learn and Leap" (where adaptive learning dominates and traditional knowledge is incorporated) at one end of the spectrum to "Techno-garden" (where technology dominates and the role of the environment is weakened) at the other end. In between we have "Economic Optimism" (where ecosystem management is crises-driven and reactive, not proactive, but there is a high capacity to respond) and "Elites" (where developed nations protect their interest through inequitable policies and property rights and with little regard for the needs and interests outside of their own region). The workshop also identified some key assumptions such as human populations will continue to grow but will level out later this century. The number of assumptions was kept small to allow greater flexibility within the groups to explore the scenarios presented.

Model-builders spent much of the week identifying the drivers and ecosystems that could be modeled and what modeled outcomes are needed to provide key indicators for quantification of the scenarios. It was interesting to learn about the range of models and their applications currently in use throughout the world. It was also interesting to note what is currently modelled (e.g. food consumption for a range of cereal crops and water flows) and what is not modelled (e.g. water quality).

A small group of the model-builders developed a concept to link biodiversity, area and ecosystem services. We are now developing the concept and will test it over the next few months, so watch this space for an update on its progress. In the meantime, the *Sea Around Us* project will be attending the "Conditions and Trends" working group meeting in Sao Carlos, Brazil in November and I hope to report on that in the next newsletter. Plans are also underway for the *Sea Around Us* project to host a Millennium Assessment workshop for the "Marine and Coastal Conditions" working group in April of next year.

The group were experts in their fields and they came with a commitment to further the working group's efforts

Stop the Press!

Bonaire reverses position on EU fleets

We have just received correspondence from Mr G. DeSalvo, of the Bonaire Nature Alliance, informing us that the statistics and advice provided by the participants of the Pew Fellows meeting has been an important factor in the Bonaire majority party's decision to reverse its stand on allowing foreign fishers into the Netherlands Antilles Exclusive Fishery Zone. Mr DeSalvo hails this as "a victory for our environment" and thanks us on behalf of the Bonaire Nature Alliance and all supporters of sustainable fishing in Bonaire's waters. *Daniel Pauly*

A CD-ROM on the Marine Ecosystems of the Northwest African Subregion

By Maria Lourdes (Deng) Palomares

Comprehensive regional and national lists of marine fishes, Ecopath models, time-series of FAO catches, Guinean Trawl Survey ...

We are pleased to announce the completion of our CD-ROM, *The Marine Ecosystems of the Northwest African Subregion*, which was designed to help implement findings of the *International Symposium on Marine Fisheries, Ecosystems and Societies in West Africa: Half a Century of Change* (see *Sea Around Us* newsletter, Issue 12). The CD-ROM was prepared by me, Deng Palomares, with the assistance of other members of the *Sea Around Us* project and funding from the EU-Northwest African 'SIAP Project'. Among the important features of this bilingual (French/English) CD-ROM are:

i) Comprehensive regional and national lists of marine fishes, incorporating the results of the 'FishBase Module' of the SIAP project (i.e., covering the seven member countries of the NW African subregion, and providing common names in various local languages);

ii) Ecopath models, incorporating the results of the 'Ecopath Module' of the SIAP project, for the continental shelves of the member countries, most covering two time periods with different ecosystem structures and biomasses;

iii) Time-series of FAO catches (1950-2000) allocated to EEZs of West African countries from Morocco to South Africa, using a procedure developed by Dr Reg Watson and colleagues of the *Sea Around Us* project, as a contribution to the 'StatBase Module' of the SIAP project;

iv) The raw data and full documentation of the 'Guinean Trawling Survey' (1963-1964), as a contribution to the 'TrawlBase Module' of the SIAP project;

v) Powerpoint presentations of selected contributions presented during the *International Symposium on Marine Fisheries, Ecosystems and Societies in West Africa: Half a Century of Change;* and

vi) Selected documentation of the fisheries of the subregion, in both French and English.

This CD-ROM went through an exhaustive pre-distribution testing cycle (S. Booth, M.L.D. Palomares and D. Zeller for the English version, and L. Morissette and D. Pauly for the French version) and multimedia production phase (Cindy Young).

For a copy of this CD-ROM, please contact me (m.palomares@fisheries.ubc.ca). For more information about the Dakar Symposium, please see http://saup.fisheries.ubc.ca/Dakar/index.htm.

Sea Around Us in *Nature* again

Continuing on a wave of recent high-profile publications, including two co-authored papers in *Nature* (Watson and Pauly 2001; Pauly *et al* 2002) and a personal profile in *Science* (Malakoff 2002), Daniel Pauly has once again brought the *Sea Around Us* project and its goals to the attention of the world. This time, his perspectives on issues of marine conservation appear prominently in a special feature in *Nature* (Schiermeier 2002), which highlights the current failure of the world's fisheries scientists and managers to halt the unsustainable practices of today's fishing fleets. Drawing on the opinions of fisheries experts from around the world, the article covers the key issues facing contemporary fisheries decision-makers, including the need to reduce effort and set aside protected areas, while fostering better dialogue between fishers, scientists and the public. The current global debate and growing awareness about the state of the world's fisheries has been fuelled in part by the work of the *Sea Around Us* project and we are glad that *Nature* has chosen to pick up the issue in recent months. We hope that this is a continuing trend that will eventually lead to action on the part of those with the power to bring about change.

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Sea Around Us

Putting the coast in the *Sea Around Us* project

by Jackie Alder

When most people try to visualize the "Sea" they envisage large marine expanses, and their underwater ecosystems. Until recently, the *Sea Around Us* project (SAUP) was way offshore, too. Yet, the sea also includes the coast – where the land meets the sea and where one finds some of the world's most productive marine areas such as reefs, mangroves and seagrass beds. Coastal areas are of great importance to fisheries, not to mention tourism, aquaculture, transportation and gas and oil. Adding an emphasis on the coast is a natural progression for the *Sea Around Us* as it moves into low latitude areas, i.e., the Caribbean, West Africa and the tropical Indo-Pacific, where large numbers of fishers depend on coastal resources. So what does this mean for the project?

Dealing explicitly with coastal areas opens up a wealth of research opportunities for the *Sea Around Us* that have immediate and wide application around the world. We will be able to investigate:

- the importance of coastal habitats to fisheries at the global scale;
- specific relationships such as those between estuaries and prawns;
- re-valuation of ecosystem services of various coastal habitats;
- marine protected area habitats and community links;
- impacts of climate change on coasts and the health of coastal populations;
- links between small-scale fishers and coastal habitats;
- river-basin impacts on coastal systems;
- plus many more exciting and interesting studies.

Specific projects such as the Millennium Ecosystem Assessment (see *Millennium update* box, p 8) will also benefit.

The *Sea Around Us* project is currently collating coastal habitat information over a diverse range of subjects as the first step to capitalizing on these research opportunities.

Substantial progress has been made in collating information from collaborating institutes such as the World Conservation Monitoring Centre (coral reefs, sea grasses and mangroves), University of New Hampshire (river discharges into estuaries), Millennium Ecosystem Assessment (coastal populations) and Land Ocean Interaction in the Coastal Zone (coastal geochemical processes). More collaboration arrangements are in progress.

Where much-needed information is not available from other sources, the *Sea Around Us* project has generated its own database to meet the project's needs. These include:

- Global estuary database (1200+ records, see Figure 1)
- Database of mangrove and estuary associated fish
- 16,000+ "coastal" cells containing fisheries catches.

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Coasts - Continued from page 1

Figure 1. Map showing the location of the1201 estuaries in the Sea Around Us *project*

The global estuary database is the first to be designed at a global scale

The global estuary database is the first to be designed at a global scale and the first to include digitized shape cells for each estuary. There are a few national estuarine databases (one is being maintained in Australia) which contain scanned maps, but these do not treat estuaries as GIS objects, which are required for deeper types of analysis. The *Sea Around Us* database contains information about the name, location, area in km^2, perimeter and freshwater input with an annual time series where available, as well as documentation of sources of information. The database will be enhanced in the future with information on sediment loading, links to relevant hypoxic zones, upstream damming and primary production. Specifically, it contains:

- 1201 estuaries, of 127 countries and territories, digitized to date with complete information for 97% of these (Figure 1);
- data that accounts for more than 80% of the world's freshwater discharge;
- coastal lagoons and fiords; and
- a wide range of estuary sizes.

Developing the coastal component has its challenges – convincing other agencies to share their data has been the biggest challenge so far. Other challenges include finding information that is representative, current and accurate. As the project progresses we are continually redefining estuaries and their boundaries, how watershed modifications should be handled, when data need to be updated, etc.

The step of linking information to the 'coastal' cells of the *Sea Around Us* project database has already commenced for some of the datasets, and once it is finalized we hope to undertake our first 'coastal' study. We will be presenting the database at the upcoming International Estuarine Federation Conference in Seattle, this coming May, whose participants may help to expand the dataset as well as enhance its usefulness to other projects. In the meantime, the estuary team will continue to put the "C"oast into the SCAUP!

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Last week it was summer - confessions of an ecosystem traveller

By Villy Christensen

Around the year in four weeks – that needs an explanation. At this time of writing, I'm sitting in Denmark preparing for Christmas and for a meeting of the Global Modelling Group of the Millennium Ecosystem Assessment, to be held in Amsterdam in early January 2003. It is winter outside, cold, below zero, but good to be back-home. We may have an ice-winter coming if this continues - would be the seventh in the last hundred years.

Summer

Last week it was summer. I was in Cape Town for a workshop and a meeting. Let's start with the former (which was later): Dr Lynne Shannon, of Marine and Coastal Management, Cape Town (whom many will remember from her visits to the Fisheries Centre) had organized a workshop at the University of Cape Town to introduce an Ecosystem Approach to Fisheries (EAF) in South Africa, and I was invited as a resource person. Not that the EAF idea is new to South Africans: they have actually shown the rest of the world how to do ecosystem research through the Benguela Program (previously headed by FC reviewer Prof. John Field), even before that kind of work became fashionable. Further, Lynne defended her Ph.D. last year on Ecopath with Ecosim (EwE) modeling of the southern Benguela. Indeed she has been our ambassador in South Africa for years.

The purpose of the workshop was to discuss the feasibility of introducing an EAF to the southern Benguela ecosystem, and examine how to go about an implementation in South Africa. A wide range of local and international scientists participated, including worthies such as Doug Butterworth, André Punt, John Field, Gunnar Stefansson, Kevern Cochrane, Tony Smith, Beth Fulton, Astrid Jarre, and Kerim Aydin to mention but a few. A range of models for ecosystem management was presented, with focus on EwE, which had already been extensively applied to the southern Benguela ecosystem. Quoting from the workshop report: "The anticipated outcome of the workshop was to propose a framework of practical ways in which we could try to incorporate ecosystem considerations (including information from other types of multispecies approaches) into current Operational Management Procedures and other management strategies for South African marine resources […] It was recommended that an EAF be implemented as an incremental procedure with immediate effect, e.g., by starting to use ecosystem models to provide guidance on reference points still currently set according to single-species assessments."

The workshop thus illustrates how ecosystem approaches are gradually but surely finding their way into assessment. Moreover, it is becoming increasingly clear that EAF will be useful for strategic management (i.e., policy exploration), and play a complementary role to our traditional, tactical (fire-fighting) management, based on single-species assessments.

The workshop thus illustrates how ecosystem approaches are gradually but surely finding their way into assessment

The IOC/SCOR Working Group 119 meeting preceding the MCM workshop was held in a former prison at the famous Cape Town Waterfront. The place, for those who don't know it, is like Big Sur in California, complete with a waterfront that is a bigger version of San Francisco's Fisherman's Wharf, only within a real, working harbor. As a tourist in Cape Town one can get away seeing very little of what is happening in the hinterland of South Africa.

The meeting was devoted to 'Quantitative Ecosystem Indicators for Fisheries Management' (see www.ecosystemindicators.org), and included an international group of scientists (Figure 1),

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hand-picked by the two co-chairs, Philippe Cury (Figure 4) and yours truly. WG 119 is a joint activity of UNESCO's Intergovernmental Oceanographic Commission (www.ioc.unesco.org) and the Scientific Committee on Oceanic Research of ICSU (www.jhu.edu/~scor) – which by itself is remarkable, as these two organizations usually do not co-sponsor Working Groups. The WG has a very strong membership (which helps a lot in getting the work done and the message accepted), and was set up in response to a large number of countries asking for advice on how to use indicators as part of EAF operational frameworks. As Tony Smith, a former grad student of Carl Walters, formulated it: "In Australia the legislation [with regards to EAF] has been ahead of the science". The existence of WG 119 shows that 'Science' is now catching up. A similar development is taking place in many other countries, and one indicator of this is that interest and support for the WG is huge and still-growing. Many organizations have already listed as co-sponsors.

I especially remembered a summer course as a student working with food of the fishes of the largest fjord in Denmark

One goal of this meeting was to prepare for the main event of WG 119: an international symposium to be held at the UNESCO/IOC HQ next to the Eiffel Tower 31 March – 3 April 2004, with the co-sponsorship of NMFS, PICES, IRD and our very own *Sea Around Us* project (see www.ecosystemindicators.org). The meeting also included a series of presentations, most available at the WG's website, including one by D. Pauly (and an absent R. Watson) on "Mean trophic levels and related indices of ecosystem status" and one that I devoted to "Fitting ecosystem models to time series data & their use for indicator evaluation." The presentations served to set the stage for what can be expected from keynote lectures in Paris, and gave prospects for a good symposium.

Winter

The week before Cape Town was a cold winter-week in Denmark, and hence the freezing workshop participants in Figure 5, gathered for a week at a field station of Aarhus University, the Rønbjerg Laboratory, on the shores of Limfjord. I came quite often to the lab as a grad student, and especially remembered a summer course working experimentally with food of the fishes of the largest fjord in Denmark. The lab has a neat, bound collection of decades of course reports, and I spent hours going through them, returning mentally to student-hood. At first, it seemed as if I had been erased from history - I couldn't find my report, nor remember what year it was. I finally found it, and to my great relief, and perhaps that of the workshop participants, I was reinstated as a person with a past - through a report that wasn't even embarrassing after a couple of decades.

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Figures 1-4, clockwise from top left:
Figure 1.
IOC/SCOR WG 119 met at Cape Town waterfront, at the foot of the Table Mountain - smiling though they couldn't stay outside ...

Figure 2.
... as the very serious meeting was held underground ...

Figure 3.
... in a former prison.

Figure 4.
My co-chair, Philippe Cury.

Figure 5. Participants in the Limfjord workshop. Smiling because they didn't have to stay outside

Figure 6. A small dedicated workshop with one aim: the Limfjord Model. A week around a table.

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Existential angst wasn't the reason for going to Rønbjerg, though. We were there to construct a trophic model of the Limfjord in order to address an overwhelming question: Why aren't there any fish in the fjord anymore? It is not simply a question of fishing effort: many of the demersals starting declining 10-15 years ago, while the pelagic fishes did well. The usual suspects are the seals and cormorants, both of which having grown from nearly nothing to population-sizes that may be near carrying capacity. However, some think it may be, paradoxically, a result of cleaning up the water in the fjord: the sewage that previously flowed into the fjord was effectively cleaned just when the fish started disappearing.

The participants of the workshop were an interesting lot. Small groups representing the Danish Institute for Fisheries Research, the environmental agency, the counties around the fjord, and the national fishers' organization (Figure 6), with representatives from part-time fishers' organizations dropping by. Funding for the workshop came from anglers' license fees, obtained only through support and approval from the various fishers' organizations (who decide how these license fees are distributed). These people not only want ecosystem-based management of fisheries, but they are willing to pay for it! Indeed, one representative joined our workshop with a box of oysters (Figure 7), and another arranged for press and TV coverage of the workshop. A preparatory workshop with some 40 participants having made it possible for a wide range of data to become available, we were able to construct a model, balance it, fit it to time series and examine its behavior in just a few days. Ecosystem modeling was new to about all of the participants, and it was remarkable how far we got in a week. Based on this positive experience, plans are now underway to widen the scope to a series of fjords in Denmark.

Autumn

The week before was a beautiful autumn week, sunny

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These people not only want ecosystem-based management of fisheries, but they are willing to pay for it!

Me too!

by Daniel Pauly

Since I participated in early December at the WG 119 meeting held in Cape Town, South Africa ('Summer'), then moved on to give a series of lectures in Reykjavik, Iceland (definitely 'Winter,' even closer to the North Pole than Denmark), I think I may be allowed to mention that, I too, went through a few climatic changes lately.

I had been invited by Dr. Tumi Tómasson, Director of the Fisheries Training Program (FTP) jointly operated by the Tokyo-based United Nations University, and a number of Icelandic organizations, foremost the Institute of Marine Research, in Reykjavik. Every year, about 20 participants, mainly young or mid-career professionals from developing countries (e.g., Cuba, Vietnam, Cape Verde, Gambia) are invited, about half in fisheries research, the other in fish processing. This year, the fish processing folks drew the shorter straw, as they had to listen to the series of six lectures/seminars I presented (besides having individual discussion with the 'fisheries' participants). At night in my hotel room, I added comments to those six lectures (Powerpoint makes this easy, but it still took hours), as Tumi wanted to have them on the FTP website (see www.unuftp.is, and click on 'Visiting Lecturers').

There was barely time to buy some Christmas tree decorations (that they have any is surprising, given there are essentially no trees in Iceland), before trading the gloom of Reykjavik with that of Vancouver.

Figure 7. Erik Hoffman, DIFRES, demonstrated strong workshop capabilities as the fastest, most tireless oyster-opener.

Figure 8. Carl Walters played a prominent role at the Mote Conference, and was even allowed to congratulate the winner of the Young Scientist Award, Sarah Gaichas, NMFS, Seattle.

Despite his fishing escapades, Carl Walters clearly was, from a scientific perspective, the head honcho of the Symposium

Last week - Continued from page 5

and up to 18°C, back in Vancouver. After 3½ years in Vancouver I'm getting convinced that the reason why Vancouverites say it's *always* raining in Vancouver is to avoid the city being flooded from the interior. Vancouver weather is far better than is rumored and putting this in print will enable me to cite a published reference when the rumor reappears.

Spring

The week before Vancouver, it was sunny, a bit chilly and with spring popping-up all over in Southern Chile. Hugo Arancibia and Sergio Neira from Universidad de Concepción had invited Bob Olson from IATTC and me to Concepción for a small workshop on the Chilean mid-shelf, a big area with catches measured in millions of tonnes. We spent the first half of the week working with a local Ecopath model, focusing on fitting time series data, and exploring optimization policies. It worked out quite well. Meanwhile Bob Olson was working on predicting primary production (PP) from sea surface temperature (SST) anomalies, and when we compared notes, it turned out that the predicted PP anomalies estimated by Ecosim matched the SST-based anomalies remarkably well.

The last part of the week was set aside for discussing the model and how to incorporate an ecosystem approach to fisheries into the management of the mid-Chilean shelf. The participants were from the Ministry of Fisheries, the private sector and from several Chilean universities. Bottom-line: the train is moving in Chile as well. I also had the pleasure of giving a well-attended (100+) presentation at the university, "Ecosystem-based management of fisheries: the role of modeling."

Summer

The week before it was summer, and we were in sunny Florida, at the 2002 Mote Symposium (www.bio.fsu.edu/mote/abstracts02.html) on "Confronting tradeoffs in the ecosystem approach to fisheries," held 5-7 November, one in a series of annual gatherings held at the Mote Laboratory in Sarasota, where Carl Walters likes to go fishing. He managed to take so many of us fishing, be it for lunch or after-hours (Figure 9) that I'm beginning to see what he sees in Florida. Despite his fishing escapades, he clearly was, from a scientific perspective, the head honcho of the Symposium (Figure 8), which was organized by Felicia Coleman. The Symposium had attracted lots of neat contributions demonstrating various

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*Figure 9. Pufferfish (*Sphoeroides nephelus*) and professor (*Jim Kitchell, *at right) observed during Mote post-Conference field sampling.*

Last week - Continued from page 6

approaches to ecosystem management of fisheries (with a strong dominance of EwE-based approaches, though) along with the consequences (tradeoffs) that must be considered when taking an ecosystem perspective to management. Clearly, the field has shifted in recent years. This was elegantly summarized by Jason Link from Woods Hole in one of the last presentations, "it is no longer a question *if* ecosystem modeling has a contribution to make to fisheries management, but *how*."

Fisheries Centre staff (current and former) served prominent roles at the Symposium, e.g., through Carl's opening lecture on trade-offs in sustainable management of marine ecosystems, Steve Martell's contribution on fishery/mammal/enhancement trade-offs in the Pacific Northwest, Tom Okey's "chasing Walters' demon toward ecosystem-based fishing policies in Prince William Sound," and Sean Cox' on "the Lake Superior ecosystem, its sequential fisheries collapses and conflicting objectives for rehabilitation". For my part, I described a further development of the ecosystem policy optimization module of Ecosim and its use.

And now we are back to where I started in early November, and I thus haven't been spending far too many uncomfortable nights in too many planes in too many time zones, so I'm feeling really quite good.

Social scientists go to GLOBEC

By Ussif Rashid Sumaila

So, if GLOBEC is focused on zooplankton, what were social scientists doing at one of its meetings?

The GLOBEC (Global Ocean Ecosystem Dynamics) project held its Second Open Science Meeting from October 15-18 October, 2002 in Qingdao, China. From my perspective as an economist, the interesting thing about this meeting was that three social scientists - Rosemary Ommer of the University of Victoria, B.C., Kenneth Broad of the University of Miami, and myself, representing both the *Sea Around Us* project and the Fisheries Economics Unit of the Fisheries Centre, UBC - were invited to give plenary presentations to a group consisting essentially of natural scientists. Dr Ommer presented her work with Ian Perry, of the Department of Fisheries and Oceans, Canada, on "Scale issues in marine ecosystems/human interactions". Dr Broad spoke about "Climate, culture and scientific uncertainty: the case of Peruvian fisheries". Finally, I presented my work on "Discounting: A crucial link in the interaction between coastal communities and global changes in marine ecosystems." It was amazing to see the amount of discussion that these presentations generated, given the interest of the audience. I think this is a good sign for the future of marine ecosystem management - the more we get social and natural scientists talking to each other, the better the prospect of fixing some of our resource problems.

GLOBEC is a core project of the International Geosphere-Biosphere Programme (IGBP), and is tasked with elucidating how global change will affect the abundance, diversity and productivity of marine populations (see *http://www.pml.ac.uk/globec/main.htm*). GLOBEC is focused on zooplankton – the assemblage of herbivorous grazers on the phytoplankton and the primary carnivores that prey on them, which are the most important prey-items for larval and juvenile fish, and hence have a crucial role in marine ecosystems.

So, if GLOBEC is focused on zooplankton, what were social scientists doing at one of its meetings? I think it is because, increasingly, scientists are discovering and acknowledging that understanding the problems of ocean ecosystem dynamics and their downstream effects on humans, and devising science-based solutions to them, is outside the scope of any one discipline. For this reason, GLOBEC intends to expand the involvement of social scientists in its work – a laudable and necessary move, which other global marine research endeavors may need to emulate, in the interest of reaching the broad understanding of the interactions between humans and marine ecosystems that is now required as a basis for management advice.

Millennium update

by Jackie Alder

I represented the *Sea Around Us* project at the recent Conditions Working Group meeting of the Millennium Ecosystem Assessment (MA) in Sao Carlos on the plateau behind Sao Paulo, a peaceful city set in the middle of an agricultural region of large cattle ranches, with cattle, orange groves and various crops. Sao Carlos also boasts a disco modeled on the pyramids of Egypt.

The aim of this meeting was to progress the structure and content of the various conditions chapters and the confirmation of Lead Authors (LAs) for the chapters. The marine and coastal chapters were a party of three – Dr. Tundi Agardy, the chapter-author for the coastal chapter, Dr. Juan Restrepo, a junior scholar, and myself. Compared to many other chapters, represented by six or seven people, we were outnumbered. However, it did not slow us down. By the end of the meeting we had a long list of potential authors and chapter outlines for the coastal sections, and a rough draft of the chapter for the marine section.

I found it interesting to see how other authors perceived the role of marine and coastal environments

In addition to this, two major benefits emerged from the meeting. First, it gave delegates an excellent opportunity to meet with other chapter-authors to clarify areas of overlap, to define work boundaries and to share ideas. I found it interesting to see how other authors perceived the role of marine and coastal environments in chapters with topics ranging from human health to bioprospecting. Second, there was a session on the databases available to MA authors, which proved to be quite informative and lively as we debated such things as data-security and distribution. It was also reassuring to find out that the MA is providing a resource person to assist other authors in searching and accessing information.

The next Conditions Working Group meeting is scheduled for May in Washington DC. The timing is perfect for the marine and coastal chapters, since we will have just held our April cross-cutting meeting here in Vancouver and made substantial progress towards finalizing the two chapters. No doubt the next issue of the *Sea Around Us* Newsletter will be able to report on much progress we have made on the MA.

For more on the Millennium Ecosystem Assessment, see articles by Daniel Pauly in Issue 13 and Jackie Alder in Issue 14.

Neville Ash (right), Bob Scholes chairpersons of the conditions working group, and Jillian Thonell (left), the new database officer for the MA.

Can anyone guess what the coils pictured above are made of? Hint – they are NOT made of any material found below high water mark! (Answer below).

Photos by J. Alder

Answer: They are coils of cigarette tobacco sold in the local market in Sao Carlos.

Sea Around Us

Millennium Assessment update: Marine and Coastal Cross-Cutting workshop

by Jackie Alder

This April, the *Sea Around Us* project hosted the Millennium Assessment's (MA) Marine and Coastal Cross-Cutting Workshop. The workshop was the third in a series of five, designed to ensure that all facets of the MA include specific components such as marine systems throughout. Several coordinating and lead authors (LA) for the various chapters in the MA reports attended this meeting to provide a different perspective and to help clarify questions and issues related to areas outside of the expertise of the marine and coastal participants.

A raven dancer greets Richard Dugdale (left) and Andrew Bakun (right) to the workshop. *Photo by J. Alder*

Daniel Pauly of the *Sea Around Us* project is coordinating lead author (CLA) for the Marine chapter and Tundi Agardy, a private consultant based in Washington D.C. is the CLA for the Coastal chapter. Several members of the *Sea Around Us* project are also involved in the MA: Villy Christensen, Deng Palomares, Reg Watson and myself participated in the workshop and will continue to contribute to the writing of both chapters as well as furthering the scenarios work.

The previous two cross-cutting workshops were on human health issues and biodiversity. This workshop was the first to focus on specific ecosystems – the marine realm and coasts. Despite the earth surface being 70% marine, the world's oceans and coasts are often forgotten in global studies. The results of this workshop, however, will ensure that this does not happen in the MA.

While the group of over 20 dedicated researchers, from a wide range of expertise (and not all of them of the 'wet' sort), was smaller than the previous two workshops, we made significant progress on the writing of the marine and coastal chapters of the planned conditions and trends report, strengthened and expanded the coverage of the other chapters, and tuned the work of the scenarios and responses working groups. The addition of experts from other fields provided a different perspective to marine and coastal issues, which will further strengthen the marine and coastal work. Many of the

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participants who did not have a marine background commented on how much they had learned and how they now have a better appreciation of marine and coastal issues.

The evening's entertainment provided visitors with a glimpse of the importance of the coast and offshore resources to aboriginals in British Columbia

The workshop was launched at the First Nations House of Learning with welcoming remarks from the University of British Columbia's Michael Goldberg, Director of International Affairs and Dick Carson, Pacific Regional Manager of Ocean Policy, Department of Fisheries and Oceans. The Longhouse venue, combined with BC's rich history of fishing and the spiritual values of BC's First Nations, provided an inspiring start to the workshop, especially since the MA has been working hard to ensure that aboriginal needs are recognized and included. The first day of the workshop was concluded with a dinner of traditional aboriginal food and The Lax Kaien Tsimshian Dancers. The evening's entertainment provided visitors with a glimpse of the importance of the coast and offshore resources to aboriginals in British Columbia and set the scene for a productive week.

Participants at the MA Marine and Coastal Crosscutting Workshop with members of the Lax Kaien Tsimshian Dancers.

The workshop then moved to St John's College for the remainder of the week and much work was accomplished. The current drafts of the three major reports on 'Conditions and Trends', 'Scenarios' and 'Responses' were reviewed in detail, including recommendations on incorporating important marine and coastal aspects. The group reviewing the Scenarios report found it quite a challenge to determine the likely events that would play out for the four scenarios that have been proposed by the MA's Scenarios Working Group. The scenarios have previously been described (see *Sea Around Us* Issue 14: www.saup.fisheries.ubc.ca/Newsletters/newsletter.htm). Because of the limited knowledge of marine systems combined with even less knowledge of the impacts of some of the proposed initiatives for such systems, the scenarios breakout group came to a consensus that any of these scenarios will have considerable uncertainty about how marine systems will behave. But under all four scenarios, it was agreed, fish landings would not increase above what they currently are.

The crosscutting workshop also made substantial progress in defining marine and coastal concepts and clarifying a number of terms that are used in the MA. The MA authors from outside of the marine and coastal chapters highlighted a number of concepts that they were not familiar with. Terms such as 'production' or 'harvest'

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The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

MA - Continued from page 2

are used extensively in the terrestrial realm to define the output of cultivated systems. In the marine sector, they do not have the same meaning. Gathering marine and coastal experts from different areas allowed identification of a range of datasets that will be useful for other researchers participating in this MA as well as for providing baseline data for subsequent MAs.

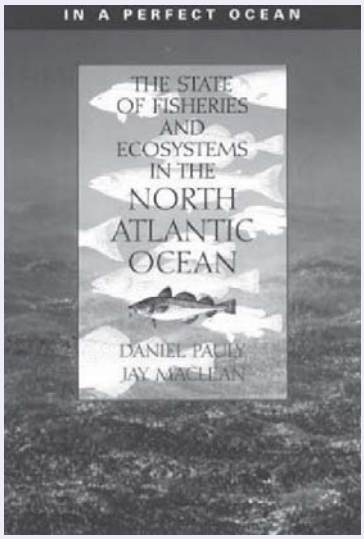
The workshop also provided the CLAs with the opportunity to meet with colleagues who are contributing to the marine and coastal chapters and to highlight information gaps and approaches to fill those gaps as well as to reach a consensus on what are the major issues and how they should be presented.

Some of the MA workshop participants took advantage of the weather and spent a few hours on Wednesday afternoon touring the Fraser Inlet and coast. It was a beautiful afternoon: the weather, sun and marine wildlife cooperated so that participants were given a glimpse of the coast of Vancouver - a mix of industry, recreation, urban and port development. Within this seascape they saw a real false killer whale, seals and a wide variety of sea birds and waders. Participants from the United States were thrilled to see bald eagles, their national bird, in such numbers while others were amazed that such wildlife could be seen so close to a city.

The *Sea Around Us* project is pleased that, through hosting the workshop, it could make a significant contribution to the progress of the Millennium Assessment. The workshop allowed us to make a major leap forward in making sure that marine and coastal systems are considered throughout the MA. It also highlighted the fact that there is considerably more work to be done to make sure that decision-makers in the public and private sectors, the major end-users of the MA, have the most up-to-date and best advice available to ensure the sustainability of oceans and coasts. No doubt the *Sea Around Us* through its participation in the MA has much to contribute to this end!

The Sea Around Us project is pleased that it could make a significant contribution to the progress of the Millennium Assessment

In a Perfect Ocean: The Sea Around Us now available in paperback



Long-term readers of this newsletter may remember a story published in May/June 2001 (*Sea Around Us*, Issue 9, p. 3), where scientific writer Jay Maclean is described as working feverishly through the night, during a *Sea Around Us* workshop in Nanaimo, to finish the first draft of *In a Perfect Ocean: The State of Fisheries and Ecosystems in the North Atlantic Ocean.* Those who have been waiting ever since for the book's publication will be glad to know that it has just been published by Island Press.

In a Perfect Ocean, by Daniel Pauly and Jay Maclean, presents the first comprehensive empirical assessment of the status of ecosystems in the North Atlantic ocean. Drawing on the results of the work of the *Sea Around Us* project, the book provides a picture of an ocean whose ecology has been dramatically altered by fishing. In addition to presenting some of the many maps and graphs produced by members of the *Sea Around Us*, including Reg Watson, Villy Christensen, Rashid Sumaila, Kristin Kaschner and Dirk Zeller, the book provides a snapshot of the past health of the North Atlantic and compares it to its present status; presents scientific assessments based on the key criteria of fisheries catches, biomass and trophic level; discusses the factors that have led to the current situation; and discusses the policy options available for halting the decline. The book is intended to be the first in a series of assessments by the world's leading marine scientists.

And Kenneth Arrow was in the audience!

by Ussif Rashid Sumaila

I think I succeeded in convincing the audience that it is both ineffective fisheries management and the way we discount flows of net benefits that contribute to over-fishing

In the past year or so I've given talks in various parts of the world on how discounting may affect our ability to manage marine resources sustainably, for the benefit of both current and future generations. In January 2003, I gave one such talk at Stanford University on the invitation of the Institute for International Studies. Given that the lecture was very early in the semester, my host, Dr Rosamond Naylor, informed me not many people were likely to attend. To our pleasant surprise we ended up with a full house, with several Stanford economists, including Nobel Laureate Kenneth Arrow, in attendance.

I began my talk by asking the question: do economic models of marine resource use adequately capture the interests of future generations? In other words, are economic models altruistic? I discussed what the literature says, and presented fisheries data to examine the empirical evidence regarding this question. I then proceeded to introduce the concept of intergenerational discounting, which has the potential to solve the vexing problem of discounting of flows of net benefits from natural and environmental resources. Finally, I used results from a model of the Icelandic ecosystem to illustrate the benefits from restoration programs for the ecosystem, compared to those from maintaining the status quo fishing strategy (Sumaila, 2001).

A key message of my presentation is that conventional discounting results in the 'front loading' of benefits and the 'back loading' of costs. This in turn leads to a situation where the interest of future generations is compromised. It should be noted that I am not the first to make this point; many others have been concerned about the effect of discounting on benefits to be received from natural systems in the distant future (e.g. Clark, 1973; Weitzman, 2002). To deal with this problem, I presented the newly developed intergenerational discounting approach of Sumaila (2001) and Sumaila and Walters (2002), and results from an analysis of the Icelandic model mentioned earlier, using the conventional and intergenerational discounting approaches.

In the discussion that followed. First, a point was made that discounting as conventionally practiced is meant to demonstrate the economic efficiency of environmental projects and policies, and nothing more. Concerns such as inter- and intra-generational equity and ecosystem sustainability should be dealt with outside the economic valuation framework. My response to this is that, while there is a need for policy makers to know the state of environmental projects with regards to economic efficiency, there is also a need for evaluation approaches that explicitly include legitimate policy questions as part of the framework of economics. By incorporating the concerns for future generations within the economic framework, policy makers can determine what they have to give up in terms of economic efficiency in order to meet crucial societal objectives such as intergenerational equity.

Another interesting point, made by Kenneth Arrow and others, was that most of the overfishing observed in various parts of the world is due to the open access nature of fisheries and not the way we value the flow of benefits. I think I succeeded in convincing the audience that it is both ineffective fisheries management *and* the way we discount flows of net benefits that contribute to over-fishing. Another comment worth mentioning is that a member of the audience encouraged me to try to link the idea of discounting clocks to Daniel Pauly's "shifting baseline syndrome". Rather coincidentally, Daniel and I had already discussed a joint contribution to do just that.

I had a wonderful time at Stanford and I believe that my visit has created the potential for future collaboration between the Fisheries Centre and the Institute for International Studies at Stanford.

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Continued on page 5- Stanford

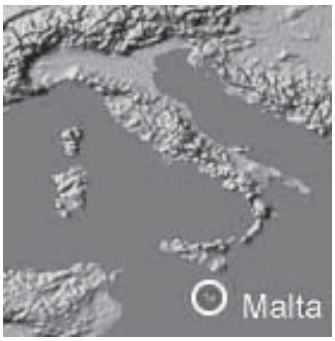
The FishBase Consortium was in Malta?

by Maria Lourdes (Deng) Palomares

Yes, it was! I went to sunny and beautiful Malta. Don't get me wrong, I went there to work! The invitation to give a FishBase overview to the Fauna Europaea Third End-users Forum Meeting, 7-10 March 2003, was welcomed and accepted with much enthusiasm (especially since I had never been to that part of the world). Organizers were Dr Patrick J. Schembri and Marika J. Gauci from the University of Malta.

The purpose of this meeting was to obtain an insight into what users of biodiversity databases in Europe want, and how they would like the access of information provided. The meeting was attended by: a) a 9-member Maltese end-user panel, consisting of representatives from the Ministry of Agriculture and Fisheries, the Natural History Museum of Malta, the University of Malta, and two national NGOs; b) a panel of 3 invited speakers from the FishBase Consortium (I represented the Fisheries Centre, and there were also representatives from the University of Agricultural Sciences, Vienna, and from the European Topic Centre on Nature Protection & Biodiversity (European Environment Agency, Paris); c) the 5-member *Fauna Europaea* Bureau; and d) the 5-member *Fauna Europaea* Newly Accessing States (to the European Union) panel.

The *Fauna Europaea* Bureau presented the prototype of the online interface which will provide access to their database



containing scientific names as well as information on the distribution of all European fauna. This primarily taxonomic database will link to similar databases (e.g. Species 2000, and others like FishBase) providing more in-depth biological and geographical information for each species. One of the many important questions addressed and resolved in this meeting was the inclusion of common names in the different languages of the region.

All of the invited speakers were asked to present their experiences in the building and maintenance of their databases. Special attention was given to future plans of collaborations and synergies between these various databases. I presented FishBase, using Maltese examples, notably the many Maltese common names supplied by Fisheries Centre graduate student, Yvette Rizzo, who is from Malta. I also outlined some of the reasons for the success of FishBase as an information and biodiversity database. I emphasized the lessons we learned through the 12 years of working with a complex, 'data hungry' database - notably that quality is not compromised by the quantity of data encoded and that all collaborators, data providers and authors of the various publications used in FishBase are given explicit credit. I also stressed the importance of vernacular names: the primary reason for the more than 6 million FishBase hits in February 2003. FishBase was well received as a 'model' database and my presentation generated a number of queries and offers of collaboration from the Maltese colleagues, notably, Mr. Darrin Stevens, from the Convention on Biological Diversity for Malta.

... an insight into what users of biodiversity databases want and how they would like the access of information provided ...

In addition to the opportunity of presenting FishBase to a receptive audience, who could not have resisted enjoying the sun, the clear blue skies contrasting with the limestone buildings of the old city of the Knights of St. John, the fantastic blue waters of the Mediterranean Sea and the friendly smiles of the Maltese people? I am happy I went …

Stanford - Continued from page 4

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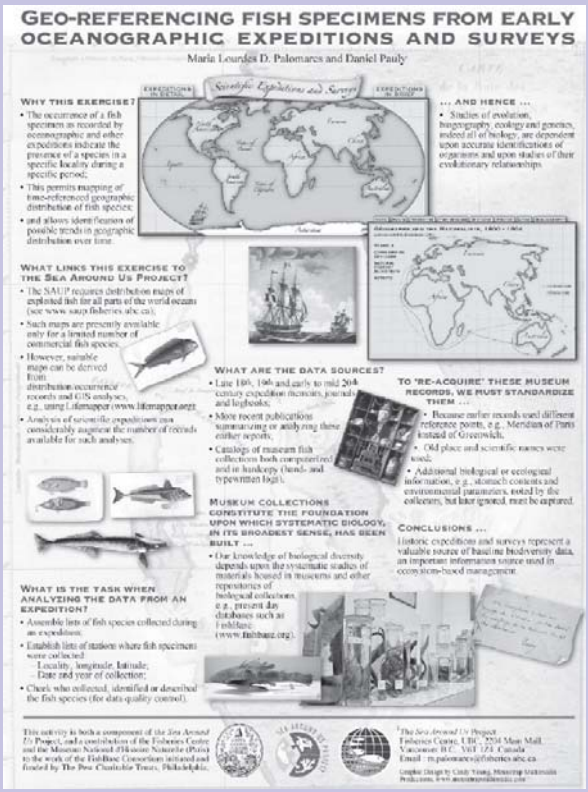
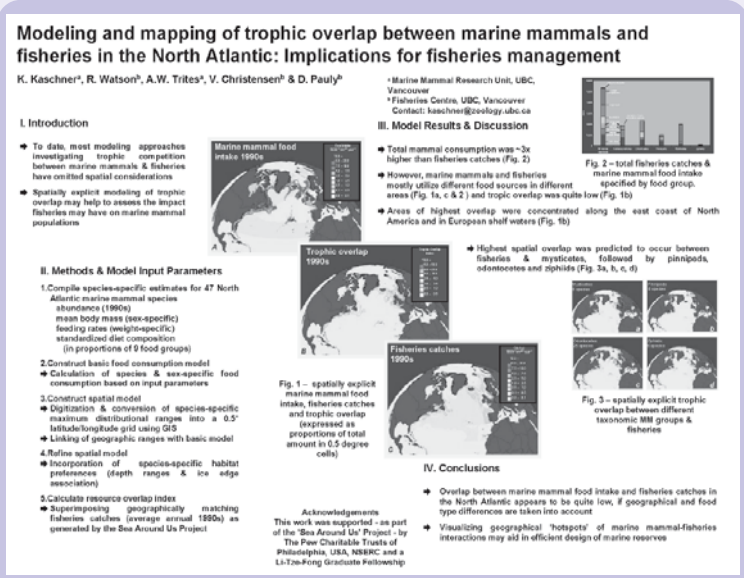
Sea Around Us posters

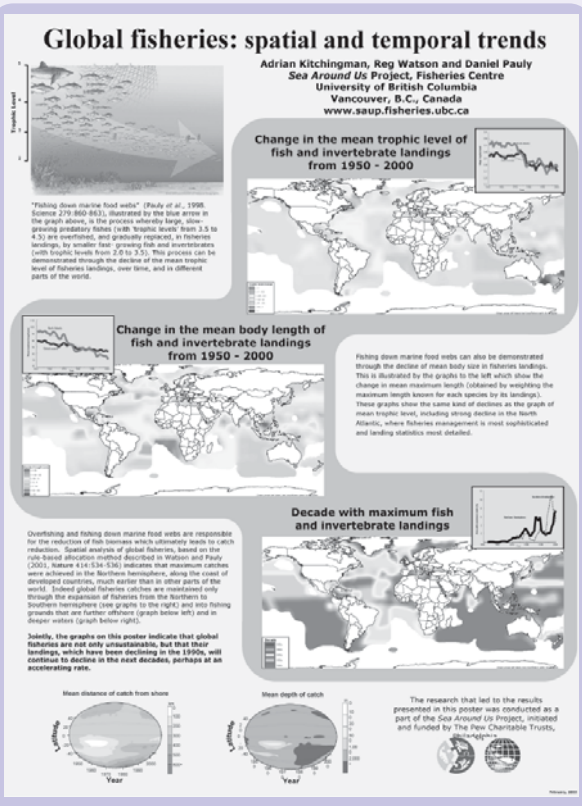
Sea Around Us members presented several posters at the Fisheries Centre Open House in February this year. Here we present a selection of these, representing some of the diversity of research interests in the *Sea Around Us* team.



"This poster introduces an initiative to establish a catalogue of late 18th to early 19th century oceanographic expeditions and early 20th century scientific surveys and also the detailed work of recovering baseline fish occurrence data from these expeditions and surveys. It can be downloaded at www.saup.fisheries.ubc.ca/ExpeditionsPoster.pdf. A website on this work is currently under construction - watch this space!" Deng Palomares.



"My research uses GIS tools to investigate the degree of trophic overlap between marine mammals and fisheries on a global scale. This poster shows some preliminary results for the North Atlantic in the 1990s and demonstrates how spatially explicit modeling of trophic overlap may improve the assessment of potential impacts of fisheries on marine mammal populations. The poster can be downloaded at www.saup.fisheries.ubc.ca/FisheriesMammalOverlap.pdf." Kristin Kaschner.



"We designed this poster to give a geographical depiction and comments on the spatial and temporal trends in global fisheries that have been revealed through our research with Daniel Pauly and other *Sea Around Us* members. Interactive maps of this work can be viewed under 'Web Products' at www.saup.fisheries.ubc.ca. You can also download the poster at www.saup.fisheries.ubc.ca/GlobalTrendsPoster.pdf". Reg Watson (left) and Adrian Kitchingman.

Sea Around Us

Millennium Ecosystem Assessment: Episode V

by Jackie Alder

The Millennium Ecosystem Assessment (MA) is making substantial progress towards the drafting of the Conditions and Trends Report and the *Sea Around Us* project has been busy in workshops associated with this progress. In May and June, I attended the third Conditions and Trends Workshop as well as two cross-cutting workshops – Food & Cultivated Systems and Freshwater & Inland Waters.

Jackie Alder (bottom right) with members of the Freshwater & Inland Waters Cross-Cutting workshop in the Kakadu World Heritage Site, Australia.

The Conditions and Trends Workshop was held at Chantilly, near Washington DC in early May. It was a productive four-day workshop with considerable progress being made in finalizing the format, scope and content of the report as well as identifying gaps in reporting, as well as clarifying areas of overlap and duplication. The workshop provided the *Sea Around Us* project with an opportunity to follow up on issues raised at the Marine & Coastal Cross-Cutting workshop held in April (see *Sea Around Us* Issue 16). Considerable progress was made in describing drivers (such as climate change), especially in the context of ecosystems and ecosystem services.

The Food & Cultivated Systems Cross-Cutting Workshop was held in late May at the International Food Production Institute in Washington DC. The three-day workshop was filled with some lively discussions on the scope and nature of the scenarios. These discussions provided very useful feedback to the scenario working group. The workshop participants were from a range of backgrounds, including myself from fisheries. This diverse mix of participants put the importance of cultivated systems and food (as an ecosystem service) into perspective and also highlighted the interactions between marine & coastal systems and cultivated systems. The relative importance of fisheries in the global supply of food - protein especially - was also highlighted.

Darwin, in Northern Australia, was the site of the Freshwater & Inland Waters Cross-Cutting workshop, held in early June. Darwin is located in the monsoon belt and is close to the Kakadu World Heritage Site - famous for its wetlands and the ideal site for such a workshop. The workshop highlighted the links between marine & coastal systems and freshwater & inland waters. A representative from Ramsar (the location of the signing of the Convention on Wetlands) attended the workshop, providing an opportunity to discuss in

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The Sea Around Us Project Newsletter

Issue 17 – May/June 2003

Counting the Last Fish

... the somewhat dire picture painted by *Sea Around Us* results may actually underestimate the true impacts of fishing ...

*A recent popular magazine article again brings a global perspective to the crisis facing world fisheries. "Counting the Last Fish" (*Scientific American, *289, 42-47), by Daniel Pauly and Reg Watson, synthesizes the work of the* Sea Around Us, *painting a picture of a global ocean that has been decimated by overfishing. Citing recent high-profile publications by Jackson et al. (*Science, *293, 629-638) and Myers and Worm (*Nature, *423, 280-283), the authors point out that the somewhat dire picture painted by* Sea Around Us *results may actually underestimate the true impacts of fishing on marine ecosystems. We hope that continuing popular publications of this type will help raise public awareness of the crisis.*

The ***Sea Around Us*** project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, 6660 NW Marine Drive, Building 022, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at www.saup.fisheries.ubc.ca and contains up-to-date information on the project.

MA Update - Continued from page 1

detail how the MA can meet the needs of the Convention. Eleven participants extended their stay in the area to explore Kakadu. The three day trip, which highlighted the wetlands of Kakadu, was excellent. The wetlands were relatively wet (compared to how they would be later in the year) but they were still filled with a range of wildlife – crocodiles (fresh and saltwater), wallabies, wallaroos, dingos, goannas, snakes and a number of species of birds. The highlight of the trip was watching a flock of red- tailed black cockatoos socializing one evening by a billabong.

The pace of progress of the MA is increasing as the cross-cutting workshops clarify various issues and provide guidance on how the authors should address areas where subjects overlap. Many authors, including the *Sea Around Us* authors, are revising and adding maps and tables in preparation for the Combined Working Group Meeting scheduled for October, 2003, in Prague. This milestone will see most chapters close to their final draft stage. No doubt between now and then we will be busy completing the marine and coastal chapters.

Daniel Pauly elected as RSC Fellow

We are delighted to announce that Daniel Pauly has been elected a Fellow of the Academy of Science of the Royal Society of Canada. Fellowship is granted to those who have achieved "exceptional distinction through a body of past and continuing scholarly publications, ..., exhibiting clear elements of discovery, or making original contributions in the humanities and sciences"[1]. The RSC was established in 1882, to promote learning and to recognize remarkable contributions in humanities and sciences, and is widely regarded as Canada's most prominent academy of scholars and scientists. Daniel is the second Fisheries Centre Faculty member to be elected to the Society - Carl Walters was elected in 1998.

1. Royal Society of Canada, Act of Incorporation and By-Laws, 2001.

The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

Sea Around Us

Four years of the *Sea Around Us* Project

by Daniel Pauly
Principal Investigator

The *Sea Around Us* Project (SAUP), named after Rachel Carson's famous book (pictured), formally started in July 1999, with the goal of investigating and reporting on the impact of fisheries on marine ecosystems. The SAUP radically differed from other projects that may have appeared to have similar goals in that it was global in scope, i.e., it was designed to assess the impact of fisheries on *all* of the world's ocean. This required the development of a completely new methodology for representing fisheries, and for presenting their development and impacts at the scale of oceanic basins, or even globally.

This methodology, largely developed by SAUP team members Reg Watson and Villy Christensen, is now mature and has enabled us to represent, through maps, processes usually represented as trend lines on bivariate graphs. It is probably one of the major reasons for the visibility of SAUP results in various media, ranging from scientific journals such as *Science* and *Nature*, to magazines (e.g., *Scientific American*), newspapers (including recently the cover of the 'Science Times' section of the *New York Times*), TV interviews and documentaries and public lectures and briefings (including on Washington's Capitol Hill, and Brussels' European Commission).

Our focus in the first two years of the project was the North Atlantic, mainly because the abundance of field data, resulting from a century of tracking fisheries, made it easier to test the methodology against traditional approaches, but also because of the critical audience provided by the many marine biologists and fisheries scientists in the government and private laboratories in countries surrounding the North Atlantic.

We survived this scrutiny, and indeed managed to turn the table on potential critics by marshalling evidence in a book titled *In a Perfect Ocean*, pointing at a massive decline of the North Atlantic resources, attributable to a massive failure of the regulatory agencies in the countries bordering the North Atlantic. Ransom A. Myers and Boris Worm, in a widely noted article in *Nature* (Vol. 423, pp. 280-283) have since shown that we probably underestimated the decline of large fish in the North Atlantic - we did not mind being wrong that way.

The third year of the SAUP essentially consisted of extending the methodology developed for the North Atlantic to the rest of that ocean, i.e., the tropical Western

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The Sea Around Us Project Newsletter
Issue 18 – July/August 2003

SAUP update - Continued from page 1

Atlantic, from the Gulf of Mexico through the Caribbean to Brazil, the west coast of the African continent, and the South Atlantic all the way to Antarctica.

... the resulting maps, documenting strong declines of fish biomass along the entire coast of North West Africa had a huge media impact ...

In the Western Central Atlantic, however, the usually deplorable state of fisheries statistics required us to devote considerable energy to assemble, in collaboration with scientists in the various countries, credible catch time series, a process led by Dirk Zeller, following his completion of similar work in the North Atlantic. As well, a large amount of marine biological data was synthesized in the form of mass-balance food web (Ecopath) models for different ecosystems in the region, notably the Gulf of Mexico.

West African fisheries statistics are usually in better shape, and there, we were able to skip the data reconstruction phase. Rather, emphasis could be given to synthesis, here achieved, as for the North Atlantic, by integrating Ecopath models, many constructed by SAUP staff in collaboration with West African colleagues, into a single spatial representation. The resulting maps, documenting strong declines of fish biomass along the entire coast of North West Africa, had a huge media impact following their initial presentation at an international symposium initiated by the SAUP, and held in Dakar, Senegal, in June 2002.

Sea Around Us *team members. Top (L-R): Cindy Young, Vasiliki Karpouzi, Shawn Booth, Deng Palomares, Catriona Day, Adrian Kitchingman, Daniel Pauly, Reg Watson, Sandra Pauly, Katia Freire and Juarez Rodrigues. Bottom (L-R): Villy Christensen, Dirk Zeller, Jackie Alder and Deng Palomares.*

Coverage of the Southern Atlantic by the SAUP included analysis of the Namibian fisheries using various approaches (time series of ecosystem indicators documenting the 'fishing down marine food webs' effect and ecosystem modeling), and modeling of the Southern Atlantic and Antarctic systems, including the ecosystems around the Falkland Islands, the Weddell Sea and, via Deng Palomares in collaboration with a French group, the Kerguelen Islands. While we should soon be able to present a regional (South Atlantic) synthesis of these results, they have already found use in some global analyses, as they cover the extreme, southern end of the global expansion of fisheries that started after World War II and which ended when large trawler fleets began routine, if often semi-legal, operations around the Antarctic Continent.

The fourth year of the SAUP emphasized the north Pacific, though global analysis by the project staff as a whole became

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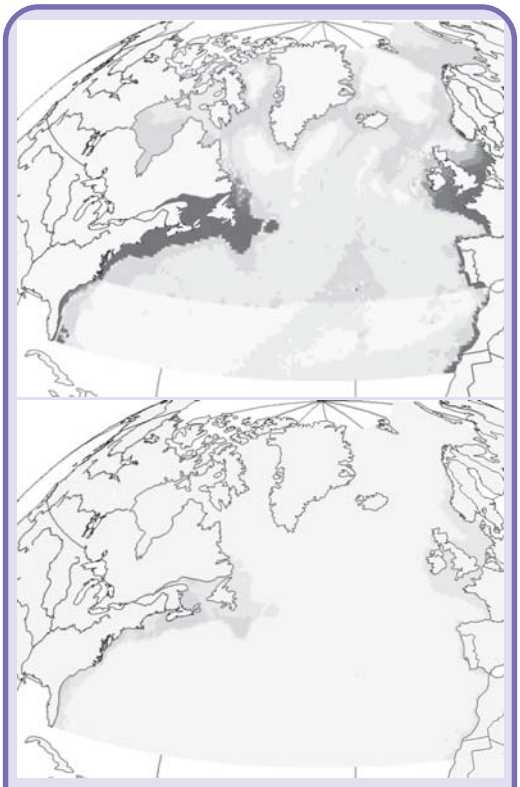
SAUP update - Continued from page 2

more common. Emphasis in the North Pacific is devoted to separating strong environmental signals, 'regime shifts', from fisheries impacts on ecosystems. For this, the SAUP can rely on a vast trove of ecosystem models and analysis - most conducted with Ecopath with Ecosim which is now widely used by researchers in the Pacific Northwest. To achieve some regional balance, construction of models in the Eastern North Pacific was also encouraged notably to cover the Sea of Okhost and other areas along the coast of northeast Asia. All of these models explicitly account for interactions between marine mammals and fisheries which are extremely important in the North Pacific and which will be emphasized in forthcoming publications.

The global analyses conducted in parallel to this regional work covered the fuel consumption by the world's fishing fleets (therein extending globally a previous analysis which covered the North Atlantic alone), and the creation of a global database of ex-vessel prices of fish, a product that strangely enough did not exist previously, and which will allow for the first time a correct estimation of the 'value' of fisheries so far overestimated by the use of wholesale fish prices. We expect the publications emanating from these global studies to reframe the context within which fisheries have been discussed so far, just as our previous analyses of global catch trends have.

The SAUP project is now entering its 5th year. Herein, emphasis will be given to small-scale fisheries and their catches, notably in countries of the tropical Indo-Pacific. Given the coastal nature of these tropical small-scale fisheries, due consideration will have to be given to habitat-dependence and impact of these fisheries, notably on mangrove, seagrasses, coral reefs, etc., which are now integrated into the SAUP global database. This work will also feed into the Millennium Ecosystem Assessment (MA) within which this author has responsibility within the 'Marine System' chapter and in which Jackie Alder plays a key role by connecting our work to the MA's coastal chapter and the MA's Scenario Working Group. Indeed, some of our results on this are anticipated in a contribution to appear this fall in *Science* presenting various scenarios for the development of marine fisheries to the year 2050.



Maps created by Villy Christensen and Adrian Kitchingman, illustrating the decline in biomass of high trophic-level fishes over the past 100 years. Top: estimated biomass distributions of top predators in1900. Bottom: estimated biomass distributions for the same in1999, indicating a decline of more than two-thirds. Darker shaded areas indicate greater biomass. For a full-colour, animated version of these maps, visit www.saup.fisheries.ubc.ca/trends.htm. See also Christensen et al. 2003. Hundred-year decline of North Atlantic predatory fishes. Fish and Fisheries *4, 1-24.*

The above account of the SAUP activities is rather dry - it fails to convey the excitement of discovering new ways of presenting trends in global fisheries, the excitement of audiences and readers in first seeing those patterns, the excitement of various media outlets in recounting the main conclusion drawn from our analyses, etc. However, readers may perhaps partake in this by visiting our soon to be improved website (www.saup.fisheries.ubc.ca) where our publications are presented along with a thorough documentation of the media coverage by newspapers, magazines, TV interviews, etc. Readers may also be interested to view our Web Products, also available on our website, which include interactive maps of global catches and national fisheries, as well as links to a fully interactive site about our 2002 symposium in Dakar, Senegal.

... the excitement of discovering new ways of presenting trends in global fisheries, the excitement of audiences and readers in first seeing those patterns ...

Salmon farming in Chile

by Jim Fulton

Companies can write off 17% of costs at all levels ... [and] receive a 49% tax reduction if they establish businesses in the Chilean Antarctic region ...

Earlier this year, Jim Fulton, Executive Director of the David Suzuki Foundation, travelled to southern Chile and conducted a series of interviews with representatives of Chile's billion-dollar salmon farming industry workers, conservation groups and the Chilean government. His findings raise serious concerns about the impact of salmon aquaculture on Chilean coastal marine ecosystems and communities and add an important and timely contribution to the global debate surrounding this issue. His findings and conclusions are exclusively reported below.

Chile's large-scale salmon aquaculture industry was established by Fundación Chile, a government-funded institution formed in 1973, following the military coup by General Pinochet to replace the duly elected President Salvador Allende. Prior to 1973, chinook and other species of salmon had been introduced into several river systems but all had died out. Today, the role of the Fundación is to conduct basic research and testing of new aquaculture methodologies and sell the operations to the private sector. There are currently about 600 licensed salmon and trout marine sites in Chile and 150 licensed lake sites. Production is 30% rainbow trout, 30% coho salmon (333,000 tonnes of rainbow trout and coho combined) and 40% Atlantic salmon (219,000 tonnes). As well as salmon, the Fundación is presently developing methodologies for farming 12 new species including red abalone, flounders, hake, sturgeon and Patagonian toothfish.

Investment in the industry is actively encouraged. Companies can write off 17% of costs at all levels if they set up in the two regions south of Puerto Montt. Companies also receive a 49% tax reduction if they establish businesses in the Chilean Antarctic region and this has led to a massive southern expansion of fish-farming, despite the extra transport costs. The Norwegian government also gives its national companies subsidies to operate in Chile.

Globally, annual production of farmed fish is around 45 million tonnes. Chile produces the world's second-highest yield of farmed salmon (behind Norway), but is expected to become number one by the end of 2003. Of the 45 million tonnes of fish farmed globally, 85% are freshwater species, mainly herbivorous carp and tilapias. While the percentage of carnivorous marine species is smaller, the effects are thought to be significant, largely because the production of carnivorous fish such as trout and salmon requires 5 kg of wild fish to produce every kilogram. Aquaculture currently consumes 70% of the global supply of fish oil and 34% of fish meal, with salmon and trout production alone using 54% of the world's fish oil! The world's largest fishmeal and fish oil producers are Peru and Chile, with huge fisheries for sardines, mackerel and anchovies providing most of the fish oil used in Chilean aquaculture. There have been serious crashes in these fisheries, linked to overfishing and climatic events. For example, catches of the South American sardine (*Sardinops sagax*) crashed from 6.5 million tonnes in 1985 to a mere 60,000 tonnes in 2001. Expansion of the salmon farming industry into the Chilean Antarctic and interest in developing a Patagonian toothfish aquaculture industry has led to fears that aquaculture cartels (which control the production of the feed as well as owning the farms) will soon begin massive exploitation of krill in the Antarctic. Notwithstanding the expansion of krill fisheries, the ceiling on wild fish oil production is expected to be reached in 2005 or sooner. Aware of this and the heavily over-exploited state of pelagic fisheries, scientists working for two of Chile's major salmon-farming companies (*Marine Harvest* and *Nutreco*) have been experimenting with different levels of vegetable oil replacement in fish feed. Currently, most fish feeds contain around 10% vegetable oil and researchers are hopeful that this percentage can be increased in the future. Unfortunately, they have found serious "taste" resistance to fish fed on vegetable oils from Japanese consumers, who buy the majority of the coho salmon produced. Industry will therefore be returning farmed coho to feed containing 100% fish oil.

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Salmon - Continued from page 4

I met with a team of scientists from Servicio Agricola Ganadero. This government department controls all drugs coming into Chile for use on animals and registers all drugs and vaccines for fish. There are presently 98 products approved for fish, 89 pharmacological drugs and 9 vaccines. During 2001, the government of Chile moved to encourage fish farmers to use Chilean-made fish vaccines. At that time, over three million doses came from outside Chile and only 89,000 from Chile. Rather than use Chilean vaccines, however, fish farmers have shifted to putting more drugs directly into the feed as additives, which has become a serious problem. In addition, there are dozens of other "off-label" drugs used to deal with a vast array of bacteria, viruses and parasites such as sea-lice.

I raised the issue of sea-lice with several of my correspondents. Most government representatives I met were aware of potential problems but did not consider sea-lice a serious enough problem to warrant a shift to closed containment cages, despite a recent finding in Chile that, for fish up to 1 kg in weight, it is cheaper (per kilo of fish) to raise salmon in closed containment rather than open netcages. Scientists at Fundación Chile acknowledged that sea-lice can be found on nearshore stocks of schooling fishes but are of the opinion that Southeast Pacific sea-lice are smaller and less ferocious than those found in British Columbia. There have been no studies on rates of movement of sea-lice between wild and farmed stocks.

Regarding pollution, Fundación Chile representatives assured me that fish farms are working together on developing methodologies for killing and processing the fish to reduce the amount of blood and offal going into the environment. Salmon heads, spine, tail and guts are being processed for fish meal (not salmon feed) and for human uses. Industry representatives could not, however, give me a satisfactory answer about the volume of waste that is turned into fish oil and feed. At an estimated 550,000 tonnes of trout and salmon produced, with 40% waste, we are talking several hundred thousand tonnes. Other forms of pollution include faeces and copper sulphate, which is still used in many farms for net-cleaning, even though its use is illegal. The magnitude and ecological impacts of pollution from open netcages are not being measured or investigated.

Escaped salmon and trout have become established in many rivers and streams and there is a great deal of concern about their impact on fragile coastal environments. As well, the farms themselves reduce the space available for local commercial and subsistence fishers and the fish stocks they depend upon. The problems created for artisanal fishers, for communities and for fish in the diet of southern Chileans is growing. Twenty-two percent of Chileans are now protein deficient and this is partly due to upward price pressure, but also due to the complete disappearance of some traditional species from the markets and the near-shore catch. The impacts of salmon farms and hatcheries in freshwater lakes have been horrific. A knowledgeable local guide took me to Puerto Varas on the largest lake in Chile. Of the 17 resident species eaten by locals, 10 have been extirpated, due to the escape of salmon and trout into the lake and there is now only licensed "sport" fishing in the lake (for salmon and trout). Artisanal fishers at virtually every location near salmon farms complain of declining catches, which are affecting coastal communities with lost jobs. Officially, the problem is masked by endemic over-reporting of catches to keep up with quota re-allocations assigned by the government. As traditional species of fish disappear from the local markets, the number of Chileans at nutritional risk is expected to rise, especially since farmed species are prohibitively expensive in the markets. Even though the near-shore zone is "reserved" for artisanal fisheries (and all salmon farms are in this zone), the government's Environmental Commission continues to approve more licences. There are striking similarities here to the inherent conflict of interest seen in Canada, where the regulator (the federal Department of Fisheries and Oceans) acts as the promoter of salmon farming. No-one in government seems to actually act to protect, conserve and restore the wild fisheries! Few studies have been done to establish baseline estimates of abundance of marine mammals, birds, invertebrates or wild fish, despite a growing body of evidence of negative ecological impacts.

The impacts of salmon farms and hatcheries in freshwater lakes have been horrific ... of the 17 species eaten by locals, 10 have been extirpated

The social problems caused by the salmon farming industry extend to its workers. Union representatives and other concerned correspondents

Continued on page 6 - Salmon

Salmon - Continued from page 5

painted a worrying picture of the industry. Workers are paid US$1 per hour (ten times less than their equivalents in Canada and Scotland) and many suffer from repetitive strain injury and what appear to be infections caused by antibiotic-resistant strains of the bacteria *Streptococcus iniae*, resulting from handling infected fish. Of the 24,000 member workforce, only 4200 are organized. Strike-action in 2001 against one of the major companies resulted in the firing of 57 workers and their black-listing from the industry. Following a recent OECD complaint filed in the Netherlands against another major salmon-farming company, two presidents of the salmon farm unions have "disappeared". The whereabouts of one is now known but he will no longer assist with the enquiry and will no longer meet or talk. The whereabouts of the other is unknown. The disappearance of these two men has made the process of confirming what workers have reported to the union more difficult to verify for the international process – an issue already raised by the OECD. The union in southern Chile faces other problems: not only have two union presidents disappeared, it will soon lose its tiny office-space and the national representative will not assist unionized workers in their ongoing struggle against the industry cartel, in which salmon farms, processing plants and fish feed supply are all controlled by a handful of transnational companies. During my trip, I was struck several times by the impression that pressure tactics and criminal force are a big problem here. In recent months, the offices of all non-governmental organizations working on environmental issues in Santiago have been burgled. There is a great degree of difficulty with engaging in transparent dialogue on these issues.

Salmon farming is but one facet of the international cartel to privatize the near-shore coastlines and ocean-bottoms ...

I met with a representative of the industry's science and public relations arm, INTESAL, but came away with the impression that it is little more than a well-funded creature of the salmon-farming cartel. They recognize that there are problems but will not commit to census work, testing for disease-transfer to the wild, consideration of impacts on marine mammals or anything else. Rather, INTESAL is seen as a way to get "information" into schools and communities. Despite these concerns, I did meet with several scientists and representatives of conservation organizations who were attempting to improve the state of research and monitoring of the salmon farming industry. One correspondent outlined his plan for an international salmon farm watch website, which would list everything from kill numbers of sea lions and birds to labour issues and criminal convictions of companies. Access to comparative data between salmon farming countries (such as Canada, Norway and Scotland) would be a great advantage and there is a real need for an independent science body to compare the impacts of salmon farms in a number of international jurisdictions. At present, the government regulatory body of the region (the 10th Region Environmental Commission) has no real idea of the impacts of salmon farming; no budget or staff for basic research; and is forced to rely on industry to "do the right thing". There is also a need to investigate the industrial cartel on prices, subsidies, taxation, national policies, exports and the legal rights of historic users of marine resources.

It is my view that a transition plan back to community-based sustainable fisheries, that includes conservation-based value-added integrated marine industries, is a matter of urgency for Chile. While Chile may soon be the largest producer of farmed salmon in the world there are many signs that this industry will collapse. Local communities and consumers must also be given access to factual information about the impacts of salmon-farming. A web-site that accurately reflects the impacts of the global salmon-farming industry must be established by the academic and non-government community and high-profile news stories in papers such as the New York Times must also be pursued.

Salmon farming is but one facet of the international cartel to privatize the near-shore coastlines and ocean-bottoms for everything from algae production to shellfish to fish. Given that the overwhelming bulk of the world's marine landings come from waters under national jurisdiction, this is a social, legal and international issue that needs immediate attention in Chile and in all coastal nations.

Eds: Readers may be interested to contrast this article with The Economist's *"The promise of a blue revolution"* (vol. 368 no. 8336, Aug 9-15, 2003, pp 19-21).

This article was extracted from a longer report and edited by Robyn Forrest, Sea Around Us Project.

Sea Around Us

Rediscovering *Ecopath* in the Kerguelen Islands

by Maria Lourdes D. Palomares

Unfortunately, this really isn't about an exploratory expedition to the Kerguelen Islands (though I would have loved for it to be!). Rather, Daniel Pauly and I went to Paris to attend the workshop on modeling the Kerguelen ecosystem (Figure 1), held at the Muséum National d'Histoire Naturelle (MNHN) in late September 2003. This was one of the rare occasions where Daniel delivered an *Ecopath* course in his native tongue. Incidentally, some of the participants were not aware that Daniel is French and they arrived armed with English up their sleeves, greeting Daniel in their best English. When Daniel responded in French, they were all amazed to have discovered a compatriot. That immediately broke the ice, paving the way to a successful workshop and to Daniel's two-day lecture on *Ecopath with Ecosim* being received with keen interest. Participants included representatives from the Centre d'Etudes Biologiques de Chizé; l'Observatoire Océanologique de Villefranche sur Mer; L'Université du Littoral Côte d'Opale; the Centre de Geostatistique of the École Nationale Supérieure des Mines; the Université de Rennes 1; and of course, our partners from the MNHN Guy Duhamel and Patrice Pruvost.

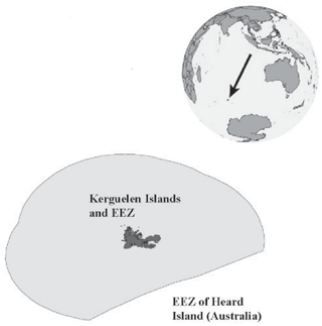

Figure 1. *The Kerguelen Islands (and Exclusive Economic Zone), a component of the French Antarctic Territories.*

We might ask why the MNHN is interested in keeping an eye on these islands, part of the French Antarctic territories. In the early 20th century, the large number of marine mammals around Kerguelen archipelago (notably sperm whales, elephant seals and fur seals) was the target of a fishery which continued until the late 1960s - when whaling as a whole was banned (IWC 1994). In the 1970s, the Soviet Union started bottom trawling, targeting marbled rockcod, mackerel icefish and grey rockcod without any management or control (G. Duhamel, pers. com.). Then, in 1978, an EEZ was established, which led to the creation and implementation of a fishery management scheme (Duhamel 1995) which included a limit of seven trawlers. In 1984, a stock of Patagonian toothfish was discovered in the area, but it was not until 1996, when the Japanese discovered a liking for the white tasty flesh of the toothfish, that the industry switched from bottom trawling to longlining for toothfish (Duhamel 1993). This highly profitable fishery led to the emergence of an illegal longline fishery in 1997 which is now still operating. This longlining produces large bycatch of other fish species, e.g. macrourids and skates, and also seabirds (Capdeville and Duhamel 1996), as well as marine mammals (e.g. orcas).

Why 'rediscover' *Ecopath* in the title of this account? Well, because I did rediscover *Ecopath*. The last time I used this modeling approach extensively was for my Ph. D.

Continued on page 2 - Kerguelen

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Kerguelen - Continued from page 1

thesis in 1991. The objective of my latest visit to MNHN was to help Patrice Pruvost and Guy Duhamel improve the Kerguelen EEZ model that Patrice and I started during his February 2003 visit to Vancouver. This entailed re-examination of the preliminary model (presented at the workshop on Modelling Antarctic Ecosystems held at the Fisheries Centre in April 2003 and to be included as a contribution in the Fisheries Centre Research Report for that workshop). This proved to be a very successful 'bug hunting' process and we were able to fine-tune some of the parameter estimates of the Kerguelen ecosystem. Though *Ecopath*'s 'look' has changed since 1991, its recognizable interface allowed me to navigate through the routines without having to shout 'HELP' to a far-away Villy Christensen.

... the participants all agreed that this model represented the Kerguelen ecosystem well ...

Thus in the end, Patrice was able to present a well balanced model to the workshop participants. This elicited constructive comments and suggestions and, aside from some minor adjustments to the parameter estimates of a few major groups, the participants all agreed that this model represented the Kerguelen ecosystem well. They also agreed that a follow-up workshop focusing on testing different fishing scenarios and simulations using *Ecosim and Ecospace* is a logical progression to this effort.

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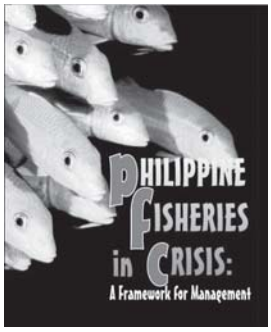
Book Review: *Philippine Fisheries in Crisis*



This book, by Stuart J. Green and colleagues, highlights the current crisis facing Philippine fisheries today. In its own words, its objectives are to highlight the role of fisheries in food security in the Philippines; measure the large economic role played by fisheries and other coastal resources; illustrate what is lost from the destruction of fisheries and habitats; and thus provide advice and support to decision-makers. It does this clearly and concisely, making good use of graphics. With a foreword by Edgardo Gomez, Pew Fellow in Marine Conservation and Professor at the Marine Science Institute, University of the Philippines, this book will be a valuable source of information for anyone concerned about sustaining the fisheries of the Philippines.

Reference

Green, S.J., A.T. White, J.O. Flores, M.F. Carreon III and A.E. Sia. 2003. Philippine Fisheries in Crisis: A framework for management. Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines, 77pp.

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Our mailing address is: UBC Fisheries Centre, 6660 NW Marine Drive, Bldg 022, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

The Sea Around Us project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

ICES 2003 Annual Science Conference

The *Sea Around Us* expands its European links

by Dirk Zeller

This year's ICES Annual Science conference was held in Tallinn, Estonia, one of the three small Baltic States sandwiched between Russia and Poland. The prime purpose for this trip was to present to the European fisheries science and advisory community a paper of the key findings and recommendations of our project to date. Additionally, I arranged to meet with local scientists in order to establish cooperative working relationships for our fisheries data-recovery efforts. Estonia and the other Baltic states (Latvia and Lithuania) represent a special challenge for improving global fisheries time series, given that they became independent countries only with the dissolution of the former USSR. Thus, prior to the early 1990 catches taken by Estonian, Latvian and Lithuanian vessels were reported as part of USSR catches within the FAO statistics.

The conference was well attended, with 200 papers and 41 posters presented in 15 theme sessions over four days. While major emphasis was placed (for geographically obvious reasons) on the Baltic Sea, topics ranged from the traditional (fisheries technology and stock assessment) to more progressive and holistic themes such as stock recovery and reference points. One interesting point was the fact that the president of ICES (Pentti Mälkki) in his opening remarks, as well as all three keynote addresses, by Fredrik Wulff (University of Stockholm, Sweden), Randall Peterman (Simon Fraser University, Canada) and John Caddy (Mexico), while covering diverging topics, all made a plea for the urgent need for scientists to improve communication outside of the direct science forum, especially with decision makers and the public. Judging by the amount of media and high-level briefing exposure our project has achieved so far (see publication and media records listed on our web page: www.saup.fisheries.ubc.ca), it seems we are on the right track and ahead of the curve in this area.

Other highlights of the conference were the theme sessions on long-term changes in spatial distribution and abundance, recovery planning, and reference points. The paper I presented was titled "*Towards sustainable fisheries: mapping regional and global trends in abundance and catches*", and summarized the major project findings to date. I also outlined some of the solutions we propose for the global fisheries crisis, with major emphasis on reduction of overcapacity, and on the need for ecosystem recovery through the establishment of no-take zones of substantial size (Pauly *et al.* 2002; Russ and Zeller 2003).

An additional outcome of this European visit was the establishment of co-operation with local scientists in our data recovery efforts. Thus, I met with Dr. Henn Ojaveer (Estonian Marine Institute), the author of a paper on Estonian fisheries catches in Baltic waters from 1928 to 1995 (Ojaveer 1999), and with Dr. Maris Plikshs (Latvian Fisheries Research Institute), who deals with Latvian fisheries catches. Attempts continue to try to extend this collaboration to Lithuania.

On a lighter note, it was pleasing to see that an established organization like ICES has not lost its sense of humour, as evidenced by a poster contribution entitled "*Staying in tune with our ecosystem*", authored by none other than "*J. Bach, G. Mahler, F. Schubert and Co-author Charlie*", and submitted for the imaginary theme session, Σ, on "*Ecosystem Tuning Management*". The authors allege that "*an exciting new scientific area has emerged in hydroacoustics: the tuning of various fish species. Tuning has been performed for many years with data, but now a small group of scientists has started tuning the fish themselves.*" The authors further present a simple mathematical formula designed to assist in individual scale-tuning of fish. The equation, replicated below (without permission) has been passed on to the Fisheries

Continued on page 4 - ICES

Judging by the amount of media and high level briefing exposure our project has achieved so far [...] it seems we are on the right track and ahead of the curve in this area.

ICES - Continued from page 3

Centre's own Prof Carl Walters for further modelling exploration and incorporation into Ecopath!

Note that *is a scale-density parameter for summer-spawning herring west of 62° N,* S_{mean} *is the mean scale equilibrium coefficient at 47.341° K (Pasteur Institute),* ξ *is the average off-key level, and is there for mathematical effect."*
Happy fish tuning!

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Letter to the editor: Aquaculture in the Philippines

by Josh E. Moncrieff

Philippines' coastal communities share many of the same worries as their Chilean counterparts

Your recent article, 'Salmon Farming in Chile' (*Sea Around Us*, Issue 18), depicts a state of affairs that is in many ways very similar to what I observed on a recent six-month stint in the Philippines. I spent this time as a research intern with the Tambuyog Development Center – a leading Philippine Non-Governmental Organisation (NGO) in coastal community development - studying the effects of the nation's aquaculture industry upon its artisanal fishers. My work revealed a widespread ignorance towards the rights of artisanal fishers and towards environmental protection as a whole, and indicated that the Philippines' coastal communities share many of the same worries as their Chilean counterparts.

The Philippines – a nation extremely dependent upon its coastal resources - has recently seen a dramatic increase in marine aquaculture production. While this growth has generally been cast in a positive light, centred on the belief that aquaculture will lead to food security and economic growth, the nation's artisanal fishers are highly susceptible to its less desirable results, and thus have recently seen their livelihood come under significant pressure.

As things stand, the threat presented by aquaculture development comes in a variety of forms. Many of the potential downsides of intensive and semi-intensive fish farming – including physical, chemical, and biological pollution – are widely acknowledged, and well represented in your article on Chile. Additionally, development of the Philippines' coast has resulted in widespread destruction of mangroves in the rush to develop fish-ponds. Another concern commonly expressed by artisanal fishers is that as large, high-value, farmed fish become increasingly prevalent, the demand for smaller fish – those that can still be caught in significant quantities in the wild - will sharply decrease. This would inevitably lead to lower prices for their wild catch, and a corresponding decrease in their income.

While many artisanal fishers in the Philippines would like to see a decrease in aquaculture activity, it seems unlikely that the industry's growth will be slowed or stopped by government intervention. It is more realistic to hope that industry, NGOs, and community-based organizations of fishers will take a more active role in managing this development to ensure that artisanal fishers are not driven away from their traditional livelihoods. In addition to ensuring that sound environmental practices are adhered to, a variety of approaches should be considered. These would include granting coastal property rights to artisanal fishers and their communities, improving access to sources of credit in coastal communities, expanding fishers' access to education and training, and developing alternative livelihoods to ease the transition from fisheries for those that desire to follow such a path. While such efforts would not single-handedly bring socio-economic parity to the Philippines' marginalized artisanal fishers, they could play an essential role in the process of beginning to recognize the needs and rights of this portion of the Philippines' population.

Josh Moncrieff is a UBC graduate, with a degree in oceanography. In 2002, he began a CIDA-funded internship in the Philippines coordinated by the International Marine Institute of Memorial University, Newfoundland. He is now a Masters student at the University of Calgary.

Sea Around Us

On the Home Stretch: Millennium Ecosystem Assessment Update 6

by Jackie Alder

A combined Working Group meeting of the Millennium Ecosystem Assessment (MA) was held during October in Prague, Czech Republic with many groups working towards nearly complete draft chapters. The Prague meeting provided a forum for the different working groups (Conditions & Trends, Scenarios and Responses) to link and harmonize various issues and topics covered by the MA including the coastal and marine components. The meeting certainly highlighted the importance of marine environments to human well-being with issues ranging from human diseases to freshwater supplies.

The chapters for the Conditions and Trends Working Group are mostly over 80% complete and this includes the Marine Chapter co-authored by several *Sea Around Us* project members. Most chapters will be available for peer-review in early January. This is quite an accomplishment, considering the huge task, the time-frame and the broad terms of reference.

Considerable progress was made in the Scenarios working group, with the story-lines described in more detail, differentiating events and interactions that may occur in developing vs developed countries. The *Sea Around Us* project scenario work by Villy Christensen and myself includes using three *Ecopath with Ecosim* (*EwE*) models: the Gulf of Thailand, the Benguela Current and the Central North Pacific, to look at what might happen to catches and diversity under the four scenarios proposed by the MA.

The four scenarios were developed to give a wide spectrum of possibilities for the future ranging from high protectionism ('Order through Strength') to a very enlightened society where learning would be an important component of managing the environment ('Adapting Mosaics') and two others, 'Technogarden' (technology solves the problems) and 'Global Orchestration' (global trade without barriers) between the two extremes.

The scenario work does show that it is not too late to start to rebuild ecosystems or to change the current downward trends. In the Gulf of Thailand for example, under the four scenarios, landings initially decrease due to the impact of climate change, but as appropriate policies are implemented and technological solutions are applied, landings increase (see figure overleaf). The diversity of the landings, however, varies depending on the scenario, with the diversity of the landings decreasing in all scenarios as fisheries in the Gulf of Thailand shift towards maximizing crustacean landings (high economic value) through the capture fisheries or through aquaculture (see figure).

The *Sea Around Us* project scenario work has also resulted in the recent

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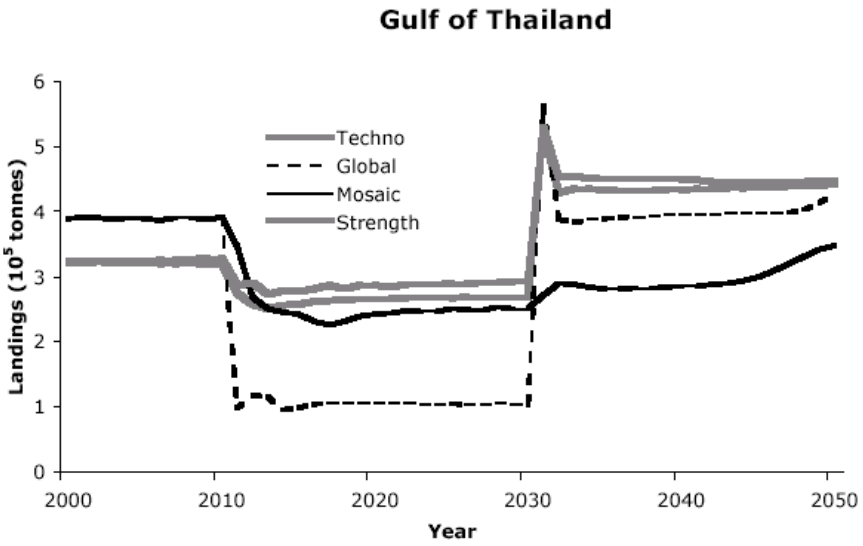
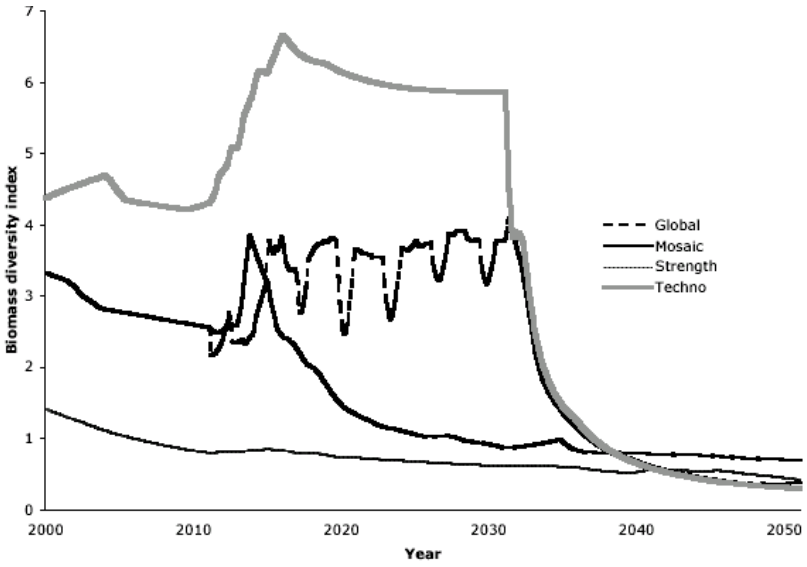


EwE is one of a few modeling tools that researchers can use to look at how ecosystems might change given a specific economic or social policy.

publication of The Future for Fisheries (*Science,* November 21 2003). In this article, we described what may be possible in the future based on the United Nations Environment Program's Global Environment Outlook 3 (GEO3) scenarios. *Ecopath with Ecosim* was also used to simulate various futures resulting from different economic and environment policies. *EwE* is one of a few modeling tools that researchers can use to look at how ecosystems might change given a specific economic or social policy. The *Sea Around Us* project's work in the MA has led many of our colleagues to realize the power of this software for looking at the future of marine ecosystems and no doubt we will be making greater use of it as we explore other questions such as climate change. So watch this space for further updates on the *Future for Fisheries.*



Top: Simulated change in landings in the Gulf of Thailand from 2000 to 2050 under the four MA scenarios described on p1.
Bottom: Simulated change in the diversity of species for the trophic level > 3 landed from the Gulf of Thailand 2000 to 2050.

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Marine Biodiversity Meeting

Using the past to inform the future: the known, unknown and the unknowable

by Ussif Rashid Sumaila

This conference was organized by Jeremy Jackson and his group at Scripps Institution of Oceanography in San Diego, California. The meeting took place during November 14-17, 2003. Presentations were by invitation only. There were five sessions each comprising a plenary talk and discussion followed by panel presentations and another open discussion. Topics for the first two sessions focused on fundamental questions about the past: (1) why is the past important? and (2) how do we know about the past? The next two sessions concentrated on case-studies in which knowledge of the recent past plays a crucial role in our understanding of dynamics of the system today: (3) cod and (4) sardines and anchovies. The final session focused on how incorporating knowledge about the past can build a better future for the world's oceans: (5) how can we use the past to inform the future?

Daniel Pauly gave one of the five plenary talks. Using Barbara Tuchman's 'March of the Folly' idea as a metaphor for the recent history and future of fisheries, he set the stage for a lively discussion of 'How do we know about the past?' Other plenary talks were given by the following scientists: Carl Safina of the Blue Ocean Institute; Alec MacCall of the Southwest Fisheries Science Centre, NOAA; Jeffrey Bolster of the University of New Hampshire; Enric Sala of Scripps; and Steve Palumbi of Stanford University.

I was on the panel for Session 4: *Cod: an extreme case of overfishing*, together with Ransom Myers, Bonnie McCay and Robert Steneck. The Canadian part of the story of the extreme overexploitation of cod was nicely told first by Professor Myers, who clearly demonstrated that northern cod has indeed suffered extreme overexploitation over time, and second by me, with a strong economic explanation of why this pattern of extreme overexploitation had occurred. I laid the blame on both ineffective management of cod and the way the present generation values cod benefits. The latter leads to the 'front-loading' of the benefits from cod, the consequence of which is extreme overexploitation. I suggested that the solution to this problem is for society to cleverly design and impose management schemes that are based on both rights and responsibilities.

Ratana Chuenpagdee of St Francis Xavier University, a Fisheries Centre Adjunct Professor, gave a panel presentation about her study on the hard choices facing the managers of Chesapeake Bay, if they want a bountiful future for the bay.

A non-academic highlight of the meeting was the presentation of a mini-film on conservation awareness based on Daniel Pauly's 'Shifting baseline syndrome' idea. The film uses humor to educate the public on the need to ensure the long term sustainable use of our natural and environmental resources.

... the way the present generation values cod benefits leads to 'front-loading' of the benefits from cod, the consequence of which is extreme over-exploitation

Endangered Marine Fishes

We are pleased to announce that Dr Reg Watson, a senior research fellow with the *Sea Around Us* project, has just been appointed to serve on the Marine Fishes Specialist Sub-Committee of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This four-year appointment will involve his helping to form recommendations on the status of many marine species, including a number of commercial Pacific rockfishes.

Living on the Coast

by Jackie Alder and Adrian Kitchingman

35% of the world's population lives within 100 km of at least one estuary

The coast is the place to be! Although 38% of the world's population live within a 100km of the coast, the habitable areas of the coast represents a much smaller proportion of the world's total land area. Much of the world's Gross National Product (GNP) is generated along coastlines; in many areas of the world, the infant mortality rate is lower on the coast; and the growth of cities is much greater. Coastal habitats, such as mangroves and estuaries, are also closely linked to communities. For example, 35% of the world's population lives within 100 km of at least one estuary.

Over the last year the *Sea Around Us* project has accessed several databases including social (population, cities, infant mortality), economic (GNP), ecological (coastal habitats and marine protected areas (MPA)) to study of the importance of marine resources to communities. Geographical information systems (GIS) have been used extensively to study and map the connections between marine systems and human populations. On the opposite page we list some interesting facts about the coast and communities that have been derived from these databases.

The figure below is an example of our efforts to map critical habitats protected in MPAs (Florida and the Caribbean). Estimates of habitats that are included in MPAs globally tend to be under-estimated for seagrasses and mangroves since estimates are based on surveys and not all MPAs have been surveyed completely. *Sea Around Us* project members, notably Ms Louisa Wood, in collaboration with Worldwide Fund for Nature (WWF) and United Nations Environment Program –World Conservation Monitoring Centre (UNEP-WCMC) are working to improve this information over the next 12 months.

Critical habitats such as coral reefs, mangroves and seagrasses (shaded in grey) that are protected by MPAs (circles and polygons) in Southern Florida and the Northeastern Caribbean.

Coastal Factoids

% of the world's population living within 100 km of:

All coasts	38
Coral reefs	12
Estuaries	27
Mangroves	17
Seagrass beds	19
MPAs	19

% of MPAs that include known areas of:

Mangroves	17
Coral reefs	25
Estuaries	17
Seagrass beds	25

Infant Mortality Rate (deaths per 1000 births):

Within 50 km of the coast	23
Inland	41

Approximately 60% of the world's GNP is generated within 50 km of the coast.

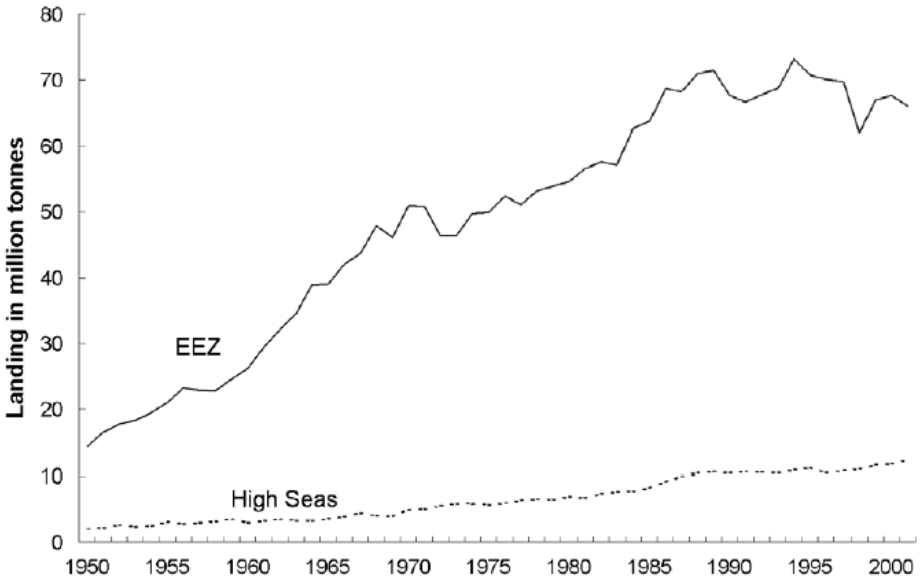
FAQ: How much of global catch is taken from the Exclusive Economic Zones of coastal nations?

by Reg Watson and Jackie Alder

... an average of 89% of global landings come from the areas currently claimed as EEZ

Not surprisingly, the 200-nautical mile buffer most nations claim for their exclusive use encompasses some of the most productive parts of the world's oceans. Here, nutrients from the land are swept into shallow coastal shelves or upwelling of nutrient-rich water occurs, resulting in high productivity.

The relative success of the huge forage fish fisheries such as the Peruvian anchoveta versus offshore tuna landings cause variations in the proportion of the world's landings that are taken within EEZ areas. Since 1950, an average of 89% of global landings has come from the areas currently claimed as EEZ (or their counterpart, Exclusive Fishing Zones). This proportion has decreased slightly with the failure of inshore stocks.



Global landing with Exclusive Economic Zone areas in million tonnes.
Source: *Spatially allocated landings data from the* Sea Around Us *project extracted from FAO and other sources.*

2003 Ocean Management Research Network National Conference

Ottawa, 13-15 November, 2003

by Dale Marsden and Dirk Zeller

There was a healthy mix of people from academia, government, First Nations, the private sector, and non-governmental organizations.

The Ocean Management Research Network (OMRN) is a Canada-based interdisciplinary group of researchers, managers and policy-makers involved in ocean and coastal management. The major aim of the network, which is jointly funded by Fisheries and Oceans Canada and the Social Sciences and Humanities Research Council of Canada, is to establish links and collaboration and thereby improve the management of Canada's oceans. The OMRN held its second annual national conference in Ottawa in November 2003. The formal proceedings were a mix of paper sessions, a poster session, and a set of 13 concurrent interactive workshops. There were also many opportunities for informal interaction and networking over lunch.

Three members of the Fisheries Centre attended the conference. Nigel Haggan of the *Coasts Under Stress* project argued that the key challenge in oceans management is how to build collective understanding of the productive potential of the marine environment. *Back to the Future* ecosystem models (www.fisheries.ubc.ca/projects/btf/) show that past ecosystem states could sustain much greater flows of economic, ecological and cultural benefits. This makes a compelling case for reinvestment in natural capital at a time when depletion of wild resources has focussed attention on the revenue potential of oil and gas and salmon farming. The social capital developed through collaboration of multiple interests on model building and valuation increases the likelihood of agreement on rebuilding targets.

Dale Marsden gave a presentation in the Environmental and Coastal Economics workshop (co-produced by the rest of the Fisheries Economics Research Unit: www.feru.org) on research needs in environmental valuation on the West Coast. The non-market values associated with British Columbia's coasts and oceans have not been well-quantified. He suggested that research should be directed toward such valuation, especially as it relates to First Nations treaty negotiations and the potential impacts of aquaculture and oil and gas development. He also presented a poster on the work that he and Ussif Rashid Sumaila are doing on flows of fisheries products and received encouraging feedback from many attendees. The first phase of this work will be published this year.

Dirk Zeller, a member of the *Sea Around Us* Project (www.seaaroundus.org), attended the Sustainability Node meeting prior to the conference, and presented a paper entitled "From *Mare Liberum* to *Mare Reservarum*: Why Canada needs to change concepts and approaches to ocean use". Dirk's presentation attracted considerable interest and positive debate. It highlighted the need for Canada to realize and engage in the changes that are required in the way the government manages marine resources and their use. Dirk also attended the Ocean Governance workshop, which involved many stimulating discussions and attracted participants from a wide range of disciplines. The workshop focused on how such a group could contribute to innovative research and policy development in Canada.

Overall, the conference was a good experience. There was a healthy mix of people from academia, government, First Nations, the private sector, and non-governmental organizations. As such, this conference provided a great opportunity to meet and network with people whom fisheries scientists at the Fisheries Centre would not normally encounter.

More information on the OMRN and their National Conference is available at their web site: www.omrn.ca.

Sea Around Us

A global assessment of marine protected areas: a new *Sea Around Us* initiative

by Louisa Wood

One of the main goals of the S*ea Around Us* project is to devise policies that mitigate and reverse the negative impacts of fisheries on marine ecosystems globally. One such policy is the establishment of representative networks of large marine protected areas (MPAs; see *e.g.* Pauly and Maclean 2003). While MPAs represent just one of a suite of policies considered necessary to halt the current decline in fish catches and biomass, and biodiversity as a whole, it is one that resonates through the recent literature and the international conservation community. Most recently, Recommendation 5.22 of the Fifth World Parks Congress (Vth WPC) held in Durban in September 2003 was made to "Greatly increase the marine and coastal area managed in marine protected areas by 2012. These networks should be extensive and include strictly protected areas that amount to at least 20-30% of each habitat" (IUCN 2003).

However, it is currently estimated that less than 0.5% of the world's marine habitats are protected (Spalding and Chape, in press). This estimate is based on the World Database on Protected Areas, WDPA, (maintained by UNEP-WCMC[1]), the only source of global MPA data. However, this database is incomplete and so current estimates are of limited reliability. In the absence of an accurate global MPA baseline, neither international nor the *Sea Around Us* project's recommendations can be implemented. Cognizant of this, the 31st decision taken during the CBD COP7[2] in February 2004 "Invites UNEP-WCMC, in collaboration with relevant organizations and authorities, to provide and maintain up-to-date information on marine and coastal protected areas ..."

A new collaboration, recently developed between the *Sea Around Us* project, WWF, UNEP-WCMC, and IUCN-WCPA[3], explicitly takes up this invitation. This relationship is predominantly manifested as my PhD project, which began in September 2003.

My PhD project has two main aims: firstly, to develop a more robust global MPA baseline than currently exists for either terrestrial or marine protected areas; and secondly, to develop alternative scenarios of global MPA networks using spatial modelling techniques. Achieving the first goal involves:

1. Improving current estimates of marine area and marine habitat coverage of MPAs;
2. Assessing management and governance infrastructure supporting MPAs; and
3. Performing other descriptive analyses of MPAs using the *Sea Around Us* project databases.

The project is embedded within a larger proposal by UNEP-WCMC to develop a sustainable system for the collation of accurate data, including detailed MPA ecosystem information. I am presently implementing the first phase of this, which is to make a series of 'broad-

Continued on page 2 - MPAs

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brush' global updates. The success of this initiative is clearly contingent on the availability of, and access to, information. The global scale necessitates collaboration. Further collaborations (additional to that between SAUP, WWF, UNEP-WCMC and IUCN-WCPA) are being developed and / or investigated with relevant international (e.g. the Ramsar Convention Secretariat, the UNESCO-MAB[4] Secretariat, the UNESCO-WHC[5] Secretariat, and the CBD Secretariat), regional and national organizations as appropriate (of which there are too many to list). Further collaborations are sought (please contact me for details).

Further collaborations are being developed and / or investigated with relevant international, regional and national organizations

In September 2003, I was fortunate enough to attend the Fifth World Parks Congress, in Durban, South Africa, where I was able to introduce and promote the project, which was also recently introduced at CBD COP7 by Marjo Vierros of the Secretariat of the CBD. Since acquiring the latest version of WDPA in late December, I have been developing an MPA database, based on the contents of the WDPA and additional sources. This work in progress will be available for review and verification in the near future. For further details on the database, the project as a whole, or your potential collaboration with the project, please contact me (l.wood@fisheries.ubc.ca).

Fisherman at Bazaruto Archipelago MPA in Mozambique. Subsistence fishing by local communities is permitted. Photo by Colette Wabnitz.

Acknowledgements

Thanks to Daniel Pauly and the *Sea Around Us* project team for providing a great working environment. Thanks also to WWF Canada and International, particularly Josh Laughren and Simon Cripps, for financial and logistical support during this first year of my PhD, to UNEP-WCMC for technical support regarding WDPA, and to IUCN-WCPA for additional support. Final thanks to Marjo Vierros and the Secretariat for the CBD for their ongoing support for the project.

End notes

[1] The United Nations Environment Programme - World Conservation Monitoring Centre

[2] Seventh Meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD)

[3] World Conservation Union – World Commission on Protected Areas

[4] United Nations Educational, Scientific and Cultural Organisation – Man and the Biosphere.

[5] United Nations Educational, Scientific and Cultural Organisation – World Heritage Convention.

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Our mailing address is: UBC Fisheries Centre, Lower Mall Research Station, 2259 Lower Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

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SPECIAL FEATURE
SEACUKES: a database

by M.L. Deng Palomares, Vasiliki Karpouzi and Daniel Pauly

CITES has been considering how it might assist with managing the international trade in sea cucumbers. Partly as a result, sea cucumbers became the first group for which the *Sea Around Us* project created a biodiversity database. This database includes taxonomic and distributional information on more than 1700 nominal species (of which more than 1400 are valid: Smiley 1994; Kerr and Kim 2001) of sea cucumbers (Holothuroidea, Echinodermata) distributed in more than 200 genera and 25 families.

Biology of sea cucumbers

Sea cucumbers belong to the marine invertebrate group of Echinoderms (Class: Holothuroidea) and inhabit benthic environments from shallow intertidal zones to the depths of ocean ridges and trenches (Kerr and Kim 2001). Species diversity for this group increases significantly towards the equatorial belt (Kerr et al.1993), though they occur from the Barents Sea to the Amundsen Sea off the coast of Antarctica.

Sea cucumbers are slow-moving animals usually found lying on the substrate, sometimes in sand or mud burrows. The shallow water forms are also found in hard bottoms under crevices, beneath rock or stones or among algae, notably near large macroalgal holdfasts (Rupert and Barnes 1991). A few pelagic species occur in the deep and/or offshore seas (Miller and Pawson 1990). Their modified mouths, consisting of a circle of tentacles, filter suspended particles in the water or sweep the bottom for deposited particles.

The use of sea cucumbers

Sea cucumbers, consumed dried, raw, boiled or pickled, have long been exploited in Southeast Asia and the South Pacific. Early 19th century explorers observed Malay fishers harvesting sea cucumbers in the Timor Islands (Peron 1807-1816) and traders in the Northern Territory of Australia processing 'trepang' (Dumont d'Urville 1841-1854). Available estimates of bêche-de-mer (the dried form of trepang; see Robertson et al. 1987) exported from Fiji to China in 1828-1852 amounted to 1000-1500 t per year (Dalzell 1998; Ward 1972). Adams (1988) suggested that these stocks were depleted when records showed that a fleet of 100 canoes harvested only 32 t in 1852.

Conand and Byrne (1993) suggest that sea cucumber fisheries are based on only about 12 species from two families and 5 genera. However, this is probably an underestimate due to the species not being differentiated out by fishers, exporters and importers. There is growing concern about the exploitation of sea cucumbers as the bulk of populations are slow growing, slow moving animals, subject to 'boom and bust' fisheries. As a consequence, management of international trade in sea cucumbers will be discussed at a CITES technical workshop in Malaysia in March 2004.

Coverage of sea cucumber biodiversity in the *Sea Around Us* project database

Data on sea cucumbers have been gathered over a period of 4 months in an Access database . The data included here were extracted from over 100 published sources and the names were checked against the Integrated Taxonomic Information System (http://www.itis.usda.gov/) and the species database of UNEP/WCMC (www.unep-wcmc.org/species/index.htm). Table 1 presents a comparison of the coverage of our database with that in Kerr (2000). Based on these figures, we can assume that our sea cucumber database covers the bulk of species so far described worldwide.

An important aspect of this exercise was assigning the occurrence of species to countries and FAO fisheries statistical zones. We were able to assign 720 species from 145 genera and 24 families to 150 countries using the over 2100 occurrence records extracted from more than 30 published sources (mostly local checklists and reports of species

Continued on page 4 - Cucumbers

[Sea cucumbers] became the first group for which the Sea Around Us *project created a biodiversity database*

Cucumbers - Continued from page 3

occurrences at a particular locality). These countries occur in 19 of the 21 fisheries/maritime zones categorized by the FAO. Table 2 presents a preliminary analysis of this dataset and shows that sea cucumbers are concentrated in FAO areas 71 (Western Central Pacific) and 27 (Northern Eastern Atlantic). Table 2 also implies that about 51% of sea cucumber species occur in tropical and sub-tropical zones, e.g., FAO areas 31, 34, 37, 51, 57, 71 and 77. This leaves about 29% in northern waters, 6% in southern waters, and just over 3% in Arctic and Antarctic seas. These results, therefore, corroborate earlier statements that the bulk of sea cucumber biodiversity occurs circumglobally along the tropical belt (see Conand and Byrne 1993).

This exercise was initially a challenge to create a 'geo-graphically enhanced' global taxonomic database for one group of species

Lessons learned

This exercise was initially a challenge to create a 'geographically enhanced' global taxonomic database for a group of species. Given that most libraries are now searchable through the Internet and that many locality-specific Internet resources are freely available, gathering the information required for such a database was straightforward. Thus, we were successful in creating a searchable biodiversity database with the minimum information on scientific and English local names and in assigning these species to countries and FAO areas. As stated above, we can claim that we have covered all described species of sea cucumbers and that we have included the bulk of scientific literature dealing with the occurrence of these species in different countries and FAO areas.

We are currently working on including additional information on the habitat (type of bottom, depth), biology (growth parameters and natural mortality) and catch statistics (by country and also including import and export values). The database will also be regularly updated. Thus, we would appreciate inputs from colleagues who might have literature which we still haven't processed (note that we are also keeping hard copies of all the references we have so far used and would appreciate receiving print or pdf copies of additional references).

Acknowledgements

We would like to thank Dr Amanda Vincent for encouraging us to undertake this project.

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***Table 1**. Number of sea cucumber species by Order obtained from the* Sea Around Us *project's database compared to estimates reported by Kerr (2000).*

Subclass	Order	Species		Genera		Familes	
		This study	Kerr (2000)	This study	Kerr (2000)	This study	Kerr (2000)
Apodacea	Apolida	270	269	33	32	3	3
Apodacea	Molapdiida	84	95	17	11	4	4
Aspidochirotacea	Aspidochirotida	404	340	27	35	3	3
Aspidochirotacea	Elasipodida	104	141	25	24	5	5
Dendrochirotacea	Dactylochirotida	38	35	8	7	3	3
Dendrochirotacea	Dendrochirotida	570	550	79	90	7	7
	Totals	**1470**	**1430**	**189**	**199**	**25**	**25**

Cucumbers - Continued from page 4

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Table 2. *Distribution of over 2100 records of sea cucumber species assigned to countries included in the* Sea Around Us *database by FAO fisheries statistical areas.*

	FAO Area	Species
18	Arctic Sea	2
21	Atlantic, Northwest	50
27	Atlantic, Northeast	431
31	Atlantic, Western Central	74
34	Atlantic, Eastern Central	156
37	Mediterranean and Black Sea	207
41	Atlantic, Southwest	43
47	Atlantic, Southeast	9
48	Atlantic, Antarctic	29
51	Indian Ocean, Western	109
57	Indian Ocean, Eastern	80
58	Indian Ocean, Antarctic	30
61	Pacific, Northwest	79
67	Pacific, Northeast	59
71	Pacific, Western Central	333
77	Pacific, Eastern Central	130
81	Pacific, Southwest	31
87	Pacific, Southeast	36
88	Pacific, Antarctic	11
-	Unassigned	243

Quantitative Ecosystem Indicators for Fisheries Management

The symposium aims to review existing indicators that have been developed as well as to develop new indicators

The programme for the International Symposium, "Quantitative Ecosystem Indicators for Fisheries Management" (March 31 - April 4, 2004, Paris, France) has now been finalized (www.ecosystemindicators.org/program.htm). This important symposium aims to review existing indicators that have been developed to support ecosystem approaches to managing fisheries (e.g. mean trophic level of landings), as well as to develop new indicators reflecting the exploitation and state of marine ecosystems. It is also aimed at evaluating the utility of indicators relative to specific objectives.

Several members of the *Sea Around Us* team will attend. Villy Christensen is one of the two co-convenors of the symposium (with Philippe Cury of the Centre de Recherche Halieutique Méditerranéenne et Tropicale, France). Villy will present a joint paper with Carl Walters, entitled "Ecosystem structure erosion under myopic management", which shows, through the use of ecosystem models that have been calibrated with long-term historical datasets, that widespread application of single-species MSY policies would in general cause severe deterioration in ecosystem structure, in particular loss of most top predator species.

Daniel Pauly will present two papers: "Mapping indicators of the state of the world's marine ecosystems" and, with Deng Palomares, "A biodiversity-based data quality indicator for fisheries catch statistics and its socio-economic correlates". *Sea Around Us* project graduate student, Vasiliki Karpouzi, with Reg Watson and Daniel Pauly, will present the results of her research on "Seabird population dynamics as indicators of ecosystem change".

The Paris Symposium represents the final meeting for the Intergovernmental Oceanographic Commission/Scientific Committee on Oceanographic Research (IOC/SCOR) Working Group 119, the first of which was "Quantitative Ecosystem Indicators for Fisheries Management" held in Reykjavik, Iceland in 2001 (see www.ecosystemindicators.org/wg/reykjavik/wg119report1001.pdf).

The objective of the Working Group is to develop theory to evaluate changes in marine ecosystems (both states and processes) from environmental, ecological and fisheries perspectives.

The marine reptile database

by Colette Wabnitz

One of the aims of the *Sea Around Us* project is to be able to provide species information for any specific country's EEZ and to produce maps of individual species' distribution (www.seaaroundus.org/default.htm). So far marine, freshwater and threatened fishes have been listed as well as cephalopods. Marine mammals, seabirds and marine reptiles are soon to be added to the existing database. The marine reptile database, which relies in part on data in the EMBL Reptile Database (www.embl-heidelberg.de/~uetz/LivingReptiles.html), encompasses data for 1 species of marine crocodile, 1 species of marine iguana, 7 species of marine turtles (with 11 sub-species) and 175 species of sea snakes.

The distribution of *Crocodylus porosus* stretches throughout the Eastern Indo-Pacific region, whilst *Amblyrhynchus cristatus*, the Galapagos marine iguana, as its name points out, is only found on the Galapagos Islands. Although one can encounter sea snakes in South America, Madagascar and the Middle East most species are to be found in the Eastern Indo Pacific region, with the highest diversity found in Australia. Marine turtles on the other hand enjoy a circumglobal and subtropical or tropical distribution (with the exception of the flatback turtle, *Natator depressus*, only found in Australia).

For all species collectively, the greatest number of species is, by far, to be found in Australia (140), followed by Papua New Guinea (52), Indonesia (48), Thailand (28), Sri Lanka (28), India (27) and Malaysia (20).

Sea turtles have been listed as endangered under the 2000 IUCN Red List, with the exception of leatherback, Kemp's ridley as well as hawksbill turtles listed as critically endangered and flatback turtles listed as data deficient. Both the sea iguana and the sea snake species *Laticauda crockeri* have been listed as vulnerable under Red List criteria.

... it was fun tracking all this stuff down and writing it up!

Darwin's Fishes: the writing of a lost book

by Daniel Pauly

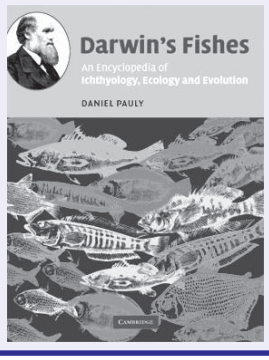
Charles Darwin (1809 - 1882), as we all know, wrote numerous books on particular groups of organisms: barnacles, orchids, earthworms - but never on fishes. Hence, I have assembled a new book, titled *Darwin's Fishes: an Encyclopedia of Ichthyology, Ecology and Evolution* out of scattered quotes 'lost' in the many works of Darwin.

Darwin's Fishes documents everything ever written by Darwin on fishes and closely related groups. Entries were extracted from Darwin's books, his short publications, his notebooks and that part of his complete correspondence now published. An appendix by Jacqueline McGlade presents Darwin's list of "Fishes in Spirits of Wine", so far unpublished, while two other appendices present Darwin's fishes in the Natural History Museum (London) and Zoology (Cambridge University) museums. The text extracted from Darwin's works was matched against his sources and then complemented by entries that provide a modern context for ideas discussed by Darwin.

Overall, quotes comprising about 45, 000 words were extracted, contributing over one third of this book. Given the extent of Darwin's writing (well over six million words), this indicates a limited interest in fishes. However, the sample of 0.7% of Darwin's entire written output analyzed here allowed me to draw a number of inferences that are missed in many conventional biographies. Examples are the high accuracy of Darwin's citations of his sources, his mining for and systematic re-publication of information relevant to Natural Selection and the high success rate of his many hypotheses.

You have to like fishes or be interested in Darwin (preferably both) to find this exciting. But it was fun tracking all this stuff down and writing it up!

Darwin's Fishes *(2004, 359 pp.) is published by Cambridge University Press.*



Sea Around Us

WELCOME TO www.seaaroundus.org: Launching our 'products' on the web

by R. Watson, J. Alder, S. Booth, V. Christensen, K. Kaschner, A. Kitchingman, S. Lai, M.L.D. Palomares, F. Valdez, D. Zeller and D. Pauly

Introducing ...
... the *Sea Around Us* project's web products site. The website allows us to meet our mandate to investigate and document global impacts of fishing on marine ecosystems. We have put considerable effort over the last four years into gathering sources of fisheries catch data and into devising ways to extract better spatial resolution from these statistics. This work, which is documented in several contributions, notably Watson *et al.* (2004), has been rather successful, leading to major publications in *Nature*, *Science* and other outlets (*e.g.* Watson and Pauly 2001; Pauly et al. 2002; Pauly et al. 2003). The new website is our attempt to share the data upon which these publications were based, summarized to be useful to a wide range of individuals and organizations interested in marine fisheries and biodiversity. The formats we chose for data summary are: 1) the Exclusive Economic Zones (EEZ) of maritime countries;
2) Large Marine Ecosystems (LMEs); and
3) High Sea Areas, divided into the 18 statistical areas used by the Food and Agriculture Organization (FAO) of the United Nations (Fig. 1).

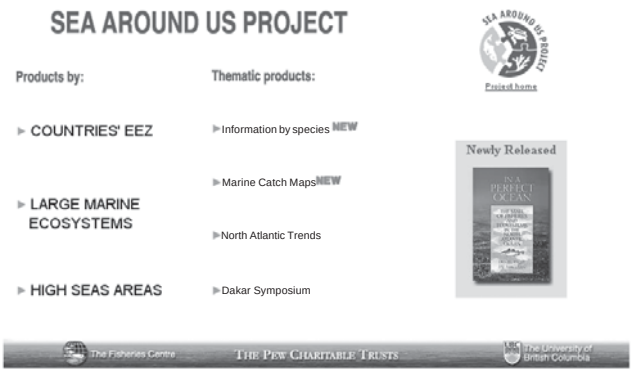


Fig. 1 The *Sea Around Us* project's web products menu, allowing choices for a range of spatial and subject areas

Besides offering our catch data globally, and separately for each of the entities above, the site provides 'deep links' to related collaborating sites such as FishBase (www.fishbase.org) and CephBase (www.cephbase.utmb.edu), thus providing a powerful synergistic tool for investigating the biodiversity in EEZs, LMEs and High Sea Areas. As well, the site offers interactive and dynamic maps of the catch and distribution of many important marine organisms, plus a wide range of graphs showing changes in commercial catches since 1950.

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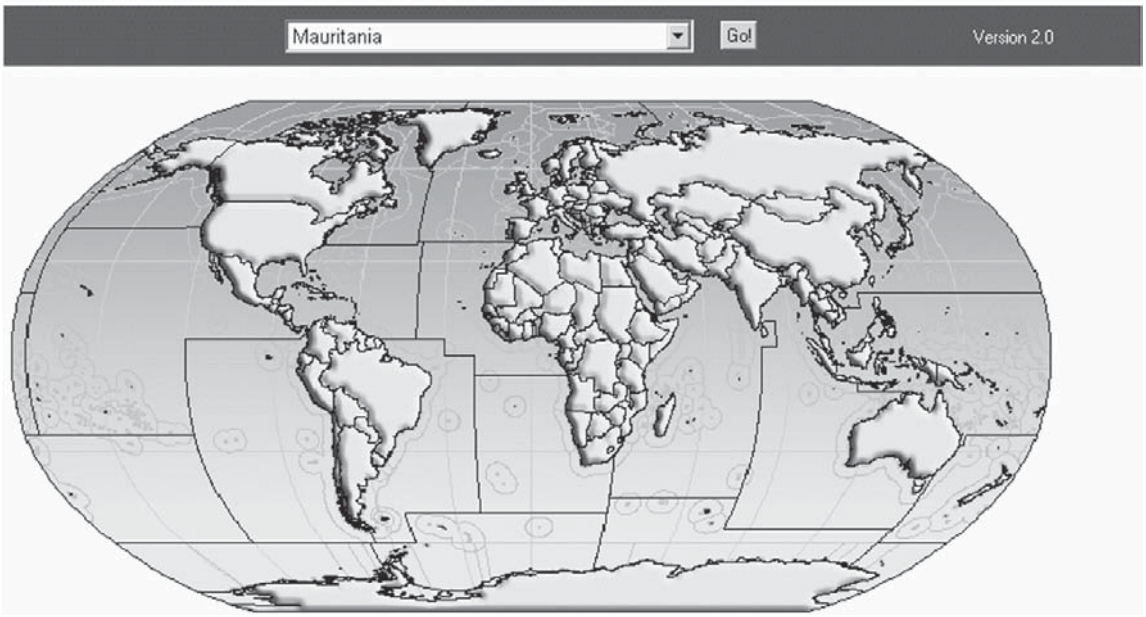

Fig. 2. Interactive map and list offering information on any coastal country.

The site offers access to a vast range of marine data in a simple interactive way

Continued from page 1

The site, which Cindy Young of Mousetrap Media helped us design, offers access to a vast range of marine data in a simple interactive way, and actually has two components: The first (www.seaaroundus.org) offers direct access to the web products our project has generated. The second (www.seaaroundus.org/project.htm) offers information about the *Sea Around Us* project (SAUP) itself: its aims, personnel, publications, media coverage and contact information. The sites can be accessed directly or via the Fisheries Centre's web site (www.fisheries.ubc.ca).

In the following sections, we introduce some of the key features of our 'web products'.

Countries' EEZ

This choice allows access to an interactive map and drop-down list of coastal countries (Fig. 2). Many countries fall within more than one of FAO's statistical areas. For each country, information is available on 'Catches', 'Biodiversity', 'Ecosystems' and 'Governance' (Fig. 3). Catches are available, for each country and section of its EEZ from 1950 to the present (Fig. 4; see Boxes 1 & 2).

These graphs are available for many different groupings of commercial catch and can include common as well as scientific names.

One important aspect of the catches in these graphs (and of the corresponding data tables, which can be downloaded into a

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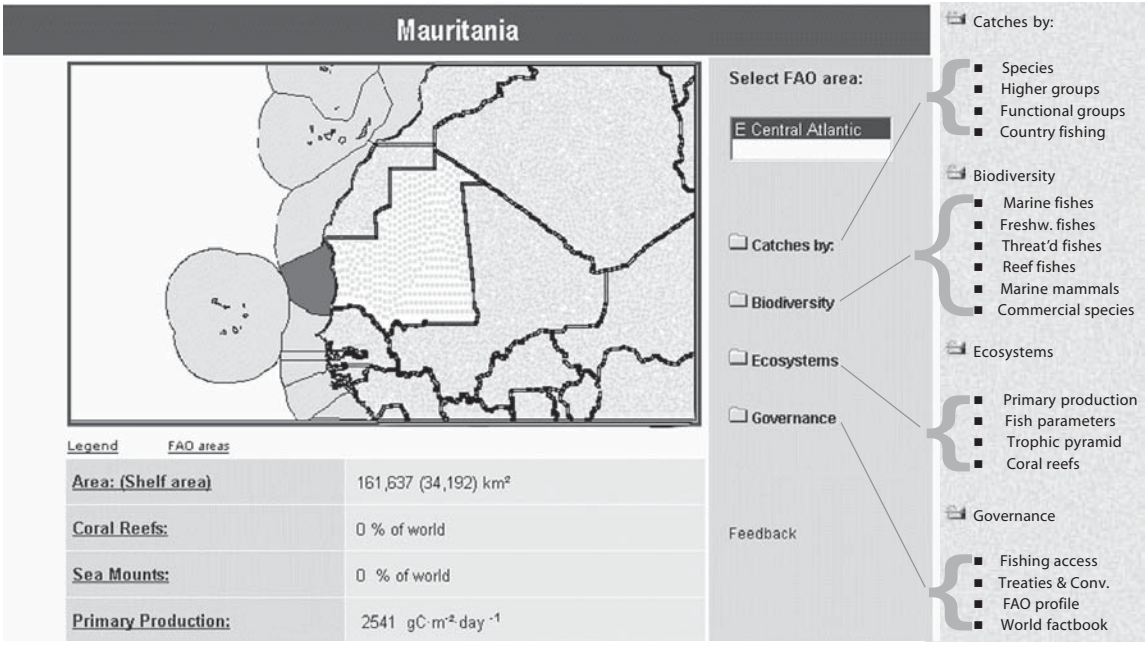

Fig. 3. An example of (a) Mauritania showing a variety of quick statistics (with links), and (b) choices for presentations of commercial catches, as well as biodiversity, ecosystem and governance links.

Continued from page 2

spreadsheet) is that they refer to the EEZ of the country in question. Here, catches by EEZ include catches taken by ALL countries in this particular area and may therefore reflect the amount of fisheries resources extracted from this area much more closely than standard fisheries statistics. Catch series from a given EEZ can also be viewed 'by country', a unique feature of the site, not emulated by any other site with fisheries information (Fig. 5). This is made possible by a built-in database of 'Access Agreements', which builds on a list (FARISIS) kindly supplied by FAO, and which we tripled in size, in an attempt to cover all the international fisheries access agreements so far documented (see Box 3). The site makes these access agreements available by country and year, and each is documented by a reference (though some are still incomplete).

Note that because of the spatially explicit nature of the catch data presented here, they are bound to differ from those available from FAO, even though this dataset served as our starting point. Moreover, we are now gradually replacing catch data known to be erroneous, for countries whose time series we have examined in some detail - *e.g.* China (Watson and Pauly 2001) and many Caribbean states (Zeller and Mohammed, 2002; Zeller *et al.* 2003).

Continued on page 4

... catches may therefore reflect the amount of fisheries resources extracted much more closely than standard fisheries statistics

Box 1. Disaggregating landings

by Reg Watson

Having fisheries catch data at a suitable spatial scale for most of the world is problematic. Where fisheries landing records exist (and they do exist in some form for most of the fisheries of the world) these statistics usually suffer from a number of deficiencies. Ignoring typical problems of missing/incomplete data and inconsistent units of measure, one of their most common weaknesses is that they are often quite vague. They can be vague in two ways: i) they can be very uncertain as to the identity of the harvested taxa (*i.e.* what was it?); and ii) very often, the catch location is not well defined or has poor spatial resolution (*i.e.* where was it?). To overcome this problem, over the past four years the SAUP has developed a spatial allocation process that relies on supporting databases and rule-based procedures to map existing coarse-scale reported landings from large statistical areas into the most probable distribution amongst a global system of approximately 180,000 water cells, each measuring 30 minutes latitude by 30 minutes of longitude. There are two main types of databases involved. The first relates to the global distributions of the reported taxa (See Box 2). The second, more challenging supporting database, describes the access of fishing nations to the fisheries resources of other coastal countries based on agreements and observations (see main text and Box 3). The intersection of these databases guides the allocation of fine-scale fisheries catches.

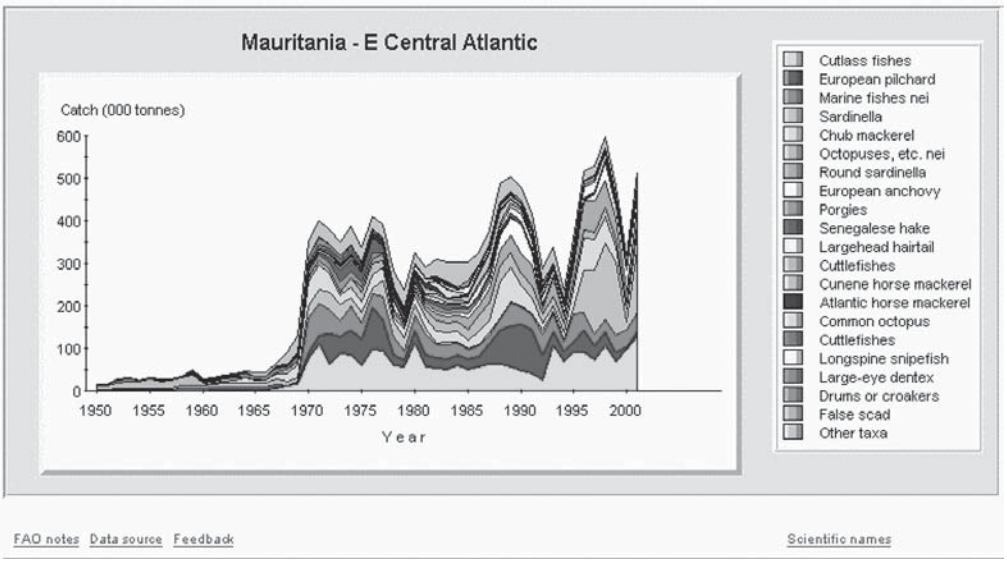

Fig. 4. Graph of commercial catches of fishes, crustacean and mollusks taken from Mauritanian EEZ waters since 1950 (common names serve as defaults, but the scientific names can also be accessed).

Continued from page 3

Links are available for many species to databases such as FishBase. Maps of the global distribution of species are also available (see Information by Species).

Biodiversity, Ecosystem and Governance Information

In addition to catches for every EEZ, the website provides information and/or links to databases with further material about that EEZ. For example: its biodiversity, in the form of lists of fish and cephalopods (through FishBase and CephBase, respectively) and marine mammals. More taxonomic groups will follow (initially marine reptiles, echinoderms and marine plants, followed by others).

The coverage of the 'Ecosystems' of an EEZ presently includes an animated map and related information on primary production in that area (Fig. 6), links to FishBase accessing ecosystem-related parameters of fish (as required for construction of trophic models using *Ecopath with Ecosim*; see www.ecopath.org), a simple trophic pyramid, and for countries with coral reefs, a deep link to ReefBase (www.reefbase.org). We will add marine ecosystem indicators to this, notably trends in mean trophic levels and related indices, and databases of various critical habitats, such as estuaries (Alder 2003).

The coverage of 'Governance' of a given EEZ presently consists of the fishing access agreements involving the country in question (see above and Box 3), treaties and conventions to which that country is signatory (from FishBase) and links to profiles of that country.

Box 2. You couldn't have caught that there!

by Reg Watson, Adrian Kitchingman & Daniel Pauly

It is obvious that landings cannot occur where the reported species do not occur. The distribution of a species (or higher taxa) is therefore a very useful tool to limit the available areas where catches can be made. We developed and used a global database of the distributions of commercial species in our process of assigning landings statistics to spatial cells. Information for this database was sourced from published global distributions (where available) or by using other sources of information to help restrict the range. These include water depth (for non-pelagic species) and latitudinal limits. In addition, a species' distribution may be limited by proximity to critical habitats. Several of these were identified and sources of mapped distributions found. These include coral reefs, mangrove, and seagrass (World Conservation Monitoring Centre, Cambridge, England), seamounts (NOAA National Geophysical Data Centre) and estuaries (Alder 2003). Conversely, it is highly unlikely that commercial quantities of fish will be landed from ocean areas permanently covered by ice. Ice coverage was received from the U.S. National Snow and Ice Data Center, Boulder, Colorado (www.nsidc.org). Many commercial species have been recorded and collected by scientific expeditions for centuries, and have been well documented by museum records (see Box 5). FishBase is an excellent on-line database, and records the presence or absence of taxa by country and by FAO statistical area. CephBase has similar records for cephalopods. Using these sources we can further restrict the possible locations of catches to those known to be within the range of recorded specimens.

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Large Marine Ecosystems and High Seas Areas

Most of the fisheries catches, biodiversity, ecosystem and governance related information available for the EEZs of maritime countries are also made available for the LMEs described at www.edc.uri.edu/lme, thus complementing this database for researchers working on LMEs. Similarly, we provide a large subset of our data in the non-EEZ waters of FAO Statistical Areas, thus contributing to a better understanding of these areas - presently the focus of discussions concerning the protections of high seas' biodiversity. These data can also be used to inform the ongoing process for claims to extended jurisdiction for continental shelf areas beyond 200 nautical miles, under provision of the UN Convention of the Law of the Sea.

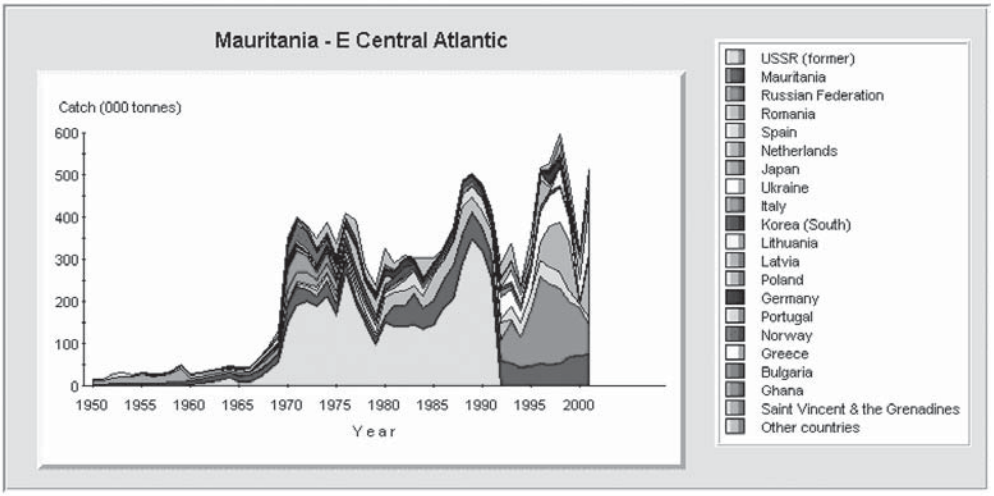

Fig. 5. Graph of commercial catches taken by countries fishing in Mauritanian EEZ waters since 1950.

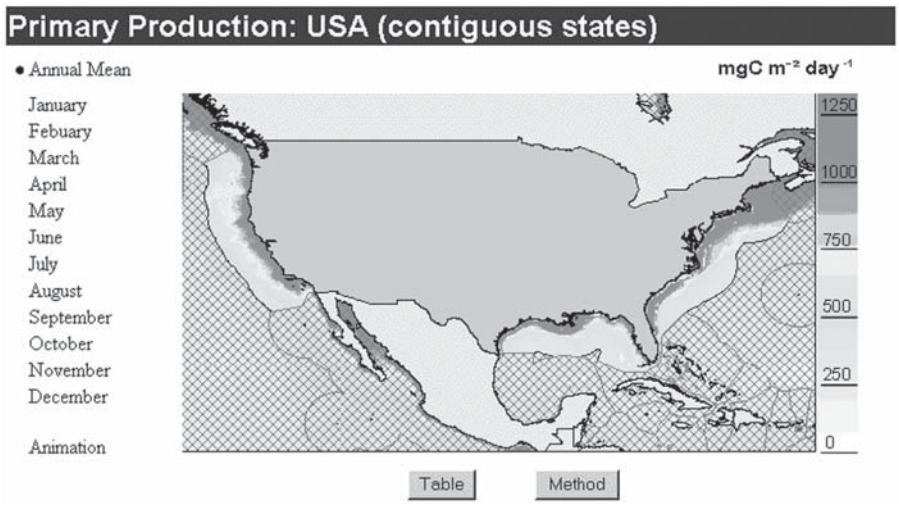

Fig. 6 Primary production for the EEZ of the US contiguous states made possible through collaboration with the European Union's Joint Research Center in Ispra, Italy.

Information by species

This part of the site makes available distribution maps, derived using generic rule-based habitat suitability modeling approaches (see Box 2) and useful links to the most commercially important fishes (see *e.g.* Fig. 7), crustaceans and mollusks, and to all species of marine mammals (see Box 4). Other groups, notably reptiles (Wabnitz 2004) and echinoderms (Palomares *et al.* 2004) will be added soon. Each map comes with full facilities such as zooming, panning and the ability to overlay other data layers. In addition, there is a useful link called 'parameters used', which opens a window describing the parameters such as depth, latitude *etc.*, used to restrict

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Box 3. Access arrangements

by Jackie Alder

Access arrangements fall into the following five categories:

1) Formal multilateral or bilateral arrangements (usually government to government).
2) Joint ventures (government to private companies or associations).
3) Illegal access.
4) Documented history of fishing in the area prior to the introduction of EEZs under the United Nations Convention on the Law of the Sea (UNCLOS).
5) Observations documented in reports, news services etc.

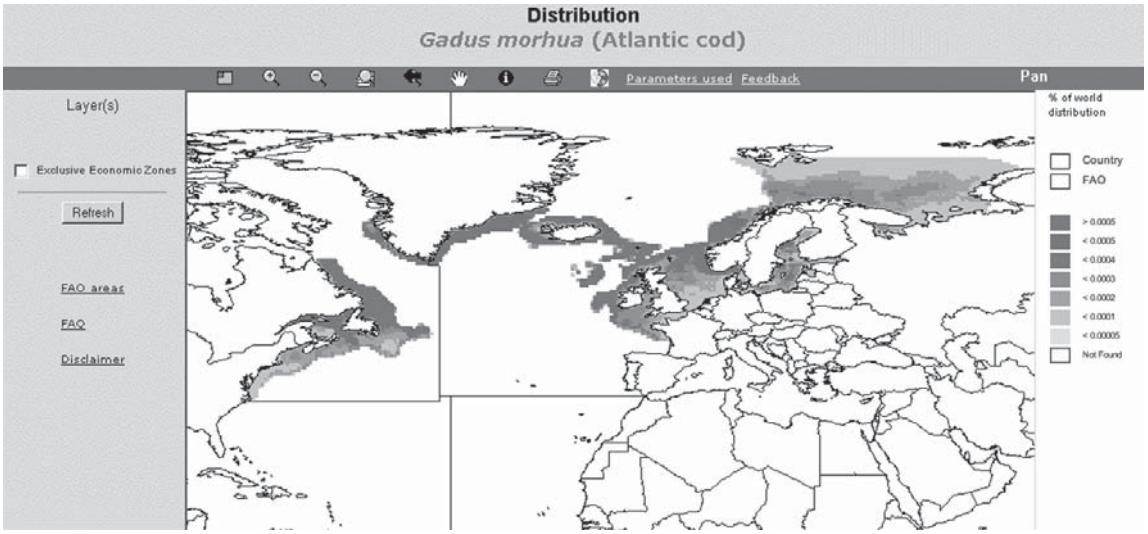

Fig. 7. This example of dynamic mapping shows the global distribution of Atlantic cod.

Catches for any year since 1950 and for all major species and groups are available in form of dynamic maps

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the distribution of the species in question, as well as references for the supporting literature. Many of these distributions are tentative (especially for groups of species) and we look forward to feedback on how to improve them.

Global Marine Catch Maps

Catches for any year since 1950 and for all major species and groups are available in form of dynamic maps, based on the spatial allocation algorithm described in Watson *et al.* (2004) and documented online, through a pop-up window with 'Frequently Asked Questions' and described here in Box 1.

North Atlantic Trends and Dakar Symposium

The *Sea Around Us* website also documents regional products of the project, notably the secular declines in the abundance of high trophic level fishes in the North Atlantic (based on the work of Christensen *et al.* 2003). Furthermore, the website documents an international symposium held in Dakar, Senegal in June 2002, which was co-sponsored by the project. This symposium served as outlet for much of our work on the status of the marine ecosystems along the coast of Northwest Africa.

The Future

Numerous additions to the website are planned for the near future. Thus, the catch series will be complemented by information about illegal, unreported and unregulated catches. Also, we will add a number of taxa to the

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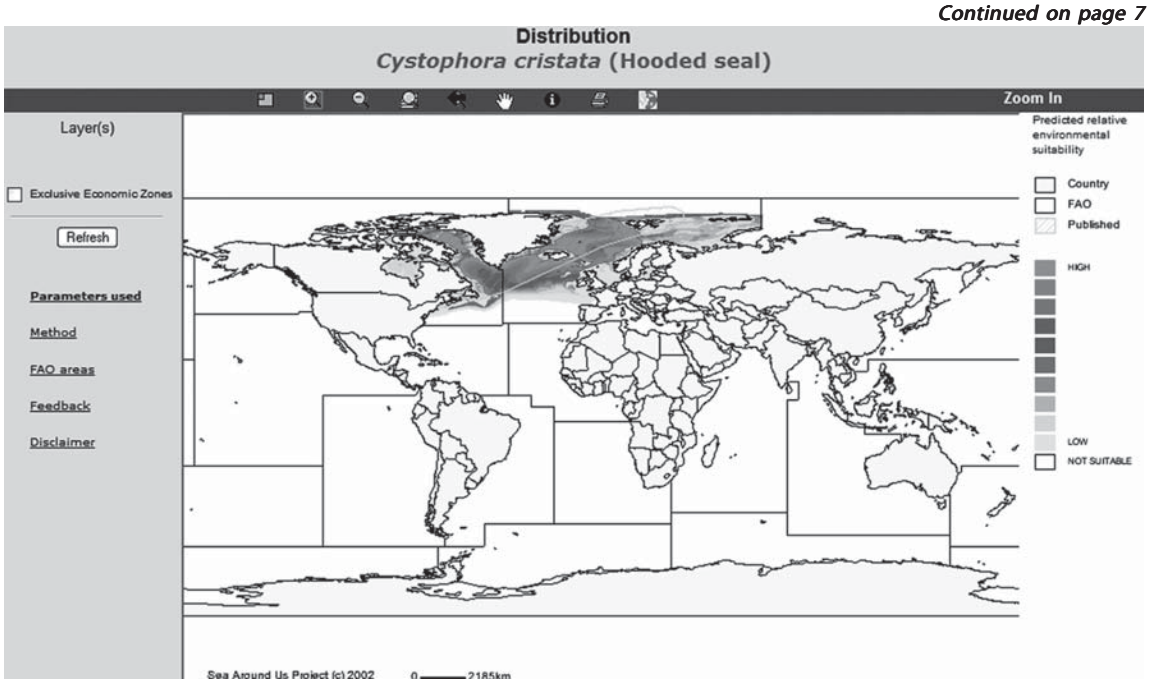

Fig. 8. The predicted global distribution of the hooded seal (see Box 4).

Box 4. We may know more than we think we know...

by Kristin Kaschner

In comparison to fish, most marine mammal species are rare in terms of numbers. Often located at the top of the food chain, marine mammals are affected and frequently threatened by fisheries and other human activities, through bycatch, competition for food resources or pollution. In order to effectively reduce such negative impacts, it is necessary to know where species occur or where there may be areas of conflict. Given the low densities of these species in combination with the vastness of the marine environment and the fact that marine mammals spend the majority of their lives under water and roam widely through the oceans, it is very difficult to determine whether a species does not occur in a particular area or whether we have not spent enough time looking there or simply missed it when we did look there. All of these factors contribute to the difficulties we encounter when trying to map distributions of any whale, dolphin or pinniped species. Consequently, existing maps are very vague, often consisting only of outlines, sketched manually by experts, representing what is believed to be the maximum boundaries of a given species' occurrence. As part of the *Sea Around Us* project we have developed a rule-based approach to map the distributions of marine mammals in a more objective way. Using our model we relate what is known about a species' general habitat preference to the locally prevailing environmental conditions in an area, thus effectively showing where the environment may be suitable for a given whale or pinniped species. In other words, the model visualizes the geographic regions that experts describe essentially when they talk about a "coastal, tropical species" (such as *e.g.* the Atlantic humpbacked dolphin) or a species that "prefers offshore, polar waters" (such as *e.g.* the hooded seal, see Fig. 8). Although the actual occurrence of a species may depend on a number of additional factors, we have tested the model extensively and have shown that we can already explain known patterns of species occurrence quite well using this approach. In the context of sustainable fisheries management, our model allows investigations of biodiversity and the relative importance of specific areas to groups of marine mammal species. Moreover, we can map large-scale geographic regions that represent potential zones of conflict with fisheries by linking what is known about abundances and dietary preferences to our mapped distributions and comparing this with disaggregated fisheries catches. All of these applications may help to develop efficient design of marine protected areas.

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biodiversity section. This requires more work than widely assumed, as most taxonomic databases found online do not include sufficient geographic information to allow for the global linkages to EEZs and LMEs that we consider essential. To complement our taxonomic information, we will be adding historical species distributions, determined from the log books of early explorers (see Box 5). To the ecosystem section we will be adding an extensive database of estuaries of the world (Alder 2003) . Rashid Sumaila and other members of the Fisheries Centre's Fisheries Economics Research Unit will be contributing ex-vessel prices for fish and invertebrates, thus allowing mapping of catch values and graphing their trends. Fisheries Centre graduate student Pablo Trujillo will soon complete his global mapping of coastal aquaculture, while collaboration with Dr Ratana Chuenpagdee, of St. Francis Xavier University in Antigonish, Nova Scotia, will allow mapping of a number of small-scale fisheries. We also plan to add recently-created maps of fishing effort, based on the fuel consumption of fishing fleets, and other indices. A planned collaboration with the World Resource Institute will allow mapping of trawled and dredged catches, while another collaboration with the World Wildlife Fund will allow mapping the marine protected areas of the world (Wood 2004). We will also make available images quantifying the changes in ecosystem structure brought about by fishing, based both on indicators (mean trophic levels, FiB index, indices measuring the diversity of species in the catch, etc.) and through direct reconstruction of the biomass that must have been present, given observed catches and other constraints.

In other words: lots of work! We hope this will be found useful.

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Most taxonomic databases found online do not include sufficient geographic information to allow for the global linkages to EEZ and LMEs that we consider essential

Box 5. Unfolding history

by M.L. Deng Palomares

Occurrence records indicate the presence of a species in a specific locality during a specific period of time. Occurrence records presented in species distribution maps may be used to determine areas of high biodiversity or endemism. Comparisons of these maps through time may also help in identifying trends in the fish biodiversity of the world's oceans and hence to the appropriate management actions needed for their conservation. However, such distribution maps are available mainly for commercially exploited fish species - the lack of baseline biodiversity data is the main hindrance to creating distributions for a broader set of species. Though not easily accessible, such data can be 'reacquired' from records of specimens brought back by, *e.g.*, the many French scientific expeditions from the late 1700s to the early 1900s. Records of specimens brought back by these expeditions are available in digital format. However, the related geographic information, though extractable from the original expedition logs, is most often captured incompletely or even erroneously. Differences in the reference meridian used (*e.g.*, of Paris as opposed to that of Greenwich), changes in the scientific name of the species and/or in the place names of the area in which the sample was caught need to be standardized before any useful analysis of the data can be done. To meet this challenge, the *Sea Around Us* project and the Ichthyology Laboratory of France's Muséum National d'Histoire Naturelle are collaborating to 'reacquire' records of specimens obtained by these early expeditions. Sources used to complete this work include expedition journals, memoirs and logbooks from the 18th, 19th and 20th Centuries, more recent publications summarizing or analyzing these earlier reports and catalogues of museum fish collections (hand and type-written logs), both computerized and in hard copy. This effort will soon be made available through the *Sea Around Us* project's Expeditions web page. As it turns out, electronic media can give a second breath or 'second souffle' to data and samples which many thought lay mummified in old museums. Vive la biodiversité!

As it turns out, electronic media can give a second breath or 'second souffle' to data and samples which many thought lay mummified in old museums

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Acknowledgments

The authors would like to thank database providers including Rainer Froese and the 'FishBase team', CephBase (particularly Catriona Day), the World Conservation Monitoring Centre (Cambridge), Nicolas Hoepffner of the European Union's Joint Research Center, and the Food and Agriculture Organization (Rome). The *Sea Around Us* project was initiated and supported by the Pew Charitable Trusts of Philadelphia.

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Sea Around Us

Assessing biodiversity loss in the oceans: a collaborative effort between the Convention on Biological Diversity and the *Sea Around Us* project

by
Marjo Vierros,
Secretariat of the Convention on Biological Diversity, Montreal, Canada
and
Daniel Pauly,* Sea Around Us *project

The *Sea Around Us* project (SAUP) and the Secretariat of the Convention on Biological Diversity (CBD) will collaborate on assessing trends in biodiversity in the world's oceans. This collaborative effort between the Montreal-based CBD Secretariat and the SAUP, based at the Fisheries Centre, UBC, Vancouver, has its origin in the CBD's need for reliable information on the state of marine biodiversity worldwide, and on how it is impacted by fisheries. The CBD, for example, needs to know what has happened to biodiversity in the oceans during the past 50 years, and what is likely to happen if present trends continue. Such information can then be used to support global policy decisions addressing the current biodiversity crisis. It is important that such policy decisions are supported by the best available science. However, in many cases, the required scientific information is only available piecemeal, if at all, and its accuracy cannot be verified. The SAUP, in constructing its global databases, offering access to a wide range of marine fisheries and ecosystem-related data (see www.seaaroundus.org), is in the process of addressing this problem.

The CBD was adopted in 1992 at the Earth Summit in Rio de Janeiro. For the first time in history, the global community decided to address biodiversity issues through a comprehensive, international treaty, and in so doing, explicitly stated that the conservation of biodiversity is a common concern to humankind. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from the utilization of genetic resources. The CBD adopts a holistic approach to the conservation and sustainable use of the Earth's entire wealth of living organisms, covering all ecosystems and species,

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as well as the diversity within species. Because of this approach, the Convention is broad and ambitious in scope. It is now the largest environment convention, with 188 Parties, and its coverage is almost universal.

... the Parties to the Convention have set themselves the difficult target of achieving by 2010 a "significant reduction of the current rate of biodiversity loss"

After some twelve years, the CBD is gradually making the transition from policy to implementation. Thus, the Parties to the Convention have set themselves the difficult target of achieving by 2010 a "significant reduction of the current rate of biodiversity loss". This target, the "2010 biodiversity challenge", is meant to inspire practical action resulting in measurable benefits to biodiversity. Although the CBD has yet to define what "significant reduction" means, there is now increasing momentum towards putting in place measures that will lead to reduction in biodiversity loss. This implies that global indicators are needed to measure progress made towards achieving the 2010 target.

It is this need for science-based indicators which catalyzed the collaboration between the CBD and the SAUP. The difficulties of measuring the achievement of a largely inspirational target with real and measurable indicators are considerable. But in an attempt to do just this, the CBD's highest body, the Conference of the Parties, adopted in February 2004 a number of global indicators[1] (Box 1). One of these is the change in trophic level in marine fisheries catches, or in CBD's parlance, the "marine trophic index". This indicator was included as a measure of ecosystem integrity and sustainability of fisheries, and was selected because of its proven relevance and reliability as a measure of human impact on exploited marine ecosystems, i.e., of "fishing down marine food webs".[2] The Parties to the CBD envisioned that this indicator would be calculated globally and regionally from fisheries data, and would be presented as a time series, which would start as far back in time as possible, and forward to 2010.

The calculation of this indicator will require reliable time series of fisheries catch data at global and regional scales. National level data will also be required, as it is likely that countries will use the indicator for their own monitoring efforts. The separation of high seas catches from those obtained within countries' EEZs is also important, given current international efforts to protect high seas biodiversity. Here, the SAUP's database of geo-referenced fisheries catches will be crucial, as it provides data at each of the required scales for calculation of trophic level changes. The other SAUP databases, such as those on marine biodiversity and biomass trends, will provide a context for assessing marine biodiversity in a more general sense. With this in mind, the Executive Secretary of the Convention on Biological Diversity has formally invited the SAUP to help the CBD in assessing trends in marine biodiversity up to the year 2010.

The SAUP will also contribute to another important global assessment need of the CBD, on the status of marine protected areas (MPAs). As described in a previous issue of the SAUP Newsletter, the PhD project carried out, with the support of WWF and the UNEP World Conservation Monitoring Centre (WCMC), by Ms Louisa Wood at the Fisheries Centre, devoted to a global assessment of MPAs,[3]

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The ***Sea Around Us*** project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, Lower Mall Research Station, 2259 Lower Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

Box 1. Provisional indicators for assessing progress towards the CBD 2010 biodiversity target. The 'marine trophic index' is the CBD name for mean trophic level, as used by SAUP to document fisheries impacts on ocean ecosystems.

A: Focal area	B: Indicator for immediate testing	C: Possible indicators for development by SBSTTA or Working Groups
Status and trends of the components of biological diversity	Trends in extent of selected biomes, ecosystems and habitats	
	Trends in abundance and distribution of selected species	
		Change in status of threatened species (Red List indicator under development)
		Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socioeconomic importance
	Coverage of protected areas	
Sustainable use		Area of forest, agricultural and aquaculture ecosystems under sustainable management
		Proportion of products derived from sustainable sources
Ecosystem integrity and ecosystem goods and services	Marine trophic index	Application to freshwater and possibly other ecosystems
		Connectivity/fragmentation of ecosystems
		Incidence of human-induced ecosystem failure
		Health and well-being of people living in biodiversity-based-resource dependent communities
	Water quality in aquatic ecosystems	
		Biodiversity used in food and medicine
Status of traditional knowledge, innovations and practices	Status and trends of linguistic diversity and numbers of speakers of indigenous languages	Further indicators to be identified by WG-8j
Threats to biodiversity	Nitrogen deposition	
		Numbers and cost of alien invasions
Status of access and benefit-sharing		Indicator to be identified by WG-ABS
Status of resource transfers	Official development assistance provided in support of the Convention (OECD-DAC-Statistics Committee)	
		Indicator for technology transfer

global indicators are needed to measure progress made towards achieving the 2010 target

Reconstruction of coral reef fisheries catches for U.S.-associated islands in the Western Pacific Region

by Dirk Zeller

Reconstructing historic catches, especially for the generally unreported small-scale coral reef fisheries, is crucial for establishing baselines for fisheries management and conservation

Fisheries resources have played a fundamental role in shaping Pacific island communities for centuries. While pelagic fisheries are the commercially most important fisheries in the U.S.-associated islands managed by the Western Pacific Fishery Management Council (WPFMC, see Figure 1), inshore coral reef fisheries are generally of more fundamental social and cultural importance. However, while catches for the large-scale pelagic fisheries tend to be documented, catches for the small-scale, artisanal fisheries often are not, or are incompletely reported. Hence, extractions of these marine resources usually remain unaccounted for in regional and global statistics (Pauly, 1998).

Reconstruction of historic catch time series often requires interpolation and bold assumptions, justified by the unacceptable nature of the alternative, i.e., accepting catches of fisheries known to exist to be zero (Pauly, 1998, Zeller et al., 2001). Without accounting for fisheries catches for all sectors, we cannot obtain a measure of the true value of these resources to the communities, or of the risks their loss through overfishing may represent for Pacific island societies. This is especially a concern, given that human population growth rates in some areas of the Pacific (e.g., American Samoa) are among the highest in the world and natural resources in the small Pacific islands are limited and declining (Craig, 1995). It is thus evident that reconstructing historic catches, especially for the generally unreported small-scale coral reef fisheries, is crucial for establishing baselines for fisheries management and conservation, and the maintenance of the livelihoods and cultures of island societies.

Hence, following a visit to Honolulu and presentation by

Continued on page 5 - Pacific

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will not only provide information towards another indicator identified by the CBD (coverage of protected areas, see Box 1), but also fulfills a direct mandate of the CBD to improve available data on MPAs globally. This mandate originates from the last meeting of the Conference of the Parties in Kuala Lumpur, Malaysia, which recognized that the documentation of existing MPAs was insufficient, and that a new global MPA database should be developed.[4]

We anticipate that other areas of overlap between the CBD and the SAUP will emerge, leading, in the future, to an even closer collaboration between the CBD and the SAUP.

Footnotes

[1] Decision VII/30 of the Conference of the Parties to the Convention on Biological Diversity (http://www.biodiv.org/decisions/default.aspx)

[2] Pauly, D., Christensen, V., Dalsgaard, J., Froese, R. & Torres Jr., F. 1998. Fishing Down Marine Food Webs. Science 279: 860-863.

[3] Wood, L. 2004. A Global Assessment of Marine Protected Areas: A New Sea Around Us Initiative. Sea Around Us Newsletter Issue No. 21 (January/February 2004)

[4] Decision VII/5 of the Conference of the Parties to the Convention on Biological Diversity (www.biodiv.org/decisions/default.aspx).

Erratum: Sea Snakes

In a recent article (*'The marine reptile database', Sea Around Us* Issue 21, p. 6), we stated that there are 175 species of sea snakes. Actually, two of these are freshwater species, even though they are commonly referred to as sea snakes (*Hydrophis semperi* and *Laticauda crockeri*). *L. crockeri* is the IUCN red listed species mentioned in the article.

Figure 1: Area managed by the Western Pacific Fishery Management Council, showing the EEZs of the U.S. associated islands. Main areas of coral reef fisheries interest are the inhabited islands of American Samoa, Guam, Northern Marianas and Hawaii.

Pacific - Continued from page 4

Daniel Pauly, in early 2004, the *Sea Around Us* project signed a research agreement with the WPFMC to undertake a catch reconstruction exercise for the U.S.-associated islands in the western Pacific, specifically American Samoa, Guam, the Northern Mariana Islands (CNMI) and Hawaii. The project will assemble and utilize all available data and information on coral reef fisheries between 1950 and the present, and derive estimates of total removal of coral reef fisheries resources for this period.

Thus, in March 2004 I visited the WPFMC where I consulted with Dr Paul Dalzell (Senior Scientist) and Jarad Makaiau (Habitat Coordinator). I took the opportunity to search the Council library for existing reports and reference material, and also received material kindly provided by Paul from his personal collection. Furthermore, I met with Walter Ikehara and Reginald Kokubun from the Hawaii Division of Aquatic Resources, and with David Hamm from the Western Pacific Fisheries Information Network (WPacFIN) at the Pacific Islands Fishery Science Centre, NOAA Fisheries. The support and assistance I received from all sides was greatly appreciated. Walter Ikehara and Reginald Kokubun will send us the official Hawaiian landings statistics, which will form the foundation for the Hawaiian reconstruction, combined with several case studies that will form anchor points for extrapolations of missing data. David Hamm has responsibility for catch databases for American Samoa, Guam, the Northern Mariana Islands and Hawaii. He provided excellent explanations on the scope and limitations of the WPacFIN databases for the islands under his area of responsibility. Extensive literature searches and data searches, with the assistance of council staff located on the islands (John Calvo – Guam; Fini Aitaoto – American Samoa; Jack Ogomuro – CNMI) has already resulted in extensive data for anchor points and extrapolations. Additional valuable assistance, information and feedback is provided by others, including Peter Craig (National Park Service, American Samoa), Kimberly Lowe (Hawaii Division of Aquatic Resources) and Nancy Daschbach (NOAA, American Samoa). We anticipate that by the end of 2004 the coral reef fisheries catches for these islands can be better accounted for than at present. This will provide the Council with a better understanding of total historic catches, and the *Sea Around Us* project with a foundation for extending this approach to other coral reef islands.

We anticipate that by the end of 2004 the coral reef fisheries catches for these islands can be better accounted for than at present

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Two *Sea Around Us* members win Mia J. Tegner Memorial Research Grants

These grants are among the first in the world awarded specifically to help scientists document the composition and abundance of ocean life before humans altered marine ecosystems

Congratulations to Research Fellow, Dr Maria Lourdes (Deng) Palomares and SAUP PhD student, Colette Wabnitz, who have both been awarded a Mia J. Tegner Memorial Research Grant in Marine Environmental History and Historical Marine Ecology.

These grants are among the first in the world awarded specifically to help scientists document the composition and abundance of ocean life before humans altered marine ecosystems. This information is important for helping lawmakers, regulators, managers and conservationists set appropriate targets for marine conservation efforts.

In 2004 the Marine Conservation Biology Institute (MCBI) awarded 11 of these grants (out of 86 applications).

Dr Mia J. Tegner, a marine biologist at Scripps Institution of Oceanography, lost her life in January 2001 while carrying out research off Southern California. She studied the ecology of kelp forest communities and abalone populations, and was particularly interested in understanding how marine populations and ecosystems have changed as a result of human activities. This pioneering research earned her appointments as a Pew Fellow in Marine Conservation and as a Fellow of the American Association for the Advancement of Science.

Mia J. Tegner Memorial Research Grants were started by MCBI to honour her memory with funding from the Oak Foundation, the Christensen Fund and the Weinstein Family Foundation.

The title of Deng's proposal, "Shifting the baseline: a knowledge-base of fish abundance anecdotes from early European explorations", reflects her ongoing research in recovering 'lost' biogeographic information about fish, stored in museum records and collections from early scientific expeditions (see *Sea Around Us*, Issue 22, p. 8). Records of observations indicating abundance of fish species at a given time and location will be gathered and structured in a database to be used for analysis of biodiversity trends (e.g., abundance of fish species in French Polynesia from the time Magellan discovered the islands of Tahiti). It is hoped that this database will provide valuable 'baseline' information dating back to the start of European exploitation of marine resources. The searchable database will be made available through www.seaaroundus.org.

Colette will use her award to look at the "Ecological functions, seagrass distribution and the conservation biology of green turtles in the Caribbean (*Chelonia mydas*)". Specifically, she will (1) develop a model to improve our current knowledge of the 'ecological role' of *Chelonia mydas;* (2) derive estimates of carrying capacity of present distribution of seagrass beds in the Wider Caribbean region from synthesised and updated habitat maps in ArcGIS; and (3) compare estimates obtained under (2) to carrying capacity estimates derived from past seagrass distribution in the region. As a result, the model derived will allow her to evaluate how many green turtles are required in the Wider Caribbean region in order to fulfil their ecological role, given the present areal distribution of seagrass estimated.

MCBI (www.mcbi.org) is a nonprofit science organization, founded in 1996 and based in Washington State, dedicated to advancing the science of marine conservation biology and promoting cooperation essential to protecting, restoring and sustainably using the living sea.

Seaaroundus.org gets write-up in *Science*

The *Sea Around Us* web products page (www.seaaroundus.org), which we launched in the last issue of this newsletter (*Sea Around Us* Issue 22), has received attention in *Science* magazine's NetWatch (*Science* 305, 9 July 2004, p. 157). This is a welcome piece of publicity that we hope will help increase awareness of our extensive online resources among fisheries practitioners around the world, particularly those with data-limitations or limited access to fisheries-related information.

Sea Around Us

Marine biodiversity vs economy, security and health

by
Daniel Pauly

As readers of this newsletter know, fisheries have huge, but long neglected impacts on the structure of marine ecosystems. Fisheries have begun to endanger marine biodiversity as well, and especially the large, long-lived species that have sustained fisheries for centuries. Indeed, the prevailing trends in fisheries are so frustrating to those who try to document and reverse them that hearing about the similar travails of colleagues working, e.g. on forestry, can give one a perverse sense of *schadenfreude*.

I recently had the opportunity to such guilty pleasure at a workshop held in London, July 19-20, on the premises of the Royal Society, and devoted to us looking "Beyond extinction rates: monitoring wild nature for the 2010 target". A number of entities, foremost the Convention on Biological Diversity (CBD), have set themselves the goal "to achieve, by 2010, a significant reduction of the current rate of biodiversity loss". The participants, drawn from Academia and a number of national and international GOs and NGOs, were supposed to exchange their experience in how to reverse what is still an accelerating trend of biodiversity loss. However, while we all had horror stories to tell on disappearing forests and the birds and mammals therein, and on decaying coral reefs and disappearing ocean predators, it became also clear that none of us knew how these trends are going to be turned around. How could we? Most of us don't even get to speak with our local Member of Parliament. But this is not because the science is not there: the workshop clearly established how good we now are at quantifying biodiversity trends through international collaborative programmes, analyses of remote sensing data, and meta-analyses of scattered, otherwise un-interpretable observations, and at presenting our results in an attractive fashion, with error bars and all.

Thus, I was particularly interested in the final presentation, by Bob Watson, who, as former coordinator of the Intergovernmental Panel on Climate Change (IPCC), would surely share with us how the IPCC was able to reach our elusive saviours: real politicians. His key message was that politicians are concerned with three issues: the economy, security, and health. These are the three issues that get them votes. Hence, unless we can relate the loss of biodiversity in various natural systems to impacts on the economy or security or health, the issue will continue to be neglected. It hit me how unfair it is that, as biologists, we not only have the inherent tasks of rigorously documenting changes in the abundance of the organisms we study, but also of convincing people around us that it matters. And we must do it even though the food we eat is biodiversity, and the medicine we take is

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biodiversity, and the fibers we use are biodiversity, and even though it is biodiversity that naturally filters the water we drink, and cleans up the air we breathe.

Fisheries have become a planet-wide force, impacting all of marine life, notably by eliminating the upper level of food webs, and simplifying the lower levels ...

Let's get back to the example provided by fisheries, still widely perceived as local activities, pertaining to one commercial fish species and perhaps a few other species caught along with it. In the five last years, the team members of the *Sea Around Us* project developed an approach to mapping fisheries catches globally, from 1950, the first year for which global data exist, to the present. These catches are then used as a backbone of procedures to map the biomass of fish over that same period for an entire ocean basin. This generates 'before vs. after' maps illustrating rather convincingly how fisheries are impacting marine ecosystems in increasingly deeper waters. Moreover, these maps can be used to document the geographic expansion of fisheries, which, starting from Europe and Northeastern North America in the North Atlantic, spread to cover the world's oceans, e.g., to Western Africa, South America and Antarctica, and similarly from Japan and Taiwan via Southeast Asia towards the South Pacific. This shows that fisheries have become a planet-wide force, impacting all of marine life, notably by eliminating the upper level of food webs, and simplifying the lower levels, now increasingly affected by outbursts of jellyfish and other short-lived invertebrates. These large-scale ecological experiments were done without control, i.e., there is no chunk of the ocean that we have deliberately set aside as reserve or to hedge our bets.
Also, most of the income extracted in the process was plowed back into acquiring more and larger boats, whose very existence now forces our hand. However, the near insatiable demand for fish that has been unleashed in the last decades can not be met anymore by the stocks that are left, and coastal aquaculture, which increasingly uses fish meal as input, and which pollutes, will likely aggravate the problems faced by capture fisheries.

Now apply Bob Watson's formula to this: what are the links to the economy, to security, and human health? One major economic link is subsidies, of which many billions are paid by governments every year, reportedly to protect jobs. These subsidies, however, have the main effect of keeping afloat the large-scale, and distant-water fleets which undermine otherwise competitive small-scale fisheries in both developed and developing countries. Unfortunately, these subsidies are neglected in the grand scheme of things, as are the increasing number of vessels involved in illegal fisheries – a security issue – and, owing to exports of fish to the developed world, the undermining of protein food supply in developing countries – a health issue.

Overall, it is thus very difficult to remain optimistic about the future of biodiversity on this planet, whether we think of its terrestrial or marine components. Perhaps dealing with the menace that rapid global climate change respresents to our economy, to our security and to our health will make us realise how urgent it is that we change the way we interact with our planet. We will be in deep trouble if this is not enough.

The ***Sea Around Us*** project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, Lower Mall Research Station, 2259 Lower Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

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Encounters of a different kind...

by
Kristin Kaschner

Imagine sitting in a very luxurious room located on an underground floor of one of the most expensive hotels in southern Italy with about 50 other people from various nations. Before being allowed to enter the room your badge has been checked carefully by serious and official looking Italians wearing sunglasses and guns and now all attention is focused on a man in a light suit sitting on a slightly raised platform in the front who is clearly in charge. You're here to discuss "strategic plans" and the chairman convenes the meeting with a request that everybody present will need to identify themselves "by their *real* name and affiliation". When the turn comes to you, you call out your name with the same kind of slightly guilty feeling one has when being stopped by the police for no apparent reason: principally, you think you know that you haven't done anything wrong, but then again who knows for sure? ...Luckily, the chairman deems your reply acceptable and moves on, but the atmosphere in the room tenses noticeably when two other newcomers identify themselves as citizens of a nation generally perceived to be the "enemy" by the majority of all members of the assembly. The small, white-haired woman, speaking with a strong accent, grows increasingly more nervous and uncomfortable as the chairman continues to question her and her associate. She struggles unsuccessfully to prove their dedication to the cause and everybody lets out their breath with a deep sigh of relief when, finally, a trustworthy witness stands up, vouching for the credibility and integrity of the newcomers and the meeting finally proceeds.

Daniel Pauly with Kristin Kaschner (left) and with Patricia A. Forkan (right), President of Humane Society International, at the strategic NGO meeting in Sorrento, Italy. Photos by Betsy Dribben.

The scene I described is not part of a second-rate spy movie, but was witnessed by Daniel and myself at an NGO meeting at this year's International Whaling Commission (IWC) meeting held in Sorrento, Italy during mid-July. Similar to my own impression, I would imagine that this kind of opening ceremony would strike most attending any scientific meeting as very unusual and somewhat bizarre or even absurd. However, in my opinion, this scene is very indicative of the level of distrust and suspicion that separates the two main factions within the IWC, one made up of member countries strongly in favour of the resumption of commercial whaling and the other emphatically opposed to it.

The International Whaling Commission is an international body, founded in 1946, with the mandate to manage global whaling operations of all member countries. As a general procedure, whaling quotas are/were set during the annual Commissioners' meeting, based on the recommendations and assessment of whale stocks through scientists during the Scientific Committee meeting which takes place every year just prior to the Commissioners' meeting. However, despite all regulatory efforts, the mismanagement of whale stocks led to an over-exploitation that brought the majority of large whale species close to the brink of extinction during the first three quarters of the 20th century. As a consequence, a worldwide moratorium on whaling was put in place in 1985. By the early nineties, a so-called revised management procedure (RMP) was developed to allow a sustainable harvest of those whale stocks that were considered to be healthy. The IWC has endorsed the RMP already, but has not yet implemented it for any stock,

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When the turn comes to you, you call out your name with the same kind of slightly guilty feeling one has when being stopped by the police for no apparent reason

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because of some complex scientific issues – much to the chagrin of those nations who argue that at least one of the baleen whale species, the minke whale, is abundant enough to allow a sustainable harvest. As a consequence of this ongoing debate, zero commercial whaling quotas continued to be set for all member countries at the IWC meeting every year for the past twenty years, even though a relatively small number of various species are still being taken as part of aboriginal whaling operations or during the – very controversial – so-called Scientific Whaling Programme conducted by the Japanese, or by the Norwegians who are not bound by the moratorium because of their initial vote opposing the decision. The situation has resulted in an effective deadlock between the opposing factions in the last decade, only interrupted by regular attempts of either faction to produce either new arguments supporting their cause or by trying to tip the scales of the voting majority in their favour with the help of new member countries.

Our findings indicate that overlap between [marine mammals and fisheries] is very low ...

Most recently, in an effort to justify the resumption of whaling, some of the pro-whaling nations, namely Japan and to a lesser extent Norway and Iceland, have argued in many international fora that marine mammals and specifically the large whales compete directly with fisheries for "our" limited marine resources; often implying that the culling of marine mammals would somehow help to resolve the world's fisheries crises and may even alleviate world hunger.

To counteract these claims, the Humane Society of the United States invited Daniel and me to come to this year's IWC Commissioners' meeting in Sorrento to launch a report that we had recently prepared for them, summarizing the main opposing arguments in this so-called 'Whales-eat-fish" debate. This report "Competition between Marine Mammals and Fisheries - Food for thought" (available at www.hsus.org/ace/21314), was largely based on the research I conducted for my PhD and as part of the *Sea Around Us* project in collaboration with Daniel Pauly, Reg Watson, Villy Christensen and Andrew Trites. Using spatial modeling and mapping techniques (see *Sea Around Us*, Issue 22, p. 8, for description of methodology) I have assessed the extent of overlap in food resources between marine mammals and fisheries by considering not only

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New Publications

Sea Around Us members have produced several new publications in the past few months. Notably, Villy Christensen, in collaboration with John L. Maclean, was guest editor for a special issue of *Ecological Modelling* (March 1 2004, Vol 172 (2-4): Placing Fisheries in their Ecosystem Context). The special issue contains 19 papers reporting the latest applications and advances in ecosystem modelling using the *Ecopath* with *Ecosim* suite of modelling tools. Papers by *Sea Around Us* members include:

Christensen, V. and D. Pauly. 2004. Placing fisheries in their ecosystem context, an introduction. *Ecological Modelling* 172, 103-107.

Christensen, V. and C. J. Walters. 2004. Ecopath with Ecosim: methods, capabilities and limitations. *Ecological Modelling* 172, 109-139.

Kavanagh, P., N. Newlands, V. Christensen and D. Pauly. 2004. Automated parameter optimization for Ecopath ecosystem models. *Ecological Modelling* 172, 141-149.

Zeller, D. and J. Reinert. 2004. Modelling spatial closures and fishing effort restrictions in the Faroe Islands marine ecosystem. *Ecological Modelling* 172, 403-420.

Other recent publications by *Sea Around Us* members include:

Alder, J. and U.R. Sumaila. 2004. Western Africa: a fish basket of Europe past and present. *Journal of Environment and Development*, 13(2), 156-178.

Atta-Mills, J., J. Alder and U.R. Sumaila. 2004. The decline of a regional fishing nation: The case of Ghana in West Africa. *Natural Resources Forum*, 28:13-21.

Christensen, V. and C. J. Walters. 2004. Trade-offs in ecosystem-scale optimization of fisheries management policies. *Bulletin of Marine Science* 74(3), 549-562.

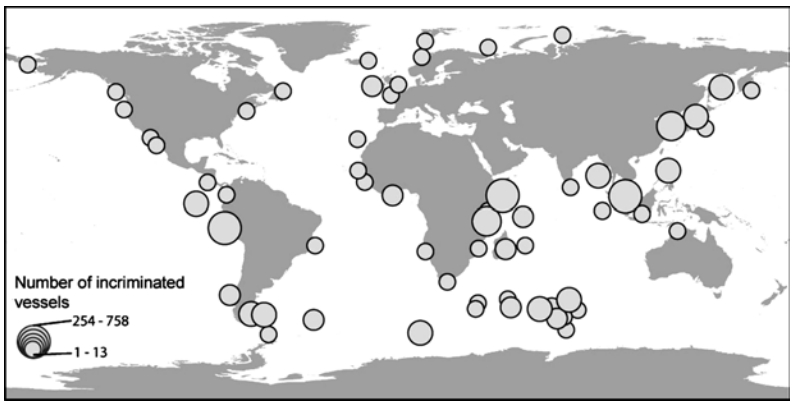
Salas, S., U.R. Sumaila and T.J. Pitcher. 2004. Short-term decisions of small scale fishers selecting alternative target species: a choice model. *Canadian Journal of Fisheries and Aquatic Science*, 374-383.

Zeller, D. and D. Pauly. 2004. The future of fisheries: from 'exclusive' resource policy to 'inclusive' public policy. *Marine Ecology Progress Series* 274, 295-303.

IUU fishing, international fisheries organizations and the *Sea Around Us*

by
Ussif Rashid Sumaila and Jackie Alder

The *I* in IUU fishing stands for illegal fishing; the *U* denotes unreported fishing; and the last *U* is unregulated fishing. When fishers catch fish where they are not supposed to, they are engaging in illegal fishing. When a fisher catches fish, whether legally or illegally, and fails to report the catch to the relevant authorities, that is unreported fishing. Unregulated fishing is conducted by vessels flying the flag of countries that are not parties of or participants in relevant fisheries organizations, and therefore consider themselves not bound by their rules (e.g. countries fishing for tuna in the Atlantic by those who are not members of ICCAT).



Map showing distribution of incidences of illegal fishing for the period 1980 -2003. Map produced by Jordan Beblow, Sea Around Us *project.*
Sources: IntraFish *and other online news services.*

IUU fishing has recently attained rock star status among international fisheries organizations

IUU fishing has recently attained rock star status among international fisheries organizations - both intergovernmental and non-governmental. The FAO, Coalition of Legal Toothfish Operators (COLTO), the OECD, WWF and UNEP are all very active in this area, trying to help tackle this burning problem. In fact, the FAO is currently working with its member countries to develop International Plans of Actions (IPOAs) for tackling IUU fishing. Also, the OECD organized a workshop in April 2004 where a group of invited speakers, including R. Sumaila, gave papers on the economic and social drivers of IUU fishing (see www.feru.org/publications/Cost_of_IUU.pdf).

Why is IUU fishing so topical today? First, governments and stakeholders recently realized that this is indeed a significant problem for fisheries management, with global estimates of the quantity of fish removals due to IUU fishing of up to 30% of official reported global catches (Pauly *et al*. 2002). Second, the fact that so much of the removals are not reported makes stock assessments that underpin most fisheries management arrangements, less reliable. Third, IUU fishing aggravates the well-known negative effects of overcapacity in fisheries. Fourth, it makes buyback schemes less likely to achieve their goals of reducing fishing capacity, since the capacity so removed simply moves on into IUU fishing. Fifth, IUU fishing makes the management of shared stocks and high seas fisheries even more difficult. Finally, IUU fishing puts legal fishers at a disadvantage since, in effect, the IUU fishers enjoy a *de facto* subsidy and therefore can supply fish at a lower cost than legal fishers.

All of these reasons make the tackling of IUU fishing a very important task if the goal is to stop the current overfishing of global fish stocks. To do so implies that we need data and analyses to support policy makers. The *Sea Around Us* project (SAUP) has been (i) compiling a detailed global database of illegal IUU fishing, and (ii) developing country case studies of IUU fishing, which will later be scaled-up to the global level (Pitcher et al. 2002). In fact an active database has already been established, which is continually being updated through access to fishing news services. The SAUP, working together with the Fisheries

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Economics Research Unit (FERU) has used this database to develop a global map of IUU fishing incidences, and undertake a study for the OECD on the economics and risks associated with being apprehended while engaging in IUU fishing (Sumaila et al. 2004). Our goal at the SAUP is to establish the most comprehensive global database, which will underpin different analysis of IUU fishing activities to provide vital scientific information to support actions to eliminate the harmful activity.

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Pitcher, T.J., Watson, R., Forrest, R., Valtysson, H., Guénette, S. 2002. Estimating illegal and unreported catches from marine ecosystems: a basis for change. Fish and Fisheries 3: 317-339.

Sumaila, U.R., J. Alder and H. Keith 2004. The cost of being apprehended fishing illegally: Empirical evidence and policy implications. In OECD Workshop Proceedings on Illegal, Unreported and Unregulated (IUU) Fishing Activities, April 19-20, Paris.

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... in the context of the whaling debate, maybe the actual problem lies elsewhere and is unlikely to be solved by any scientific research ...

what type of food either group targets but also where this food is consumed or caught. Our findings indicate that, from a global perspective, resource overlap between the two is very low, because the vast majority of food consumed by marine mammals is taken in areas where fisheries don't operate and/or consists of food types that are not exploited by fisheries. Consequently, even given all the associated uncertainties, potential competition is also likely low, except in the case of a few hotspots of high resource overlap, which warrant further investigation. However, we found no evidence that fisheries catches would likely increase due to a reduction of any marine mammal population.

The actual report was launched at a press conference, and during the days prior to this event Daniel and I met with many IWC Commissioners, reporters and – during the closed strategic NGO meeting described in the opening paragraph – representatives of the various international conservation or animal welfare organisations that hold observer status at the IWC. Although not introduced as an official agenda item of the Commission's meeting this year, we have been told that the findings of our report may become the main focus of a special session during the IWC's Scientific Committee meeting next year. Since it was launched, the report has been covered widely in the media including articles in *Nature News* and *New Scientist* (www.nature.com/news/2004/040719/full/040719-7.html; and www.newscientist.com/news/print.jsp?id=ns99994983). Overall, the feedback we received was very positive and I have been contacted by several colleagues, politicians and conservationists, praising us for the work we've done and for the "reality-check", as someone called it, our report has provided in the context of the on-going marine mammal-fisheries competition debate. In one sense, this article therefore describes a success story and I am obviously very pleased with the recognition of our work. Nevertheless, I wonder if somehow we have been preaching mainly to the converted. Without exception, everybody we spoke to at the IWC or who has since approached us was on "our side" in the first place (i.e., people that are opposed to whaling), while members of the Japanese delegation and other pro-whaling nations made no attempt to engage in any kind of discussion. In my opinion, this lack of constructive interaction – similar to the deeply embedded suspicion that was so apparent at the NGO meeting and that seems to dictate and determine the interactions between most IWC member countries – is symptomatic of the unyielding, cemented positions in the whaling debate that have resulted in the organization's current deadlock.

I believe that our report is a useful attempt to provide some badly needed perspective on the extent of the problem of potential competition between marine mammals and fisheries. However, based on my observations, I tend to agree with many others that, in the context of the whaling debate, maybe the actual problem lies elsewhere and is unlikely to be solved by any scientific research. It may therefore be time to refocus our efforts to resolve this issue, shifting the emphasis to much more basic questions of how to deal with problems arising due to vastly different viewpoints when nations from very different cultural backgrounds are thrown together in the ongoing globalization process. But don't ask me how – fortunately, that's not my job as a scientist – or is it?

Sea Around Us

Letter from the Cook Islands

by David Ngatae

In August, 2004, Daniel Pauly travelled to New Zealand and delivered several public lectures in Auckland, Christchurch, Wellington and Kaikoura, sponsored by the New Zealand Department of Conservation. Dr Pauly's message has become familiar: the world's oceans are overfished and governments and citizens must be mobilised to act before the world's marine ecosystems cease to provide us their bounty. Sadly, it seems, that his story still needs to be told and that the southern oceans may soon be as overexploited as those of the north. Mr David Ngatae attended Dr Pauly's lecture at the Auckland Girls Grammar School on August 17 (see p. 2). Here, we publish his response to the lecture.

Dear Dr Pauly,

I attended your lecture recently at the Girl's Grammar in Auckland on world fish populations. I have always feared that what you painted of the real state of world fish stocks to be true, but was devastated to learn the extent of the damage. I have recently returned to Rarotonga, in the Cook Islands, to live and am appalled at what is about to happen to these islands in the name of progress and growth. We have recently acquired five Taiwanese fishing boats to help us clean out what little fish we have remaining. This was out of the blue last week, an arrangement by government and a private processing plant, while we were all focused on larger vessels being built by the Chinese. We are told that eight vessels will be coming as each one is completed. They are too large to be built in the region.

There is a sense of overwhelmed helplessness amongst the people here to prevent the pace at which a few in power are being enticed with gifts, while using the ignorance of the people to the laws and the real statistics on the state of world fisheries, to push through their deals. There is also a lack of knowledge on the reasons we should protect these fisheries now, before the damage is done, in not only sustaining the resource but positively working towards creating your vision of world reserves to replenish the fish stocks.

The North is dead and the pillage is about to take place in the last remaining relatively unspoiled part of the world. The Chinese have also designated the Cook Islands a preferred visiting country. They have set up fish factories in Fiji, Samoa, Tonga and are firmly focused on this part of the world. France is holding tightly on to Tahiti. The statistics you provided in your lecture virtually paint the picture that apart from commercial fishing being economically redundant, it is already too late for most of the fish stocks to sustain the present reported catch let alone the unreported catch. Establishment of these fish park/ reserves must be enacted as soon as possible. The UN will not do anything in the short term and nor will any of the major powers. They have too much to lose to entertain the idea of not fishing anywhere and creating a reserve. I believe that the Cook Islands with its vast economic zone can become an example of such a vision. However, political change through awareness and alternative economics is the key to enabling such a concept to actually become a reality. The fifteen islands are all small volcanics and atolls

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and are inhabited by a mere 10-12,000 people. There is however very strong growth in all facets of the economy. The Cooks have finally been discovered and everyone wants a piece. There are foreign investors well embedded in the society who also will not let go easily the foothold they have and the wealth they are about to make. With such growth however comes the price of the few getting most while most will get very few.

The Cooks have finally been discovered and everyone wants a piece

I speak fluent Maori and as I walk amongst the people I am constantly reminded by them that it is my responsibility to voice and do something about their concerns, being able to communicate their feelings in English and to people who may be able to help. I couldn't think of anything more pertinent than attending your lecture on my visit back to Auckland. I wanted to communicate with you to get your initial feelings as I am gathering those around me who can and want to stop this ridiculous plunge into unconscious wastefulness, having learnt nothing from the northern fisheries already in their death throes. It is a medium to long term plan that must begin by the publishing and education of relevant and accurate statistics to at least paint the other side of the picture even if it is to bring pressure on those in power to slow down the so called progress. The Cook islanders are mainly shy people who have been relatively left alone until now but are being hurled into the 21st century by those who are willing to destroy the resources and culture at all cost. Apart from the fisheries and

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Daniel Pauly visits New Zealand

Daniel Pauly delivers a public lecture at the Auckland Girls Grammar School (left) and speaks with students afterwards (right).

Jim Fyfe (Programme Manager Coastal, Otago Area Office, NZ Department of Conservation), Daniel Pauly and Ann McCrone (Senior Marine Conservation Officer, Marine Conservation Unit, Department of Conservation), just prior to (left) and during (right) a successful whale watching trip out of Kaikoura on the northeast coast of New Zealand's South Island. Photos by Roger Williams of Whale Watch Kaikoura Ltd

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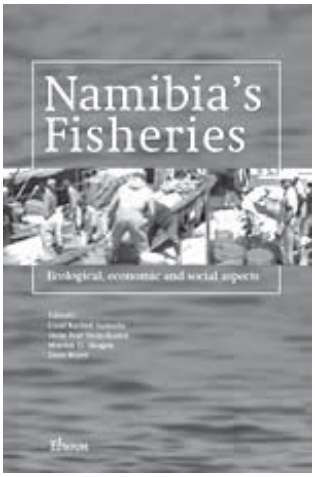
ISSN 1713-5214 Sea Around Us (ONLINE)

New Book: *Namibia's Fisheries*

We are pleased to announce a new book focusing on the fisheries of Namibia, edited by Ussif Rashid Sumaila, David Boyer, Morten D. Skogen, and Stein Ivar Steinshamn; published by Eburon Publishers.



Namibia's Fisheries is a timely contribution to the global debate over destructive modern fishery methods. The book examines Namibia's Benguela upwelling system: an area that supports traditional and modern forms of fishery. It also analyzes the Namibian experience in fishery management, featuring essays by researchers, Namibian fishery managers, and international specialists that cover a range of ecological and social issues.

Namibia's Fisheries will be a valuable resource for researchers, conservationists, and students of fishery management.

Contributions from the Fisheries Centre include several chapters co-authored by Ussif Rashid Sumaila on aspects of the economics of Namibian fisheries and chapters by Daniel Pauly, Maria Lourdes Palomares and Sheila Heymans. The book is available from Chicago University Press: www.press.uchicago.edu/cgi-bin/hfs.cgi/00/16501.ctl or www.amazon.com.

Namibia's Fisheries is a timely contribution to the global debate over destructive modern fishery methods

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the invasion of tourism, I am also watching the rapid decline of my culture in front of my eyes. The things that make us who and what we are. The things that are dear to us. However, It is not irreversible yet.

I guess one can only do what one can do and our paths did cross. I hope that you and/or your department can help or at least give some advice.

Sincerely Yours,
David Ngatae

David Ngatae *is a Producer with Cook Islands Film Company making documentaries on the Cook Islands. He is also spokesperson for a political and environmental lobby group," Te Tu Maori", which aims to protect and preserve the culture and resources of indigenous people in the Cook Islands and the Pacific, through awareness and economic alternatives.*

What, no canals?

by Jackie Alder

Dateline …..24 & 25 September, 2004, Venice, Italy (without the canals)

A meeting of the Global Ocean Observation Systems (GOOS) Working Group of the Scientific Committee on Ocean Research (SCOR) met in Venice September 24 and 25. I thought what an appropriate a place, given the canals and looming marine issues facing Venetians. The meeting was in fact in a Holiday Inn crammed between two freeways with not a canal in sight! Nevertheless it did not stop my presentation of the marine and coastal aspects of the Millennium Ecosystem Assessment (MA) to SCOR's Working Group. An overview of concept of the MA, the process to date and the marine and coastal topics that are included in the various reports was given. The presentation resulted in considerable discussion about indicators and more importantly, how, members of SCOR, in particular the Global Observation Systems Group, could contribute to MA initiatives in the future. The consensus of the group was that progress has been made towards investigating a set of indicators that could be developed for an assessment such as the MA, and that the SCOR-GOOS Working Group has a key role to play. The way ahead is to propose a workshop with SCOR members, as well as other groups involved in monitoring coastal and marine areas on large scales, to determine the range of indicators that might be appropriate and to identify the data requirements so that Global Ocean Observation Systems can begin to incorporate them into their programs. Watch this space for updates!

The Millennium Ecosystem Assessment – moving it to the next level

by Jackie Alder

... it was even more rewarding to know that the Sea Around Us *project [...] made a significant and lasting contribution to this global initiative*

The third and final meeting to finalize the three main volumes of the Millennium Ecosystem Assessment (MA) was held in Kuala Lumpur in late September. The meeting included chapter review editors who assisted in advising on the finishing touches to the various chapters. The meeting also provided the opportunity for authors of various chapters to consult with colleagues on overlaps and information gaps, as well as ensuring consistency across the chapters. It has been a Herculean task to pull information together on ecosystems (natural and built) and their services; explore four plausible and possible futures for these ecosystems; and to discuss potential response options to address current and potential issues. In addition to producing three information-rich technical volumes, several syntheses are currently being drafted that will focus on communicating the MA's major outcomes to decision makers and the wider public.

The oceans and their services (fisheries in particular) were initially left out of the MA, but they are now included. Although the oceans cover about 70% of the world's surface, there is a much smaller level of coverage in the MA volumes. Fisheries and oceans topics are focused on in two chapters in the Conditions and Trends volume (Chapters 18 and 19). As well, in the same volume, Chapter 4 includes marine biodiversity, Chapter 8 covers fisheries as a food provisioning service, Chapter 12 outlines nutrient cycling, and Chapter 13 climate regulation. In the Scenarios volume, Chapter 6 (Models) provides an overview of fisheries models and the models used in the development of the volume; Chapter 8 describes the future scenarios for fisheries as well as coastal ecosystems; Chapter 9 presents the results of modeling three ecosystems using the four scenarios described in Chapter 8; and Chapter 10 examines how landing diversity might change under the four scenarios. The various responses policy makers can take to manage fisheries are described in Chapter 6 (Food and Ecosystems) of the Responses volume, while Chapter 15 (Integrated Responses) includes managing coastal areas.

Over the next three months the various chapters will be finalized and reviewed by MA board members and then edited for publication in early 2005. The launch date of the MA results is scheduled for early 2005 in New York. After the launch the various volumes will then be available from the MA's website: www.millenniumassessment.org and, more importantly, decision makers will hopefully start to implement the findings of the Millennium Ecosystem Assessment.

Working with colleagues on the MA over the last two years has been interesting and exciting, and at times challenging. After spending a week in Kuala Lumpur, it was exciting to see the final product come together into a series of publications that will no doubt influence decision makers in managing the world's ecosystems. However, it was even more rewarding to know that the work of the *Sea Around Us* project made a significant and lasting contribution to this global initiative.

Alternative office space ideas?

On a recent trip to California, *Sea Around Us* research assistant Adrian Kitchingman spotted this potential new office space, should the new AERL building be unsatisfactory. The building comes with ready-made sign and a built in ecosystem of various silk octopuses and sea creatures.

Publications Mail Agreement No: 41104508

Sea Around Us

Rebuilding fisheries and coastal livelihood in tsunami affected areas

by
Daniel Pauly

Many of the victims of the recent tsunami in South and Southeast Asia were fishers and their families, and much of the infrastructure that was destroyed was ports and boats and other fishing gear. It seems therefore obvious to many in the developed world that they should help in rebuilding the fisheries, for example, by funding the construction or purchase of replacement vessels. Indeed, I have recently received several phone calls asking my advice on how to go about such rebuilding. One of my callers even suggested that we should send surplus vessels from British Columbia as part of this rebuilding effort.

Before countries such as Canada commit themselves to such far-reaching decisions, a few important features of South and Southeast Asian fisheries need to be considered, notably that (except for the oceanic tuna fisheries), they consist of two fundamentally different and antagonistic components. One of these is small-scale fisheries, employing tens of thousands of fishers, operating traps and other fixed gears along the coast. Open crafts are also used, some motorized and many not and usually of the size ranging from that of a kayak or row boat. The other component consists of large-scale, 'industrial' fisheries operating motorized and decked vessels, mainly bottom trawlers, along with purse seiners and other specialized crafts.

Some small-scale operators are still, in various places, 'traditional fishers' in the sense that they are members of families that have been fishing for many generations. However, in many parts of the tsunami affected region, the majority of fishers have entered the fisheries only recently. They are, in the main, landless farmers who have been driven into what is, in effect, an occupation of last resort.

In the tropics, nutrient recycling and biological production occur near the coast and, thus, tropical fisheries differ from temperate ones in that they operate relatively close to the shore, where prawns and fish are concentrated at depths of between 10 and 50 metres. Small-scale fishers and industrial vessels thus largely exploit the same resource, leading to competition between these two components of the fisheries sector. This conflict has led to numerous acts of violence, ranging from the wilful destruction of traps and set nets by trawlers to the latter being set on fire by irate small-scale fishers.

The governments of the region are well aware of these conflicts. However, their fisheries policies, while stating an intention to assist in the 'sustainable development' of the small-scale fisheries, usually tend to favour the industrial sector, as manifest in boat-building, fuel and other subsidies, lack of enforcement of the regulations banning trawlers from shrimp-rich inshore areas, etc.

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The challenge is thus to rebuild fisheries while directing funds and energy to generating land-based job opportunities for young fishers

The lending policies of regional development banks have tended to exacerbate this conflict: only the industrial fisheries provide opportunities for big, 'bankable' projects. Alternative, micro-lending schemes would thus help, and so would the implementation, on the ground, of stated policies designed to assist small-scale fisheries. In the long run, however, these policies will fail to lift the incomes of South and Southeast Asian small-scale fishers, who are usually desperately poor. There are simply too many small-scale fishers and too many new ones are recruited from coastal hinterlands, every year anew, for this sector to become sustainable.

This is true even if small-scale fisheries appear to have been sustainable in pre-industrial times, when traditional self-management, and lack of technology and of globally integrated markets for seafood, imposed limits on the growth of fisheries.

The challenge is thus to rebuild fisheries while, at the same time, directing as much of the available funds and energy as possible to generating land-based job opportunities for young fishers. Emphasis should thus be given to basic education and technical skills, as fishers in South and Southeast Asia are generally the worst educated in countries where illiteracy tends to be high, which limits their social mobility.

Education, whether basic or technical, would contribute to increasing their ability to leave a sector that cannot give them anything but a grim future.

The tsunami crisis and the Millennium Ecosystem Assessment

by Jackie Alder

The 'Assessment' in the Millennium Ecosystem Assessment (MA) may give the impression that this global initiative has little relevance to the recent crisis in the Indian Ocean. However, the work of the MA, especially in Scenarios and Responses, can make a significant contribution in the medium to long-term to the rebuilding of sustainable ecosystems and livelihoods for many of the coastal communities affected by this disaster. While the Conditions and Trends volume highlighted the vulnerability of coastal communities to events such as increased storms and flooding due to climate change, the Scenarios volume highlighted the possible futures that coastal communities could have under different development policies. The Responses volume provides some guidance on the policy options that could be used in the coast. In the short-term providing the basic needs to these communities is of paramount importance. However, once these needs are met and the focus shifts to rebuilding communities, these people are in the unique position of being able to decide what future they would like to have, and the outcomes of the MA scenarios can give them some idea of those possible futures, while the Responses outcomes gives them guidance on how to move towards that future, one which we hope includes healthy ecosystems and sustainable communities.

The ***Sea Around Us*** project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, Lower Mall Research Station, 2259 Lower Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

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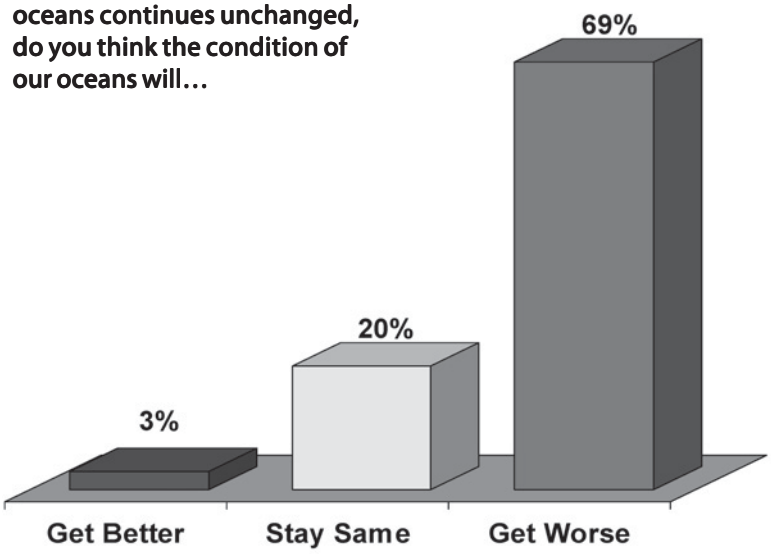
ISSN 1713-5214 Sea Around Us (ONLINE)

Fish fingers matter

by
Jackie Alder and Ussif Rashid Sumaila

How valuable are inshore coastal areas, coral reefs, seagrass and kelp beds, and deep-water environments such as seamounts to the public? Finding the answers to such questions is critical to policy makers. There is also a growing urgency to answer such questions because marine habitats and the resources they support are being used to meet a growing variety of human needs and demands. Hence, decisions on how to allocate these resources between competing uses emerge. Answering such questions requires more than one approach, which is what we did in an ongoing study for Oceana (www.oceana.org/index.cfm) where we combined traditional monetary valuation techniques for commercial and recreational fisheries with survey/opinion polling to help determine how much value the US public places on its marine habitat and the sources they support.

If current management of the oceans continues unchanged, do you think the condition of our oceans will…



Working with EdgeResearch, a company with extensive experience in opinion polling of marine issues, over 1100 randomly selected US residents were surveyed in early December, 2004. The participants in the survey were asked their opinions on such aspects as funding for resource management, and maintaining biodiversity for marine habitats. The marine habitats were represented by commercial fish that people could easily recognize or relate to. These include species such as salmon, pollock (expressed as fish and chips and fish fingers) and lobster.

The results of the survey have just been collated and we are currently in the midst of detailed analysis. However, some preliminary results reveal that the US public is concerned with the current and future condition of their marine habitats (see Figure), and that they are willing to either pay more through higher prices to consume fish or to shift their tax dollars from other initiatives to help ensure the long term sustainability of their marine ecosystems. We are excited about our findings and hope to present a more detailed analysis in future newsletters.

Some preliminary results reveal that the US public is concerned with the current and future condition of their marine habitats

Biodiversity matters

Senior Research Fellow with the *Sea Around Us* project, Reg Watson, has just returned from Santa Barbara, California, where he joined the third of a series of working group meetings at the National Centre for Ecological Analysis and Synthesis (NCEAS), devoted to 'linking marine biodiversity to ecosystem functions and services'. This meeting generated a major synthesis of information, from small-scale experimental set-ups to large marine ecosystems. The group is quantifying the link between marine biodiversity and ecosystem functioning and examining the potential for the disruption of marine ecosystem services that are vital to our food supply, economies, and human health. The group, led by Boris Worm (Dalhousie) and Enric Sala (Scripps), includes experts from a range of fields. Reg is contributing his expertise with modelling global fisheries data. For more information see: www.nceas.ucsb.edu/

Call for Abstracts - 2005 NAAFE Forum
Fisheries Benefits to all Generations: the role of economics

... a platform for fisheries economists, policy makers [...] and fisheries stakeholders to analyze fisheries problems and explore workable and effective solutions

In December 2003, the Board of Directors of the **North American Association of Fisheries Economists (NAAFE)** appointed Ussif Rashid Sumaila of the University of British Columbia's Fisheries Centre to host the third biennial NAAFE Forum. Dr Sumaila will head the organizing effort in collaboration with NAAFE President, Dr Jon G. Sutinen and others.

The Forum promises to be a major event and will take place from **May 25-27, 2005** at the UBC Conference Centre in Vancouver, BC, Canada.

Forum Goal
To provide a platform for fisheries economists, policy makers, intergovernmental and non-governmental organisations and fisheries stakeholders to meet and analyze fisheries problems and explore workable and effective solutions.

Session Themes
Fisheries governance and management issues
Fisheries governance; Property rights in fisheries – ITQs, community quotas; Environmental Impacts of Alternative Fisheries Regulations; Spatial effort dynamics: predicting fisher reaction to spatial closure policies; What have EEZs accomplished?; Managing shared fish stocks.

Economic and valuation issues
Fisheries and ecosystem values and valuation – do they go far enough?; Fisheries subsidies: the good, the bad and the ugly; Fish for whom: ethics and fisheries economics; Economics of fisheries and ecosystem restoration; Economics of ecosystem-based fisheries management; Large-scale versus small-scale fisheries.

Trade and fisheries management
Globalization and fisheries sustainability; Fish trade and marketing; Economics of illegal, unregulated and unreported fishing (IUU); Net costs and benefits from aquaculture, including open-ocean aquaculture.

Special highlight: Fisheries debate of our time
Ensuring Fisheries Benefits for all Generations. In Search of Common Ground: Two Visions from Ecology and Economics

Featuring Jim Wilen (Dept of Agricultural and Natural Resource Economics, University of California, Davis) and Daniel Pauly (UBC Fisheries Centre).

For more details about the 2005 NAAFE forum; to register or submit an abstract online: visit www.feru.org/events/naafe.htm.

Synthesizing the Millennium Ecosystem Assessment
by Jackie Alder

Now that the Millennium Assessment (MA) is winding up, one of my last tasks, as for many of the writers of the various volumes, has been to contribute to the synthesis reports for the various conventions that have supported the MA over the last three years. The RAMSAR Convention for Wetlands (www.ramsar.org), which includes many coastal areas such as reefs, estuaries, lagoons and kelp beds is one of the original conventions to support the idea of the MA. Indeed, the parties to this convention are keen to see how the MA can assist in managing their wetlands. Last year several authors from the MA drafted a synthesis report based on the current findings in the three volumes: Conditions & Trends, Scenarios and Responses. Now that these three volumes are complete, we have spent three days (12 to 14 January 2005) in The Hague condensing over 3000 pages of text and figures to less than 88 pages of text and figures that describe wetlands, now and in 2050, as well as how parties to the Convention might manage wetlands in the future. It was a challenging task to assimilate such a volume of material and more importantly to consolidate the material into key messages for decision makers, but quite rewarding to work with ten other authors from diverse backgrounds and perspectives. After three intense days of writing, a very focused report was produced which I hope readers interested in wetlands will read when it is released by the MA later this year.

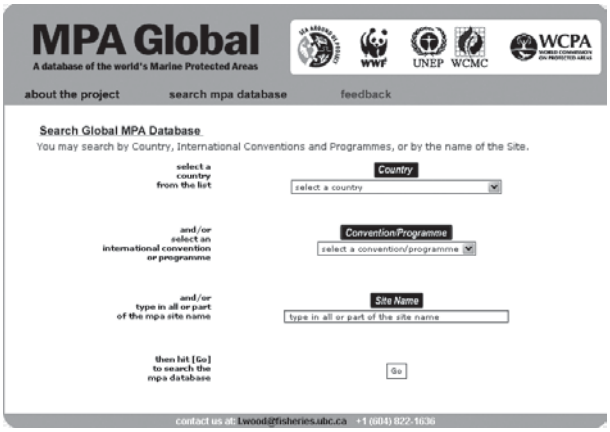
Publications Mail Agreement No: 41104508

Sea Around Us

MPA Global – an online database of the world's marine protected areas

by Louisa Wood

The *Sea Around Us* project's website, www.seaaroundus.org, has a new addition: MPA Global, a spatial database of the world's marine protected areas (MPAs). This database is the result of a formal collaboration with World Wildlife Fund (WWF) and the United Nations Environment Programme – World Conservation Monitoring Centre (UNEP-WCMC) and constitutes a substantial part of my PhD thesis.



There is an explicit global need for a robust and detailed MPA baseline, such that progress towards a comprehensive, representative global network of MPAs can be readily monitored. MPA Global serves as a means to achieve that global baseline. It was initially developed by extracting the marine information from the World Database on Protected Areas (WDPA), maintained by UNEP-WCMC and searchable at http://sea.unep-wcmc.org/wdbpa. Since then, the structure of MPA Global has been further developed to store and present additional, MPA-specific information explicitly. It also provides for referencing at the field level. The MPA Global website has two main goals:

a. To provide information on the world's MPAs in a clear and explicit format; and
b. To solicit feedback on the data contained within MPA Global, so as to improve the global MPA baseline.

MPA Global is currently searchable by country, international convention and by all or part of the area name, both independently (www.mpaglobal.org), and as part of the *Sea Around Us* website , the latter allowing a view of MPAs as part of a system of information on marine fisheries and ecosystems. All available information is freely provided for each MPA. Currently, around 5000 sites are listed, of which approximately 3700 are designated under national legal / informal mechanisms and 900 under international conventions. The remainder are of uncertain designation status. The project is currently in a substantial edit and update phase. So, when searching and/or viewing the database, you may notice gaps and/or errors in the information provided. The *Sea Around Us* project would like to extend an invitation to all readers to verify the data currently available in MPA Global for the MPAs with which you are familiar or for

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which you have references. You can do this simply by registering at MPA Global, logging in, and then submitting edits directly online. Registration is open to anyone and required only so that we can attribute every edit submitted in this manner to the person who provided it.

The addition of data on regulations that apply to an MPA [...] constitutes a substantial part of this project that will add much value to the global MPA baseline

In the coming months the website and the contents of the database will continue to be improved and updated. For example, a mapping interface showing the location and boundaries of the MPA is currently in development, and we will be adding to the search criteria as the database becomes more populated – e.g. searching for all no-take MPAs, or those that ban trawling. Throughout this process, we welcome your feedback, comments and requests.

Contact:
l.wood@fisheries.ubc.ca

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What's included in MPA Global?

There are many widely varying definitions of MPA available, with perhaps the most globally applicable being the IUCN definition (*'Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment'*, IUCN 1988). In considering which definition to apply to MPA Global, we identified two guiding principles:

1) **Inclusivity**: MPA Global seeks to be an inclusive database, that can provide comprehensive MPA information to any (and hopefully, all) stakeholders, that is tailored according to their particular definition of MPA;

2) **Objectivity**: This is key to the academic integrity of a PhD thesis that seeks, among other things, to assess the current extent of marine protection globally.

MPAs and other spatial resource management tools, such as fisheries closures, may have different objectives and be implemented by different organizations under different frameworks, but their outcomes can also overlap: regulation or restriction of resource extraction over a defined spatial extent. The distinction between the two becomes ever more blurred and their inclusion in, or exclusion from, a list of MPAs becomes increasingly subjective as one descends the protection continuum. We suggest that the differences between them can best be represented in terms of how the space they cover is regulated.

As a consequence, the approach being taken with MPA Global is to broadly follow the IUCN (1988) definition of MPA, but to supplement it with data on how the site is regulated. The addition of data to MPA Global on regulations that apply to an MPA (or, indeed, the lack of regulation) constitutes a substantial part of this project that will add much value to the global MPA baseline.

References

IUCN (1988) Resolution 17.38 of the 17th General Assembly of the IUCN. Gland, Switzerland and Cambridge, UK, IUCN.

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The natural history of the Falkland Islands traced through European expeditions

by M.L. Deng Palomares and Elizabeth Mohammed

In June 2004, a Tegner Memorial Grant was awarded to the first author, through the Marine Conservation Biology Institute (MCBI), to document the abundance of marine organisms observed by the great European oceanographic expeditions. This project aims to gather qualitative information on the abundance of marine organisms from narratives of these early expeditions, render them in an analyzable format and finally use them to map trends of observed abundances in a specific locality over time, the final objective being to provide an older baseline of the biodiversity and abundance of marine organisms. Given that the sources of information form an enormous pile, we had to focus on one geographic region. We chose the Falkland Islands.

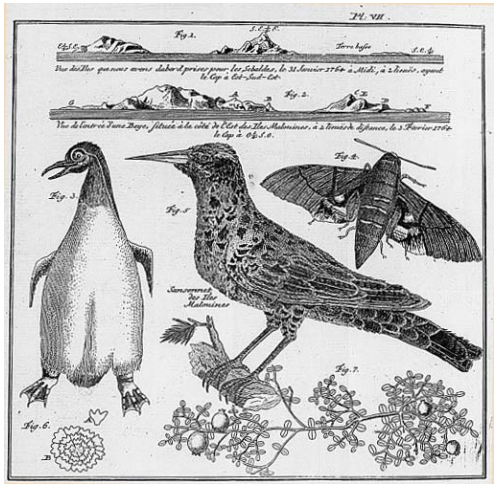
This project aims to gather qualitative information on the abundance of marine organisms from narratives of these early expeditions [and] render them in an analyzable format ...

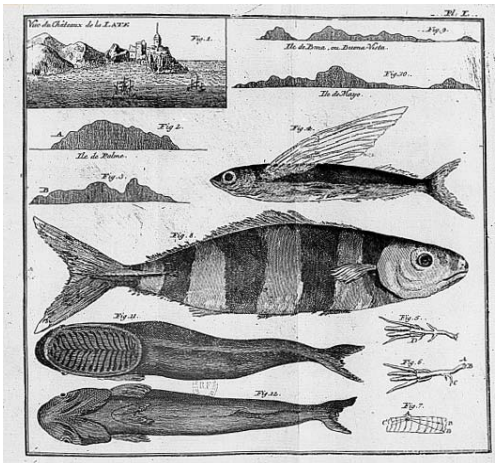
The first cartographer to plot the Falklands, marked as "*Insule 7 delle pulzelle*," was Martin Waldseemüller in 1507 on the first map to bear the name of *America* (Haeber 2003). Sixteenth century Spanish, Portuguese and English navigators knew of these islands as the *Yslas de Sanson* (Boyson 1924). No landings were made and most descriptions were cartographic; no particular attention was given to the natural history.

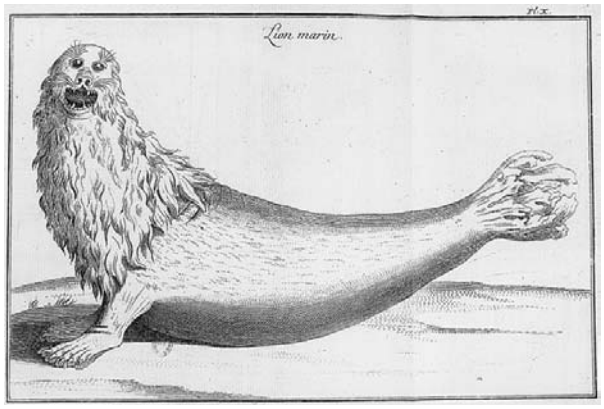
The discovery of the Falkland Islands is attributed to Captain John Davys of the *Desire*, of the second '*privateering*' expedition of Thomas Cavendish in 1591-1593 (Pepper 2001). After wintering in the Magellan Straits, on his way home to England, on 9 August 1592, blown by stormy weather, Davys' fleet was '*driven in among certaine isles never before discovered* […] *lying fiftie leagues or better from the Shoare East and Northerly from the Streights* […]' (Boyson 1924).

Except for describing how they replenished supplies, most privateering expeditions paid little attention to the natural resources of these islands. Most of the earlier narratives mention that the Falklands were 'barren'

Continued on page 4 - Falklands







Plates from the voyage of de Bougainville to the Malouine (or Falkland) Islands made in 1763 and 1764. Reproduced from Pernetty 1773.

Falklands - Continued from page 3

in that the islands provided little or no wood, and there was no access to freshwater. However, seabirds, e.g., penguins, and seals were observed as 'extremely abundant' – expectedly so, as these are animals that are easily seen.

Sebald de Weert, vice-admiral of a Dutch fleet on board the *Blijde Boodschap* wrote: "*They here saw vast numbers of those birds called 'plongeons' or divers, because they dive into the water to catch fish* [probably penguins, given that they were at Penguin Island at the time of observation, but could also refer to diving petrels]. *They killed there ten or fourteen of them with sticks, and might have killed as many as would have served the whole fleet* [5 ships at 100 men each would have amounted to 500 mouths to feed], *but would not lose the opportunity of a fair wind*" (p. 133 of Kerr's 1824 interpretation of Sebald de Weert's observations upon arriving at Penguin Isle on 6 April 1599; see other de Weert anecdotes at the *Sea Around Us* website: ww.seaaroundus.org).

The English William Dampier on board a buccaneer's ship in 1684 wrote the following: *January 28th we made the Isles of Sebald de Weert* […] *where we found foul rocky Ground, and the Islands barren, and destitute of trees, but some Dildo-bushes growing near the Sea-side. We saw the same day vast shoals of small red Lobsters, no bigger*

Continued on page 5 - Falklands

The current project is intended to provide a baseline on catches in the Canadian Arctic coastal region

Arctic and Philippine collaboration

Visiting scientist, Paul Watts was invited to the Fisheries Centre from January 31- March 3 2005 to work on two projects: a summary of fisheries harvest in the Canadian Arctic and a scientific/cultural orientation for a two year volunteer placement in the Philippines through the Volunteer Service Overseas (VSO). Vancouver is also a great place to adjust between -35°C and +35°C! These projects have been greatly advanced by the logistical and scientific support at the Fisheries Centre, particularly those working on the *Sea Around Us* and *Project Seahorse*. The Fisheries Centre is also an excellent location to look at comparisons in both fisheries and marine management on a global scale and to consider common issues.

Previously, Canada's perspective on Arctic fisheries has evolved primarily through local interest in subsistence harvest and regional economic initiatives. Information on for these activities has often been incomplete both in terms of limited geographic application and as a result of defined mandates for specific datasets. The current project is intended to provide a baseline on catches in the Canadian Arctic coastal region through comparative analysis of existing reports on subsistence and commercial catch. The final result will be to transform community-based records from about 50 settlements and to put the information into a format that will be compatible with global *Sea Around Us* datasets.

As a volunteer coastal resource manager going to the Philippines, Watts will have the opportunity to work with communities, NGOs and government agencies on the efforts to advance a holistic approach to sustainable resource use, local capacity building and other related considerations. He feels that the history of Fisheries Centre programmes in the Philippines and *Project Seahorse* provide an ideal environment to learn about the country, as well as the resource sectors and different levels of intervention that are occurring. Prior to coming to the Centre, he felt that this invitation would be a great opportunity to obtain information before starting his in-country cultural and language training. The experience has surpassed his expectations. He looks forward to next time.

Paul Watts has a background of research on single animal energetics and behavioral ecology of large Arctic mammals and has also worked on educational, health care and business development in the north. His current research interests include beluga whale ecology, ethnoecology and the development of community based research/management.

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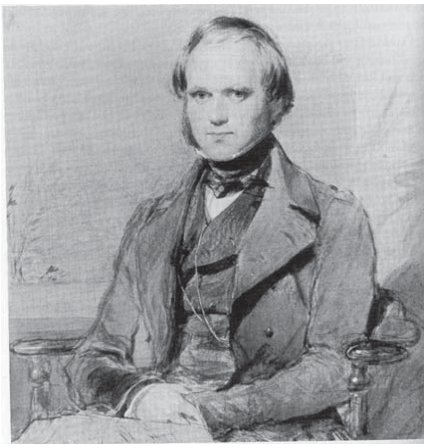
than one's Finger […]." Boyson (1924) identifies this as a shrimp, *Munida surugosus*, "*much liked by whales and penguins.*" The genus *Munida* belongs to the decapod family of squat lobsters, Galatheidae, and the species occurring in the Falklands is *Munida subrugosa*, with benthic adults but planktonic larvae (Tapella *et al.* 2002). However, the swarming description might refer to what is now termed as 'lobster krill' (usually *Munida gregaria*, but also other species of *Munida*) occurring in the diets of sea lions, *Otaria flavescens* (Thompson *et al.* 1997) and penguins (Clausen and Pütz 2003).



1840 portrait of Charles Darwin, age 31, by George Richmond.

The first recorded landing was not until 28 January 1690 when the British captain, John Strong, anchored at Bold Cove, Port Howard, where he wrote: "[…] *this land doth show like a great many Islands […] there is several keys that lye along shore. Wee sent our boat on Shoar to one of them and they brought on board abundance of Pengwins and other fowl and Seals* […]." Strong named the islands after the Viscount of Falkland, one of the owners of his ship, the *Welfare* (Boyson 1924; Pepper 2001).

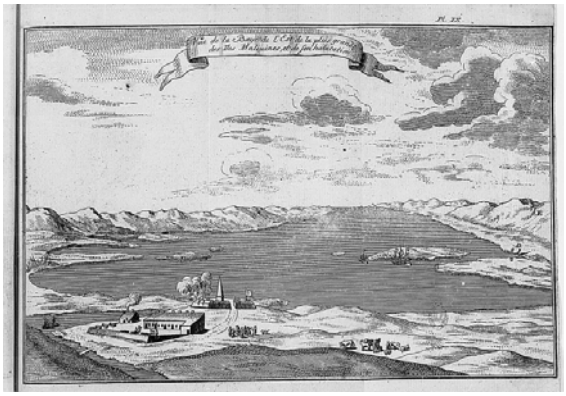


Plate from the voyage of de Bougainville to the Malouine (or Falkland) Islands made in 1763 and 1764. Reproduced from Pernetty 1773.

At the end of the 17th century, French seafarers, quietly establishing an extensive trade with South America, used the islands as their base, which they called *îles Malouines*, after St. Malo, a city in northwestern France (Boyson 1924). French activity in the southern seas led to the establishment of a French colony at Fort St. Louis (named after the ship *St. Louis* commanded by Jacques Gouin de Beauchêne which landed there in 1698) in the East Falkland by Louise-Antoine Comte de Bougainville (Pernetty 1773; Taillemite 1997). Bougainville's stay (1763-1764) and successive voyages (1766) to the Falkland Islands provided science not only with detailed descriptions of aquatic and terrestrial life but also of their abundance (Bougainville 1771; Pernetty 1773). Our analyses (see documentation of Bougainville's expeditions at www.seaaroundus.org) show that half of these descriptions represent observations on the abundance of birds (mostly seabirds) and fish (mostly marine). About 43 % describe the commonness of invertebrates, seaweeds, herbs and shrubs and about 5 % describe the rarity of reptiles. The French relinquished the islands to the Spanish in 1767, and from then on the islands were known by the Spanish name of *Malvinas.* In the early 1830s, a successful colony of 'cowboys', the 'gauchos,' was exporting dried beef (and salted fish) to Brazil and wool to London (see www.falklands.info). However, the British reclaimed the islands, renaming them the Falklands, and in the 1840s the population of 'gauchos' was replaced by settlers from England (Cawkell 2001). This era marks the beginning of the exploitation of terrestrial and aquatic resources, though American sealers were already slaughtering the seal populations around the islands since the late 1820s.

Charles Darwin's visits to the islands in 1833 aboard the Beagle *and again in 1834 provided a rich collection of specimens ...*

Charles Darwin's visits to the islands in 1833 aboard the *Beagle* and again in 1834 provided a rich collection of specimens along with notes, his and those of Captain Robert Fitzroy and Syms Covington (Darwin's servant), describing the islands' natural resources. Upon arriving, Darwin found the islands 'desolate' being "*universally covered by a brown wiry grass, which grows on the peat* […] *& excepting snipes & rabbits, scarely any animals*" (Armstrong 1992). Covington, on the other hand, found "[…] *low Bushes with red berrrys* [sic] *which are very good eating* […]" and "[…] *enormous numbers of Bullocks Horses & Pigs* […] *Rabbits, wild geese & Ducks* […] *& most excellent Snipe Shooting in the Marshy ground & Long grass, which the Island in general is very little else.*"

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Falklands - Continued from page 5

But the islands were not desolate after all. They had "[…] *an immense quantity & number of kinds of organic beings which are intimately connected with the Kelp* […] *the infinite number of small fish which live amongst the leaves* […] *Crustacea of every order swarm*, […] *Encrusting Corallines & Aztias are excessively numerous* […] *The number of compound & simple Ascidia is a very observable fact* […] *Heurobranchus is common: but Trochus & petalliform shells abound on all leaves* […]." Darwin believed that these islands would "[…] *become a very important halting place* […]" with "[…] *fine harbors, plenty of fresh water & good beef* […]" (letter to Caroline Darwin, 6 April 1834; cited in Armstrong 1992). However, as the islands became colonized, rare, endemic and exploited species of the islands (e.g., he was here referring to the Falkland fox ('warrah')) "[…] *will be ranked among those species which have perished from the face of the earth*." (Darwin, 1839-1843).

We have yet to exploit the big pile of books of expeditions to the Falklands as we have only seen the tip of the iceberg

We have yet to exploit the big pile of books of expeditions to the Falklands as we have only seen the tip of the iceberg. Our goal is to further assemble accounts of organisms occurring in the Falkland Islands from these early narratives in order to have a more representative documentation not only of the observed occurrences of species, but also their relative abundances. So far, our relatively 'scanty' data (from only 7 major references though it now numbers 250 records) show that, in the period 1590-1790, most observations mention a general abundance of seabirds, an expected result – a reason why some islands are named after them, e.g., Penguin Island (one in the Falkland archipelago and one in the Straits of Magellan). We hope to show other trends, e.g., rarity of some species groups which have since disappeared from these islands or are currently under threat of extinction. More results will be available this winter through the *Sea Around Us* website.

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Sea Around Us

From Halifax to the White House

by Ussif Rashid Sumaila

Academics are generally known to travel more often than the average citizen. The story I am about to tell confirms this in my case. This story began in January 2005 with my trip to Halifax, Nova Scotia, and ended at the Office of Management and Budget, Executive Office of the President of the United States on March 31, 2005.

In Halifax, a group of multidisciplinary fisheries scientists and managers met to participate in a workshop and Public Forum on "Creating a Positive Future for Fisheries and Coastal Communities". The key goal of the meeting (law.dal.ca/law_6433.html), was to provide insights into how to create a positive future for fisheries, which, as we have learnt from recent studies, are in overcapitalized, overfished and, in some cases, depleted states. Instead of attempting to define what is meant by a positive future for fisheries, participants generally agreed that declining biomass of fish species targeted by a fishery over time *does not* signal a sustainable and therefore a positive future for fisheries. Workshop participants agreed generally that global fisheries are currently in bad shape, and that some drastic measures need to be taken in order to turn things around and create a positive future for fisheries. Keys for creating a positive future for fisheries identified included (i) developing methodologies for determining the total value of fisheries to society; (ii) engaging the public through educational and outreach programs; (iii) getting business involved; and (iv) linking science to policy.

Inspectors about to board a fishing vessel in Tanzania. Photo courtesy of C. Palin, SADC EU MCS Programme.

From the winter of Halifax – I missed one of the famous Halifax winter storms on arrival to the city and escaped another one by flying out a few hours before it hit the city - I moved on to Cape Town, South Africa - an African city, which is home to the famous Table Mountain. Cape Town is affectionately compared to Vancouver by its many lovers, in terms of its beauty and natural surroundings, with mountains, ocean views and much else. The city was host to the Southern African Development Cooperation (SADC) - European Union (EU) Monitoring Control and Surveillance (MCS) Conference in February, which was why I found myself there (www.mcs-sadc.org/Welcome%20page.htm). The choice of Cape Town as host of a conference on MCS in the region underscores the pressure being felt by fisheries scientists and managers in South Africa from chronic illegal fishing by both foreign and local-based pirate vessels active in the country's waters. A case in point is a recent case of illegal fishing by the Hout Bay Fishing Company ... the

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company is believed to have illegally caught the equivalent of about 50% of the total quota for the South Coast rock lobster for over 10 years before it was caught.

As an applied game theorist, it was great to come to the home of the man who set game theory free by proving the Nash equilibrium concept

I focused my talk on the economics of MCS, emphasizing (i) the need to understand the economic drivers of illegal fishing; and (ii) the cost-effectiveness of MCS systems and the financing of MCS activities. MCS is necessary because illegal fishing is currently widespread globally, making stock assessments inaccurate; endangering the sustainability of resources; causing economic waste; and putting fishers who play by the rules in a disadvantaged position. Without MCS, illegal fishing would increase, resulting in the loss of economic, social and ecological benefits. Cost-benefit analysis of 16 cases of incriminated vessels fishing illegally around the world showed that the penalty they faced needed to be increased 25-fold in order for the penalties to serve as adequate deterrents to illegal fishing (Sumaila *et al.* 2004). Part of the reason penalty levels are low is, in general, that judges do not see why they should penalize fishers harshly 'just for fishing'. South Africa is on the way to providing a solution to this problem by constituting environmental courts to deal with serious cases of illegal fishing and other environmental crimes.

My next port of call was Princeton University, back in the U.S., where the game theorist, John Nash of the *Beautiful Mind* movie fame, made his mark and still resides. As an applied game theorist, it was great to come to the home of the man who set game theory free by proving the Nash equilibrium concept. I went to Princeton on the invitation of Sara Curran to participate in a conference entitled "Trading Morsels" (www.princeton.edu/~piirs/trading_morsels/conference.html). The conference is part of a larger project at Princeton, which seeks , through systematic assessments and comparisons of food-based commodity chains, to explore how these chains affect the economic development and environmental consequences in both producing and consuming nations. In my contribution, I demonstrated how the trading of fishing access rights between West African countries and the European Union is leading to a situation where fishing communities are left dry – with 'no fish and no dollars' - thereby impacting negatively on their food security (Atta-Mills *et al.* 2004 and Alder and Sumaila 2004).

Many readers may know about Cancun, the big Mexican tourist trap where the 2003 WTO Conference took place and which, incidentally, I attended. Well, my next port of call, Loreto, Mexico, is not nearly as big and popular with tourists yet, but it seems to me that this is only a matter of time! I went to Loreto on the invitation of the North American Marine Protected Areas Network (NAMPAN) to give a keynote address on the 'Challenges to estimating the benefits of marine protected areas'. The Commission for Environmental Cooperation (CEC) of North America (www.cec.org/programs_projects/index.cfm?varlan=english) coordinates NAMPAN, in collaboration with the North American Marine Working Group of IUCN/World Commission on Protected Areas. The aim of NAMPAN is to enhance and strengthen the conservation of marine biodiversity in critical marine habitats throughout North America by creating functional linkages and information exchanges among existing and planned marine protected areas. I

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Our mailing address is: UBC Fisheries Centre, Lower Mall Research Station, 2259 Lower Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

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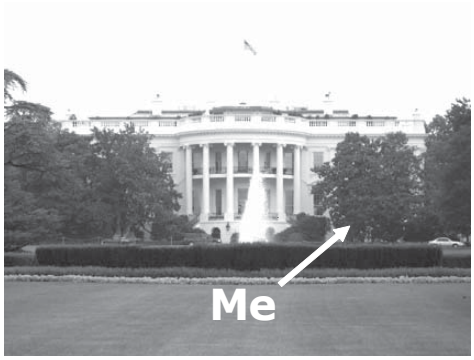
used the opportunity to stress the need to capture the total values from marine ecosystems in general, and marine protected areas in particular, in economic valuations (see Sumaila and Walters, 2005). A correct computation of the values of marine protected areas needs to include how their creation will affect the quality and quantity of the use, non-use, option, bequest and existence values that the ecosystem is able to provide. I also took the opportunity to introduce the new *Sea Around Us* Global MPA database (www.seaaroundus.org) and solicit data from participants to enrich the database.

My next trip was to Thessaloniki, the Greek city which is home to Aristotle University. I took the opportunity to give a lecture on the valuation of marine ecosystem goods and services at the university. However, the primary reason for my visit was to give a keynote address at the annual meeting of the European Association of Fisheries Economists (www.eafe-fish.org/), on the invitation of the President of the Association. The topic of my talk was fisheries subsidies, a topic that is of interest in Europe because of the popularity of buyback or decommissioning subsidies in the European Union. In general, fisheries subsidies are topical today for two reasons. First, someone has to pay for them – usually the taxpayer. Second, it is generally accepted that most fisheries subsidies are detrimental to the sustainable use of fishery resources. A key question I addressed in my presentation is whether buyback schemes are green subsidies, that is: do they reduce fishing pressure on fish stocks? I argued that because fishing capacity tends to seep back into the fishery after a buyback scheme (Milazzo 1998), and that fishers are rational and therefore would incorporate rational expectations into their investment decisions (Clark *et al*. in press), buyback schemes are likely to contribute little, if anything, to reducing fishing pressure in a fishery. If buybacks are anticipated, the tendency is for fishers to invest in more vessels than they would otherwise, thus resulting in worse outcomes than the open access equilibrium outcome in some cases (Munro and Sumaila 2002; and Clark *et al*. in press).

A few participants in the conference tried to argue that European buyback (decommissioning) schemes have worked pretty well, and therefore seem to be an exception to my argument. However, even before I could react to this assertion, others in the audience provided counter arguments, making the point that European decommissioning schemes are indeed no exception and have not been as successful as claimed.

Finally, a unique experience for me - a visit and a presentation at the powerful White House Office of Management and Budget (OMB: www.whitehouse.gov/omb/). Making a presentation close to the famous Rose Garden (www.whitehouse.gov/history/grounds/garden/) was simply awesome. What is interesting about my visit to the White House is that I went there to present arguments against proposed revisions to the regulations implementing National Standard 1 of the Magnuson-Stevens Act, which deals with the rebuilding of federally managed overfished stocks. The regulation in question stipulates that if a stock



of fish is declared overfished by the National Marine Fisheries Service and if it is possible to biologically restore the stock in ten years, then all must be done to restore the stock within this period. The proposed revisions want to relax this regulation to allow the management councils "more flexibility" in restoring overfished stocks. Based on recent work at the Fisheries Centre (Sumaila 2004; Sumaila and Walters 2005; and Ainsworth and Sumaila in press), I demonstrated that relaxing the regulation amounts to postponing investment in the future of U.S. fisheries. It amounts to putting too much weight on the current cost of taking action compared to the potential future benefits from restored fished stocks. In general, my message was well-received by the participants at the meeting, which included staff members at the OMB, the National Marine Fisheries Service, the Environmental Protection Agency of the U.S. and representatives of environmental NGOs. It seems to me that the political time horizon of 4 years (that is, from one election to the next) is a problem. It makes the pressure to postpone action now very high due to pressure from interested parties. The only way to counter this pressure is for the public to be provided good information to help them push their representatives in the other direction, if that is what they want.

I went [to the White House] to present arguments against proposed revisions to the regulations implementing National Standard 1 of the Magnuson-Stevens Act

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Catch reconstruction and ecosystem science workshop: U.S. Western Pacific - Part II

by Dirk Zeller

... according to a senior Council staff member, the Fisheries Centre participation in and contribution to the workshop was a success ...

In Issue 23 of this newsletter (May/June 2004), I reported on a research agreement between the *Sea Around Us* project and the Western Pacific Regional Fisheries Management Council (WPRFMC) in Hawaii, to undertake a catch reconstruction exercise for the U.S. associated islands in the Western Pacific (American Samoa, Guam, the Northern Mariana Islands and Hawaii). This project is now reaching its final stage, with a draft final report being reviewed by the Council. Here, I would like to give a brief update on the project, whose findings I presented at the Ecosystem Science and Management Planning Workshop that was held in April 2005 by the WPRFMC in Honolulu. Fisheries Centre faculty members Carl Walters, Villy Christensen and Steve Martell also attended the workshop, which was expertly hosted by the Council Executive Director Kitty Simonds, and well organized and coordinated by the Council's Senior Scientist Paul Dalzell.

Without pre-empting the final revisions of the catch reconstruction, it is fair to say that the results I presented caused some surprise and concern among the participants of the workshop. Based on the reconstruction, all coastal fisheries catches (coral reef-, bottom- and reef-associated pelagic species) appear to have declined substantially between 1950 and the present, with overall declines possibly as high as 70-80%. This trend is in contrast to that observed if one considers only those data that form the officially reported catch statistics (i.e., are missing subsistence and other non-commercial fisheries catches), which suggest a slight increase in catches over the same time period. Furthermore, the missing fisheries sectors (subsistence and other non-commercial) may account for several times the reported catches, in terms of tonnage, over the time period considered here. Thus, our perspective of historic fisheries development in these islands over the last half century will have to change significantly, and so do management approaches.

Furthermore, this project clearly demonstrates the need for the responsible local, national and regional agencies to fully account for catches from ALL fisheries sectors, i.e., account for TOTAL extractions of living marine resources in their national accounting schemes.
It should be noted that not all of the likely decline in catches can be attributed directly to excess fishing, as dietary preferences have changed in many Pacific Islands with the growing establishment of cash economies, and near-shore habitats have also been extensively modified and often degraded due to coastal developments, thus likely reducing stock productivity. Nevertheless, overfishing of coastal resources is a major concern for most of the main islands of the U.S. associated Pacific region, as has already been documented prior to the present project (e.g., Green, 1997). However, the presentation of complete time series of reconstructed catch estimates, despite high data source uncertainty, serves as a powerful visualization of the scale and magnitude of the likely decline in catches.

As a final note, according to a senior Council staff member, the Fisheries Centre participation in and contribution to the workshop was a success, and it is hoped that this will mark the beginning of a long and fruitful collaboration. We concur, and look forward to future collaborations. On the casual side, it was suggested that the social engagements of the Fisheries Centre contingent during the workshop has also left a lasting impression, and not only for the sinking of large volumes of wine, for which a certain member of the Fisheries Centre delegation (who shall remain anonymous) was significantly responsible! Enough said.

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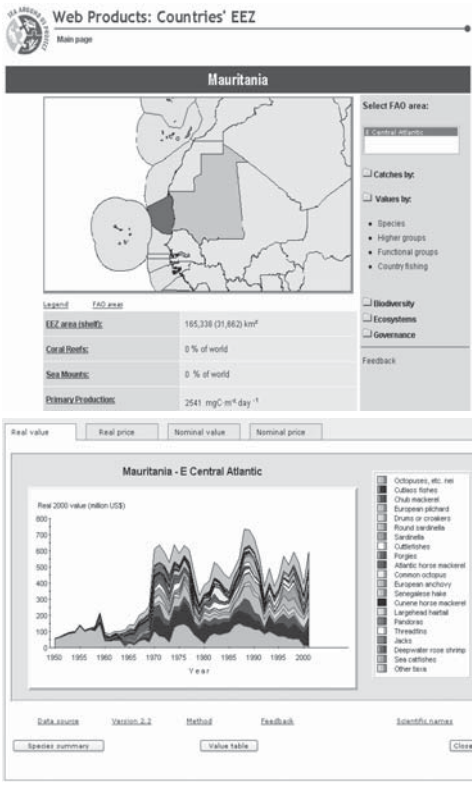
A global ex-vessel fish price database is born!

by Ussif Rashid Sumaila

A new feature has been added to the *Sea Around Us* project's website (www.seaaroundus.org): a database that provides real and nominal ex-vessel fish prices, and the corresponding landed values of fish caught from the exclusive economic zone (EEZ) of each coastal country of the world.



Ex-vessel fish prices are an essential piece of information needed to help manage fishery resources. This is because the financial value that is obtainable from catch is one of the primary motivators for fishers to go fishing. This is the first time that a global ex-vessel price database has been created and made available in this way, where interested members of the public, researchers and managers can easily obtain the prices of fish of all of the world's major commercial fish species. The United Nations Food and Agricultural Organisation (FAO) compiles product and processed fish prices, but not ex-vessel prices.

Ex-vessel price data for the world's commercial species were compiled from a number of sources, the aim being to add value by taking the data, already available but widely scattered, to a higher level that would permit more policy-relevant ecological and economic analysis of fisheries. We[1] concentrated, in the first instance, on data for the major fishing countries in each continent. In this way, we collected data that covered the major fisheries of the world, while putting in place a database structure that would allow further inclusion of data for more countries over time.

The database runs from 1950 to the present (2001, currently). It should be noted that 1950 was the year the FAO started collecting and compiling global fish catch data. Hence, many analyses of global fisheries begin in 1950.

We searched all available sources of ex-vessel price data, including the FAO, the statistics office of the OECD, the European Commission, Fisheries and Oceans Canada, the US National Marine Fisheries Service, Statistics Norway, Southeast Asia Fisheries Development Centre and FAO-Globefish, plus the web and the published literature (e.g., Anon. 2002a,b, 2003a,b and 2004). We also worked through our partners from all over the world to help us search for local data.

Ex-vessel fish prices are an essential piece of information needed to help manage fishery resources

As would be expected, a substantial portion of the data matrix could not be completed with available data. Therefore, an assignment procedure was implemented courtesy of Reg Watson to fill the gaps. Thus, the price data we collected from published sources were used in an interpolation process to ensure that all catch records from the *Sea Around Us* project's global catch database, regardless of taxon, country, region and year, would have prices assigned to them. Given that prices for much of the world's catch were available directly from the price collected, it was possible to use a structured interpolation process to fill in missing cases. The general process of interpolation was one of replacing general prices with more specific ones. This process assumes that the affinities of an animal (i.e., its place in the taxonomic classification) was the primary determinant of the price. Following this, in order of importance, were the country

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fishing and the year when the catches were reported. At each step in the interpolation process, the level of specificity in the documentation was recorded. If a more specific price for a catch record occurred in a subsequent step in the process, then the old price, and its record of specificity, was overwritten with the new price. In this way, all catch records in the global database were matched with the most specific and relevant prices recorded in the price database or weighted averages of these (weighted by their individual specificity) when several were available. A measure of the price specificity/applicability is computed for each taxon for which a landed value is presented. These measures will be used to guide the priorities in further price data research.

Please explore the database, scrutinize it and send us your feedback on how best to improve it

With the launch of our ex-vessel price database, we hope that the community of fisheries scientists, managers, the fishing industry, NGOs and all interested parties in the world's fishery resources will help us improve the current version of the database for the benefit of all. Please explore the database, scrutinize it and send us your feedback on how best to improve it. And, of course, we would appreciate you sending us any price data you may have that you believe would be helpful to the effort (Contact: r.sumaila@fisheries.ubc.ca).

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Footnotes

1. By 'we' I mean all those who contributed to making this database a reality, in particular: Reg Watson and his team, Dale Marsden and Daniel Pauly.

Sumaila - Continued from page 3

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Upcoming publication

In a soon to be released issue of *Fish and Fisheries* (www.blackwellpublishing.com) Dirk Zeller and Daniel Pauly present a paper on global discard estimates, entitled "*Good news, bad news: global fisheries discards are declining, but so are total catches*". In this paper, they combine the latest discard analysis undertaken by FAO with previous global discard estimates and global landings data for the 1975-2000 time period. Reducing wastage in fisheries, as indicated by the lower discard rates reported in the latest FAO analysis is good news indeed, and to be applauded and encouraged. Nevertheless, if one considers this decline in discards in conjunction with the reported decline in global landings over the last decade (see Watson & Pauly, 2001, *Nature* 414), it becomes evident that total global catches (being landings plus discards) might have declined at a steeper rate then previously thought. This could be bad news, if it is indicative of declining total availability of fish, rather than only the result of better fishing practices.

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Sea Around Us

The Marine Trophic Index: A new output of the *Sea Around Us* website

by Daniel Pauly

The first demonstration that the mean trophic level of fisheries is declining (i.e., that global fisheries catches increasingly consist of smaller fish and invertebrates low in the food web) occurred in the late 1990s (Pauly et al. 1998). Over the next few years, this finding was replicated and refined by a number of authors and this led to the process, now known as 'fishing down marine food webs', becoming widely known and accepted (review in Pauly and Watson 2005). As a result, the Parties of the Convention on Biological Diversity decided, at a meeting held in Kuala Lumpur in February 2004, to use mean trophic level of fisheries catches, renamed the 'marine trophic index' (MTI), as an indicator of biodiversity, specifically of the richness and abundance of large, higher trophic-level fish species (CBD 2004). This implies that the Parties (i.e., member countries of the CBD) will have to report annually on the MTI of their fisheries, along with seven other indicators of biodiversity. The point here is that if the mean trophic level of the fisheries catches (= MTI) from the marine ecosystems of a given country is steadily declining, then these fisheries are not exploiting the resources sustainably, whatever one's definition of sustainability. As a result, the biodiversity of these resources will be threatened as well.

To facilitate reporting to the CBD and other applications, we have incorporated into the *Sea Around Us* website (www.seaaroundus.org) a routine which computes the MTI from 1950 to the present, for any country's EEZ, Large Marine Ecosystem (LME) or High Seas area (see box on p. 3 for summary of how the MTI and related indices are calculated).

Experience indicates that the MTI is very sensitive to fisheries catches being accurate, and particularly not being taxonomically and spatially over-aggregated. Thus, we are working on disaggregating the catch statistics for many countries. Until this is completed for all countries for which this is necessary, we cannot guarantee that the catch database of the *Sea Around Us*, mapped by countries' EEZ, LME and High Sea areas, will allow accurate MTI trends to be computed. Trends of MTI and related indices (see Figure 1 for an example) are thus offered mainly for indicative purpose, and must always be interpreted with caution, especially when the underlying catch statistics are unreliable.

To enable various definitions of the MTI, particularly MTI computed from certain cut-off values of trophic levels to exclude the strongly fluctuating lower trophic-level fishes (Pauly and Watson 2005), we allow for the user to identify groups to be deleted from the computation of the MTI. In many cases, this will make apparent a fishing down

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trend that was not visible initially.

Ecosystem indicators related to the MTI

Besides a fractional trophic level (see box on p. 3), which is needed for computing the MTI, each taxon included in the world marine fisheries statistics (species, genus, family, etc.) has an approximate maximum length (ML, in cm) assigned to it. This enables computation of time series of mean ML as another ecosystem and biodiversity indicator - again on the assumption that an ecosystem is not managed for sustainability if the catch extracted from it consists of ever-smaller species.

Thus, mean ML (which on the *Sea Around Us* website is output only in tabular form, see below) is complementary to the MTI. Another indicator, like the MTI output in graphic and tabular form, is the FiB index, a measure of the 'balance' between catches and trophic level. The FiB index is designed so that its value remains constant if a decline in trophic level is matched by an ecologically appropriate increase in catch, and conversely for increasing trophic level (see box, p. 3). Thus, a time series of the FiB index can be useful in interpreting a series of MTI values, as it allows us to determine whether a decrease in trophic level was 'worth it', in terms of increasing catches (see Figure 1). Also, the FiB index allows assessment of whether fisheries have been expanding geographically (the logic involved here is detailed in a note available as a pop-up window).

[The indices] can all be accessed under the 'Ecosystem' button for any country's EEZ, LME or High Sea area

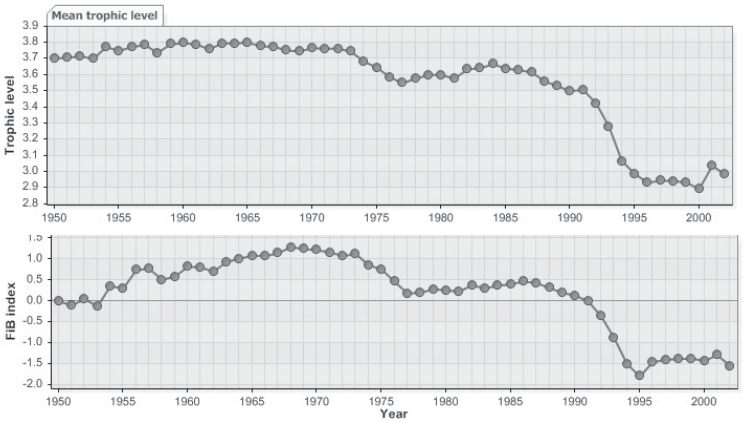

Figure 1. Time series of MTI and FiB index for the east coast of Canada, 1950-2002. Top: time series of MTI (mean trophic level), showing strong decline, especially in the 1990s ; Bottom: Corresponding series of the FiB index, indicating that the decreasing TL were not matched by increasing catches (see text).

The FiB index is computed using 1950 as a baseline year, but this can be changed as required. Also, the FiB index requires a measure of the transfer efficiency (TE) between the trophic level of an ecosystem, and a default value of 10 % is provided. The routine allows this to be changed but, as may be seen, the overall shape of time series of the FiB index are little affected by the precise value of the transfer efficiency.

Implementation and prospects

On the *Sea Around Us* website, ML and the FiB index can all be accessed under the 'Ecosystem' button for any country's EEZ, LME or High Sea area. The outputs are two graphs (as illustrated in Figure 1) and a table listing the values of all indices from 1950s onward. Also, a list of species included or excluded, and their mean trophic level and maximum size, as used in the computation, can be printed. Under the 'Method' button, a note is provided as a 'pop-up'

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Our mailing address is: UBC Fisheries Centre, Lower Mall Research Station, 2259 Lower Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

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The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

The Marine Trophic Index and related indicators

Trophic levels (TL) express the position of an animal in a food web, relative to the primary producers (which have a definitional TL of 1). TL can be calculated from:

$$TL_i = \Sigma_j TL_j \times DC_{ij} \quad \ldots 1)$$

where TL_j represents the fractional trophic levels of prey j, and DC_{ij} represents the fraction of j in the diet of i. Using catch data, and TL estimates for species (or groups thereof), mean TL and, hence, Marine Trophic index values, can be computed, for each year k from:

$$\text{Mean } TL_k = \Sigma_i (Y_{ik} \times TL_i) / \Sigma_i Y_{ik} \quad \ldots 2)$$

where Y_i refers to the landings of species (group) i, as included in fisheries statistics. [Note that, ideally, mean TL should be based on catches - i.e., all animals killed by fishing (landings + discards) - rather than only on the landings included in most fisheries statistics. This is ignored here, where we deal only with landings]. Mean maximum length (ML) is calculated similarly to mean TL, by weighting by the catches.

The fishing-in-balance (FiB) index is defined as:

$$FiB_k = \log[Y_k \times (1/TE)^{TL_k}] - \log[Y_0 \times (1/TE)^{TL_0}] \quad \ldots 3)$$

where all parameters and subscripts are defined previously, except TE, the mean transfer efficiency (specific to an ecosystem, often set at 0.1), and 0, which refers to any year used as a baseline to normalize the index. This definition implies that the FiB index:
- Does not change (remains = 0) if TL changes are matched by 'ecologically correct' changes in catch;
- Increases (>0) if: either 'bottom up effect occurs, e.g., increase in primary production, or if a geographic expansion of the fishery occurs (and the 'system' definition has in fact changed);
- Decreases (<0) if the fisheries withdraws so much biomass from the ecosystem that its functioning is impaired.

Further details on these indicators and their interpretation are given in the literature cited, and on the website in pop-up windows which present further details on TL and their estimation, and on the MTI and related indicators (www.seaaroundus.org).

We hope that this routine, elaborated in collaboration with the CBD, will be found useful and we look forward to your feedback

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window, which explains the concept presented here and provides access to peer-reviewed literature on the MTI and related indices.

We hope that this routine, elaborated in collaboration with the CBD, will be found useful and we look forward to your feedback. Notably, we would like in-country collaborators, which would help us (and their country) to improve the fisheries statistics upon which these indicators are based.

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Funding news

We are pleased to announce that we have been officially informed that the Board of the Pew Charitable Trusts approved continuation of the *Sea Around Us* project grant in its last meeting.

Also, UNESCO has officially approved a project proposal by Villy Christensen to expand his work on Large Marine Ecosystems. Details of this project soon.

Reconstructing the *John Murray/Mabahiss* expedition

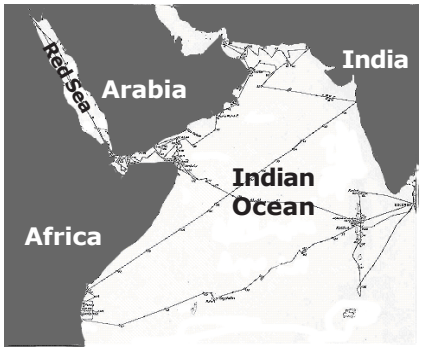
by Dawit Tesfamichael

At the end of the expedition, 2700 fish specimens representing 276 species had been collected

Expeditions are a good source of bio-geographical information (Palomares and Mohammed 2005). A famous example is the expedition of *Challenger,* which is commonly accepted to have ushered in the birth of modern oceanography. In this article, I present another expedition, done in the west Indian Ocean - the geographic area of my PhD research. Both expeditions have a lot in common and one strong link.

The *John Murray/Mabahiss Expedition*, known for short as the *John Murray Expedition* was intended to investigate the physical, chemical and biological characteristics of the West Indian Ocean and adjacent seas. The expedition was named after John Murray, a Canadian-born oceanographer, and was largely funded by money he bequeathed twenty years before the expedition. Murray was a member of the *Challenger* expedition and was responsible for the expedition's final report.

The *John Murray* was an Anglo-Egyptian expedition, which started on Sept 3, 1933 from Port Alexandria, Egypt and finished May 25, 1934 at the same port (see map). It was carried out aboard the 138' Egyptian research vessel, *Mabahiss* (Arabic for 'research'), rented by a committee of scientists mainly from the British Natural History Museum, with chief scientist, R. B. Seymour Sewell. The expedition covered the Red Sea, the Gulf of Aden, the South Arabian Coast,



Track of the voyage of Mabahiss *in the John Murray expedition.*

the Gulf of Oman, the Arabian Sea, Zanzibar and the Maldives (see Rice 1986).

The vessel was equipped with water samplers, plankton nets, trawls and dredges. Water, plankton and fish samples were taken from 209 major and some minor stations over a period of 9 months and 3 weeks. At the end of the expedition, 2700 fish specimens representing 276 species had been collected. The specimens are kept in the Zoology Department of the British Museum of Natural History.

My task was to create an electronic database of the expedition, based on published reports and web resources. The database consists of descriptions of the sampling stations; depth; temperature at the surface and different depths; bottom type; gear used; and salinity. Information about stations was obtained mainly from Sewell (1935). Data on fish specimens were obtained mainly from Norman (1939). For each specimen the following data are given: scientific name, station sampled, sex, length and life stage. The valid scientific name is according to the Eschmeyer Catalogue of Fishes (Eschmeyer, 1998). The database of the British Natural History Museum (http://flood.nhm.ac.uk/cgi-bin/perth/fish/indextaxon.dsml) was used to obtain the catalogue number of the specimens.

Reconstructing expeditions can be a painstaking, but worthwhile job. When I first took this assignment, I thought it would take me a month. However, a month was gone before I was even halfway, although I am happy to say I finished it in less time than the actual expedition!

The database is now available in the expedition table of FishBase (www.fishbase.org) and from the *Sea Around Us* project (www.seaaroundus.org).

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Sea Around Us

Business as usual for tsunami-affected communities in Thailand?

by Ratana Chuenpagdee[1]

Thailand was one of several countries in Asia heavily hit by the tsunami of December 26, 2004. A disaster of this magnitude was a new experience to the country, which had until then been largely spared from major natural disasters and hazardous events. Compared to India, Indonesia and Sri Lanka, the tsunami damages on Thai coastal areas and coastal communities were small. Nonetheless, Thailand attracted exceptional media attention, largely due to the fact that about half of the lives taken by the tsunami were those of foreigners. Emergency responses, humanitarian aid and other immediate relief efforts were very effective and there were no disease outbreaks or health, water or sanitation problems. Temporary shelters were quickly built and children were well cared for. Help came from several directions including volunteer organizations, religious and student groups from all parts of Thailand, several major international organizations and from individuals who were able to donate money or volunteer their time. Responses from the Thai government were also rapid. An 'Ad-hoc Task Force on Tidal Wave Disaster' was formed to coordinate foreign and national assistance. It was not long before focus was shifted from emergency responses and recovery to rehabilitation and reconstruction.

Reports on the damages showed the death of 5,395 people, with between 100,000 to 120,000 people in 490 fishing villages affected, destruction of about 7,500 fishing boats, damages to 225 hectares of agricultural farm lands and death of 54,000 livestock. Scientists from several universities in Thailand also worked collaboratively in assessing damages to marine resources and ecosystems, such as coral reefs, seagrass, marine mammals and water quality. They found that the damages were generally less severe than anticipated. Physical alterations of land- and seascape were evident, however, with collapsed houses and damaged buildings, large areas with fallen trees and a widening of channels and bays. Cleaning up of debris was most intense in tourist hot spots, like in Patong Beach in Phuket Province (see map above). In other areas, like Khao Lak in Phangnga Province, a new tourist development, reconstruction faces challenges as many of the damaged properties were either newly opened or about to be opened for business, and there seemed to be some uncertainty whether or not to continue with the investment. While evidence of the damages can still be seen eight months after the disaster in many fishing

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villages in Phangnga and Ranong Provinces, rehabilitation efforts are active, as seen in the numerous signs announcing permanent housing and boat replacement programs.

Visitors to these fishing villages today will witness rows of identical, small one or two-story houses, built on land often adjacent to mangrove forests, with a blue wall plate indicating the name of the donors. The only image that resembles the pre-tsunami period is the people working on their fishing gears near their houses (see Figure opposite). These new houses were built quickly by the Thai military with external funding channelled by the Thai government to the tsunami-affected people, who were basically offered either a house or a sum of cash as compensation. There was no consultation with the people about the kind of housing they preferred and some expressed discontent with the structure and design of the new houses, but accepted them in fear of not receiving the promised cash. However, the few who accepted the cash benefited more, since other independent volunteer groups arrived in the villages soon after and asked them what they needed. Soon, new houses were built for them, as the owners wanted them and on land bought with the cash received from the government. It is likely that the government-built houses are owned by the inhabitants, but it is less clear whether they own the land.

The new boats, including about 400 trawlers, are generally larger in size than the ones they replaced

Another striking image in these fishing villages is the number of beautiful wooden boats that are being built (see Figure opposite). Many aid organizations, including the Food and Agriculture Organization of the United Nations (FAO) supported boat replacement programs. After conducting the rapid need assessment, FAO allotted a sum of money to buy materials to build boats and fishing gears and to buy boat engines. The distribution of these materials was based largely on a list of tsunami-affected fishers compiled by the village heads and through consultation with government officials and FAO representatives. However, there were some challenges with this process (K. Juntarashote, pers. comm.). Firstly, it was difficult to verify whether those on the list were really those who were affected. Secondly, by the time the materials were ready to be delivered to the villages, many fishers had already received new boats from other sources and many fishers are now in possession of more than one boat. The new boats, including about 400 trawlers, are generally larger in size than the ones they replaced, just as predicted (see *Sea Around Us*, Issue 26, p1-2). Similar drawbacks affect the fishing rehabilitation and livelihood restoration programs funded by other agencies and donor organizations.

Lots of aid rapidly arrived in Thailand from around the world due to the accessibility of the tsunami-affected areas. The coordination of the aid and assistance was, however, neither sufficiently effective to meet the needs of the affected communities nor were direct inputs from the communities sought about their needs and preferences in the process. As a result, the post-tsunami situation in Thailand leaves one wondering whether people will be able to resume their livelihoods, despite numerous efforts such as a religious ceremony held one hundred days after the disaster to help people to move on. Although some tourists from Europe and Australia have started to come back to Phuket, those from China and Korea are still reluctant. It is thus difficult to gauge the overall impacts of the

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Above: Fishers making traps in front of their new houses; Below: New wooden fishing boats.

tsunami on the tourism industry and consequently on the socio-economics of the people. With fishing beginning again in the fishing communities after about six months of disruption, can one expect that business will be as usual? Given the increase in vessel size and number, fishing effort will increase. Furthermore, given the lack of knowledge about the impacts of the tsunami on the health of fisheries and marine ecosystems, there may be long-term changes to the resource. Questions such as sustainability and ecosystem health need to be raised. On another note, many residents of the fishing communities seem to have a new appreciation for the mangrove forests, after seeing that shabby huts built behind the forests were saved while the sturdy ones in the front were destroyed. Yet, the challenge is how to provide a balance between protection and uses of these coastal resources, given the current demands. Many of these questions remain unanswered and it requires mid-term and long-term research programs to provide information needed for sustainability of the coastal areas and for building resilience within coastal communities of Thailand.

At an international workshop hosted by the European Commission in Brussels on 25-26 May 2005, scientists and researchers involved in post-tsunami efforts put together recommendations for research programs related to human health, land use and socio-economic implications of the tsunami and other natural disasters. This is encouraging, as several long-term research programs will likely be initiated as a result. At the People and the Sea III Conference in Amsterdam, a special tsunami roundtable discussion was organized on 9 July 2005 to discuss the state of affairs, implications and research agenda. It was interesting to hear stories from Sri Lanka where concerns about the fisheries similar to those of Thailand were raised, in addition to the competition between tourism and fisheries in the reconstruction plan. Most striking, however, was the story about Indonesia where the rehabilitation and reconstruction process is much slower than in the other countries. Some of the people in Banda Aceh actually have a unique opportunity to 'custom-make' their new houses to their own liking. The story was remarkable and uplifting, despite the dire state they are in.

What lessons can be learned from these experiences? Surely, donations, aid and restoration efforts from international aid agencies, government and NGOs, private and public associations, scientific communities and individuals are to be strongly commended. Thailand rapidly recovered because of the generosity of the people around the world. Internally, Thai people need to recognise, however, that it is also their responsibility to help themselves. There is certainly sufficient local knowledge and scientific expertise that can contribute to enhancing our understanding about the roles of mangrove forests, for example, in mitigating the tsunami damages. In the understanding of 'social capital', which is the degree to which a community or society collaborates and cooperates (through such mechanisms as networks, shared trust, norms and values) to achieve mutual benefits[2], the capacity of local scientists also needs to be examined. As much as local communities should not be seen as simply waiting to receive external aid, local scientists need also to turn their expertise into knowledge and take an active role in setting research agendas and conducting research to deal with such events. By the same token, research projects initiated and funded by international agencies should directly involve and engage local experts in the exchange and sharing of knowledge to build overall research capacity at local and international levels.

... local scientists need also to turn their expertise into knowledge and take an active role in setting research agendas ...

Footnotes

[1] Ratana Chuenpagdee (ratana.chuenpagdee@dal.ca) is an adjunct professor at the Fisheries Centre; senior research fellow at the International Ocean Institute – Canada, in Halifax; and co-director of Coastal Development Centre in Thailand. Together with Jackie Alder and Colette Wabnitz of SAUP, she is involved in a project that examines the roles of ecosystems and human systems in mitigating tsunami damage (See *FishBytes (Issue 11-4),* p1). The project is led by Dr Stephanie Chang of UBC, and Dr Phil Berke of University of North Carolina and is funded by the National Science Foundation. The opinions expressed in this article are based on the author 's personal observations. Alida Bundy and Daniel Pauly provided helpful comments on this article.

[2] See more definitions in Putnam (2000) 'Bowling Alone: The Collapse and Revival of American Community', Simon & Schuster Publishing.

Mapping the global biomass of mesopelagic fishes

by Vicky W.Y. Lam and Daniel Pauly

Mesopelagic fishes are generally not exploited by fisheries ... but are an important prey item to a number of species targeted by fisheries

Mesopelagic fish, most belonging to the lanternfish family (Myctophidae) live, during daytime, at depths between 200m and 1000 m, performing a diel migration to between 200m and the water surface at night. They are largely quiescent during day, but feed actively at night, mostly on crustaceans (copepods, amphipods and euphausiids). Their oceanic distribution ranges from the Arctic to the Antarctic, but their annual production is highest in subtropical and tropical seas.

Mesopelagic fishes are generally not exploited by fisheries, owing to their extreme dispersion (about 1 g·m^{-3}), but are an important prey item to a number of species targeted by fisheries, as well as to marine mammals and seabirds. As such, they must be included in ecosystem models, which is why the *Sea Around Us* project includes them as a 'layer' in its coverage of the world ocean (see www.seaaroundus.org).

Gjøsaeter and Kawaguchi (1980; henceforth: G&K), who also reviewed the biology of mesopelagic fishes, are the only authors to have attempted to describe their distribution globally. Combining the surface areas covered with estimates of density (in g·m^{-2}), G&K estimated a global biomass of 945 million tonnes. This was done by summing up the biomass estimates (i.e., the products of density x surface area) from 15 Large FAO Areas, (Table 1), themselves composed of between 2 and 8 strata.
We noted, however, some obvious typographical errors, as well as small inconsistencies between different parts of G&K's report, which then prompted a verification of the entire work. We recomputed the surface area of each stratum, checked that they added up to the larger FAO area (using ArcGIS 9.0, a tool not available in 1980), and verified that the density estimates for each stratum were consistent with the text of G&K's report and with each other.

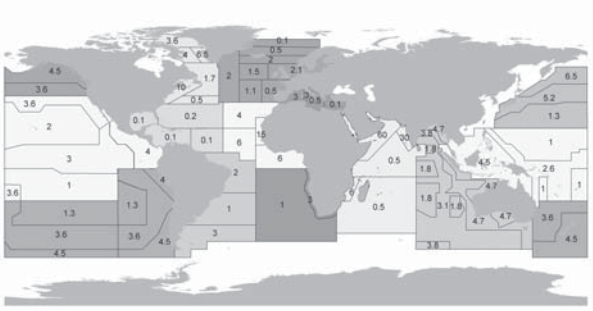

Figure 1. Density of mesopelagic fishes (in g·m^{-2}) by strata of the world ocean. Shades of grey represent different FAO Areas.

Table 1 summarizes the results by FAO Area. As can be seen, the sum of products calculated directly from the tables in G&K (which give densities and surface area for the different strata) for all 15 FAO Areas add to 797 million t (column **A** in Table 1), while the sum of the biomass for each FAO Area, mentioned in the text of G&K, is 945 million t (column **B**). Our revised estimate, finally, with all density estimates checked for internal consistency, and the surface area of all strata recomputed, is 999 million tonnes (column **C**) - very nearly one billion tonnes. The resulting map (Figure 1) can be downloaded from www.seaaroundus.org, as a graph and as a shapefile, under the WORLD OCEAN menu item. This is new, incidentally, and features those of our web products that are global in nature.

Reference

Gjøsaeter, J. and Kawaguchi, K. 1980. *A review of the world resources of mesopelagic fish*. FAO Fisheries Technical Paper, 193, 151 pp.

*Table 1. Biomass (in million t) estimated in various FAO Areas Columns **A**, **B**, and **C** are defined in the text).*

FAO Area	A	B	C
Northwest Atlantic (21)	14.9	14.8	22.0
Northeast Atlantic (27)	14.7	14.7	15.9
Western Central Atlantic (31)	1.9	19.4	2.3
Eastern Central Atlantic (34)	77.5	77.0	80.7
Mediterranean Sea (37)	2.5	2.5	3.0
Southwest Atlantic (41)	33.0	39.0	33.4
Southeast Atlantic (47)	17.8	18.0	20.4
Western Indian Ocean (51)	133.0	257.0	263.2
Eastern Indian Ocean (57)	92.9	94.0	02.3
Northwest Pacific (61)	48.6	49.0	52.5
Northeast Pacific (67)	26.8	27.0	27.8
Western Central Pacific (71)	51.3	52.0	85.4
Eastern Central Pacific (77)	129.0	129.0	35.0
Southwest Pacific (81)	101.0	01.0	99.9
Southeast Pacific (87)	52.1	51.0	54.9
Total	**797.0**	**945.0**	**999.0**

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Sea Around Us

On solutions to the global fisheries crisis

by Daniel Pauly

This is a report of my participation in the inaugural celebration of the Nicolas Institute for Environmental Policy Solutions (good name!) at Duke University (look it up, it's in the southeastern U.S.) on September 20-21, 2005.

One attraction was Jared Diamond, author of the recently released *Collapse* (2005), and a man who captivates his audience, perhaps because he does not use PowerPoint.

The price I had to pay in return was participating in a panel discussion on 'Oceans'. In line with an emphasis on solution, I was asked to diagnose the marine fisheries in three minutes, and to propose solutions in three minutes as well. I did, and here are the pertinent bullet points (no PowerPoint either!), pre-tested for a six-minute presentation.

Five aspects of the problem:

1) Although not known precisely, the world marine fisheries catch is most probably declining; recorded landings have been declining since the late 1980s;

2) The existing fishing fleets are three to four times too large;

3) The biomass of the large fish traditionally targeted by fisheries is one tenth or less that before the onset of industrial fishing;

4) About half of the world's fish is consumed in a country different from that which has the fishing ground where the fish was caught;

5) An increasing fraction of the world's forage (small pelagic) fishes, normally the food of large fish, seabirds and marine mammals, is being diverted to feeding carnivorous farmed fish (salmons, tunas, groupers).

Five aspects of the solution:

1) Marine protected areas are increasingly seen as part of any scheme with a chance of success in putting fisheries on a sustainable basis. Unfortunately, they presently cover a cumulative area of less than 1% of the world's ocean, and their annual rate of increase – about 5% - is not high enough for minimum conservation objectives to be reached (e.g., 10% coverage in 2010);

2) Fishers should have predictable access to the resources, through equitable allocation agreements. Many fisheries economists, strangely, describe this as 'rights-based fishing', and thus turn a straightforward proposition (that fishers and fishing firms must be able to plan their operation) into an ideological argument (that public resources must be privatized before they can be managed properly);

3) Eco-labeling can involve the public in preferentially purchasing fish from sustainable fisheries. The London-based Marine

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Stewardship Council is the most prominent initiative of this sort, along with the credit card-sized advisories which, in the U.S., tell customers whether the species offered in restaurants are 'good' or 'bad' in terms of the sustainability of the fisheries they support;

There were numerous energy experts [who] acknowledged that their government's energy policy is misguided at best, and probably will prove catastrophic

4) Subsidies, which are responsible for most of the overcapacity of many fisheries, are also their Achilles' heel: they are equivalent to at least 20% of the ex-vessel value of the catch. Hence, the overcapacity problem could be addressed substantially by the WTO, whose mandate covers the eventual abolition of all subsidies;

5) However, the solution to the overcapacity problem, and perhaps even to some forms of destructive fishing (e.g., deep sea trawling), is likely to come from two aspects of their operation connected to their source of energy, diesel fuel:

i) The profits gained from deploying large trawlers are very sensitive to fuel prices, and these are likely to increase substantially in the future;

ii) Also, fishing fleets are likely to be affected when carbon taxes (or their equivalent) are introduced to reduce emission of greenhouse gases, as will inevitably have to occur in the near future.

Conclusions

Publications by *Sea Around Us* project members document the claims made here, but I won't cite them, except for our prescient linking of the excessive capacity of global fishing fleets to fuel prices that were, until very recently, extremely low (Pauly *et al.* 2003).

There were numerous energy experts at the Duke meeting, including the CEOs of major corporations. They acknowledged that their government's energy policy is misguided at best, and probably will prove catastrophic. These experts, and other participants, were very surprised by our estimate of the contribution of fishing fleets to greenhouse gas emission (1.2 %, much more than they guessed), which will have to be considered when, in the near future, such emission will have to be controlled. Thus, our forthcoming paper on this (Tyedmers *et al.* 2005) may become influential.

One last observation: Duke can really be described by "Trees, trees, trees and PhDees"!

Acknowledgments

I wish to thank Dr. M. Orbach for arranging for me to be invited to this event, and giving me a slot in the 'Oceans Panel' that he chaired, and Sandra Pauly for the 'Duke motto', which my colleagues at Duke liked, though apparently they had never heard of it.

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Policy, advocacy, NGOs and the *Sea Around Us* project

by Jackie Alder and Daniel Pauly

A highly successful workshop, *Evaluating Marine and Fisheries Information Needs of NGOs*, held with representatives from various NGOs (see Box) occurred on October 5-6, 2005, in the lecture hall of our new Aquatic Ecosystems Research Laboratory (AERL) building. It was sponsored by the Lenfest Oceans Program (www.lenfestocean.org) and was devoted to identifying the data needs of NGOs for their policy and advocacy work, as well as to assessing how well the *Sea Around Us* project helps to meet these needs and what can be done jointly in the future. Twenty-six representatives from large to medium sized NGOs, which span Africa, the Pacific, the Caribbean, Asia, Europe and North America, spent two days sharing ideas and providing constructive feedback on the current and planned databases that are behind the *Sea Around Us* website (see www.seaaroundus.org), and which have been featured in previous newsletters.

The workshop allowed the project to showcase the last six years worth of work, and to give greater exposure to our web products. Some participants were not aware of our work until they received the invitation to the workshop, but left enthused and full of ideas about how the information contained in the website can help them in their campaigns for better fisheries management and marine conservation. The workshop also provided NGOs with opportunities to increase their awareness of the breadth and depth of the work of the *Sea Around Us* project. Many ideas for future projects were hatched between the *Sea Around Us* staff and NGO representatives.

The workshop ended with a round table between students and NGO representatives (see *FishBytes* Issue 11-5, p. 2), followed by cocktails, giving students and workshop participants ample opportunity to network.

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Some participants were not aware of our work until they received the invitation to the workshop, but left enthused and full of ideas

Non-governmental organizations represented at the NGO-*Sea Around Us* Workshop.

October 5-6, 2005

1. American Bird Conservancy
2. Caribbean Conservation Association
3. David Suzuki Foundation
4. Environment and Conservation Organizations of Aotearoa (New Zealand)
5. Foundation of the Peoples of the South Pacific International
6. Greenpeace Australia Pacific (Fiji)
7. Greenpeace International
8. Humane Society International
9. Island Press (Washington, DC)
10. IUCN Netherlands Committee
11. Lenfest Oceans Program
12. Lewis and Clark Law School
13. Marine Conservation Biology Institute
14. Marine Fish Conservation Network
15. National Environmental Trust
16. National Research Defense Council
17. Oceana
18. Regional Marine Conservation Project
19. Sea Turtle Restoration Project
20. State of the Salmon - Ecotrust
21. State of the Salmon - Wild Salmon Centre
22. The Ocean Conservancy
23. WWF - Eastern Africa Region
24. WWF - Latin America and Caribbean Regional Program
25. WWF - US
26. WWF Sulu-Sulawesi Region

NGOs - Continued from page 3

One of the most significant outcomes from the two-day workshop was participants' confirmation that the *Sea Around Us* project is meeting its mission of providing useful scientific information for assessing the impacts of fisheries, i.e., information that advocacy groups can use. Our consistent focus on creating global datasets from reliable sources and expressing the information through our mapping system has ensured that we are on the right track, and no doubt we will continue to improve and expand our data and associated research.

We thank the Lenfest Oceans Program for initiating and funding this activity.

Photographs from Evaluating Marine and Fisheries Information Needs of NGOs. *Left: Daniel Pauly addresses representatives from 26 Non-Governmental Organizations. Right: Participants during discussions. Photos by Sherman Lai.*

Our consistent focus on creating global datasets from reliable sources and expressing the information through our mapping system has ensured that we are on the right track

Africa meets on fish

by Ussif Rashid Sumaila

Abuja, Nigeria, was the venue of the New Partnership for Africa's Development (NEPAD) *Fish for All Summit*, which took place from August 22 – 25, 2005. The Summit had strong political backing from the Nigerian government, with President Olusegun Obansanjo serving as the chief host of the meeting. In fact, the President chaired the morning session of the meeting on August 25 to the delight of most participants.

Sponsors of the meeting included the Federal Government of Nigeria, NEPAD, the WorldFish Centre, the FAO, the World Bank, World Vision International, and the Nasarawa State Government of Nigeria. The objectives of the Summit were (i) to establish a shared understanding among key stakeholders of the current status and likely future trends of African fisheries and aquaculture; (ii) to identify priorities for the development of fisheries and aquaculture; and (iii) to agree on future directions for research and capacity building in support of these development priorities. Key outputs of the Summit were: (i) the Abuja Declaration on Sustainable Fisheries and Aquaculture in Africa (www.nepad.org/2005/fishforall/Abuja_Declaration_En.pdf); and (ii) A NEPAD Action Plan for the Development of African Fisheries and Aquaculture (www.fishforall.org/ffa-summit/ActionPlanDraft.pdf).

While efforts were made by all participants at the Summit to meet the above objectives, in my view, the Summit, by its very nature, was not capable of giving concrete guidance on the objectives above. The Summit was essentially a high profile political meeting whose main achievement was to bring to the attention of the continent and its international partners the important role that well-managed fisheries can play in the continent's development. But the real work of charting a viable, sustainable fisheries sector in Africa that benefits the continent's coastal communities can only begin after the Summit. The starting point will be at the national and/or regional levels. This is where each country and

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region needs to seriously evaluate the challenges and opportunities it faces in the areas of capture fisheries, inland fisheries and aquaculture. It is only at these levels that concrete plans and programmes can be identified to ensure responsible management for achieving the goals of viable and sustainable fisheries that can contribute to Africa's development.

In the case of capture fisheries, for example, each country and region will need to make an honest assessment of the current state of the resources. Where the resources have been overexploited, for instance, feasible restoration plans will need to be put in place. Each country and region needs to assess the total values from its fisheries and how the values are distributed to various stakeholders. Are the countries and regions adding maximum value to their fish landings? Are the coastal fishing communities capturing a good portion of the benefits from their fisheries? Answers to these questions will help guide the shaping of economically, socially and ecologically sustainable capture fisheries in Africa.

With respect to aquaculture, each country will have to look at its prospects in this regard very carefully and dispassionately. Listening to many speakers at the Summit, it appears to me that aquaculture is seen as a kind of panacea that will help solve Africa's animal protein needs and poverty problems. This optimism is yet to be justified. Apart from Eqypt, aquaculture production in the continent is currently pretty insignificant. And this is not because of a lack of trying. Countries such as Ghana have put quite a bit of effort into developing aquaculture production without much success so far. Before plunging into huge investments in aquaculture farms, it is prudent to explore very carefully why the continent has not yet been successful in this area. Also, each country will need to carefully determine what kind of species to farm, as this will have huge environmental and economic implications for the sector and the country at large. There is the need to explore what the consequences of expansion in aquaculture operations means for a given country's capture and inland fisheries. Is it likely to complement these sectors economically and environmentally or is it likely to substitute them?

Participants at the NEPAD Fish for All Summit.

With regards to inland fisheries, countries and regions will have to assess their current state. If they are declining, as the literature seems to suggest, then countries and regions will need to find the causes of the declines. Is it because the rivers are drying up, for example? Alhaji Muktar Shagari, the Hon. Minister of Water Resources of Nigeria, made, in my view, one of the best speeches at the Summit – and it was unprepared! In a few minutes, he managed to make convincing science-based arguments connecting the state of water resources in Africa to the fate of inland fisheries in the continent, made statements about Nigerian hospitality, and provided reasons why he thinks Nigeria is qualified to be a permanent member of the United Nations Security Council. A key point Alhaji Shagari made was that Lake Chad is now only about 10% of its former length, which by implication means that, everything being equal, the inland fisheries of Lake Chad should have shrunk by about 90% too. Hence, without healthy rivers and water resources, there cannot be sustainable inland fisheries. This is an important point for the continent's inland fisheries managers to note.

Without healthy rivers and water resources, there cannot be sustainable inland fisheries

On a lighter note, Nigeria got the opportunity at the Summit to demonstrate the hospitable and friendly nature of its people. Participants also got the opportunity to see how Nigerians can overdo some things (like providing two Summit bags to each participant – the first time most would have experienced this) and 'underdo' some (more important) things like starting functions on time.

Finally, it was great for me to return to Abuja for the first time since 21 years ago, when I visited what was then the biggest construction site in the continent, as an undergraduate student on an excursion. For those who do not know, Abuja is the new federal capital of Nigeria, which was built virtually from scratch, right at the centre of the country, partly to make the capital more accessible to its citizens.

Rebuilding Aceh's fishing fleets: anecdotal field observations of an ill-conceived concept gone predictably astray

by Mark Erdmann
Senior Advisor,
Conservation International Indonesia Marine Program

It seems that these boats, though constructed locally with relief funds, were poorly made and local fishers did not consider them seaworthy

As governments, NGOs, and relief agencies began to turn their attention from the urgent rescue and relief efforts for communities in Aceh, in northern Sumatra, Indonesia - decimated by the December 2004 Asian tsunami - towards the broader and more long-term issues of rebuilding local economies and restoring livelihoods, many focused upon plans to rebuild the fisheries sector. Despite strong arguments to the contrary[1], well-meaning groups carry forth with various programs aimed at "rebuilding fisheries" – ranging from supplying new and used foreign fishing vessels (some ironically gained from fisheries buyouts designed to reduce overcapacity in other countries) to building new boats locally for fishermen, to supplying grants-in-aid to fishers to replace boats and fishing gear lost in the tsunami (see also Ratana Chuengpagdee's article on the situation in Thailand: *Sea Around Us* Issue 30, pp. 1-3).

In a previous issue of this newsletter *(Sea Around Us* Issue 26, pp. 1-2), Daniel Pauly argued that such efforts were largely misplaced, and that relief funding would in fact be much better directed towards education and assisting fishing families to reinvest in other economic sectors with a brighter, more sustainable future. Unfortunately, even if we set aside these arguments about the long-term (un)sustainability of the small-scale coastal fisheries sector throughout Southeast Asia, anecdotal observations that I made during the course of a two-week post-tsunami coral reef assessment in Aceh would suggest that these fisheries rebuilding efforts have gone astray in many instances. In speaking with dozens of coastal inhabitants (fishers and otherwise) and simply observing boats around Aceh, several recurrent issues were raised. Firstly, several people, previously farmers or tradesmen, informed me that they had now become fishers – drawn by the fisher grants-in-aid being administered by various NGOs. Though I cannot comment on how widespread this phenomenon is, it is clear that at least one small net effect of these programs has actually been to draw 'new recruits' to an already overfished coastal fishery.

The second major misfire that we observed was a significant number of beached vessels which had recently been donated by various relief groups. Enquiries about why these vessels were not being used were met with sarcastic laughs from local fishers – a number of the vessels, donated from foreign sources, were neither appropriate for local sea conditions nor locally-used fishing gear types. Moreover, we observed several brightly-painted wooden vessels, roughly the same design as local vessels, sitting on the beach and in some cases being used as temporary shelters. It seems that these boats, though constructed locally with relief funds, were poorly made and local fishers did not consider them seaworthy (they moreover expressed annoyance at the "corruption" involved in building useless boats with relief funds).

Though I have no doubt that all of these efforts were well-meaning and that undoubtedly there are other successful examples of fisheries relief programs in Aceh, it is perhaps telling that the few anecdotal observations that I made during a two week survey there were indicative of what is perhaps best summarized as an ill-conceived concept gone – predictably – astray.

Footnote

1. Pauly, D. 2005. Rebuilding fisheries will add to Asia's problems. Correspondence to *Nature* 433:457.

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Sea Around Us

An Ethic for Marine Science: thoughts on receiving the International Cosmos Prize

by Daniel Pauly

In October 2005, Daniel Pauly travelled to Japan with his wife Sandra to receive, on October 18th, the 13th International Cosmos Prize from the Expo '90 Foundation in Osaka (see FishBytes 11-3). The prize is awarded for research work that has achieved excellence and is recognised as contributing to a significant understanding of the relationships among living organisms, the interdependence of life and the global environment. Also, Dr Pauly gave several seminars in three cities on "Trends in Global Fisheries" and participated in two symposia, in Osaka and Tokyo. We are very pleased to be able to publish Dr Pauly's acceptance speech and some images from this very special occasion.

Ladies and Gentlemen,

I would like to express in Japanese my thanks to the International Cosmos Prize committee and the Expo '90 Foundation for having me here, but I have to do so in English – a foreign language to you, but also to me.

Receiving an award such as the Cosmos International Prize invites serious reflection, and I will share with you some of the thoughts that I have had since that glorious day in early July, when traveling in France, I was informed that I would be this year's prize recipient.

People have good reasons to be worried about the fate of life in the ocean, as we now engage our whole industrial might in chasing and catching, for our food, the top predators of marine ecosystems. Increasingly, these predators are being depleted, and we now turn to their prey, smaller fishes and invertebrates, some highly valuable. This phenomenon is now known as 'fishing down marine food webs', and it explains a vast number of observations, which before remained unconnected. Fisheries have been able to move easily from larger to smaller targets, aided by high technology – such as echolocation and Global Positioning Systems – and abetted by a processing technology which can turn even the most improbable sea creatures into tasty morsels.

Life in the ocean, though, was not designed to be ground up by a transoceanic food production machine. In fact, it was not designed at all, but evolved over the eons, and its ability to produce a surplus that we can share, year for year, is an emergent property of marine ecosystems, contingent on their continued existence as complex entities. If the species we target are depleted, and the ecosystems in which they

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are embedded are drastically simplified, this surplus is reduced, and eventually vanishes. This is the situation we have now in many parts of the world ocean. I wish to emphasize this: global catches from marine fisheries are declining, in spite of, or rather because of, increasing fishing effort.

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There are those who believe that the problems of fisheries do not justify speaking of a crisis, and that various technological fixes will suffice for solving these problems. Among these fixes are updated versions of our traditional management schemes, jazzed up to include explicit laying out of the costs and benefits of various options on fishing levels, and the presumed risk attached to each. This would enable 'managers' to make rational choices under a given set of economic and political constraints. Presently, this approach, which sees this laying out of options as all that scientists can do, and which therefore limits our role to that of vending machines, is very popular in fisheries sciences.

However, our inability to tackle another, much bigger problem – global warming – indicates that we are, as a species, usually unable to make rational decisions to avert long-term harm to ourselves, even if the risks can be estimated, especially if these decisions involve short-term sacrifices. The recent tsunami in South and Southeast Asia, and the even more recent flooding of New Orleans, underline this. In both cases, planning for an eventual catastrophe and working with nature, not against her, would have saved thousands of lives, and avoided immense material damage. Yet, the managers had no plans, and the populations concerned, when they could vote, elected politicians who at best had other priorities, and at worst actively campaigned against such investment for the public good.

This has been similar in all the great collapses of fisheries, where after the catastrophe, in virtually all cases, the voice of prudence - usually that of scientists - was shown to have been ignored by the managers, in favor of the voices of short-term interests. Where does this put me – one single person – amidst a cacophony of voices? I understand the award of this wonderful prize to be a vindication, and an encouragement to raise the stakes. And the stakes must be raised. We scientists working on environment-related issues have been too meek when managers, lobbyists and politicians have twisted the results of our work to fit their agenda. The main tool they have used to silence us, and to reduce us to vending machines, is the notion that an engagement for the environment would compromise our scientific objectivity. Yet this argument is never evoked in medicine. Indeed, passionate engagement for the patients, against disease-causing agents is not only the norm, but also an essential element of doctors' professional ethics.

This is not the case for environmental scientists, probably because many of us work for governments, and can be easily silenced, or even made to serve a short-term political agenda. Universities, however, are less constrained, and we should expect university researchers to make themselves heard when science is not put to use for the public good. And the public good it must be, because science is a collective venture, ultimately funded by the public, our ultimate master.

There is, presently, in a number of Western countries, an intense public debate about the compatibility of

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13th International Cosmos Prize award ceremony

Photographs clockwise from top left: Sandra and Daniel Pauly with Mr Hajime Toyokura, the Foundation president (L) and Mr Takashi Imai, the Foundation chairperson (R); Daniel Pauly receiving the Cosmos Prize; Daniel Pauly meeting Dr Tatuo Kira, 1995 Cosmos Prize winner; the Cosmos Prize certificate and medal; a commemorative music performance; Daniel with the French consul general in Osaka; and Daniel thanking the Foundation.
Photos by Tsuneo Kano

I understand the award of this wonderful prize to be a vindication, and an encouragement to raise the stakes. And the stakes must be raised

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science and religion. I believe these to be incompatible, but this a minority view: most people, including many scientists, believe not only that the two can co-exist – both in one's head, and in the public discourse – but that this co-existence can be mutually enriching. If this is so, why is there so much resistance against the co-existence - in the heads of environmental scientists and in their discourse - of two eminently compatible modes of relating to nature, i.e., a 'scientific mode', which describes nature, and a 'conservation mode', which strives to maintain it?

We must learn to combine scientific integrity with taking firm positions

We must learn to combine scientific integrity with taking firm positions, not only on the conservation of the plants and animals about which we have expertise, but also for the continued existence of the ecosystems of which they are parts. Humans have become the major ecological force on earth, but we can secure continued services from these plants, animals and ecosystems only if we give them the space they need, and the time they need. Most people don't know that. It is the job of scientists working on ecosystems, and on wild flora and fauna to remind politicians and the public of that, and being silent when this is not taken into account is unethical.

As the magazine *Science* sees it, my award of a major scientific prize by one of the most important fishing nations on earth has put squarely in the mainstream the notion that over-fishing is, regrettably, our dominant mode of interaction with ocean life. What is not yet in the mainstream is that the simplest, and most effective approach to re-establish some semblance of abundances past is for humans to withdraw from parts of the ocean, and to let nature, there at least, heal the wounds we have inflicted. Thus, to be more specific, I will work for the establishment, throughout the world, of more marine protected areas, and similar zones of reduced human impacts. Right now, they cumulatively cover less than 1 % of the world ocean, with about only a tenth of that effectively protected. And not enough new ones are declared for the goals we have set for ourselves to be reached, e.g., protecting 10% of the world ocean by 2010.

I must come to an end. The best way to thank you for this unforgettable afternoon, to thank the International Cosmos Prize committee and the Expo '90 Foundation for this wonderful prize, and to thank the many people- foremost His Highness The Crown Prince - who have welcomed me and my wife in your beautiful country is to continue, with renewed vigor, the research and public speaking for which I was awarded the Cosmos International Prize for 2005.

And so I will. Thank you.

Sea Around Us *working papers*

Available at www.fisheries.ubc.ca/publications/working/

U. Rashid Sumaila, Lisa Suatoni (2006) Economic Benefits of Rebuilding U.S. Ocean Fish Populations. Fisheries Centre Working Paper #2006-04.

J. Alder, . Hopkins, W.W.L. Cheung and U. Rashid Sumaila (2006) Valuing US Marine Habitats: Fantasy or Fact? Fisheries Centre Working Paper #2006-03.

D. Pauly, S. Booth, V. Christensen, W.L. Cheung, C. Close, A. Kitchingman, M.L.D. Palomares, R. Watson, and D. Zeller (2005) On the Exploitation of Elasmobranchs, with Emphasis on Cowtail Stingray *Pastinachus sephen* (Family Dasyatidae). Fisheries Centre Working Paper #2005-07.

Matthew Berman and U. Rashid Sumaila (2005) Discounting, Amenity Values and Marine Ecosystem Restoration. Fisheries Centre Working Paper #2005-06.

Dirk Zeller, Shawn Booth and Daniel Pauly (2005) Fisheries Contributions to GDP: Underestimating Small-scale Fisheries in the Pacific. Fisheries Centre Working Paper #2005-05.

A.C.J. Vincent, A.D. Marsden and U. Rashid Sumaila (2005) Possible Contributions of Globalization in Creating and Addressing Seahorse Conservation Problems. Fisheries Centre Working Paper #2005-04.

Maria Lourdes D. Palomares, Elizabeth Mohammed and Daniel Pauly (2005) European Expeditions as a Source of Historic Abundance Data on Marine Organisms. Fisheries Centre Working Paper #2005-03.

U. Rashid Sumaila, Jackie Alder, and Heather Keith (2005) Global Scope and Economics of Illegal Fishing. Fisheries Centre Working Paper #2005-02.

U. Rashid Sumaila, Dale Marsden, Reg Watson, and Daniel Pauly (2005) Global Ex-Vessel Fish Price Database: Construction, Spatial and Temporal Applications. Fisheries Centre Working Paper #2005-01.

Sea Around Us

Turning the tide is easy enough

by Villy Christensen

Tides are after all predictable: just wait for the right moment before pushing the water back. When it comes to re-directing a current, it is far more difficult – it takes climate change to shift the Gulf Stream.

To many, what is happening to the world's fisheries, at the local, regional, or global scale appear to be more like a one-way current than a tide with ups and downs [1]. We seem to be gradually eroding the ecosystems on which our food supply from the oceans relies, even if we may not notice it individually [2]. What can we do to curb the direction of widespread degradation? It is a daunting task to embark on; one where we (like the artists *sensu* Piet Hein, see p.2-3) cannot explicitly express how we will go about solving the problem. We do, however, have an idea of, and experience with, techniques and materials we can use to deliver our small contribution to the solution.

We take as a starting point that few ministers of fisheries actually go to sea. Their agricultural colleagues appear in the evening news when there is a crisis, kicking the soil and pretending to be farmers. How do you take a minister of fisheries on a field trip? And how can we show the minister the impact we have had on ocean resources, and those our future actions will have? We'll try virtual reality.

A necessary factor for us to even consider such an approach is that ecosystem modeling has taken some major steps in recent years, linked to the incorporation of foraging arena theory into *Ecopath* with *Ecosim* (*EwE*) [3], and making us quite capable of reproducing the known history in many marine ecosystems [4]. We are learning in the process that to explain historic trends we must, as a rule, include fisheries as well as environmental factors [5]. This provides an important component of the techniques we need to set up realistic field trips. As for materials, we have at hand a suite of global databases through the *Sea Around Us* project (see p. 5) that can be used directly to parameterize the ecosystem models we need for the field-trip simulations.

Adding to this is progress in gaming-theoretical approaches, needed to set up a realistic framework for the future scenario simulations. Going back to the 'fish wars' approach of Levhari and Mirman [6], the games of Walters and colleagues [7], and the work of Clark, Munro and Sumaila [8, 9], we now have a well-developed portfolio for including economic and human-behavior aspects.

The component to be added is visualization. We are, as scientists, inclined to communicate with other scientists. Our tools are designed to that end, and presenting figures in PowerPoint and tables in papers may well be the right media. If we examine the world where decisions of ecosystem management are made, we note,

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Visualizations can provide powerful messages, and, when building on the best available science, the messages may also be convincing and enabling

however, that it is one dominated by people with very diverse backgrounds and experience, and we need to consider means of communication going beyond our usual repertoire. Visualizations can provide powerful messages, and, when building on the best available science, the messages may also be convincing and enabling. That's our ambition.

We have entered into partnership with the Lenfest Ocean Program (www.lenfestocean.org/) to develop a methodology for "Ocean Summits" ambitiously aimed at shifting the current. We envisage bringing together decision-makers for two days' discussion about the management of specific ecosystems. Prior to each summit, we will work with scientists from the given area to produce an ecosystem model describing the known history of exploitation. At the summit we will run through the ecosystem history visualized in 3D, above and below the surface, and emphasizing ecological as well as social impacts of our exploitation.This will set the stage for forward-looking scenarios aimed at quickly exploring how ecosystem and society is likely to react to management interactions and resulting fishing pressure.The people at the table will represent all aspects of the management process. For this, we are developing software that incorporates multiple objectives and management options, all as part of a theoretical gaming approach.

While the visualizations and the underlying modeling approach are important for conveying impact, they will only set the stage for the deliberations around the table.The aim is to enable discussions and display results of the decisions taken, not to point to 'best solutions' to be obtained, e.g., through optimizations (though such optimizations are indeed feasible and will be used to provide reference points). We hope there will be win-win scenarios emerging (shifting the current, remember?), but realize that there are serious trade-off issues to be dealt with in a world of 'real-politik' [10].

We are currently well underway with the software development for the Ocean Summits, and one tangible, initial result from it will be a re-designed and re-programmed version of the EwE software (for release September 2007). A new version is required in order to link EwE to the visualization software.The visualization software is being developed in close cooperation with the NECTAR project of the Computer Science Department of UBC and is drawing on Vancouver's status as a hub for the computer gaming industry.

We are, for the development, relying heavily on the scenario laboratory of the newly opened AERL building at UBC.This dark room (see picture top of p. 4), which some consider the heart of the building, is designed with the intention of enabling the form for cooperation and visualization described here for the Ocean Summits: a war-room functionality.Technically, this is achieved with focus on enabling discussions around the table while allowing all participants a sense of immersion through large wall plasma screens, and a sense of control via direct access to information and management controls through the built-in

Continued on page 5 - Tide

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Our mailing address is: UBC Fisheries Centre, Lower Mall Research Station, 2259 Lower Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

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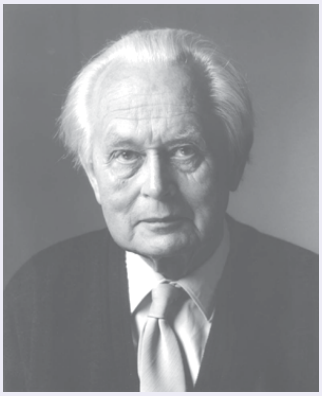
ISSN 1713-5214 Sea Around Us (ONLINE)

Piet Hein and the scenario lab table

After all, what is art?
Art is the creative process
and it goes through all fields.
Einstein's theory of relativity
- now that is a work of art!
Einstein was more of an artist in physics
than on his violin.
Art is this:
art is the solution of a problem
which cannot be expressed explicitly
until it is solved.
Piet Hein (1905-1996)



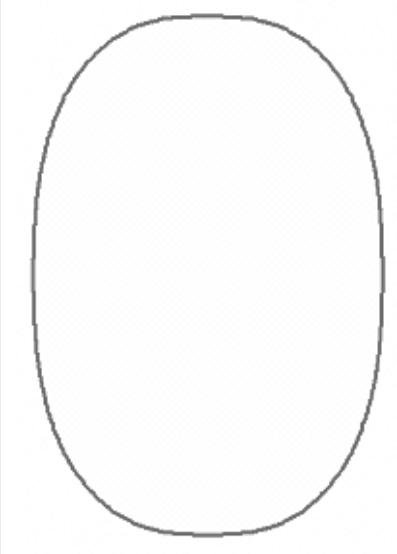
What is the simplest and most pleasing closed curve that mediates fairly between the clashing orthogonal and circular shapes that dominates our surroundings?

Piet Hein was a good friend of Einstein, as well as with Bohr and Chaplin; the mathematician Norbert Weiner dedicated a book to Hein; he studied fine arts and philosophy, then quantum physics. He invented the Soma Cube while listening to a lecture by Werner Heisenberg; he studied engineering, leading to industrial inventions and design; he spent a good part of the Second World War underground as an outspoken anti-Nazi leader, while achieving eponymous fame writing short, double-meaning poems for the leading Danish newspaper – he eventually wrote some 10,000 of such 'grooks' (see Box, p.5); he invented numerous games with a mathematical touch, one the basis for the TV game show 'Blockbusters'; he was a productive writer in philosophy, humanity and science; and … he invented the superellipse.

This came about when, in the early 1960s, he was asked to solve a design problem as part of a major city-planning project in Stockholm. He turned the problem into the intriguing question: what is the simplest and most pleasing closed curve that mediates fairly between the clashing orthogonal and circular shapes that dominates our surroundings? [11]. The search led him to discover the superellipse, a special form of an ellipse. Ellipses are mathematically defined as:

$$\left(\frac{x}{a}\right)^2 + \left(\frac{y}{b}\right)^2 = 1$$

Piet Hein, however, generalized the equation (as Lamé had done before him) by using variable exponents, and found that as the exponents were increased above 2, the shape gradually transformed toward a rectangular form. He called such shapes 'superellipses', and found the shape with exponents of 2.5 especially pleasing from an aesthetical point of view. They are a beautiful compromise between a circle and a rectangle (see right).



The superellipse.
Source: *www.piethein.com*

Continued on page 4 - Piet Hein

We all wanted a table where there was no "us and them"; a table that would encourage cooperation between those at it

The scenario lab., featuring the superellipse table *Photo by Calvin Lo*

Piet Hein - Continued from page 3

Indeed, the shape spread like wildfire and soon it was used for buildings, plazas, sport centers (notably the Olympic Stadium in Mexico City), board games, drink coolers, anti-stress balls, candle holders, lamps, dishes, trays, beds, … and not the least tables.

We now have such a superellipse table in the AERL building.

It is the centerpiece of the scenario laboratory of the AERL, the new home of the Fisheries Centre. In discussions with Prof. Douw Steyn, Associate Dean of Research and responsible for the AERL building process, and Architect Greg Boothroyd, we considered a variety of shapes for the table. We all wanted a table where there was no "us and them"; a table that would encourage cooperation between those at it. The round table of King Arthur-fame springs to mind for several reasons, but the scenario lab is rectangular and a round table would not seat enough participants. Piet Hein's superellipse provided the solution (see picture above). Expressed mathematically we have for any point along the table length (x) that the width (y) can be obtained from:

$$\left(\frac{x}{a}\right)^m + \left(\frac{y}{b}\right)^n = 1, \quad with\ m = n = 2.5\ we\ have \quad y = b \cdot \left[1 - \left(\frac{x}{a}\right)^{2.5}\right]^{0.4}$$

Where the length $a = 380$ cm and the width $b = 260$ cm. With the equation in hand, Greg Boothroyd and colleagues at Patkau Architects designed the table, and Boelling Smith Design created the beautifully-crafted table, which now stands complete with 10 built-in workstations and 12 seats. Also, Renee Stewart-Smith from PJS Systems has done an incredible job connecting dozens of cables between the workstations, the adjacent control room, screens and computers to the right places.

It is a beauty of a table; everyone can see everyone else at it. There is no 'us and them'. Or in Piet Hein's words "Co-existence or no existence".

Picture of Piet Hein from www.piethein.com

"Grooks" by Piet Hein

THE ETERNAL TWINS
Taking fun
as simply fun
and earnestness
in earnest
shows how thoroughly
thou none
of the two
discernest.

LILLE KAT, LILLE KAT
Lille kat, lille kat,
lille kat på vejen
Hvis er du?
Hvis er du?
Jeg er s'gu min egen.

SOCIAL MECHANISM
When people always
try to take
the very smallest piece of cake
how can it also
always be
that that's the one
that's left for me?

For more grooks try www.chat.carleton.ca/~tcstewar/grooks/grooks.html or Google for "grooks".

Tide - Continued from page 2

workstations as well as to the resulting impacts.

Technically, the modeling and visualizations represent a clear challenge, but it is one we are fairly certain we can meet, making it a technical and scientific challenge, rather than art *sensu* Piet Hein. Where the art comes in is in getting the summit participants to explore and adopt management options that will change the direction we have taken in most ecosystems – in shifting the current.

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For the simulations we need extensive information about environmental impact; past, present and future. For this, we are cooperating with several research groups specialized on predicting ocean productivity based on climatic drivers and incorporating it in climate models. We can mention the European Commission's Joint Research Centre in Ispra, Italy; CSIRO Hobart, Princeton University; as well as the Climate Modelling Centre at University of Victoria. Resulting from this are spatial predictions about primary and secondary productivity spanning a century from 1950.

Through the *Sea Around Us* project we have information about spatial catches back to 1950, effort data has been added through the theses work of Ahmed Gelchu, Heather Keith and Robert Ahrens, while those of Kristin Kaschner, Line Bang Christensen and Vaso Karpouzi have added marine mammal and bird information. Information about population trends for marine organisms (3000 records globally) has been added through a database developed by Jordan Beblow. Prices (and soon cost of fishing and trade of fisheries products) is available through the work of Rashid Sumaila and colleagues. See www.seaaroundus.org for further information.

Where the art comes in is in getting the summit participants to explore and adopt management options that will change the direction we have taken in most ecosystems

Thinking big: a global look at fisheries science

May 2nd, 2006
University of British Columbia, Vancouver, Canada

A symposium to honour Professor Daniel Pauly for the 13th International Cosmos Prize and his 60th Birthday

The University of British Columbia is proud to host a celebratory symposium at the University, on the occasion of Prof. Pauly's 60th Birthday. Distinguished international colleagues will give invited lectures with focus on topics representing Prof. Pauly's career, with further festivities at dinner. A student forum and public lectures will follow on Wednesday May 3rd. We are pleased to be able to announce the following schedule of events. For more information visit http://thinkingbig.fisheries.ubc.ca/index.php or email us at paulysymp@fisheries.ubc.ca.

Tuesday, May 2, 2006

Time	Description	Speaker
9:00am	Welcome	
9:05am	UBC celebrating research	John Hepburn
9:15am	Issue-driven research and interdiscipliarity	Frieda Granot
Capacity building		
9:30am	Science and education: capacity building as part of the international development agenda	Gotthilf Hempel & Cornelia Nauen
9:55am	Tropical fish biology, a review	John Munro
Life in the Oceans		
10:50am	Life history strategies of marine fishes	Rainer Froese
11:15am	Evolving fisheries management	Annadel Cabanban & Jose Ingles
11:40am	Patterns of life in upwelling oceans	Philippe Cury & Andrew Bakun
12:05pm	Farming up and down	Roger Pullin
Evaluating impacts on marine life		
1:30pm	Shifting baselines: what was natural in the oceans?	Jeremy Jackson
1:55pm	Fishing down the food web	Kostas Stergiou
The human side		
2:20pm	Social research for sustainable fisheries: evaluating global impact of small scale fisheries	Ratana Chuenpagdee
2:45pm	Social science aspects of small scale fisheries	Kenneth Ruddle
Impacting policy		
3:40pm	Policy impact: linking science and conservation	Joshua Reichert
4:05pm	The scientist as communicator	Nancy Baron
4:30pm	Linking fisheries and conservation science	Carl Safina
4:55pm	Closing Remarks	

Wednesday, May 3, 2006 Student Symposium

Morning	Discussion sessions
1:00pm	Public lecture at UBC: Dr. Jeremy Jackson
5:00pm	Public lecture at Robson Square: Dr. Carl Safina

Note: Times listed are subject to change. For details of timing of siccial events and meals, see http://thinkingbig.fisheries.ubc.ca/schedule/index.php

Sea Around Us

Golden coast - tarnished sea

by Jennifer Jacquet and Jackie Alder

In West Africa, where the warm Sahara winds travel south to meet the easterly Guinea current, is Ghana. Fed by a biannual ocean upwelling, her waters attract droves of small silver fish to the surf and draw thousands of men to the sea.

A Ghanaian canoe, dug out from the wawa tree, sets sail in the early morning. Photo by J. Jacquet

One of these men was Dr. Daniel Pauly. Long before he envisioned the *Sea Around Us* project, Daniel did his Master's fieldwork in a coastal lagoon where he waded the shallow waters studying the fish inhabitants and their relationships. He would eventually model the lagoon's ecology. Thirty-five years later, we visited Ghana as part of the *Sea Around Us* project with the intention of modelling the relationship between poverty and marine fisheries for the Biodiversity International Project of the Netherlands.

Across from this lagoon, a large, brightly painted wooden canoe bobs at sea. The men aboard pull in their blue nets with mesh sizes small enough to catch the smallest sardines. This dugout canoe is one of more than 10,000 in Ghana. Its story is rich in tradition but its future is decidedly insecure.

Unlike most West African nations, Ghana has a deep-rooted tradition of fishing that parallels a heavy reliance on fish for food security. Members of the Fanti tribe were found to be freshwater fishing upon the arrival of the first European explorers in the 15th Century. Ghana's marine fishing sector emerged during the 19th Century when river canoes were modified for ocean travel to transport European explorers along the coastline [1].

Over the last half-century, Ghana's population has grown significantly, as has the number of fishermen (the number of canoes, however, has oscillated between eight and ten thousand). The canoe sector hauls in 70% of the country's catch, comprised mainly of small, low-value fish that are consumed domestically. The remainder of the catch is accounted for by the semi-industrial and industrial sectors.

With heavy government assistance, the local industrial fleets developed from the mid-1960s to the mid-1970s. Most of the industrial boats operate on Ghana's continental shelf and have had a history of

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Ghana - Continued from page 1

.. the canoe is a subtle emblem for the growing conflict between a traditional, localized economy and a rapidly growing, profit-driven global market

conflict with the canoe sector. Since the introduction of industrial trawling in the 1960s, Ghana has faced declining catch rates and reduction in specimen size, and has witnessed a high proportion of non-targeted fish in catch [2]. For instance, Ghana's shrimp industry has been identified as having a large by-catch problem - shrimp sometimes account for only 4% of the catch [3]. This by-catch consists of the very fish the canoe sector would have caught.

Our model recognizes competition for marine resources by the artisanal and the industrial fleets. It also accounts for the differences in motivation for fishing between the two sectors. The industrial sectors are driven by profit and, therefore, fish prices. The canoe fishermen are also motivated by profit but will fish even at a loss to feed themselves and their families. The drivers of artisanal effort are, therefore, strongly linked to population and fish demand.

Jackie Alder, A.K. Armah and Jennifer Jacquet at work at the University of Ghana.

Ghanaians derive nearly 20% of their total protein from fish, which is more than three times the world average. But with population growth and the added competition with the industrial sectors, the canoe fleet has been unable to meet Ghana's annual demand for fish, which exceeds 600,000 tonnes annually. In the mid-1990s, imports increased more than five-fold from the previous decade as domestic supply further failed to meet domestic demand. Erosion of domestic supply has obvious implications for nutritional well-being in coastal communities but is also a symptom indicative of reduced fish stocks and harvests.

Because biodiversity is the primary concern of our model, we have been unable to capture the entirety of the Ghanaian dependence on fish for food security or the social welfare issues of the marine fisheries. The canoe sector employs roughly 80% of all fishermen and it faces challenges not only internally (e.g., population growth) but also externally from the industrial sectors and an increasingly global fish market.

In a sense, the canoe is a subtle emblem for the growing conflict, in fisheries and beyond, between a traditional, localized economy and a rapidly growing, profit-driven global market. This dichotomy is evidenced in Ghana's shark fishery, the details of which were shared with us by some of our collaborators at the University of Ghana.

Just before the end of the 19th Century, a small wall net was introduced in Ghana for catching sharks [4]. Though the eastern region fishing communities abstain from shark fishing due to traditional beliefs, the western fishing communities do

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A Ghanaian lagoon fisherman and his scanty catch. Photo by J. Jacquet

Ghana - Continued from page 2

consume shark. In recent years, the shark fishery in Ghana has grown considerably with a new export market opening in response to the Asian market demand for shark fin soup. Aquatic mammal ecologist Patrick Ofori-Danson reports that artisanal fishing communities in western Ghana now use drift gillnets to catch dolphins (adults and calves) to use as bait for the growing shark fishery.

The shark fishery and use of marine mammals as bait are unregulated by a government flooded with fisheries dilemmas. Over the last decade, Ghana's national fisheries policy has focused on resolving conflicts between the canoe and industrial sectors and eliminating inequitable access agreements with foreign fleets. The government initiated an Inshore Exclusion Zone that reserves two to four miles of the continental shelf for the canoe fishermen, built a port in Tema for exclusive use by the canoe fleet, and began charging a fee for industrial boat licenses. The problems in the shrimp industry, with only one remaining active vessel, have been resolved with the virtual collapse of shrimping in the area.

But many detrimental activities continue, such as uncontrolled trawling, illegal fishing by foreign fleets, the use of dynamite or poisons and the use of dolphins as bait. The tribulations of population growth and food insecurity likewise escalate. Once called the Gold Coast due to its abundant gold resources, most of the gold was depleted before Ghana gained independence in 1958. Left with poverty, limited regulatory funds, and an absence of marine-focused NGOs, history will repeat itself in terms of fisheries resources unless Ghana is able to combat food insecurity, fund fisheries management and foster partnerships with researchers and NGOs.

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... history will repeat itself in terms of fisheries resources unless Ghana is able to combat food insecurity, fund fisheries management and foster partnerships

Ghana's fish mammies await the arrival of the fishermen and their catch at the bustling canoe port in Tema. Photo by J. Jacquet

Canoes land their catch at Tema. Photo by J. Jacquet

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**Please note that Fisheries Centre Working papers are available at www.fisheries.ubc.ca/publications/working/index.php*

Publications Mail Agreement No: 41104508

Sea Around Us

An anthropologist in Palau[1]

by Yoshitaka Ota
Department of Anthropology, University of Kent

Palau is well-known among fisheries scientists, especially among social scientists, for having provided the backdrop to Bob Johannes' masterwork, *Words of the Lagoon* (Johannes 1981), which documented and cross-validated the rich marine biological knowledge of the local fishers. I spent 17 months in Palau, in 2000 and 2001, gathering ethnographic data for my PhD research (Ota 2006a), mainly from the local fishers. One of my minor goals was to check how Johannes' research has held up since the late 1970s, as Palau has now become an independent country, whose people are fully exposed to the modern economy and its mass consumption.

Rock Islands, Palau

My main concerns were anthropological and cultural, but set in the fishing practices of the contemporary Palau: the gender, cultural identity and social relations of the people, constructed through their interactions with the sea (Ota 2006a).

However, in contrast to the time of Johannes' study, today people in Palau do not fish for subsistence, i.e., they do not have to fish to live. However, they are still involved in ritual gatherings in which traditional exchanges of gifts, notably fish, play a crucial role. In fact, one of the main reasons that people continue to fish is "to protect their tradition". Here, rather than following up these traditions, as my training as an anthropologist would require me to do, I will take on the challenge of quantification of catch estimates for the reef fishes of Palau, using my local knowledge - a topic that was not addressed by Johannes (1981).

Fish consumption in Palau consists largely of reef fish species, which have a proper "taste of fish", while large pelagic fishes, such as tuna, are generally served to tourists in hotels and restaurants. A survey conducted in 1989 reports the Palauan mean daily consumption of fish as 0.23 kg per person (i.e., 84 kg/year). Other sources report that in Koror, the capital of Palau, where imported food is readily available, approximately 0.7 kg is consumed daily per person (~260 kg/year). Taking the average of these numbers and multiplying by the population of Palau in 1989 leads to a reef fish consumption of 1,000 to 1,200 t/year. This figure was compared with the estimates of catch by major gears (lines, spear-guns, barrier nets, trolling lines and traps) which I was able to obtain, albeit 17 months after the catch surveys were

Continued on page 2 - Palau

[1] *This contribution is adapted from talk given on April 7, 2006, as part of the Fisheries Centre Friday Seminar Series.*

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done. Note that there are no fresh reef fish imports to Palau, so catch can be assumed equal to consumption.

Line fishing in Palau is conducted with nylon fishing line, fishing hooks, and weight to keep fish baits at the bottom of the seabed. This form of fishing is often practiced with family and friends, on the occasion of a leisurely weekend excursion at the sea. Large boats are used, which can comfortably carry several men and women, who spend the night fishing larger reef fish, including snappers and groupers. Out of 300 boats that were reported as domestic fishing boats in 2000, probably less than a third of them are used for this form of fishing. Given that each of these boats can be assumed to be used for one excursion per month, I estimate the overall catch taken by this form of fishing as 200 t per year.

[Line] fishing is often practiced with family and friends, on the occasion of a leisurely weekend excursion at the sea

Social evening with fishermen, Koror, Palau (author first from left)

While line fishing is popular among Palauan of both sexes, males dominate the practice of underwater spear-gun fishing, and it is practiced by the largest number of fishers. Men between 18 and 45 years of age free-dive to depths of 20 m, and shoot reef fish, notably parrotfish and rabbit fish, with locally-made spear-guns. A trip can last between 3 and 10 hours, depending on when enough has been caught for supper. A few fishermen use this method for commercial fishing: in this case, they tend to target species that are popular among tourists, including grouper and Napoleon wrasse. The amount of catch varies between trips and individuals, but on average, a fisherman catches 20-50 kg of fish per fishing trip. I have estimated the Palau-wide spear-gun catch at around 350 t/year (Ota 2006b).

Barrier net fishing (*kesokes*) is conducted around spring tides, as it relies on tidal currents as mechanism to aggregate and catch fishes. At high tide, a large net is set across the shallow part of a reef so that the fish cannot move to deeper water as the tide recedes. There are a few groups of fishermen specialised in this fishing method, primarily for commercial purposes, because the method more or less guarantees a large catch of mainly smaller fish, as much as 500 kg per set. I have estimated the total annual catch by barrier reef net fishing at about 150 t.

The elder population of Palauan fishermen often practice hand-line trolling, as this gear challenges their knowledge of fish behavior and sea conditions. Contrary to the tourists, who used larger boats overloaded with high technology, local fishermen use only small boats – and no fishing rods. They usually operate close to the shore and target small reef-associated pelagic fish, such as bonito and barracuda. About 15 to 20 fishermen carry out this type of fishing regularly. Among these, two are professionals, who sell their catch in local markets for

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Our mailing address is: *Sea Around Us* project, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

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consumption by tourists. The others, who fish for domestic consumption, catch much less than the commercial fishermen, as they prefer "not to waste their money on petrol". Their success depends on the weather and pattern of fish migration, and the amount of the catch varies between individuals. I have estimated the total catch and effort of this fishing at about 100-120 t/year.

Trap fishing has become much less popular due to constant vandalism. However, it is still used to catch mangrove crabs in one region in the northwest part of Palau. More than 100 traps are used to catch those crabs, which are almost all sold to the tourist sector, and whose catch amounts to only a few tonnes.

Adding the whole annual catch estimated by those five fishing methods, in 2000-2001, yields over 800 t/year, which is about 300 t less that the survey figure of 1000-1200 t estimated for 1989. I cannot assess here whether this difference reflects changes that occurred between 1989 and 2000-2001, or errors in my estimates, or both. Elucidating this will be an important topic in the next years, because all is not well with Palauan fisheries. Carl Safina, who interviewed a government fisheries biologist in Palau in the mid 1990s, cites him as saying "I could catch two hundred pounds of fish in one day. Now, you would be lucky if you catch fifteen" (Safina 1997, p. 339). Similarly, Myers (1999, p. 23) writes that "[c]ertain large species such as the giant humphead parrotfish […] that were once common are now rarely seen on Guam and becoming scarce in Palau". For the time being, however, I will elaborate on how the catch is used.

Traditionally, people in Palau hold various ritual gatherings to mark certain life events, including the birth and the death of their kin members. It is obligatory for the host to serve fish to participants at those gatherings, and failure to do so is considered failing the Palauan tradition. For men, providing fish for those gatherings is their obligation to fulfill the male part of gift exchange and a failure would jeopardize their gender identity and kin status to others. For instance, at the gathering of the funeral (*kemeldeel*), a piece of fish is served to each of more than 200 participants, which can total more than 500 kg of fish consumed in one gathering. More than 25 funerals were held during the 17 months of my fieldwork, corresponding to 7 t/year consumed at funerals alone. This, then, is the main reason why Palauan still fish, although they don't need to in terms of subsistence.

Pauly (1998) suggests that what has prevented both social and natural scientists from recognizing the use of each other's knowledge and information originates in our "psychological", rather than academic attributes, a theme he elaborated upon in Pauly (2006). I agree, and also think the two schools of thoughts are ultimately compatible. Anthropologists may say that they do not do 'counting', whereas for natural scientists it is necessary to 'count'. Thus some natural scientists think that ethnographic information given by anthropologists is not 'data'. We need to overcome this. My estimates of catches of Palauan fishers certainly require much more attention to details, but this represents my attempt at building bridges, and I hope that this will be reciprocated.

Acknowledgements
I thank the members of the Fisheries Centre for discussions of small-scale fisheries issues across natural and social scientific disciplines, particularly Daniel Pauly and Dirk Zeller for convincing arguments – and methods for catch reconstruction. This small contribution is adapted from the talk I gave as a result, and illustrates how far a cultural anthropologist can go towards the natural sciences. I now appreciate that 'counting fish' can contribute to insights within my discipline.

It is obligatory for the host to serve fish [...] and failure to do so is considered failing the Palauan tradition

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Historic Raja Ampat: recovering early anecdotes of abundance

by Sheila Heymans

Over the past 5 centuries this archipelago was visited and captured by the Portuguese, Spanish, French, Dutch and English

During the past six months, *Sea Around Us* Research Associate, Maria Lourdes (Deng) Palomares and I have been populating a database of historic anecdotes from the Raja Ampat area of Indonesia. This is part of Deng's work towards "shifting baselines" back to historical levels by recovering records of occurrence and abundance of marine organisms from early European expeditions (*see Sea Around Us* Issue 22 (p.8); Issue 23 (p.6); Issue 27 (p. 3-6); and the 'Expedition' section of the *Sea Around Us* website: www.seaaroundus.org). This particular phase of the project was funded by Conservation International (Indonesia) as part of the ongoing global assessment of the Bird's Head Seascape, headed by Dr Mark Erdmann.

Raja Ampat is a group of islands to the north of the Bird's Head Archipelago in the Papua Province of Indonesia. Over the past 5 centuries this archipelago was visited and captured by the Portuguese, Spanish, French, Dutch and English. It only became independent from The Netherlands in the 1960s and has since been part of Indonesia. In the 1500s Papua was visited by the Portuguese, French and Spaniards (Utrecht 1978), but it was the Dutch and British that really tried to conquer the East Indies. By the early 1600s the Dutch were settled at Amboina and Ternate in the Banda and Halmahera Islands east of Raja Ampat, and were extending their explorations towards New Guinea and Australia. The Dutch met with substantial resistance from the Papuans (Robequain 1958) and stayed away from New Guinea between 1636 and 1824 (Utrecht 1978). The English East Indian Company claimed the eastern part of New Guinea in 1773 and, in 1824, the Dutch and the English decided to divide New Guinea in two (Jansen-Weber et al. 1997).

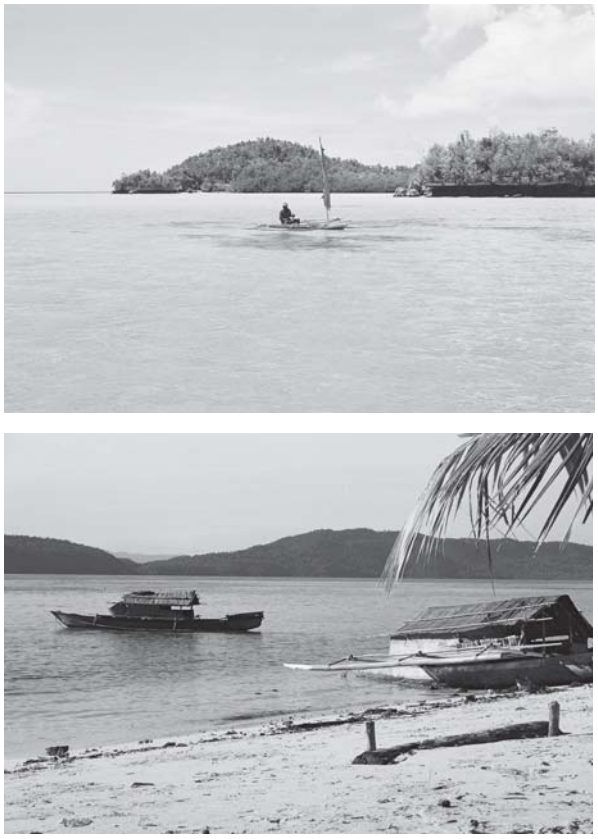

Figure 1. Fishers still go out to fish in outrigger prauws (above); and the Orang Laut or "sea gypsies" still travel and fish where they can (below). Photos by Sheila Heymans

During my work on this project, I traveled to Sorong and Kri Island (one of the small islands in the Raja Ampat Archipelago) to meet with Conservation International scientists and with Max Ammer, the owner of Papua Diving on Kri Island, and ex-Dutch-navy, with extensive knowledge of the Dutch historic documents on Indonesia. During my stay on Kri Island, I obtained many documents, references on Papua and the names of knowledgeable scientists in the Netherlands and England. I also saw first-hand the native Papuan population and fishers whose lifestyle seems to be little changed from the earlier pre-European times. Fishers still go out to fish in outrigger prauws and the Orang Laut or 'sea gypsies' still travel and fish where they can (Figure 1).

On my return from Papua, I traveled to France, where I met up

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with Deng, who had been working with French and Spanish observations and collaborating with the historians from the Museum of Natural History in Paris, to coordinate our data collection efforts before I moved on to The Netherlands to collect historical documents about Raja Ampat. In the Netherlands I visited the Dutch Archives in The Hague, the Naturalis and Royal Netherlands Institute of Southeast Asian and Caribbean Studies (Koninklijk Instituut voor Taal-, Land- en Volkenkunde, KITLV) in Leiden and the Royal Tropical Institute (Koninklijk Instituut voor de Tropen, KIT) in Amsterdam, with a very fruitful day visit to the Papua Bibliotheek en Studiecentrum run by Phia de Groot-Licher in Amstelveen. In London I visited the Linnean Society, the Maritime Museum and the Natural History Museum. During these visits, I obtained over 100 historical documents to add to the more than 100 references that were available in the UBC Library or through Interlibrary Loans. Many of the documents available in the various libraries were too old to be copied and could only be photographed, which was an interesting and new methodology for me. It also increased my knowledge and proficiency in Dutch, although I had an advantage in the fact that my first language, Afrikaans, is closer to old Dutch than modern Dutch.

Finally in May, I met up with Deng once again, this time in Los Baños, Philippines, to finalize the database and begin writing the report for the project.

The database is now populated by observations from various scientists, freebooters, ships' captains, etc. who traveled to the area during the past five centuries.

For example, between 1843 and 1861, the Dutch Ichthyologist Pieter Bleeker collected and described thousands of fish species from the Dutch East Indies and specifically from Raja Ampat, and he also voyaged to the Moluccas (Bleeker 1856). William Dampier sailed past the north coast in 1700 and James Cook sailed past the south coast through the Torres Strait in 1770 (Utrecht 1978). The *H.M.S. Samarang* visited the area between 1843 and 1846 to do an oceanographic study (Adams 1848) and, between 1854 and 1862, Alfred Wallace traveled through the Malay Archipelago to collect specimens and stayed in Raja Ampat (Wallace 1869). The *H.M.S. Challenger* undertook their major study of the area between 1874 and 1875 (Tizard et al. 1885), and the *Siboga* visited the area between 1899 and 1900 (Weber 1902-03).

Unfortunately, not all of these observations could be included in the database. However, we hope to continue populating it, using the more than 200 documents that still need to be encoded.

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During these visits I obtained over 100 historical documents to add to the more than 100 references that were available in the UBC Library

Continued on page 8 - Raja Ampat

Number of abundance records in database

Papua: 118
Waigeo: 103
Misool: 82
Ambon: 57
Sulawesi: 48
Halmahera: 45
Makassar: 34
Marokwari: 32
Salawati: 29
Moluccas: 28
Sorong: 28
Gebe: 27
Ternate: 26
Buru: 25
New Guinea: 21
Biak: 20
Raja Ampat: 26
Seas surrounding Indonesian Archipelago: 151

U.S. Western Pacific fisheries catches part III: reconstruction completed

by Dirk Zeller

The purpose of the catch reconstruction was to estimate likely total catches [...] and thus provide a more comprehensive baseline picture of catch trends

The historic catch reconstruction that the *Sea Around Us* project undertook for the U.S. flag island areas in the Western Pacific (American Samoa, Guam, Northern Mariana Islands, Hawaii, and the so-called 'other' islands), for the Western Pacific Regional Fishery Management Council (WPRFMC) in Honolulu, was concluded at the end of 2005. As previously reported (Issues 23 and 28 of this newsletter), the results of this project were presented at a regional Ecosystem Science and Management Planning workshop. This work has now been released as the final report (Zeller *et al.* 2005a; available at: www.wpcouncil.org). Also, the first in a series of peer-reviewed papers has been published (Zeller *et al.* 2006). Extension of the catch reconstructions to incorporate economic aspects of small-scale fisheries are also in progress (Zeller *et al.* 2005b). Here, I would like to present a brief summary and overview of the key findings of the final report. The purpose of the catch reconstruction was to estimate likely total catches (excluding large pelagic species such as tuna and billfishes) taken between 1950 and 2002 for each island entity, and thus provide a more comprehensive baseline picture of catch trends over time than can be obtained by relying on the subsets of catches that form the reported data. The catch reconstruction undertaken by this project indicated:

1. The reconstructed catches for all islands combined suggested a likely 41% decline in total catches between 1950 and 2002, largely driven by declines in recent years. This contrasted with the pattern observed from the data officially reported by individual countries, which suggested a slight increasing trend (Figure 1);
2. The official reported data may have under-represented the reconstructed likely total catches for this time period by a factor of 4.3 (Figure 1);
3. Excluding the U.S. state of Hawaii, the reconstructed data for the three other U.S. flag island areas (American Samoa, Guam, CNMI) suggested a decline of about 77% in total catches between 1950 and 2002. This contrasted with the pattern observed from the data officially reported by the three individual countries, which suggested an increase in catches of about 45% between the start of reported data in 1965 and 2002 (Figure 2); and
4. The predominantly non-commercial fisheries sectors (shore-based, subsistence, recreational) were likely larger than commercial fisheries in terms of estimated catches.

For American Samoa (Zeller *et al.* 2006), the reconstructed total catches suggested a decline of about 79% in catches for non-pelagic species between 1950 and 2002. Significant also was the 17-fold difference between the reconstructed catches and the reported data (representing only the predominantly commercial small-boat bottom-fish catches, but excluding large pelagic species).

For Guam, the reconstruction of historic catches suggested a decline of 86% over the 52 year time period. Also important was the 2.5-fold difference between the reconstructed catches and the reported statistics for the 1965-2002 period for which reported data exist. Noteworthy is Guam's commitment to and consistent application of creel surveys to estimate total catches for the last few decades, resulting in what may be the most reliable estimates of total catches for any of the islands considered here.

For the Commonwealth of the Northern Mariana Islands (CNMI), the reconstruction suggested a decline of about 50% in catches between 1950 and 2002. Comparing the non-pelagic catches reported by CNMI with the reconstructed total catches for the 1983-2002 period where the two data sets overlap, indicated a 2.2-fold under-reporting of likely total catches by the reported data.

For Hawaii, our reconstruction suggested that the estimated total commercial catches were between 28% and 130% higher than the reported commercial catches. Reconstruction also suggested that non-commercial

Continued on page 7 - Islands

Islands - Continued from page 6

catches may have increased between 1950 and 1990, but have declined since, and ranged from a low of approximately 931 t·year^{-1} to a high of approximately 3,000 t/year. Summed over 1950-2002, non-commercial catches were approximately 1.8-fold higher than reported commercial catches, and reported data may have underestimated likely total catches of non-pelagic species by a factor of 3.7.

For the so-called "other islands" (Midway Atoll, Johnston Atoll, Palmyra Atoll, and Wake, Jarvis, Baker and Howland Islands), only Johnston, Midway and Wake have small resident populations of contractors and military personnel, with data not reported in the fisheries statistics. Reconstruction of catches suggested that an estimated 435 t was likely extracted around Johnston Atoll between 1950 and 2002, while the small population of military and civilian personnel based on Wake Island were thought to catch on average approximately 890 kg/year.

In general, while local and regional fisheries experts and agencies may be aware of the limited nature of much of the official data (e.g., commercial sectors only), our reconstruction makes the potential scale of the likely under-reporting of total extractions of marine resources evident (Figures 1 and 2), and can be useful, e.g., as baselines of likely historic patterns and trends in fisheries catches.

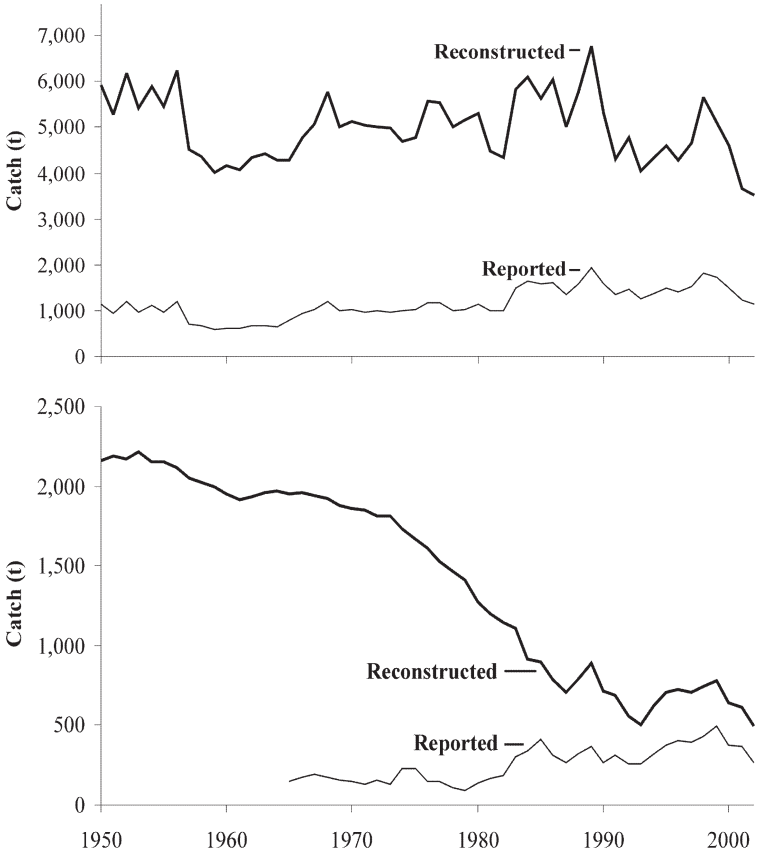

Figure 1 (above) Total reconstructed catches of coral reef-, bottom- and reef-associated fisheries for the four main U.S. flag islands of the Western Pacific combined, versus the reported statistics. The under-representation of likely total catches is evident.

Figure 2 (below) Total reconstructed catches of coral reef-, bottom- and reef-associated fisheries for three of the four U.S. flag islands of the Western Pacific considered here (excluding Hawaii), versus the reported statistics. Both the under-representation of likely total catches, as well as the missed decline in catches is evident.

Considering the distinctly different baselines of past catches presented by this project (Zeller *et al.* 2005a; Zeller *et al.* 2006), may shed new light on issues and concerns for fisheries sustainability and ecosystem conservation. Furthermore, reconstructions, as documented by the present project, illustrate the importance of small-scale and non-commercial fisheries sectors, and suggest an urgent need to account for all fisheries catches in official statistics.

Significantly, this work is now beginning to draw attention to likely different historic baselines and likely levels of catches, and is being considered within a broader stock assessment being undertaken via NOAA NMFS in Honolulu.

In general, while local and regional fisheries experts and agencies may be aware of the limited nature of much of the official data, our reconstruction makes the potential scale of the likely under-reporting [...] evident

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The Marine Trophic Index in Europe

by Reg Watson

Overall, this was a useful meeting which illustrated that our products are increasingly used in policy settings, as they should be

In February 2004, the Conference of the Parties to the Convention on Biological Diversity (CBD) identified a number of indicators to monitor progress toward reaching the target to "achieve by 2010 a significant reduction in the current rate of biodiversity loss" (CBD 2004). The "Marine Trophic Index" (MTI), i.e., the mean trophic level of fisheries catches, is one of the eight indicators that the Conference of the Parties of the CBD identified for "immediate testing" of their ability to measure progress towards the 2010 target.

The member states of EU being parties to the CBD, European institutions are confronted with implementing the MTI. This is the context of an invitation I received to participate at an expert meeting convened by the Rania Spyropoulo of the European Environment Agency in Copenhagen 27-28 June 2006. I relied on a PowerPoint presentation, prepared with Daniel Pauly, which illustrated the concepts in our paper on the topic (Pauly and Watson 2005). This, and the other presentations to this meeting, are now available at: http://biodiversity-chm.eea.europa.eu/information/indicator/F1090245995/fol689706/ .

Of these other presentations, one, by John Pinnegar from CEFAS, in Lowestoft, U.K., was most interesting, as it showed numerous approaches through which the MTI can be made more sensitive, i.e., better reflect what is happening in the ecosystem. In fact, some of the ideas expressed therein are worth investigating for their potential usefulness to our website. This will allow us to better respond to the increasing number of queries on the MTI we get from users in Europe and elsewhere.

In this context, I should mention that the Institut français de l'environnement (IFEN), of France's Ministry of the Environment, has included the MTI on its list of indicators (D. Pauly, pers. comm.). Also under consideration at this short meeting were various possible indicators based on seagrass. Several presentations available at the above URL helped put this and other work in the European context.

Overall, this was a useful meeting which illustrated that our products are increasingly used in policy settings, as they should be.

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Sea Around Us

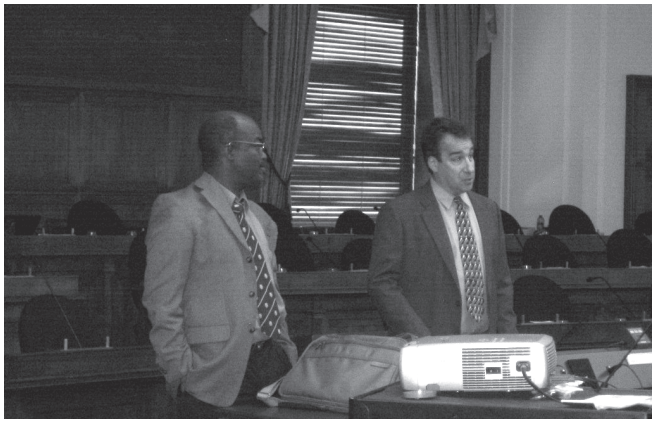
Briefing on the Hill on rebuilding overfished stocks in the U.S.A.

by Ussif Rashid Sumaila

The U.S. Congress is currently working on the re-authorization of the Magnuson-Stevens Act. The most controversial aspect of the re-authorization relates to provisions regarding the restoration of stocks declared overfished by the U.S. government. There is, therefore, an ongoing debate in Washington, D.C. on this issue. Andrew Rosenberg (University of New Hampshire) and I got involved in this debate when we were invited by the Lenfest Ocean Program to give a Congressional (Hill) Briefing in Washington D.C. on June 15 this year, based on our recent works on the issue of rebuilding overfished U.S. fish stocks.

Rosenberg discussed his new study entitled, *Rebuilding U.S. Fisheries: Progress and Problems*, which documents successes and failures in fisheries rebuilding programs since the Magnuson-Stevens Act amendments were passed in 1996, and recommends ways to improve the success of the program. I presented my joint work with Lisa Suatoni, *Fish Economics: The Benefits of Rebuilding U.S. Ocean Fish Populations*, which puts a dollar figure on the U.S. government's current approach to rebuilding fish stocks and compares this to the economic impact of other approaches.

The goal of the briefing was to provide information about issues contained in HR 5018 (The American Fisheries Management and Marine Life Enhancement Act) sponsored by Richard Pombo (R-CA), to re-authorize the Magnuson-Stevens Fishery Conservation and Management Act of 1976. It is expected to be put before the full House of Representatives for a vote, hopefully before the November congressional elections.



Rashid Sumaila and Andy Rosenberg taking questions at the Congressional Briefing in Washington D.C., June 15, 2006.

Both Rosenberg and I were delighted to see a very good turnout. There were a range of Hill staff present, mainly from the House side (as usual there were no Members in the audience). Also present were representatives from NOAA, EPA, USAID, World Bank, NGOs, etc. The audience was very engaged, posing lots of good questions – underscoring how critical this issue is right now, with debate expected in the House shortly.

The key messages from the

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two presentations include: (i) after 10 years, only 3 stocks have been rebuilt, and 82% of overfished stocks still need recovery; (ii) over half of the stocks undergoing rebuilding are still experiencing overfishing; (iii) if overfishing is eliminated, stocks can recover (in 37% of stocks, this is happening); (iv) rebuilding stocks quickly will not only benefit the fish, it will benefit fishing interests as well, at least in the medium and long term, because economic benefits to the commercial and recreational sectors could triple from current levels; (v) more jobs will be generated both from the fishing sector and downstream sectors with rebuilding; and (vi) more fish protein will become available to Americans from domestic U.S. waters should overfished stocks be rebuilt.

... rebuilding stocks quickly will not only benefit the fish, it will benefit fishing interests as well ...

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Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

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Darwin's Nightmare: to the Tanzanian government the nightmare is the film, not the Nile perch

by Jennifer Jacquet

In 2005, Lake Victoria's Nile perch fishery received high profile exposure with the release of the film, *Darwin's Nightmare*. International audiences praised the film but the Tanzanian government was not pleased.

Darwin's Nightmare, directed by Hubert Sauper, uses the Nile perch industry as a vehicle to explore social issues in the Mwanza district, the centre of the Lake Victoria fishery—rich in fish and yet one of the poorest regions of the country. The result, which has nothing to do with Darwin or evolutionary biology, includes painful scenes of street urchins, prostitutes and AIDS victims. Hygienic fish-processing plants that export Nile perch to the EU are juxtaposed with macabre images of the processors' leftover carcasses hung to dry for local consumption. The climactic moment of the film occurs when the viewer finally discovers that the cargo planes that fly Nile perch out of the country come to Tanzania full of weapons to equip guerilla operations in neighbouring countries.

The film was highly acclaimed—nominated for an Academy Award and lauded by the critics [e.g., 1]. Some of the responses, perhaps imitating the film, were incendiary. A critic from *The New York Post* wrote, "Africa starves because corrupt governments own the natural resources and export them to buy weapons to keep their people at bay." Correspondents in an online chat room discussing the film [2] advocated

Continued on page 3 - Darwin

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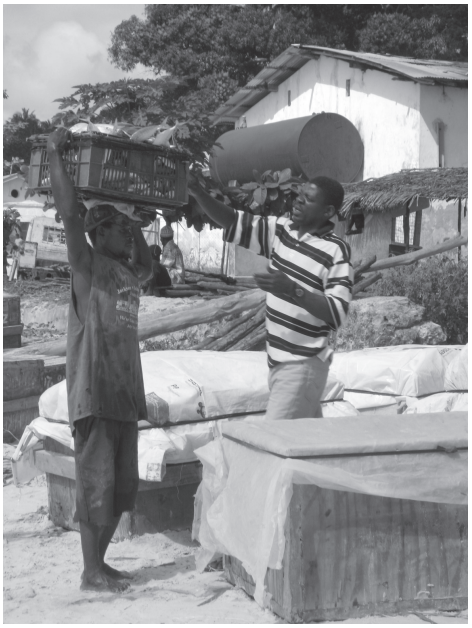
Darwin - Continued from page 2

a boycott of Nile perch. This year the EU, which normally sends inspectors to examine the Nile perch processing plants for three days, announced it would send its team for eleven days.

The Tanzanian government, perhaps unsurprisingly, has reacted strongly against the film (a reaction quite different to that of the U.S. government after Michael Moore's *Fahrenheit 9/11*). In the year following its release, the Tanzanian government has become *Darwin's Nightmare*'s most vociferous adversary.

First, the government arrested people associated with the film (e.g., Tanzanian journalist Richard Mgamba). In August 2006, the Tanzanian government accused Sauper of hurting the country's image and decreasing sales of Nile perch in an official letter printed in the national newspaper [3]. There is now a sponsored Internet link in opposition to the film, which includes the negative reactions to the film by the Tanzanian embassy in France and the Tanzania office of the IUCN. The website includes faked photos of Sauper arm in arm with Osama Bin Laden and Saddam Hussein, and notes, "lots of [Sauper's] scenes have been done at nights, which proves that he is a cheater and liar" [4].

In their open letter, the government conceded that the conditions in which some of the film's characters live are "appalling and unacceptable" but argued that Sauper "maliciously closes the eyes of viewers to the many benefits that the Lake Victoria fishery has brought to hundreds of thousands of people." The government noted the positive aspects of Nile perch, such as the industry's "big multiplier effect, which puts the total employment at about two million people deriving livelihoods in extended activities ..."



Marine finfish in preparation for export from Mafia Island, Tanzania.
Photo by J. Jacquet

In the year following its release, the Tanzanian government has become Darwin's Nightmare*'s most vociferous adversary*

This sentiment was the one voiced repeatedly as I visited fisheries offices, NGOs, and universities on my August 2006 trip to Tanzania. Everyone had an opinion on *Darwin's Nightmare* (one professor even gave a 20 minute speech describing the film's inaccuracies, only to finally admit he had not actually seen it). A government official pointed out that, while Western culture may not readily perceive the benefits of Nile perch to the local

Continued on page 4 - Darwin

Material for *Darwin's Nightmare II*?

Since independence, the Tanzanian government has restricted finfish exports to promote food security. In 2005, the government opened the export sector for marine finfish belonging to 10 groups of fish listed below [10]. Anderson and Ngutunga [11] have already expressed concern. Sharks and rays show a low resilience to fishing pressure and many Tanzanian species are classified on the IUCN Red List. The minimum weight limit of 2kg is also not adequate for many species included in the groups of parrotfishes, snappers, and groupers.
But, with permission to export, the small-scale sector has already drastically expanded. In 2005, 14 new landing sites emerged along the coast of Tanzania. The number of coastal fishers in 2005 increased by 10,500 from the census four years earlier, while 2200 vessels were added to the coastal fishery over the same time period [12].

1. Tunas and kingfishes
2. Carangids (jacks)
3. Parrotfish and bluefish
4. Red snapper
5. Groupers and rock cod
6. Sharks
7. Rays and skates
8. Soles
9. Marlins
10. Catfish

Darwin - Continued from page 3

communities, there is evidence of improvements. For instance, some Mwanza residents now have metal corrugated roofing instead of thatched roofs. A professor explained that residents in the fish basin actually prefer the fish heads to the fillets.

The Tanzanian government had an opportunity to use Darwin's Nightmare *to catalyze change*

The attention in Tanzania was curiously centred on the Nile perch industry and insistence that it benefits local communities. The government letter, for instance, dedicated only one unconcerned paragraph to the weapons imports. In the film's press release, Sauper said, "I could make the same kind of movie in Sierra Leone, only the fish would be diamonds, in Honduras, bananas, and in Libya, Nigeria, or Angola, crude oil." Though the director intended the issue of the arms trade or effects of globalization to take precedence, somehow, in Tanzania at least, Nile perch consumed the limelight (in addition to haplochromines).

But the information in *Darwin's Nightmare* is hardly new. The film largely reiterated points about the Nile perch fishery documented in the scientific literature in the last 15 years. The ecological catastrophe was well-known (and published in reputable journals [e.g., 5, 6]), as was its social consequences. Researchers described the prioritization of foreign exchange (through Nile perch exports) over food security and the subsequent protein malnutrition in the lake basin communities [7, 8]. They discussed the migration of fishermen that contributed to the rise of the AIDS epidemic [9]. Yet, the film caused controversy where the academic literature and even a related book (*Darwin's Dreampond*) had not.

The Tanzanian government had an opportunity to use *Darwin's Nightmare* to catalyze change. They had an opportunity to use the film to highlight inequity brought on by globalization, to emphasize again the need to reform trade and eliminate subsidies as well as to request aid from the Western world. Instead, they harassed participants in the film and vilified the director. *Darwin's Nightmare* has become their own.

A dhow sets sail on the afternoon wind. Photo by J. Jacquet

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Note: The Fisheries Centre hosted a screening of Darwin's Nightmare. Tuesday, September 19th, 4.00pm.

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Sea Around Us

Recalling the goals of the *Sea Around Us* project: documenting, communicating and mitigating fisheries impacts on marine ecosystems

by Daniel Pauly

The *Sea Around Us* project, funded by the Pew Charitable Trusts in Philadelphia, and hosted by the Fisheries Centre, started in mid 1999. Its goal was - and still is - to investigate the impact of fisheries on marine ecosystems, and to propose policies to mitigate these impacts.

One early product of the project, which had a large impact on both fisheries research and international policy, was the demonstration that the world catch, rather than increasing through the 1990s, had in fact been decreasing since the late 1980s, the latter trend, however, having been masked by over-reporting of catches (for internal, political reasons) from China (Watson and Pauly 2001). This declining trend is explained by Figure 1, which documents that globally, fisheries have been involved in the serial depletion of the stocks they exploit.

Although conceived as a global activity, the project first emphasized the data-rich North Atlantic as a test bed for developing its various approaches, which rely on mapping of catch data and indicators of ecosystem health (see e.g., Pauly and Watson 2005) derived from the analysis of long catch time series data, ranging at least from 1950 to the present (Watson *et al.* 2004). Initial achievements included mapping the decline, throughout the North Atlantic basin, of high-trophic level fishes from 1900 to the present (Christensen *et al.* 2003). Also, we presented compelling evidence of change in the functioning of the North Atlantic ecosystems, summarized in a book authored by Pauly and Maclean (2003), but which drew on work by all *Sea Around Us* project members.

The Central and South Atlantic were the next areas to be tackled, with some emphasis on the distant-water fleet off West Africa, and culminating in a major conference in Dakar, Senegal, in 2002 (Chavance *et al.* 2004). The project then worked on the North Pacific, Antarctica, and the multiplicity of tropical Indo-Pacific fisheries (much of this published first in *Fisheries Centre Research Reports*, available from www.fisheries.ubc.ca/publications/reports/fcrr.php), after which all our major contributions became based on global analyses. Example are our global estimates of fuel consumption by fishing fleets (Tyedmers *et al.* 2005), of the catches of small-scale fisheries (Chuenpagdee *et al.* 2006), and of government subsidies to fisheries (Sumaila and Pauly 2006).

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One of the reasons why the destruction of marine life by heavily subsidized fishing fleets could go as far as it did is because the public at large retained, until recently, a romantic image of fishers and fisheries. On the other hand, the environmental NGOs which could have corrected this benign view of fisheries, largely depended, for their analyses, on fisheries data from government laboratories, mainly assembled and pertinent to the tactical (year-to-year) management of industrial fleets, and generally useless for demonstrating the ecosystem impact of fisheries.

The Sea Around Us *project must therefore pursue a dual strategy of contributing to the technical peer-reviewed literature [...]*

The *Sea Around Us* project was designed to counter this, its purpose being the development of what may be called 'fisheries conservation science', geared toward maintaining ecosystem configurations likely to allow for sustainable fisheries, and not to the largely unsustainable fisheries that we have now (Pauly *et al.* 2002). This is also the goal, incidentally of most NGOs working on fisheries and ecosystems, even if the fishing industry doesn't see it.

To achieve its purpose, the *Sea Around Us* project must therefore pursue a dual strategy of contributing to the technical peer-reviewed literature, to maintain the scientific credibility of its members, and reaching out to the members of the environmental NGO community and to the public at large, using a range of products (magazine and newspapers articles, public lectures, etc.) suited for various audiences. One major tool is our website (www.seaaroundus.org), and hence the emphasis on this aspect of our work, and on maps, which can communicate complex information even to lay audiences (see Watson *et al.* 2005).

Our website presents, for each maritime country of the world (and also for 64 Large Marine Ecosystems) what we believe are key information on the marine fisheries and ecosystems of the world. The information we provide could be far more detailed for some developed countries. However, this would leave most developing countries behind, which would seem inappropriate, given that it is fish caught along the coasts of, or exported from, developing countries which now largely supply markets in developed countries (Alder and Sumaila 2004).

Thus, the *Sea Around Us* project, now mature, will continue to exploit its global niche, i.e., concentrate on global fisheries issues. We call on interested colleagues to help us improve the coverage of their countries, or region of interest.

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Continued on page 3 - Goals

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Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at saup.fisheries.ubc.ca and contains up-to-date information on the project.

The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

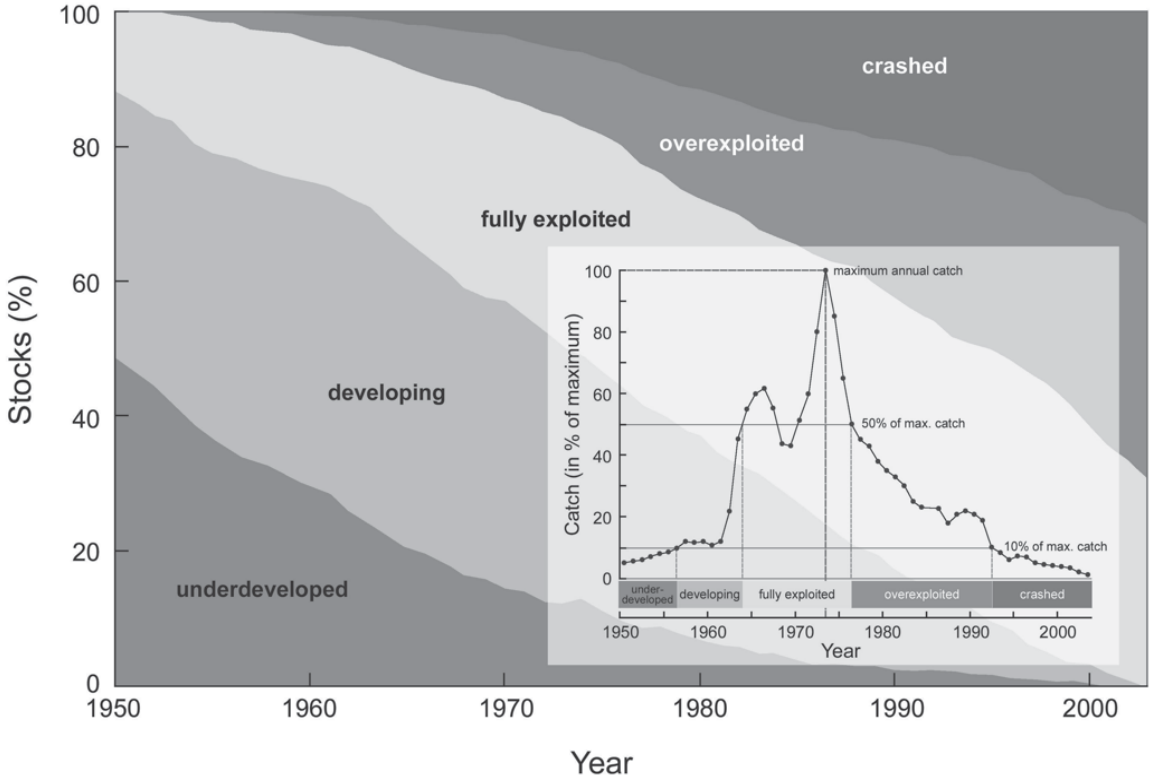

***Figure 1**. Time series of the composition of global marine fisheries catch according to the status of the stocks making up that catch, 1950-2003. This status (underdeveloped: 0-10%; developing: 10-50%; fully exploited: above 50% of maximum; overexploited: 50-10 %; and crashed: 10-0%) is defined with respect to the highest catch of each time series (see insert for example), representing one stock, usually a species, within one of 18 FAO statistical areas covering the world ocean. More elaborate, but similar graphs were developed by FAO to generalize regional and global trends. Dr. Rainer Froese, of Kiel University, simplified these graphs to their present form, which can be used for predictive purposes (e.g., by projecting into the future the border line between 'overexploited' and 'crashed'; see Worm* et al. *2006).*

[...] and reaching out to the members of the environmental NGO community and to the public at large.

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Country Profiles: a new *Sea Around Us* web product

by Ganapathiraju Pramod and Ahmed Khan

[...] the existence and effectiveness of fisheries governance systems is central to successful management

Clicking 'Countries' EEZ' on the *Sea Around Us* website www.seaaroundus.org) leads to detailed information about the fisheries and related information for each of the world's maritime nations. These include EEZ area, the percentage of the world's coral reefs and primary production, time series of fisheries landings, fisheries values and species lists. Other information includes the marine protected area in each country's EEZ, time series of the Marine Trophic index, allowing testing for the occurrence of 'fishing down', of the primary production required to sustain the fisheries catches in that EEZ, etc. As a whole, this information provides a standardized, freely-accessible database that can be used in global analyses of the scope and impact of the world's marine fisheries.

On the other hand, the website contains little on the governance of fisheries, although the existence and effectiveness of fisheries governance systems is central to successful management and provides the important link between scientific advice and action. Until now, only a lists of treaties and conventions to which each country is party, as well as details of international fishing access agreements, were available.

Thus, as a first step to expanding our coverage of governance issues, a new page was added to our website, labeled 'Country profile', which identify, for each of 144 countries (or territories), the government agencies responsible for marine fisheries and protection of the marine environment, as well as the relevant legislation. The Country profile also lists local and international NGOs covering the marine environment and fisheries issues, so far they could be identified. In addition to the full names of the institutions identified, web links are given (so far available), thus enabling rapid access to more details.

The 28 other islands/territories with distinct EEZ and ruled by foreign governments, but with enough local autonomy to manage their natural resources, were treated as separate 'countries'. Also, for countries with coasts spanning several regional management areas, we provided links to authorities at sub-national (State, Province) level. In countries where more than two ministries or agencies are responsible for protection of the marine environment, we attempted to identify the authority with the most responsibility. Similarly, in case of information on maritime laws and fisheries regulations, adapted from the FAO, UN and the IUCN databases, we selected only what appeared to be major pieces of legislation.

Overall, the amount of content given on management agencies' websites varied, with developed countries providing more detailed information, covering longer periods, and with more regular updates than developing countries.

In its present version, the 'Country profile' pages also allow access (for many countries) to more detailed accounts of countries' fisheries and their governance, i.e., 'FAO profiles', brief portraits and sets of summary statistics compiled by FAO staff, and 'Code of conduct profiles', detailed evaluations of the countries' compliance with Article 7 ('Fisheries Management'), of the FAO Code of Conduct for Responsible Fisheries, published in 1995. The latter profiles are the result of work by Prof. Tony Pitcher, this note's first author, Daniela Kalikoski, Marcello Vasconcellos, Patricia Rojo-Diaz and others. Evaluations have been completed for 53 countries (strictly, marine fisheries jurisdictions representing 96% of the reported world fish catch) and form the basis of a soon-to-be released *Fisheries Centre Research Report*.

Although it is difficult to ensure the accuracy, pertinence and timeliness of information such as given in our 'Country profiles' and 'Code of conduct profiles' pages, we will attempt to do so, and readers are welcome to give the first author (pramod@fisheries.ubc.ca) or the *Sea Around Us* project (office@fisheries.ubc.ca) feedback that would contribute to improve this product.

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Sea Around Us

Babette's feast in Lima

by Daniel Pauly

Through 2006, the members of *Sea Around Us* project were heavily involved in the 'Forage Fish Project', now completed (see Alder and Pauly 2006a). This was a global, multi-authored study of those small pelagic fishes which transfer primary and secondary production to the higher trophic levels (notably seabirds and marine mammals) of marine ecosystems. The project also emphasized that forage fishes provide humans with large, but not limitless quantities of valuable protein, which we, however, tend to waste by using it as raw material for fishmeal.

The report contained a paper (Alder and Pauly 2006b) which recalled that forage fish, a.k.a. small pelagic fish, have, since time immemorial, contributed directly to the human diet, and that the emergence of fish husbandry practices requiring fishmeal as input should not make us swallow the notion that these fish have suddenly become unpalatable to humans.

However, I recently had an experience that would make me sharpen that paper, were I to write it now. This was a meal I recently had, with a number of Peruvian friends, in a Japanese restaurant in Lima, which consisted exclusively of Peruvian anchoveta (*Engraulis ringens*), and which was so delicious that, like the Danish villagers in the film 'Babette's Feast', we turned for, a while at least, into better people.

I had been invited to give the keynote address of the '*International Conference on the Humboldt Current System: Climate, Ocean Dynamics, Ecosystem Process and Fisheries*' held from November 27 to December 1, 2006, organized by the *Instituto del Mar del Peru* (IMARPE) and the French *Institut de Recherche pour le Development* (IRD). The invitation was due to my earlier work in Peru, the result of multiple visits through the 1980s, and which led to two edited books on the Humboldt Current Ecosystem, which included, notably, detailed analyses of 30 years' worth of (often monthly) time series on the Peruvian anchoveta, its predators, and their abiotic environment (Pauly and Tsukayama 1987; Pauly *et al*. 1989).

Although well received at the time - Cushing (1980) spoke of a "formidable collection of papers" - I didn't follow up on this work, for a number of reasons, one of them being that the German-Peruvian project through which I had carried out this research ended in the early 1990s. But the event to which I was invited, more than 15 years later, made clear that the work was not forgotten. Indeed, much to my surprise, I discovered that it is alive and well, and that it provided the baseline for several of the studies conducted in the joint French-Peruvian project which organized the conference. Germans, French….*plus ça change, plus c'est la même chose*.

Thus it could be anticipated that my keynote, based on work with Sylvie Guénette and Villy Christensen, and which presented an ecosystemic synthesis, based on *Ecopath with*

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Ecosim, of the time-series data we gathered in the 1980s, would be of interest. Parallel to the conference, however, there was, in Lima, another series of unanticipated activities which have the potential to become a key to the future of Peruvian fisheries.

[...] we should not think of small pelagics as 'forage fish' in the first place, but as a way to resolve some of the fish supply issues we now have

Dr Patricia Majluf, a Peruvian marine mammal expert and conservationist, and a team of students from her University, were starting a campaign to change the image of the anchoveta from something that only poor people eat, to a fish that could be turned into the tasty dishes consumed by well-heeled sophisticates. For this, she convinced the chefs in 30 leading restaurants in Lima to serve newly created anchoveta dishes, which the President of the Republic would also eat, all under the glare of local media. But how could encouraging the consumption of anchoveta be a good thing?

Right now, because the Peruvian fishing fleet suffers from a tremendous overcapacity, the annual anchoveta quota suggested by IMARPE and set by the government is caught and processed into fishmeal in three or four months, under appalling conditions, leaving the vessels and their crew idle for rest of the year. Also, the ex-vessel price of the anchoveta caught is extremely low. While the government often claims it is interested in increasing human consumption of anchoveta (presently about 0.3% of the catch), its focus on anchoveta as subsidized food for the poor actually prevents the emergence of a market for fresh, good-quality anchoveta.

Patricia Majluf thinks that if the negative association of anchoveta with poverty (similar to that we have in North America of anchovies with pizza) could be broken, this would generate a demand for freshly caught anchoveta, whose price would then decline, as market competition increased. Anchoveta would then become available to the poor, but without subsidies, and without the negative image. She calculates that the Peruvian anchoveta catch of 2-6 million tonnes per year, if used for human consumption, would generate revenues an order of magnitude higher than presently gained from the export of fishmeal. Also, Peru could supply both its internal market and the international market, which now features small pelagic fishes from northern Europe, especially Norway, being exported to West Africa, especially Nigeria.

Having had this wonderful meal, which included anchoveta tempura, marinated fillet of anchoveta, a "soup with no name", and other delights, I can attest that anchoveta are tasty (and they contain omega 3 fatty acids, too!). I realize now that we should not think of small pelagics as 'forage fish' in the first place, but as a way to resolve some of the fish supply issues we now have, especially because we waste such a large part of the world catch (30-40%) by turning it into fishmeal.

A massive increase of direct consumption of small pelagics would affect the fish farming industry. However, their representatives have been telling us for years that a replacement for fishmeal is around the corner, so that would not be a problem ...

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The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the project.

Announcing a new global fisheries subsidies database

by Ahmed Khan

Fishery subsidies are financial payments from public entities to the fishing sector, which help the sector make more profit than it would otherwise. Subsidies are currently topical because of the concern that they contribute directly or indirectly to overcapacity and overfishing, thereby undermining the sustainability of marine living resources and the livelihoods that depend on them. These issues were reiterated at the World Summit on Sustainable Development in Johannesburg (WSSD 2002), the Doha Ministerial Conference (Doha Conference 2001), by the FAO Code of Conduct for Responsible Fisheries (FAO 1995), and in the Millennium Ecosystem Assessment (2005), and have thus prompted significant research interests. Until the work that produced the database being described here (Khan *et al.* 2006; Sumaila *et al.* 2006), there was no comprehensive estimate of global fisheries subsidies that covered all maritime countries, particularly subsidies provided by governments of rich

Continued on page 4 - Subsidies

Subsidies are currently topical because of the concern that they contribute directly or indirectly to overcapacity and overfishing

Fisheries subsidies in Argentina

Subsidies categories and types		Amount US$ '000 (Y 2000)	% of landed value	Source
Good				
• Fisheries management and services		15,000		UNEP, 2003
• Fishery research and development		(37,203)		UNEP, 2003
	Sub total	52,203	2.00	
Bad				
• Boat construction, renewal and modernization		(73,351)		FAO profile
• Fishery development and support services		(24,163)		UNEP, 2003
• Fishing port construction and renovation		-		-
• Marketing support and storage infrastructure		(90,220)		UNEP, 2003
• Tax exemption		(18,545)		UNEP, 2003
• Foreign access agreements		-		-
• Fuel subsidies		(115,000)		Onestini and Gutman, 2001
	Sub total	321,279	14.78	
Ugly				
• Fisher assistance		(73,189)		UNEP, 2003
• Vessel buyback		(72,273)		FAO info
• Rural fisheries community development		-		-
	Sub total	145,462	6.69	
	Grand total:	**518,945**	**23.47**	

Figure 1. A sample fishery subsidies web page (Argentina). These data are taken from Khan et al. *(2006) and Sumaila* et al. *(2006), who identified for each maritime country three categories and twelve fishery subsidy types, with subsidy amounts provided for 2000 in real (inflation adjusted) US$. References for both the reported subsidy amounts and the estimates (in brackets) are provided. The subsidy intensity in the form of total subsidy as a percentage of landed value is also given. Source: www.seaaroundus.org/eez/eez.aspx*

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countries to both the small-scale and commercial fisheries sectors in developing countries.

To create the database, information was gathered and recorded for twelve fisheries subsidy-types, for 144 coastal countries, for the period spanning 1995 to 2005 (Khan *et al.* 2006; Sumaila *et al.* 2006). Subsidy amounts were estimated for the year 2000 in inflation-adjusted US dollars. Each of the twelve subsidy types were further categorized into 'good,' 'bad' and 'ugly' subsidies, depending on whether they improve, weaken or are indeterminate with regards to their impact on the sustainability of the resource.

The proportion of subsidies contributing to excess fishing capacity globally amounts to US$21 billion or about 65% of the total

Data on fisheries subsidies were obtained from the following major sources: (a) Organization for Economic Cooperation and Development; (b) Asian Pacific Economic Cooperation; (c) European Commission; (d) Food and Agricultural Organization (FAO) of the United Nations; (e) national fisheries department web sites and publications; (f) the 'onefish' community directory program; (g) United Nations Environment Program; (h) regional financial institution portfolios such as the African Development Bank; (i) overseas development project reports on fishery issues, such as the UK's Department for International Development (DFID); (j) World Trade Organization (WTO) trade notifications; and (k) environmental NGO reports on marine issues.

Quantitative data were collected and recorded in each cell for each country and for each subsidy type, and summed to provide subsidy category totals. Where quantitative data were lacking, we used a statistical approach to fill in the gaps. The complete methodology and detailed database is reported in Sumaila and Pauly (2006). Also, the full datasets of the subsidy estimates are provided under the Governance tab in the Countries' EEZ section of the *Sea Around Us* project website (www.seaaroundus.org). Subsidy information for each maritime country is presented by category and type (e.g., Figure 1).

Using the database, Sumaila and Pauly (2006) report that global annual fisheries subsidies are estimated to be US$30-34 billion, and that fuel subsidies make up about 20-25% of total global fisheries subsidies. Further, the proportion of subsidies contributing to excess fishing capacity ('bad' subsidies) globally amounts to US$21 billion or about 65% of the total. It is worth noting that we see this database as a living web product, which will be improved through time, with the availability of better information. We therefore encourage colleagues to contact Rashid Sumaila by email (r.sumaila@fisheries.ubc.ca) if they have comments and/or better information and data.

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Sea Around Us

Lessons from a reconstruction of catch time series for Mauritania

by Didier Gascuel

For a fisheries scientist, Mauritania is probably one of the world's most fascinating countries. It is a very poor country, a desert for the bulk of its territory. Landing for the fist time at the airport of Nouakchott, the capital, is a shock: how can people live here, in the middle of nowhere?

But in fact, this is a country of very enterprising people, and there are natural resources: large iron deposits in the desert, recently discovered oilfields on the shelf, an intensive upwelling along the coast, and a large, extremely productive shallow, the 'Banc d'Arguin.' As a result, Mauritania's coastal waters are (or have been) among the world's richest fishing grounds, and the fishery sector is of huge importance to the country's economy. In 2005, official landings were estimated at around 720,000 tons, representing 6 % of Gross Domestic Product, generating 30 % of the value of Mauritanian exports and 30 % of the state's revenue (IMROP 2007).

The fisheries statistics available from Mauritania, at least those submitted to FAO, leave much to be desired, however. While a fisheries monitoring system, based on logbooks, sampling at landing locations, and onboard observers has been developed by the Mauritanian national fisheries institute (IMROP) in the 1980s, its implementation has faced difficulties, and a complete database is available only since 1991 for the industrial, and 1997 for the small scale fisheries. Only scattered and heterogeneous statistics were published earlier, covering short periods. I have attempted to harmonize these different datasets, and to generate, in the process, a 'catch reconstruction' (*sensu* Zeller *et al.* 2006) of the industrial pelagic and demersal fisheries, and of the artisanal fisheries, covering the years 1950 to 2005 (Gascuel et al., in prep.).

Seven lessons emerge from this reconstruction

1. Even if estimates remain uncertain, notably for the 1950s and 1960s, the catch reconstruction is extremely useful in that it provides a first picture of long term catch trends by the various fisheries which have exploited (what became) the Mauritanian EEZ. The FAO statistics are really deficient in this regard. The main reason for this is that the bulk of the catch is due to foreign fleets, and thus is not reported by Mauritania to FAO. Of course, the foreign boats have to declare their catches. Their declarations, however, refer to larger FAO fishing areas, not the Mauritanian EEZ. Thus, in FAO statistic, neither the catch by country, nor the catch by area gives information on the catch taken from the Mauritanian EEZ.

2. The results I obtained can be compared with the catch estimates by the *Sea Around Us* project database (see www.seaaroundus.org). The latter relied on Watson *et al.* (2004), who allocated the FAO catch by (groups of) species to ½ degree cells, and regrouped these into different EEZs. This case study of Mauritania was the first

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independent test of the results obtained by Watson *et al.* (2004), and it passed the test with flying colours: total catches in the Mauritanian EEZ from the *Sea Around Us* are very close to my estimates of the official landings of the industrial fisheries (which should roughly resemble the FAO data). On the other hand, a detailed look allows identification of the limitations of the method of Watson *et al.* (2004), which requires local knowledge for validation. Thus, I found that demersal catches off Mauritania were overestimated in the *Sea Around Us* database, while pelagic catches were underestimated. The main reason is the fact that the fisheries history differs between Mauritania and its neighbours, particularly Senegal. Mauritania has no tradition of fishing, and its resources have been exploited by mainly foreign countries targeting the small pelagic fishes. On the other hand, small scale fisheries targeting demersal resources developed very early in Senegal. Thus, the demersal and pelagic catches to be allocated between these two countries do not simply depend on their fishable areas. The method, however, allows for the incorporation of information such as provided here, and thus it should be possible to correct the result in a subsequent catch allocation.

As a consequence, the overall picture of Mauritanian fisheries is strongly modified

3. Several hundred thousand tons of small pelagic fishes, recorded in the IMROP database during the 1980s and 1990s have simply disappeared from the statistics reported to FAO. These had been caught by foreign boats (particularly from Eastern Europe), operating on the basis of special agreements as 'Mauritanian chartered boats.' Thus, they probably should have been declared as Mauritanian catches. But they were not, and neither do they appear (or only partially) in the landings reported by the foreign countries in question.

4. As in many other developing countries, official landings are also underestimated due to a large amount of undeclared by-catches and neglect of the small scale fisheries. Indeed, the latter have always been considered insignificant in Mauritania. This was more or less true before the early 1990s, when a few hundreds 'pirogues' were involved, with annual catches under 15,000 t. However, since then, their number has increased nearly ten-fold, generating catches of around 80,000 t, of which 60,000 t are demersal fish and invertebrates. Obviously, a 'small-scale' fishery of such magnitude is a major economic factor, whose impacts on the ecosystem can no longer be ignored. As for the by-catch, it has been so far ignored because the vessels report overwhelmingly the species they target, and for which they have a license. As if shrimp trawlers caught only shrimps, and the cephalopod fishery only octopus! Taking into account the undeclared by-catches leads to an increase of the industrial demersal catches by a factor of over 1.7.

5. As a consequence, the overall picture of Mauritanian fisheries is strongly modified. So far, it was thought that the industrial fishery for small pelagics overwhelmingly dominated the fisheries sector. While this is still true in term of tonnage (indeed Mauritania has one of the world largest reduction fisheries, where the catch is used for making fishmeal), this may not be true in term of value or value added, as the demersal fisheries

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Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Robyn Forrest, *Sea Around Us* Newsletter Editor.

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(industrial and small-scale), catching higher-priced species such as hake, octopus, shrimp, etc., have much higher catch than previously thought.

6. Having established that demersal resources are important, we must then deal with the fact that these resources suffer from tremendous overexploitation. The industrial demersal fisheries developed in the late 1960s, mainly targeting octopus, whose abundance increased at that time, probably due to the previous overexploitation of bottom fish, notably porgies (family Sparidae). Since then, total demersal catches have remained around 180,000 t, albeit with a huge increase of fishing effort. For instance, the number of industrial trawlers grew from around 150 in the early 1980s to 300-350 in the late 1990s/early 2000s. Of course, their fishing efficiency has also increased, which further increased effective effort. In the process, various species groups have been successively exploited, then overexploited. This was probably the case for several fishes belonging to the Sparidae community in the 1960s and 1970s. Octopus has been overexploited since the mid 1980s, which induced a decrease in cephalopod landings from a maximum of 55,000 to presently about 35,000 t. Catches of coastal Scianidae reached their maximum in the 1990s and are now decreasing too. Now, it is turn of the mullet and shrimps. Overall, the demersal biomass has been strongly depleted: at present, it is about 25 % of what it was in 1982, when regular trawl surveys began (Gascuel et al., submitted). This corresponds to the loss of 20,000 t per year.

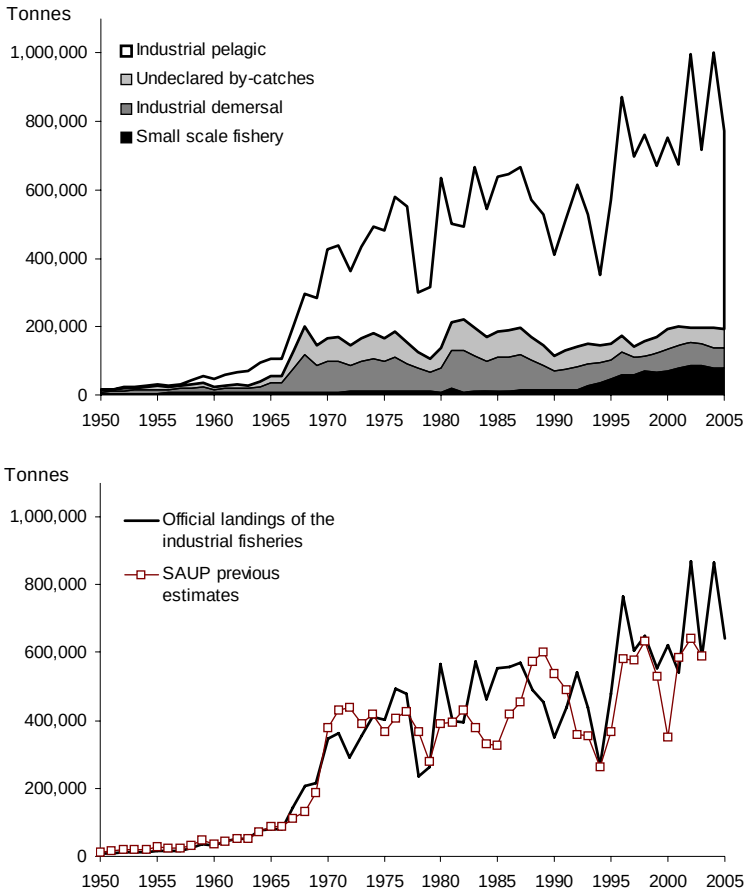

Figure 1 – Reconstruction of the catch time series off Mauritania. Top: desegregation by fisheries. Bottom: comparison with SAUP previous estimates

Mauritania is a very clear case study of an inequitable allocation of fisheries resources

Moreover, the biomass of top predators has been reduced by a factor of 8 to 10 and up to 20 for the most affected species. The mean trophic level of the catch, and its biodiversity decreased, inducing a higher sensitivity to climatic variability.

7. Mauritania is, finally, a very clear case study of an inequitable allocation of fisheries resources. Almost all the large fishing countries of the world have exploited Mauritanian waters. Octopus and demersal fishes have been targeted by Japanese, then by Spanish, Korean and Chinese vessels. Pelagic fishes have attracted vessels from Russia, Ukraine and other eastern European countries and, more recently, Dutch vessels. The Mauritanian industrial fisheries remained limited in spite of several attempts to develop national or joint ventures, especially during the 1980s. Of course, foreign countries have to pay for licenses or fishing agreements. Presently, 30 % of public receipts come from the EU – probably not a good basis for exerting national sovereignty. But the main part of the catches was and is still not landed in Mauritania. Rather, the foreign vessels offload in the Canary Islands (i.e., in Spain), or directly in their country of origin. Mauritania benefits neither through jobs, nor value added. As for the small-scale fishery, we saw that it was very limited for a long time, and that it has developed only since the mid 1990s, partially in competition with industrial fisheries – and

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only after the resources were much reduced.

Conclusion

The context in which Mauritanian fisheries scientists operate, and try to assess stocks and fisheries is thus very challenging. Perhaps the very recent development of an oil industry will make it possible for Mauritania to acquire more weight in international negotiations and to manage its fisheries resources, and the access of foreign fishing fleet to its waters in a more equitable fashion, i.e., so that more of the benefits accrue to Mauritania. There is no doubt that international scientific cooperation will remain useful in this process.

The context in which Mauritanian fisheries scientists operate, and try to assess stocks and fisheries is thus very challenging

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Sea Around Us

Oilfish – the case of the imitation Atlantic cod

by Vicky Lam

A high demand for seafood, along with unsustainable fishing practices, not only results in over-exploitation of fisheries resources, but may also pose serious health risk. In December 2006, people in Hong Kong enjoyed eating inexpensive "cod" steak from local supermarkets, which cost 4 to 5 times less than the average cod. However, the "cod" dish caused its consumers to check into the hospital, due to intense diarrhea. It was later discovered that this lower priced "cod" was oilfish (*Ruvettus pretiosus*), which was imported from Indonesia and mislabeled as "southern cod", "Canadian cod" or "codfish" (all translated as Atlantic cod in Chinese) when it was sold in Hong Kong supermarkets.

The retailers marketed this species as the higher priced Atlantic cod (*Gadus morhua*), which is listed as vulnerable in the IUCN redlist. It is hard for consumers to distinguish the real Atlantic cod steak from the oilfish steak. In fact, *Ruvettus pretiosus* is poisonous to most people; its flesh contains indigestible wax esters, hence the many cases of oily diarrhea it caused in Hong Kong (www.news.gov.hk, accessed March 11, 2007).

More appealing titles for fish species usually enhance the marketability and market value of non-commercial and deep-water fish species that were previously unknown to most consumers. One of the most well-known examples is the Patagonian toothfish (*Dissostichus eleginoides*), which is now on the verge of "commercial extinction" (National Environmental Trust 2001), which was renamed Chilean sea bass, though it is not really a bass. This species was formerly considered trash fish by fishers. Another example is the rock crab, which was thrown away by fishers as bycatch, but is now on the market having been renamed as 'Peekytoe crab'. In fact, renaming and mislabeling is common and affects not only price but also the effectiveness of eco-friendly fish campaigns (Jacquet and Pauly 2007).

Although the misleading name of oilfish was claimed to be an error made in the translation from scientific name to English name on the health certificate issued by the Indonesian authorities, this incident reflected the shortcomings of labeling systems in the seafood trade. Due to the serious health issue, the Hong Kong government is looking into improving the fish labeling system, for instance, by including the scientific name in addition to the common name. This provides more information to consumers regarding unhealthy seafood but also allows consumers to distinguish fish from unsustainable sources.

Some people argue that we can maintain our seafood supply by targeting previously unexploited species or by being conscious consumers. However, as the case of the oilfish suggests, these goals may have unintended consequences. The alternative

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is, perhaps, to reduce our consumption and improve fisheries management - two endeavors that rarely lead to a hospital visit.

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In recent years, various global targets have been adopted to develop representative MPA networks

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A Global Plan of Action for Networks of Marine Protected Areas

by Louisa Wood

As part of the IUCN's World Commission on Protected Areas (WCPA), WCPA-Marine is the world's premier network of marine protected area (MPA) expertise, with members in over 50 countries. Its global mission is to promote the establishment of a global, representative system of effectively managed and lasting networks of MPAs. In recent years, various global targets have been adopted to develop representative MPA networks covering from 10 to 30% of the world's oceans by 2012 (United Nations, 2002; IUCN, 2003; CBD, 2006). WCPA-Marine has a unique strategic role to play in these efforts, and has been developing a Global Marine Plan of Action for 2006-2012, to support nations in developing MPA networks. From April 10th -12th, 2007, WCPA-Marine held a Summit at the National Geographic Society in Washington DC, attended by 50 of the top marine conservation experts drawn from government, intergovernmental organisations, NGOs, the donor community and academia. The purpose of the Summit was to finalise the WCPA-Marine Plan of Action, and agree on a new global MPA Call to Action.

Seven strategic priorities were discussed:

1) MPAs, climate change, and human health;
2) MPAs and management effectiveness;
3) The Wet List (see below);
4) Developing good practice for MPAs and networks;
5) MPAs, ecosystem-based management and marine spatial planning;
6) Fisheries, MPAs, and human well-being;

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7) MPAs, species, and ecosystem management.

I was lucky enough to be invited to attend the Summit to share some of the experience I have gained over the last few years monitoring MPAs globally as part of my PhD research, particularly in relation to the development of the 'Wet List'. The Wet List (so named to bear relation to its well-known sister, the IUCN Red List of endangered species, but subject to change) is a new and innovative global partnership. The Wet List will be IUCN's global status report celebrating marine protected areas. It is designed to provide unprecedented levels of outreach to map progress and celebrate successes in marine conservation, as well as to identify challenges towards building networks of Marine Protected Areas (MPAs) and conserving the wider marine environment.

It is intended that the Wet List will take the form of an annually produced, single hard copy/web-based global overview, supported by 18 web-based regional reviews. These publications will be based on MPA data in the World Database on Protected Areas (WDPA), maintained by UNEP-World Conservation Monitoring Centre (UNEP-WCMC).

The global MPA database I built, called MPA Global (see www.mpaglobal.org or www.seaaroundus.org), was originally developed from the WDPA, and continues to feed directly into it. As a WCPA-Marine member, I will be working closely with UNEP-WCMC and WCPA-Marine Regional Coordinators to develop appropriate strategies to meet the information requirements for the Wet List.

Delegates at the WCPA-Marine Summit. Photo by Dan Laffoley

The Summit was an intense but invigorating three days, with an incredibly positive vibe and a real sense of purpose. As someone essentially at the beginning of my career, I left the Summit with a couple of feelings. Firstly, I feel profoundly honoured to have been invited to a meeting attended by such a rich, fascinating, intelligent, and downright friendly group of people. Secondly, I left feeling energised, optimistic, and empowered – this really is an exciting time for marine conservation. It's hard to make statements like that without sounding naïve or trite, especially given the massive disparity between current and desired levels of marine protection. However, I think the world is finally waking up. And we are getting organised. I'm excited to be part of this snowball, and to see where the next few years take us.

For more information about the Summit, including the session backing papers, the Call to Action, and WCPA-Marine membership, please see http://groups.google.com/group/wcpamarine-summit/web.

The Wet List will [...] provide unprecedented levels of outreach to map progress and celebrate successes in marine conservation

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Sea Around Us

An Ecosystem Approach to Fisheries should imply a shift in EU policy targets used for single-species management

*by Didier Gascuel**

Since 1998, according to the "Code of Conduct for Responsible Fisheries" (FAO 1995), the European procedure for the production of scientific advice is largely based on a standard method called the "precautionary approach". This uses single-species assessment models and is the basis for the adoption by politicians of annual Total Allowable Catches (TACs) for the main target stocks. Such an approach is supposed to ensure long term sustainability of exploited stocks and marine ecosystems. Undoubtedly, it has had positive effects for some severely depleted stocks, usually leading to more restrictive access to allow stock recovery. Nevertheless, the overall state of European fishes stocks remains grim, with the situation deteriorating for some species. More generally, the current procedure should be considered inappropriate from an Ecosystem Approach to Fisheries (EAF) perspective.

Indeed, the current approach has consisted of assessing stocks close to the edge of the abyss by determining the minimal spawning biomass (and the maximal fishing effort) that can be applied to ensure, theoretically, stock regeneration and bringing stocks back within safe biological limits. Even with safety margins, this approach tends to maintain low abundances, with stocks above critical limits. Conversely, EAF should imply a major change regarding conservation measures for resources management: single-species policy targets should be changed to provide the maximal stock biomass that allows sustainable high catches. In other words, an ecosystem approach must deal with the minimization of fishing impacts on the major exploited stocks. This would be the first step to reducing ecosystems impacts and preserving ecosystem integrity, biodiversity and function and should lead to higher catches in the longer term and to economic profitability.

The shift from a minimum stock biomass target to a maximum target would have huge consequences. From that perspective, the 2002 Johannesburg decision (endorsed by the European Commission) to restore stocks to levels that permit the maximum sustainable yield (MSY) "as much as possible not later than 2015" is a step in the right direction. Its main purpose is not to maximize catches but to enforce the idea that further biomass reductions, due to increasing fishing pressures, are unacceptable when they lead to decreasing catches. Such a decision should imply enormous changes, as current levels of overcapacity are over 50% for the majority of

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major European stocks. It would also lead to a re-definition of management measures, by combining TACs and fishing effort limitations. However, MSY targets usually lead to a 2.5 to 3-fold reduction in fish abundance compared to the unexploited state. This is probably not sufficient from the EAF perspective, as the same amount of catch could result from more conservative exploitation patterns if larger mesh size was used. Therefore, managing not only fishing effort but fishing patterns as well would lead to the same increases in catch but to stronger reductions of impact on marine ecosystems, according to the new suggested target.

Ecopath modeling was one of the top ten – a significant achievement given the numerous outstanding contributions of NOAA and its predecessors

* Visiting Professor (Rennes, France) hosted by the *Sea Around Us* project at the UBC Fisheries Centre.

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The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the project.

Ecopath with Ecosim one of NOAA's top 10 breakthroughs

by Ussif Rashid Sumaila

The US National Oceanic and Atmospheric Administration (NOAA) has during its history charted the seas, forecast the weather, launched satellites into space, modeled the climate, managed fisheries and much more. As part of the organization's 200th anniversary, it reflected on the outstanding individuals, inspiring achievements, and defining moments that shaped the NOAA of today, selecting the most deserving to be honoured as the NOAA 'Top Ten Breakthroughs' (http://celebrating200years.noaa.gov/toptens.html#categories). Ecopath modeling was one of the top ten – a significant achievement given the numerous outstanding contributions of NOAA and its predecessors during their history. For anybody studying marine ecosystems, however, this recognition is not a surprise. Back in 1993, the renowned ecosystem modeler R.E. Ulanowicz hinted at the potential of Ecopath when he wrote "The heavens were opened to us by Galileo and his telescope, the world of microbes by Pasteur and his microscope. It may not be much of an exaggeration to say that the realm of ecosystems is being opened to us by Polovina, Pauly, and Christensen." This was before Ecopath, which is static, was extended by Carl Walters by the addition of Ecosim and Ecospace - dynamic and spatial versions of the modeling software, respectively. The Ecopath approach was initiated by NOAA scientist Dr Jeffrey Polovina in the early 1980s, and modified into its current form by Pauly, Christensen and Walters. Ecopath has the ability to represent complex ecosystems using novel equations, smaller data sets and limited computing power – advantages that most other ecosystem modeling approaches lack. This quality of the Ecopath suite along with numerous courses and lectures given by its authors have resulted in its widespread use. A recent addition is the optimal policy search module, which uses nonlinear optimization to improve an objective function by iteratively changing relative fishing rates. This module connects the functioning of an ecosystem to human behaviour, allowing different policy and management objectives to be analyzed. This new development has brought the Ecopath approach into full cycle, with implications for our ability to impact positively on policies for the sustainable use and management of marine ecosystems worldwide.

I wish to conclude by congratulating Drs Jeffrey Polovina, Daniel Pauly, Villy Christensen and Carl Walters, and of course NOAA, for this significant contribution to the world of marine ecosystem science, policy and management.

The *Sea Around Us* project is a Fisheries Centre partnership with the Pew Charitable Trusts of Philadelphia, USA. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organisations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organisations.

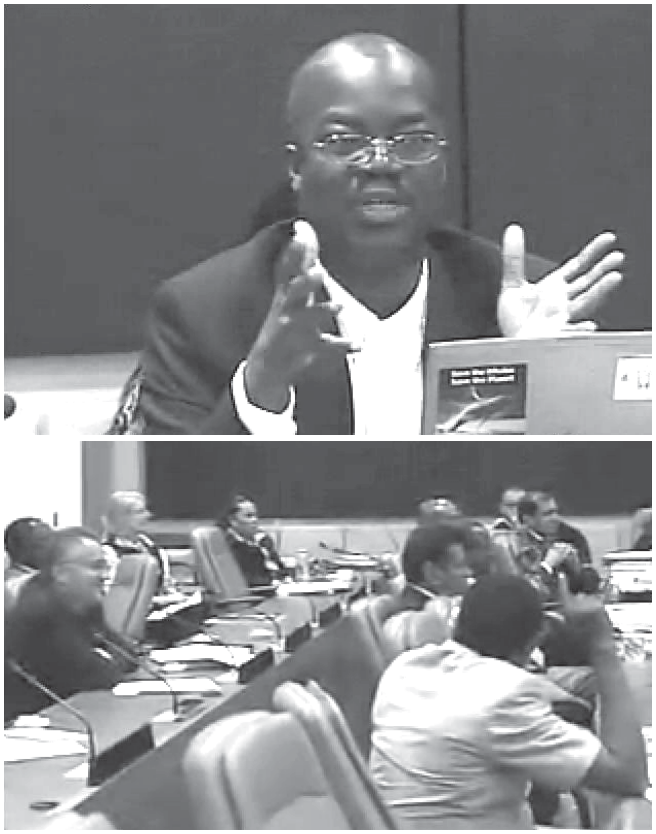
ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

Briefing at the United Nations on global fisheries

by Ussif Rashid Sumaila

The Group of 77 (G77) consists of 130 member (developing) countries at the United Nations (UN). The current Chair of the G77, from Pakistan, feels the need for the influential group at the UN to be more proactive regarding the oceans and their sustainable management. Hence, the Chair convened a briefing in New York for its members on the state of the world's oceans, the implications of this for developing countries, and what policy options G77 countries should be pursuing. This led to me being invited to give a briefing at the UN, together with Callum Roberts of the University of York, UK and Karen Sacks of Greenpeace International.



Rashid Sumaila addresses the UN briefing (top); and delegates attending the briefing (bottom).
Photos by Steven Lutz, Marine Conservation Biology Institute

The briefing was opened by Pakistan's Deputy Permanent Representative to the UN, Mr Farukh Amil, who spoke passionately about the importance of ocean and natural resource protection to the global community. Karen Sack then provided an overview of high seas conservation and discussed access agreements by countries in the North to fish in the South. I followed with a presentation on the state of global oceans over the period 1950 to the present, based on *Sea Around Us* data, describing the implications for developing countries. Callum Roberts commented on the misconception that creation of marine protected areas (MPAs) takes away from the fisheries. Rather, MPAs and marine reserves rebuild the resilience of depleted populations, he argued. Concluding the briefing, Mr Amil stressed that "As G77 countries, we need to preserve our natural resources in a sustainable

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manner. We have to be vigilant of over-exploitation."

The key points I made in my presentation included: (i) global fisheries are in trouble (Pauly *et al.* 2002); and (ii) the current state of global fisheries has resulted in: (a) a rise in distant water fishing (Alder and Sumaila 2004); (b) an increase in fishing access agreements between countries in the North and the South (Kaczynski and Fluharty 2002); (c) an increase in global trade of fish products (Anderson 2003); (d) increasing use of fisheries subsidies (Milazzo 1998; Sumaila and Pauly 2006); (e) rise in illegal, unreported and unregulated fishing (OECD 2004; Sumaila *et al.* 2006, High Seas Task Force, 2006); (f) drive to extend fishing to the deep and high seas (Morato *et. al.* 2006; Sumaila *et al.* 2006); and (g) increasing (and misplaced) faith in aquaculture as the solution to dwindling wild fish stocks (FAO 2007; Liu and Sumaila in press). I explained the implications to developing countries of each of these developments.

... modern fisheries development should be seen in terms of maintaining and rebuilding overfished stocks ...

Until now, fisheries development simply meant more boats and more people out fishing. Instead of this, I suggested that modern fisheries development should be seen in terms of maintaining and rebuilding overfished stocks such that they can continue to produce benefits to both current and future generations in a sustainable manner. Modern fisheries management should seek to optimize the net benefits from each unit of fish taken from the ocean, that is, we should focus on quality rather than the current emphasis on the quantity of fish caught.

Three foundations of modern fisheries development as conceived here are: (i) know the state of your fish stocks and ecosystems; (ii) know the value (in a broad sense) of your fishery resources; and (iii) strengthen fisheries management, especially monitoring, control and surveillance. Without these three foundations, G77 countries cannot engage in global fish trade, sign access agreements and/or provide subsidies that are ecologically sustainable, and economically and socially beneficial to their coastal communities. I also identified desirable elements that modern fisheries development should include: (i) engage only in mutually beneficial global trade/access agreements that are ecologically sustainable; (ii) use subsidies rarely and only those that do no harm to the resource base; (iii) where feasible, assign fishing rights or dedicated access privileges to fishing communities; (iv) engage only in sustainable aquaculture that contributes to fish protein supply and increases food security; (v) emphasize smart small-scale inshore fisheries; and (vi) use marine protected areas as insurance against uncertainty and management failures.

I concluded by highlighting the role of the international community in working with G77 countries in their effort to transit from the current notion of fisheries development to modern fisheries development. I also took the opportunity to stress the need for a concerted effort to educate fishers because education is the key to finding alternative jobs and livelihoods thereby making people less dependent on fishing for a living. To do this effectively, we must educate the educators, from governments to NGOs, using information from works such those of the *Sea Around Us* project.

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Large Marine Ecosystems and the *Sea Around Us* project

by
Daniel Pauly, Jackie Alder, Shawn Booth, William W.L. Cheung, Chris Close, Ussif Rashid Sumaila, Wilf Swartz, Ar'ash Tavakolie, Reg Watson, Louisa Wood and Dirk Zeller

Introduction

Fisheries have traditionally been seen as local affairs, largely defined by the range of the vessel exploiting a given resource. The need for countries to manage all fisheries within their Exclusive Economic Zones (EEZ), a consequence of the United Nations Convention on the Law of the Sea (UNCLOS), led to attempts to derive indicators for marine fisheries and ecosystems at the national level (see e.g., Prescott-Allen 2001). Also, it was realized that, given the large scale migration of some exploited stocks, and of distant-water fleets, an even better integration of fisheries could be achieved at the level of Large Marine Ecosystems (LMEs, Sherman *et al.* 2003).

However, no national or international jurisdiction reports, at the LME level, catches and other quantities from which fisheries sustainability indicators could be derived. Indeed, if the fisheries of LMEs are to be assessed, and if comparisons of the fisheries in, and of their impact on LMEs, are to be performed, then the fisheries within LMEs must be assembled for these explicit purposes, mainly by assembling data sets from national and other sources.

The *Sea Around Us* project was created in 1999 with the aim of assessing the impact of fisheries on marine ecosystems and of developing policies which can mitigate this impact (Pauly 2007). Thus, we set ourselves, from the very beginning, the task of assembling data on all the fisheries that impacted on 'places', i.e., areas of the sea, since whatever one's definition of an 'ecosystem' is, it must include reference to a place.

When dealing with the fisheries of places such as LMEs, the physical and other features that are relevant to the fisheries must also be expressed at the LME scale. The *Sea Around Us* website (www.seaaroundus.org) provides such statistics, which can be used in LME-specific accounts, as will be presented in Sherman and Hempel (in press). These are:

1) The percentage of global coral reef area in a given LME (rather than the area itself, which is highly variable between sources), based on a global map produced by the World Conservation Monitoring Centre (www.unep-wcmc.org);
2) The percentage of seamounts in a given LME (rather than their number, for the same reason), based on a global map of Kitchingman and Lai (2004);
3) The percentage of the area of a given LME that is part of a Marine Protected Area (MPA), based on an MPA database documented in Wood *et al.* (in press).

Other fisheries-relevant information, not presented here, but available through the 'Biodiversity' option on our website, are fish species by LME (from www.fishbase.org), and marine mammals and other marine organisms, to be consolidated in SeaLifeBase (www.sealifebase.org). Additionally, the 'Ecosystem' option allows access to maps of primary production, major estuaries (Alder 2003), and other features of LMEs.

However, the major exhibit of the website, and the major product of the *Sea Around Us* project are time series of fisheries catches by LME, obtained by aggregating catches previously mapped in 180,000 spatial cells of ½ degree lat.-long. (Watson *et al.* 2004).

As these aggregates of spatial cells can then be combined with other data, for example, the

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... we set ourselves, from the very beginning, the task of assembling data on all the fisheries that impacted on 'places' ...

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price of the fish therein, or their trophic level, one can straightforwardly derive other time series, e.g., of indicators of the value, or the state of fisheries in any of the 64 LMEs presently recognized in the world ocean. As this capability is globally unique to the *Sea Around Us* project, we were recently asked to collaborate on a report on the LMEs of the world (Sherman and Hempel in press). Our role was to help characterize the fisheries of each LME, by producing for each of them a set of 5 graphs presenting catch trends and time series of indicators of the status of fisheries, and commenting on them. (The only exceptions were 6 Arctic LMEs, for which catch data time series had been previously unavailable, and where we limited ourselves to presenting new time catch series, recently derived in the context of another initiative by the *Sea Around Us* project.)

We believe in the power of good graphs

An emphasis on compelling graphs

We believe in the power of good graphs. Thus, while we wrote a chapter for a UNEP report (from which this account was adapted) which presented the methods, data and assumptions behind each of the indicators we used to describe the fisheries of LMEs, we put our emphasis on the five graph types used to document the fisheries of LMEs. We reproduce two of these types of graphs here, for all LMEs combined, as they provide a nice summary of world fisheries. Further details can be found on our website (www.seaaroundus.org), and in the above-cited book, which should become available at the end of 2007.

Figure 1 shows the landings, by species for all LMEs in the world. Since this graph is normalized to show the 11 most abundant species (with the remainder pooled into 'mixed group'), and not many species are globally important, this graph exhibits more 'mixed group' landings (as 12th category) than typically occur in any specific LME. Also, it will be noted that LMEs account for the overwhelming part of the world catch. Indeed, the only major group not caught primarily in LMEs is represented by large pelagic fishes, predominantly tunas.

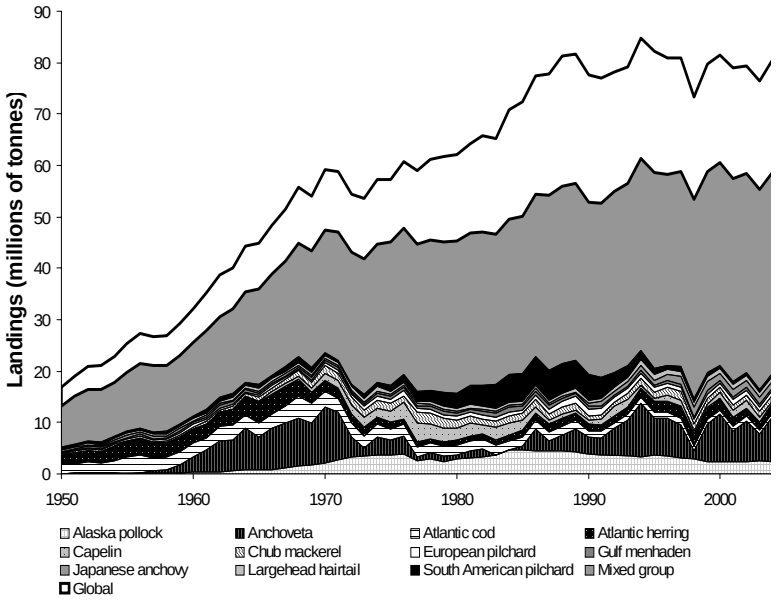

Figure 1. Landings by species in all LMEs (shaded time series), and in the world ocean (top black line). Our website (www.seaaroundus.org) also presents landings by 'Commercial groups', 'Functional Groups, as used in Ecopath models (see www.ecopath.org), 'Country fishing', and 'Gear', based on Watson et al. *(2006).*

Figure 2 illustrates the dual nature of newly derived Stock-Catch-Status Plots, for all LMEs in the world combined. It illustrates that, overall, 70 % of global stocks within LMEs are deemed overexploited or collapsed (Figure 2, top), while only 30% of the stocks remain fully exploited. However, the latter provide 50% of the globally reported landings biomass, while overexploited and collapsed stocks provide the remainder (Figure 2, bottom). This confirms the common observation (e.g. Worm *et al.* 2006) that fisheries tend to affect biodiversity even more strongly that they affect biomass.

Discussion

The five types of graphs used to characterize each LME (only two types were presented here for all LMEs combined) allow comprehensive overviews of the general status of fisheries of LMEs. Catch and catch values indicate status and trends of the fisheries, through changes in catch levels and composition. These relate strongly to the status of

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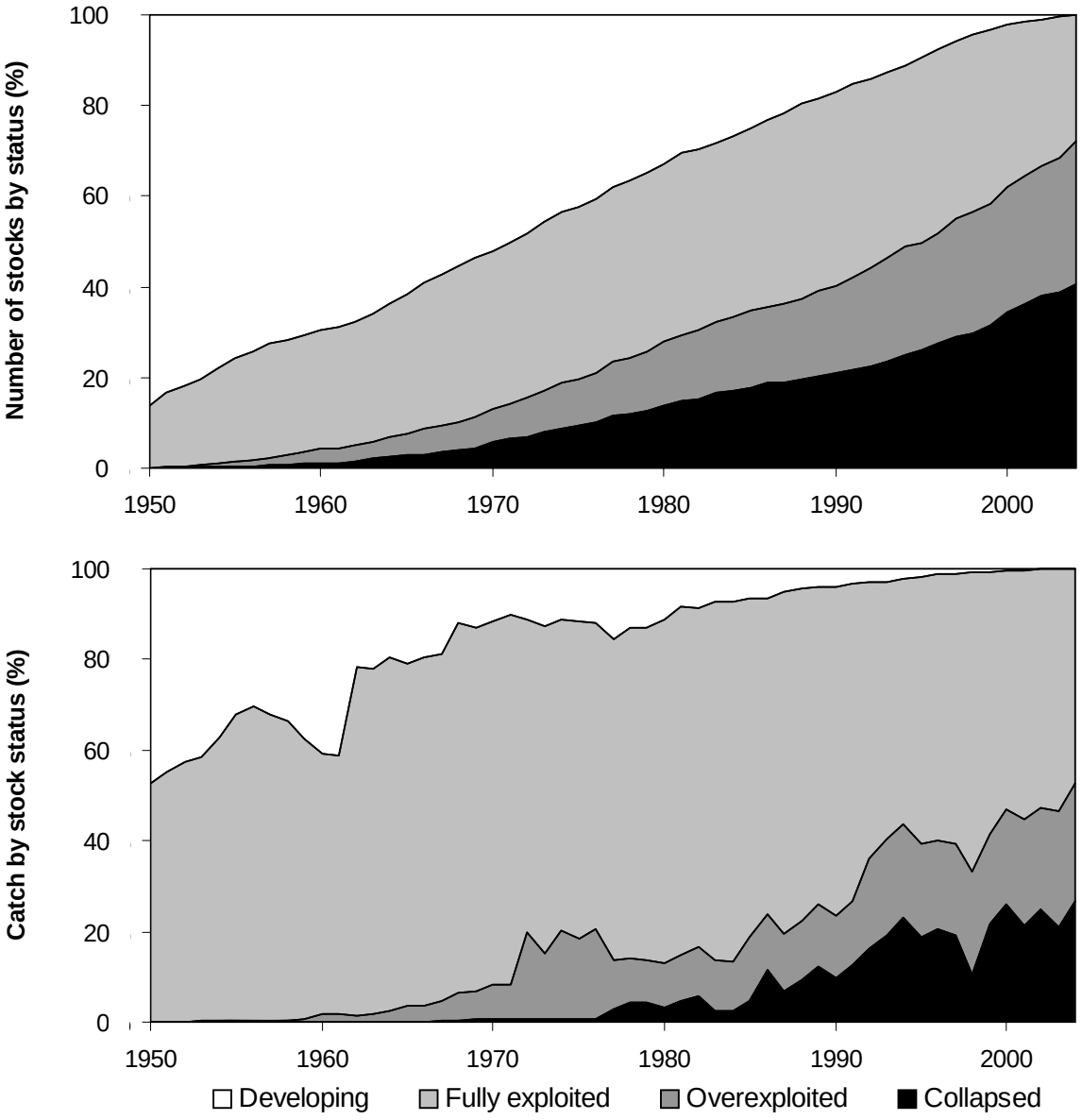
stocks in the LME, as indicated by the Stock-Catch-Status Plots developed here. These graphs, however, require accurate and complete catch data. Such catches are not available for all LMEs. The methods we use for re-expressing FAO's global reported landings dataset on a spatial basis, here through LMEs, cannot compensate for these limitations. Rather, it makes them visible, and emphasizes the need for catch reconstruction at the national level (*sensu* Zeller *et al.* 2007), from which LME catch time series can then be derived. Hence the present emphasis by the *Sea Around Us* project on catch reconstructions, i.e., on accounting for IUU catches.

References on page 6 - LME



... fisheries tend to affect biodiversity even more strongly that they affect biomass

Figure 2. A newly proposed type of paired 'Stock-Catch-Status Plots' (here presented for all LMEs in the world combined), wherein the status of stocks, i.e., taxa with a time series of landings in an LME, is assessed, based on Froese and Kesner-Reyes (2002), using the following criteria (all referring to the maximum catch in the series): Developing (catches < 50 %); Fully exploited (catches >= 50%); Overexploited (catches between 50% and 10%); Collapsed (catches < 10%). Top: Percentage of stocks of a given status, by year, showing a rapid increase of the number of overexploited and collapsed stocks. Bottom: Percentage of catches extracted from stocks of a given status, by year, showing a slower increase of the percentage of catches that originate from overexploited and collapsed stocks. Note that the number of 'stocks', i.e., individual landings time series, only include taxonomic entities at species, genus or family level, i.e., higher and pooled groups have been excluded.

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Sea Around Us

Ecopath with Ecosim 6: the sequel

by Villy Christensen and Sherman Lai

The Ecopath with Ecosim (EwE) approach, which has been primarily developed at the UBC Fisheries Centre, was in 2007 named as one of the ten biggest scientific breakthroughs in NOAA's 200-year history (http://celebrating200years.noaa.gov/toptens.html#categories). The citation highlighted that Ecopath "revolutionized scientists' ability worldwide to understand complex marine ecosystems". Behind this lay a couple of decades of development work accompanied by a strong dedication to user support and training, resulting in some 6000 registered users in 155 countries. The many years of development have, however, also had a less-desirable effect. As we have been expanding the approach, the software implementing it has grown to be a rather complicated entity, with limited ability for customization, e.g., through addition of alternative calculation modules by other developers. Also, making things worse, the development environment (Microsoft VB6) we have used since the late1990s is no longer supported. EwE5 was technically reaching its limits, and we were faced with a difficult decision of whether to carry on while the going was good, refurbish or rebuild.

Motivation to overhaul is one thing; being able to see it through is something quite different. Too many successful scientific softwares have faced sudden death when they were redeveloped. Adding to such concern is that, while it is feasible to obtain funding for application of tools and models, it is extremely difficult to get funding for tool development. We have been fortunate, however, to get support from the Lenfest Ocean Program (www.lenfestocean.org) for redeveloping EwE over a two-year period 2005-2007. The outcome of this is a new release of EwE (6), developed in a new, integrated software environment (.NET) and totally restructured so that only the key computational parts have been ported, while all other parts, module structure, data handling, user interface, etc. have been re-programmed as fully object-oriented programming.

Ecopath with Ecosim version 6 (EwE6) is available for free download from www.ecopath.org

The new EwE6 has been restructured to modularize its individual components, and we have completely separated the user interface from the computational core so that we can implement different interfaces - not just the standard scientific but also, for instance, gaming interfaces. Doing so was actually the main reason for embarking on the redevelopment and this is where the focus will be for the next phase of the Lenfest Ocean Futures Project

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... in support of ecosystem-based management of fisheries, while offering a possibility for managers to quickly explore alternative scenarios ...

(www.lenfestoceanfutures.org). The Lenfest Ocean Futures Project is designed to explore ways in which current fisheries management approaches can be modified to become more responsible from social and economic as well as ecological perspectives. The project is developing a new approach to evaluation of fisheries management through an EwE-based ecosystem modeling and visualization methodologies, aimed at exploring management scenarios in policy and management workshops. The project relies on development of three technical components: optimisation of the ecological software system, Ecopath with Ecosim (EwE); development of interactive gaming software; and visualization of the impact humans have on ecosystems through fishing activities. The activity will thus serve to support ecosystem-based management of fisheries, while offering a possibility for a group of managers to quickly explore alternative scenarios and evaluate the potential outcome.

During the many years we have developed EwE, it has grown to a very complex and capable software for evaluation of ecosystem-based management of aquatic ecosystems (or for an ecosystem-approach to fisheries as FAO calls it). As discussed above, this has led to very wide-spread use of EwE, to the degree that there are now active projects and very capable modelers using the approach in most fisheries countries of the world. The group of developers has, however, remained quite small, with most being attached to the UBC Fisheries Centre. This, we find, is related to how the 'old' EwE5 was structured with one big, interlinked coding block. If a developer, as has happened, wanted to create a new module for EwE5, this entailed going into the existing code, finding the variables of interest, adding new forms, etc. While this was all very feasible and indeed straightforward to do, there was a major hurdle: maintenance. Whenever the core developer group (i.e., Carl Walters and Villy Christensen) updated the master source code, the 'private' versions would be left behind and the developer had to download the new master code and then integrate the new modules again. This process had to be repeated numerous times, and we see this as a major reason for why the group of EwE developers remained quite small.

With EwE6, we have broken with the past. The programming of the new version is fully object-oriented, which ensures code integrity and enables multiple developers to work on the code simultaneously. We have thus had a team of developers (see box above) working on the source code in parallel, and updating the code daily through a web-based version control system.

To enable external developers (who can get access to the web-based source code on request) to create and easily maintain new modules, we have

Continued on page 3 - EwE6

EwE6 has been developed by Joe Buszowski, Villy Christensen, Fang Gao, Joe Hui, Sherman Lai, Jeroen Steenbeek, Carl Walters and Will Walters, Carie Hoover and Robyn Forrest.

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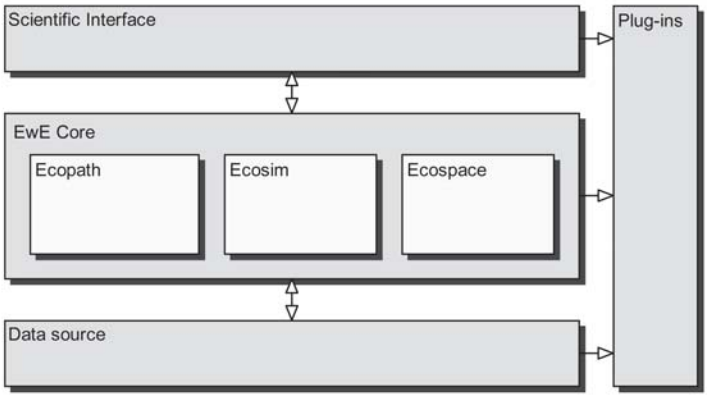
developed a 'plug-in' system, which makes it possible to query the computational core at a number of breakpoints, and then to replace sequences of the calculations, perform new calculation, obtain or pass on variable values (for instance to display results or modify the program flow in other ways). The plug-in system is also capable of accepting new modules, which if dropped in the program folder that holds EwE6, will integrate in the Navigator and menu-system of EwE6, without a recompilation of the program being necessary.

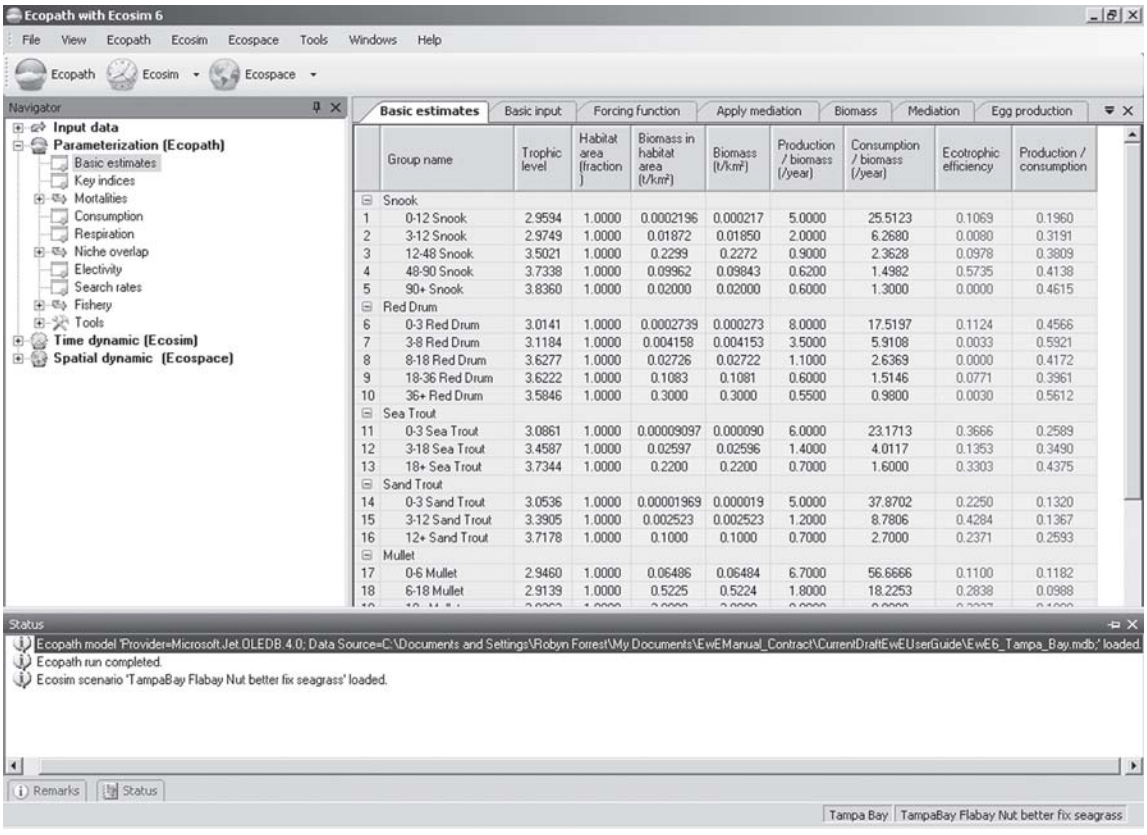


The new EwE6 is developed with a computational core that communicates with the data source and the scientific interface, as well as with 'plug-ins'. The plug-ins may implement new interfaces (e.g., gaming), new scientific routines and extract customized results.

A major aspect that is being facilitated through EwE6 is that it allows for customization of the approach

It is thus now a major aspect of EwE6 that it allows for customization of the approach. For example, if an agency office wants to present some specific analysis and results to a fisheries management council, they can straightforwardly develop a new interface for EwE6, and it can be customized with exactly what needs to be included. It can thus can be under the control of the agency; yet, they can benefit from the shared facilities in the form of data storage systems, etc., which will facilitate both development and management as well as making it easier to cooperate with other agency offices working with other versions.

Continued on page 4 - EwE6



The new EwE6 interface – a new look and feel offering increased flexibility. The 'Navigator' in the left panel has replaced the previous versions' button-bar navigation.

EwE6 - Continued from page 3

EwE6 can also be called from other programming environments, for instance from R. Given the rapid development of this environment (from which we have learned in the design of EwE6), we see this as an especially promising avenue. It is thus possible to create routines for analysis in R that can call the EwE6 libraries, for instance to run Ecosim, while giving and obtaining parameter estimates. We are also able to couple EwE6 to other models using Internet protocols and this is especially of interest for linking to UNIX-based biogeochemical models.

Our focus with the redevelopment has, up to now, been on porting/redeveloping the existing capabilities of EwE5, and as we are about to declare this part of the development done ("Mission Accomplished", you remember), we can focus on new elements. One development worth noting is a zoning tool, Ecoseed, which will form part of the EwE6 spatial modeling approach, Ecospace. This development is being funded by the David and Lucile Packard Foundation through the Duke University EBM-Tools Development Innovation Fund, and involves building a 'bridge' between Ecospace and MARXAN, a very widely used zoning tool.

While the development of EwE6 will continue for the foreseeable future, we are now reaching the stage with it where we can start thinking about user support. Two initial training courses are thus planned for early 2008. One will be in South East Asia and will focus on participants in the GEF/LME projects in the region, while the second will be hosted by the Guinea Current LME project in Ghana, and likely will involve participation from 19 West African countries.

The Ocean Hero Award is given to those who make contributions through their professional work to improve the health of the world's oceans

Daniel Pauly wins 2007 Ted Danson Ocean Hero Award

Daniel Pauly has been awarded the Ted Danson Ocean Hero Award at Oceana's 2007 Partners Event. The event is held annually in Los Angeles to honour individuals who have made outstanding contributions to protection of the oceans. There are two awards: the Partners Award and the Ocean Hero Award. The Ocean Hero Award is given to those who make contributions through their professional work to improve the health of the world's oceans. Previous honorees include James Cameron, Jean-Michel Cousteau and Julie Packard.

The 2007 Partners Award was presented to Former U.S. Vice President and Nobel Prize winner, Al Gore. The Partners Award was established in 1994 by American Oceans Campaign to honour individuals who have made outstanding contributions through their personal commitment to the cause of protecting the world's oceans. Former honorees include Pierce Brosnan, Ron Howard, Hillary Rodham Clinton, Bill Clinton and Ted Danson (founder of American Oceans Campaign).

Daniel Pauly, Oceana CEO Andy Sharpless, Anjelica Huston, Vice President Al Gore, Mary Steenburgen and Ted Danson.
Photo by Eric Charbonneau. Reproduced with permission from Oceana.

For more on Oceana, see http://oceana.org/international-home-nao/.

Sea Around Us

On bycatch or How W.H.L. Allsopp coined a new word and created new insights

by Daniel Pauly

An old friend of mine, and often a role model, Dr. W.H.L. 'Bertie' Allsopp recently turned 80, and wrote me that at the celebration, his brother, the author of the Oxford Dictionary of Caribbean English Usage (Allsopp 1996) asked him for a reference attesting the earliest introduction of the word 'bycatch'. Bertie, who was for many years a senior official at the Canadian International Development Research Centre (IDRC; Allsopp 1989) provided me with the background in two e-mails, whose substance, slightly edited, was as follows:

"The use of the term 'bycatch' originated in British Guiana in 1950 when I was first shown the large discards of catfishes (which were called 'skinfish'), caught incidentally by local fishermen in their nets and abandoned as unmarketable. We started, from 1950-1955, an 'Eat-More-Skinfish Campaign' with the full participation of the Governor and other high colonial officials, fish-feasts on St Peter's day, recipe book, calypsos, etc.

Figure 1. Sample of publications dealing with bycatch.

When a trawling survey, conducted off Guyana in 1957, found large resources of penaeid prawns, the situation became much worse. Soon, over 200 US, Japanese, and other Guyana-based trawlers started jettisoned their bycatch. However, the FAO declined to help. They hired me, however, to work for them in West Africa from a base in Togo. There, I saw the same pattern of discarding by shrimp trawlers, again considered by FAO a normal industrial practice.

It was only when I resigned from FAO, and started the IDRC fisheries program in 1972, that there was hesitant approval to undertake a bycatch utilization project in Guyana (Allsopp 1982). My new word – 'bycatch' - was first questioned, but eventually accepted as replacement for 'trash fish'. It also beat cute ('bye-catch') and boring ('non-target species') alternatives. The publication division of IDRC also identified similar terms

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for translation into its French, Spanish and Arabic publications. IDRC made a film on the topic, which had a great impact on policy makers, though we also got lots of resistance, especially from the USA and Japan. The word bycatch was then adopted by European environmentalists, by the Inter-American Development Bank, UNEP, and finally by FAO, which made the reduction of bycatch a good thing under their Code of Conduct for Responsible Fisheries. In fact, they just published the second edition of a 'Guide to Bycatch Reduction in Tropical Shrimp-Trawl Fisheries' (Eayrs 2007; see Fig. 1).

There is an opportunity for the Sea Around Us *project to advocate the wider development of bycatch-based products for human consumption*

I think there is an opportunity for the *Sea Around Us* project to advocate the wider development of bycatch-based products for human consumption. This was admirably done, for example, in Singapore, where they modified standard Japanese fish processing machines to handle smaller bycatch species, and trained fish technologists to start a new industry with the latest machinery. This is now a billion dollar seafood industry. The new products that are available for direct human consumption are marketed at greater value than the customary shrimp and fish. Looking up a Google search for 'bycatch from shrimp trawling', I find that there are over 120,000 hits [see Figure 1 for a sample]. All of this started with our humble advocacy from Guyana in the 1950s."

Simply put, Bertie Allsopp saw bycatch when others saw trashfish. I wonder how many new worlds lurk in words not yet invented.

References on page 4 - Bycatch

On volunteering for the *Sea Around Us*

by Lou Frotté

The Sea Around Us project regularly employs volunteers to assist with its work. This mutually beneficial arrangement provides young scientists with an opportunity to gain experience and to network while furthering the work of the project. Our most recent volunteer, Lou Frotté, joins us from France.

My first aim when I volunteered as an intern with the *Sea Around Us* was to gain professional experience in fisheries research, whilst at the same time improving my English. My second ambition was to enjoy my time here and discover the landscape and culture of British Columbia.

My work here has focused on the French territories in the South Pacific Ocean - that is to say French Polynesia, New Caledonia and Wallis and Futuna islands. I have collected a large amount of data about catches from commercial and subsistence fisheries between 1950 and 2005, using published sources. Processing these data has allowed me to estimate annual catches and match these data with those published by FAO. In most cases, FAO's numbers were lower than my estimates. Currently, I am taking the same approach for the French Antilles (Martinique and Guadeloupe) and French Guiana.

I have enjoyed my time at the Fisheries Centre - with both researchers and students. I have achieved my professional aims and have also discovered a beautiful country with an ubiquitous, wild nature and friendly people.

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The untapped treasure of local fishers' knowledge

by Dawit Tesfamichael

Clockwise from top left:

1. A fish landing site in Hodeidah, Yemen;

2. A fisherman with his son being interviewed in Hodeidah, Yemen. Net-mending time is one of the best time to do interviews;

3. Catch ready for sale in Port Sudan, Sudan

Photos by D. Tesfamichael

Many people who have been to a fish landing site and spent a few hours talking to fishers and observing the busy and non-stop movements of different kinds of people will agree that a lot can be learned about fish and fisheries right there. Fishers have a great deal of knowledge, accumulated over their years of experience. In many tropical fisheries, which are dominated by small scale traditional fishing methods, "lack of data" is always mentioned as a problem. Actually, over my few years in the Fisheries Centre, I have heard many researchers from the relatively "data rich" temperate countries also complaining about it.

As part of my PhD research, I went to countries bordering the Red Sea to obtain data for my thesis. I looked not only in the usual places, such as ministries, research institutes and universities, but also at fish landing sites, on the boats and in fishing villages. The objective was to interview fishers in order to obtain historical background and time series information for Red Sea fisheries. The work was done mainly by interviewing fishers of different age groups.

In the absence of data records, it is not uncommon for researchers to depend on information gained from people knowledgeable about the system and the issue being investigated. For example, oral traditions (a.k.a. Local Environmental Knowledge, LEK, or Traditional Environmental Knowledge, TEK) have been a valuable source of information about historical events in fisheries (e.g. Neis *et al.* 1999, Sáenz-Arroyo *et al.* 2005). Pauly (1995) argues that anecdotes e.g., about occurrence of species, can be 'as factual as temperature records'. Sometimes the only information available is expert or traditional knowledge and not using it may mean putting the fisheries at risk (Johannes *et al.* 2000). A good example of using information from fishers is in estimating unreported catch, which as the name indicates, is not found in any reports (Tesfamichael and Pitcher, 2007). Hence, in the situations of many countries where good, long-term data-recording systems do not exist, every effort should be made to collect information from the fishers themselves.

It goes without saying that including fishers, or users of other resources, in the assessment and management of

Continued on page 4 - LEK

Oral traditions [...] have been a valuable source of information about historical events in fisheries

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resources has many advantages. Their knowledge of the system is usually quite extensive and is an important guide for starting any kind of survey. Fishers' knowledge may also be complementary to existing knowledge of the resources. Understanding the motivations, concerns and operations of fishers is also an important part of ecosystem-based management, for isn't ecosystem-based management about taking a holistic approach - and what is the whole without the human element? From a practical point of view, the participation of resource users in decision-making may also increase the odds for successful sustainable use of resources. This issue was highlighted in the 8th Larkin lecture by Dr Ray Hilborn titled "Managing fish is managing people" (see Hilborn 2007) and also in many publications.

Many fishers told me stories of encounters with marine creatures that were sometimes bigger than their small boats

I had many opportunities to talk to old and young fishers. More than 400 fishers were interviewed from 3 countries: Sudan, Eritrea and Yemen. Questions were organized systematically so that the historical knowledge or 'data' in the fishers' memories were captured. For example, fishers of different ages were asked what was their best ever catch and when it occurred. They were also asked where they go fishing frequently. This will give an idea of as to what is happening to the resources in time and space. Fishers were also very good at providing information about changes in species and size composition of their catches over a long period of time. The main outputs of my work will be indices showing the status of each fishery and an evaluation of the available statistical data.

An additional treat was the amazing stories the interviewees were willing to share with me. Two of my interviewees were fishers who survived for three days in the sea after their boats were wrecked in stormy seas. Sadly, all of their colleagues were killed in the accident. Many fishers told me stories of encounters with marine creatures that were sometimes bigger than their small boats, although such encounters appear to be less common in recent years. I wonder what other insights will be attained once the interviews are analyzed quantitatively.

Acknowledgements

My heartfelt thanks go to the diligent and friendly assistants I had during the field trip, without whom the field work wouldn't be successful: Ahmed, Aron and Yonathan in Eritrea; Kalid and Mohammed in Sudan; and Fahad and Hesham in Yemen. It was always fun and pleasant to be around Bokretsion, our driver in Eritrea. I would also like to thank many friends and colleagues both in Canada and the countries I visited for their encouragement and contributions in many ways. Thanks is also due to the *Sea Around Us* project for funding the field work.

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Sea Around Us

Short, cold days and long, even colder nights: A successful arctic catch reconstruction workshop[1]

by Dirk Zeller and Shawn Booth

It wasn't above the Arctic Circle, but close enough for *Sea Around Us* project participants Daniel Pauly, Dirk Zeller and Shawn Booth, who presented a talk and conducted a workshop during the Alaska Marine Science Symposium in Anchorage on January 23-24, 2008. The purpose of the workshop was hinted at by the title of Dirk Zeller's symposium talk: "No fish caught in arctic Alaska? Contrasting reported data with actual catches."

The USA is a member country of the United Nations Food and Agriculture Organization (FAO), and thus commits to reporting annual fisheries catches to FAO. Interestingly, an examination of FAO data indicates that the USA does not report any catches for the arctic region of its territory (i.e., northern part of Alaska, Figure 1), as US catches for FAO Statistical Area 18 (Arctic Sea) are zero for the entire 1950-present time period. However, the two main arctic boroughs of the State of Alaska had a human population of approximately 14,500 people in 2005. The majority of this population is Iñupiaq, and is known to extensively engage in subsistence fishing and hunting. Thus, while some fisheries data for subsistence fishing are available via Alaska State agencies (e.g., Division of Subsistence, Alaska Department of Fish and Game, ADF&G), it appears that these data do not make it into the national reports of fisheries catches that the US federal government submits, on behalf of the United States of America, to FAO for global reporting.

The *Sea Around Us* project endeavors to improve global data on the impacts of fishing on marine ecosystems, and thus engages in catch reconstruction activities in which the project utilizes all available data and information sources to derive estimates that better account for likely true extractions of marine resources (see, e.g., *Sea Around Us* Issue 35). Not only do we utilize commercial fisheries data (which are generally reported by official fisheries data collection agencies), but we also incorporate non-commercial and small-scale fisheries sectors. Often these small-scale sectors are monitored by State (e.g., Alaska Division of Subsistence) and Federal (US Fish and Wildlife Service) agencies that generally do not have an

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1. This project and the workshop were funded by the Lenfest Ocean Program, with excellent workshop logistics and local contacts facilitation provided with enthusiasm by Jon Warrenchuk and Susan Murray from Oceana - Juneau, Alaska.

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exclusive fisheries mandate such as NOAA-NMFS. Until investigated in detail, it remains uncertain if, and which parts of, small-scale, non-commercial fisheries data are incorporated in federally-reported statistics. From past experience (Booth and Watts, 2007; Zeller and Pauly, 2007; Zeller *et al.*, 2007), we have found that, in general, catches for large-scale commercial fisheries are relatively well documented and reported, whereas catches for small-scale and subsistence fisheries are often neither reported to national fisheries agencies nor incorporated in national accounts as provided to the global community via FAO.

This will serve as baseline, so far missing, for the anticipated push for expansion of fisheries in the arctic region, driven by climate change

Thus, we proposed to assemble available information and data, and reconstruct historic fisheries catches for the arctic area of Alaska, for the period from 1950 to the present, based on the approach outlined in Booth and Watts (2007) and Zeller *et al.* (2007). The overall aim was to derive estimates of total removal of fisheries resources for this period. This will serve as baseline, so far missing, for the anticipated push for expansion of fisheries in the arctic region, driven by climate change. Important in this context is the present development of an arctic fisheries management plan by the Pacific Fisheries Management Council in Alaska. We hope that our reconstructed data will provide a representative baseline and input into any such plan.

Fisheries in this area fall under the mandate of the state, as they occur within 3 nm of shore. Commercial fisheries are reported annually by the ADF&G-Division of Commercial Fisheries. Subsistence catches are reported only intermittently for some communities, with estimated catches being derived mainly through household surveys. Subsistence catches are reported by the ADF&G-Division of Subsistence, but the re-construction process also used reports from other sources, especially for the earlier time periods. Having completed a preliminary time series of estimated fisheries catches, the next step was to go to Alaska and present these findings at a regionally important conference, and discuss the findings at a workshop with local experts.

The symposium presentation gained interest from a relatively large group of listeners. More importantly, judging by the questions being asked after the presentation, and the people approaching us afterwards, we had managed to target exactly the people we needed to speak to. The general impression from this input was very supportive, and the mutual feeling was that we seem to be getting it right. A few minor missing pieces in the puzzle were also pointed out, and were subsequently addressed during the workshop the following day.

The workshop participants represented a diverse group of local experts and were identified and invited with help from Susan Murray and Jonathan Warrenchuk, local representatives of Oceana. After an initial introduction on the state of global fisheries statistics by Daniel Pauly, Dirk Zeller expanded on the purposes and examples of why catch reconstructions are needed. Shawn Booth then walked participants through the details

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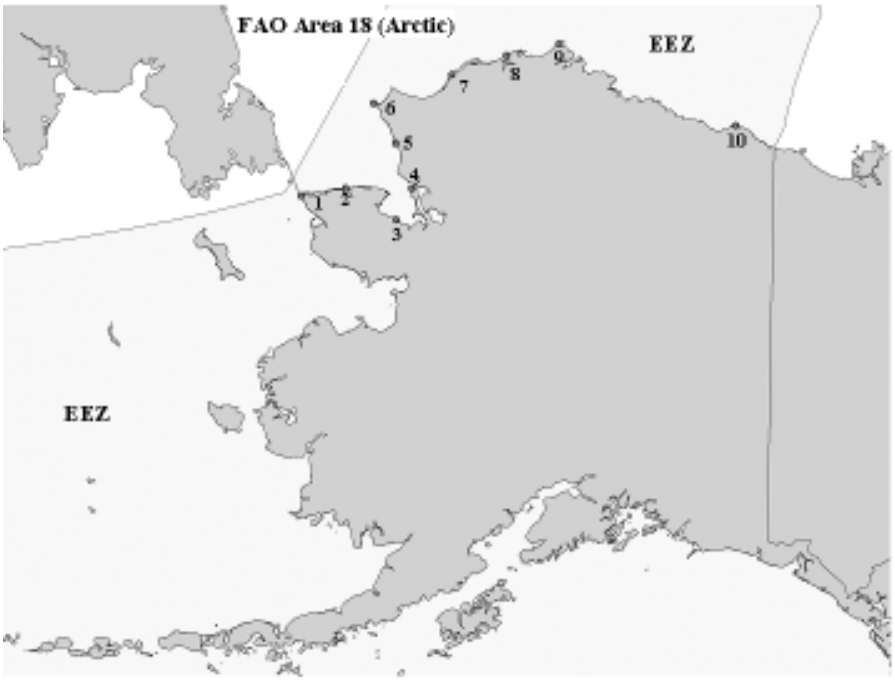

Figure 1. State of Alaska, showing the Exclusive Economic Zone (EEZ) and southern boundary of FAO Statistical Area 18 (Arctic). Indicated also are the arctic communities used in this study: 1) Wales, 2) Shishmaref, 3) Deering, 4) Kotzebue, 5) Kivalina, 6) Point Hope, 7) Point Lay, 8) Wainwright, 9) Barrow, and 10) Kaktovik.

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of the Alaskan arctic catch reconstruction, community by community (Figure 1). During the detailed explanations for each community, feedback from the local participants was sought and given. This feedback was largely related to subsistence catches, which have large data gaps due to the intermittency of studies in time and space.

Two immediate concerns were raised: one regarding species identification and the other concerning communities that were not included in the catch re-construction. The first concern arose because most of the reports describing subsistence catches used non-standardized common names. Thus, each community had to have an initial clarification of local common names, which were then assigned to a taxon. It was proposed that local Iñupiaq names be placed along with the local common name and the scientific names for each species. It was also felt that a few communities that were located further inland should also be included in estimates for anadromous and marine species. Including these other communities' catches will increase subsistence catch estimates, but will also be useful for the local agencies to have a complete picture of the fisheries catches for species that rely, for at least part of their life-history, on marine waters, rather than focusing on capture locations (i.e., fresh water vs marine or brackish water).

A side-benefit to discussing species compositions for each community was the opportunity to assess the arrival of some salmon species to places further north than their historical distributions, illustrating ecological range expansions due to climate change. It seems that chinook salmon, (*Oncorhynchus tshawytscha*), have been appearing in local waters around Barrow since the mid-1990s, but there is no local Iñupiaq name for them (Craig George, North Slope Borough-Division of Wildlife Management, pers. comm.).

Another point was raised in relation to commercial fisheries. There are basically two commercial fisheries in the area, one located on the North Slope, targeting arctic cisco (*Coregonus autumnalis*) near the mouth of the Colville River, and another fishery, largely targeting chum salmon (*Oncorhynchus keta*) around Kotzebue Sound. These fisheries began in the 1960s - however, Charlie Lean (Norton Sound Fisheries Research and Development) pointed out that despite the commercial fishery in Kotzebue Sound being deemed by government reports to have started in 1962, there were local commercial fisheries taking place prior to that date. The commercial fishery pre-1962 was an informal one, whereby local people sold their catch for dog feed to people who ran dog-sled teams, the transportation link prior to the introduction of the snow-mobile.

The commercial fishery pre-1962 was an informal one, whereby local people sold their catch for dog feed to people who ran dog-sled teams

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Of turtles and people: 28th International Sea Turtle Symposium

by Colette Wabnitz

A landmark turtle conservation accord was signed between the Grupo Tortuguero and a local fishing co-operative

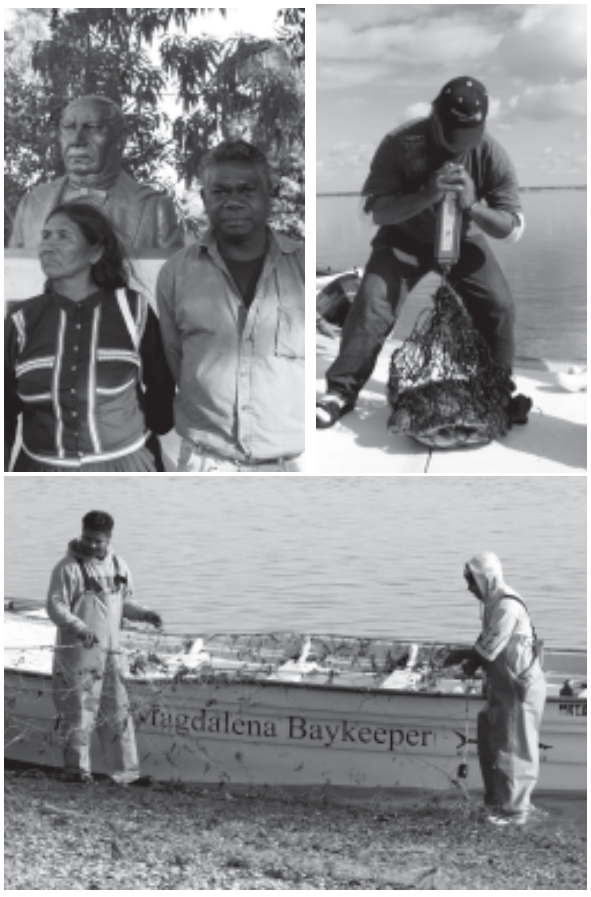
Every year the sea turtle research community gathers in more or less exotic places to share and report on the latest progress on sea turtle research and conservation. Organised by a team of intrepid and visionary folk led by J Nichols (Senior Research Scientist at the Ocean Conservancy), this year's event sought to depart from the usual format of international meetings. Instead of a cosmopolitan city, the symposium was held in the community of Loreto, Baja California Sur, Mexico (population: 12,000). The location was strategic for two reasons. First, it is on a beach in Baja that Nichols released a satellite-tagged loggerhead turtle12 years ago. Adelita, as it was nicknamed, would swim across the Pacific Ocean to its birthplace in Japan representing the first time that a turtle had been tracked across an ocean basin. Second, the international congress was meant to coincide with the annual meeting, and 10-year anniversary, of an important regional environmental organisation, the Grupo Tortuguero (GT).

The GT is a network of individuals, communities, organizations, and institutions from around the world, dedicated to sea turtle conservation. By uniting fishers, scientists, conservationists, and other stakeholders, the GT's success is built on a foundation of solid science, coupled importantly with the trust that researchers have nurtured over the years with the members of local communities.

The GT's efforts led to two notable achievements in 2007. Through an international exchange programme, local fishers from Baja California were brought together with their counterparts from Hawai'i and Japan to share information on turtle-friendly fishing methods. A landmark turtle conservation accord was also signed between the GT and a local fishing co-operative. By ratifying it, the co-operative members agreed to give up longlines in exchange for less harmful gears such as traps and surface nets.

This year's International Sea Turtle Symposium also placed emphasis on Native Oceans - seeking to recognise that indigenous communities' efforts to conserve their natural environment are a key and integral component of international initiatives. Indeed, not only are native peoples often those living closest to the natural environment, they also maintain deep cultural ties to marine species such as sea turtles, and a direct need to coexist with these species. Some of the events at

Continued on page 5 - ISTS



Clockwise from top left: 1) A Seri woman and Torres Strait Islander meeting here for the first time and sharing traditional knowledge and customs; 2) Adan, a local fisherman and member of the new turtle tourism initiative, seen here weighing a turtle; 3) Local fishers cleaning the nets after a night spent catching turtles in order to tag and release them. The fishermen are part of a local initiative, Magdalena Baykeeper, which promotes ecological welfare through public advocacy, environmental education and clean-up campaigns.

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the symposium that honoured indigenous initiatives included traditional Seri turtle songs and dances. The Seri, an indigenous group from the state of Sonora, Mexico, consider the leatherback turtle sacred and have strong emotional, spiritual and cultural ties to the animal. One of the most moving, powerful, and humbling events of the meeting was a roundtable and exchange of gifts between native community members from countries including Mexico, Panama, Australia (Torres Strait), Nicaragua and Palau.

In keeping with the common entreaty to "think globally, act locally", the symposium also saw the Ocean Conservancy officially launch the SEE Turtles Project (www.seeturtles.org). This initiative, currently in its pilot phase and with one of its sites in Baja California Sur, aims to promote turtle conservation through small-scale ecotourism. By working with tour operators that have strong environmental records, the project primarily seeks to help build non-consumptive alternatives to illegal fishing.

Another remarkable aspect of this meeting was the effort to keep the event's environmental footprint as small as possible: local transport was provided chiefly by our own feet, recycling bins were placed in strategic locations, and eating choices were sustainable and local. LIVBLUE Awards were given to those attendees who had travelled the greatest distance but with the lowest carbon footprint, showcasing some interesting and often rather entertaining methods of footprint reduction!

Mercury in the Chesapeake?

by Shawn Booth, Howard Townsend[1] and Villy Christensen

The Chesapeake Bay is in the backyard of those who live on the eastern seaboard of the United States. Its brackish water touches Maryland and Virginia, while its watershed extends to the states of Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia. Not unimportantly, it forms the backyard of Washington, DC, where the powers that be often struggle to demonstrate concern for the environment.

With this background, it is no surprise that very considerable effort over the years has been allocated to cleaning up the Bay, as well as to attempting to restore it to a more original state. The Bay has, in modern times, changed from having a vast abundance of oysters, that may once have kept the waters clear, to a state where agricultural run-off impacts water quality and where anaerobic conditions prevail in the deeper parts.

There is also concern about pollutants. For this, the U.S. Clean Water Act sets Total Maximum Daily Loads (TMDLs) to determine the amount of a pollutant that a water body can receive while still maintaining water quality standards. TMDLs have been or are being developed for each state impacting the Chesapeake Bay, and there is special interest regarding mercury, which is a contaminant in coal. Chesapeake states, particularly Pennsylvania, have most of their electricity generated by coal-fired power plants. With atmospheric transport, mercury is deposited into the Bay, and transformed into physiologically-active methylmercury compounds. Methylmercury can cause deleterious effects in fish (Klaper *et al.* 2006), and is also a human health concern (UNEP 2002), primarily through seafood consumption. Therefore, the individual states set consumption advisories for the amount of seafood that can be consumed where methylmercury loads are of concern. For example, the Maryland Department of the Environment recommends that the general public should avoid eating more than two standard servings of smaller striped bass (*Morone saxatilis*) per month. Larger ones should be consumed much more rarely.

Methyl mercury can cause deleterious effects in fish and is also a human health concern, primarily through seafood consumption

With this background and with TMDLs being developed for mercury, the Chesapeake Bay Program's Scientific and Technical Advisory Committee arranged a workshop to develop integrated modelling and monitoring programs for mercury in the Chesapeake Bay from Oct 2-4, 2007 – a workshop in which we participated. The workshop focused on three main topics: emission inventories, atmospheric modelling, and ecosystem modelling, with our contribution focusing on the latter.

We have been working for several years on a detailed ecosystem model of the Chesapeake Bay using

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1. NOAA Chesapeake Bay Program Office/Collaborative Oxford Laboratory

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The workshop also highlighted the utility of data 'handshakes', where the output of the atmospheric models [...] can be used as inputs within Ecospace

Ecopath with Ecosim (EwE) in a co-operative effort funded through the NOAA Chesapeake Bay Office's Fisheries Science Program. As part of this we have constructed an EwE model that describes the ecosystem, and how its resources have been used and developed since 1950. We used this model with the Ecotracer module of EwE to track how methylmercury moves through the foodweb. We fitted the model to available data on methylmercury loading for various fish species in the Chesapeake, based on loading values derived from sediment cores which reflected trends in mercury input from 1955 to 2005. We found that the model, although preliminary, was quite capable of tracking the methylmercury concentrations that have been observed for fish in the Bay.

An interesting observation was that we could see the impact of a moratorium of fishing for striped bass in the Bay. Because of stock depletion, Maryland and Delaware stopped all fishing from 1984-1990, and Virginia imposed a one-year moratorium in 1989. The ecosystem model shows how the striped bass population was severely depleted up to the mid-1980s and has since recovered to what may be historic levels. The estimated methylmercury trends closely follow the population trends: when the stock was depleted in the mid-1980s the methylmercury loads were at an all-time low, and have rebounded since the population recovered. The explanation is simple: low population size is associated with high mortality rates, and this equates to young individuals with low methylmercury loading. When fishing pressure was restricted with the moratorium, we saw the population grow older and hence have longer to accumulate the toxin, with the bottom line being that mercury loading increased disproportionately with age. For some, this is an unforeseen consequence of a moratorium impacting mortality of fish populations. It is also an interesting observation that may help explain increased susceptibility to mycobacteriosis, a bacterial disease that has affected striped bass in the bay in recent years. Overall, we found that the two main predictors of methylmercury concentrations in the 45 functional groups in the model were trophic level and longevity.

The workshop also highlighted the utility of data 'handshakes', where the output of the atmospheric models (which include point and non-point sources of mercury emissions) can be used as spatial inputs within the spatial-dynamic EwE module, Ecospace. This is an area we are now exploring further.

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Alaska - Continued from page 3

The feedback gained through the symposium presentation and workshop activity will form part of the final report for fisheries catches in the Alaskan arctic. This work will extend the reconstruction to include more communities and also report the total catch of fish for both the commercial fisheries, which will be extended back in time, and for the subsistence fisheries, which will include the total catch of marine and anadromous species regardless of capture locations. This was deemed important by the local participants in light of potential lost opportunity costs for any development that might hamper the ability of the communities to participate in subsistence fishing.

Having successfully navigated arctic marine fisheries 'waters' through this workshop, we retired to a nice dinner after bravely venturing (temperature influenced) less than two blocks outside the workshop venue.

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Sea Around Us

Around the fisheries world in 90 days

by Ussif Rashid Sumaila

January 14, 2008 marked the end of my quiet days in the first quarter of the year, when I took off to Nha Trang, Viet Nam to attend a training workshop organized by the World Bank and the WorldFish Center. Other trips in January were to Penang, Malaysia, to give a lecture, and Washington, D.C. to participate in a workshop on corruption in fisheries at the World Bank. February came with its own list of places to visit. My first stop was in Boston, USA, where I attended the 2008 American Association for the Advancement of Science Meeting; then to Kiel, Germany to participate in the final Steering Committee Meeting of the European funded Incofish project (www.incofish.org/index.php). Next, I went to Dakar, Senegal, to participate in a documentary on fisheries in West Africa, and, finally for the month, I travelled to Ottawa, Canada to serve as an expert witness on fisheries subsidies and the World Trade Organization, at the February Meeting of the Standing Committee on Fisheries and Oceans in the Canadian Parliament. March took me first to Monaco, where I was invited to chair a session at an international seminar on governance of high seas biodiversity (the Prince of Monaco was in the audience). Second I went to Lima, Peru, where I was asked to give a talk at IMARPE, Peru's National Fisheries Research Institute, on the need to establish a socioeconomics research unit at the institute. My final visit of the month was to Rio Grande, southern Brazil, where I contributed to the design of a new project on climate change and fisheries, based at the Federal University of Rio Grande (www.labmon.io.usp.br/projects/sacc-CRN2/SACC_CRN2.html).

Participants at the Peruvian Marine Institute meeting (L-R): Renato Guevara-Carrasco (FAO), Rashid Sumaila, Astrid Jarre (University of Cape Town), Rafael Rey Rey (Minister of Production, Peru), Gerd Winter (University of Bremen, Germany), Claudia Wosnitza-Mendo (Peruvian Marine Institute, IMARPE) and Carlos Benites (Peruvian Marine Institute, IMARPE. Photo by Unidad de Comunicaciones e Imagen Institucional del IMARPE.

In the next few paragraphs, I select a few of the activities undertaken during my 90 days around the fisheries world, and provide some details.

The goal of the Nha Trang training workshop was to equip World Bank task managers and program officers from partner development agencies to make informed judgments about how to address fisheries and aquaculture concerns in 'pro-poor projects' and policy interventions. As part of the workshop, three innovative parallel sessions (denoted 'clinics') were organized so that participants could offer peer-critique and suggestions addressing fisheries project or policy reform efforts, underway or under preparation in different parts of the world. I participated in a session on a current initiative of the Vietnamese Ministry of Fisheries, which has the goal of reducing the current

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overcapacity in the country's inshore fisheries. It was revealed during this clinic that subsidies given by the Vietnamese government to the inshore fishing sector decades ago, to spur development, are a key reason for the current overcapacity in the country's inshore fisheries. Ironically, the government is currently giving subsidies to the offshore fishing sector in the country - repeating the mistakes of previous decades. In my opinion, the single most important policy action that Viet Nam can take immediately is to stop subsidizing the offshore fisheries and to use the savings to help fishers move on to other activities (Teh *et al.* 2008) – otherwise, a few years from now, another group of experts will have to be convened to advise Viet Nam on how to reduce overcapacity in the country's offshore fisheries - when it may well be too late!

My contribution at the corruption in fisheries workshop was based on a report I co-authored with Jennifer Jacquet (cms.iucn.org/search.cfm?uNewsID=202) for the International Union for the Conservation of Nature (IUCN). My intervention briefly highlighted the main stages in the fish chain where corruption can take place. Basically, we concluded that corruption happens both on and off the water – i.e., it occurs throughout the entire fish chain. I ended my intervention by calling for high priority to be given to drastic reduction of corruption in fisheries by all interested parties. Tackling corruption is absolutely necessary if our goal is to use fishery resources sustainably into the long, distant future.

In Boston, I attended the 2008 American Association for the Advancement of Science Meeting (see also www.ubc.ca/aaas/). I participated in two sessions, one of which I co-organized with Kate Newman of WWF-USA. The other was organized by the Fisheries Centre's Mimi Lam, entitled 'Privilege or Right to Fish' (see *FishBytes* Vol. 14 Issue 2). The goal of the session I co-organized was to explore how we can learn from the collapse of northern cod off Newfoundland to help protect tuna stocks, currently facing pressure from overfishing. Session contributors were Barbara Block (Stanford), Jose Ingles (WWF), Mark Kurlansky (Ballantine Books), Daniel Pauly (UBC), Andy Rosenberg (University of New Hampshire), Renne Subido (Growth with Equity in Mindanao, Philippines) and Kate Newman (WWF). Together, we made the case that continued mismanagement could force some tuna populations to quickly go the way of northern cod - a highly threatened fishery that once helped shape economies of whole nations. It seems our call is already being heeded - on June 16, eight Pacific nations banned tuna boats from an area of ocean almost the size of Alaska "to save the fish from a repeat of the collapse of Atlantic cod fisheries in the 1980s" (www.bloomberg.com/apps/news?pid=20601101&sid=aqOdnFHygH1k&refer=japan).

My briefing and the discussion that followed on fisheries subsidies at the Canadian parliament brought to the fore the key reason we still have problems managing our environmental and natural resources sustainably: i.e., the ever-present pressure to trade off future environmental and natural resources in order to minimize current socioeconomic pressures (see www.seaaroundus.org/NewspapersF.htm). This behaviour is now being played out with the current increase in fuel prices (Sumaila *et al.* in press) and the call for fuel subsidies to the fishing sector, to which many governments are succumbing. Until we find a solution to the problem of how to balance the flow of present versus future benefits from our natural environment, we will continue to degrade the environment, with potentially significant impact on the wellbeing of not only future generations but also young members of the current generation.

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ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

Worrying about whales instead of managing fisheries: a personal account of a meeting in Senegal

by Daniel Pauly

On May 8 and 9, 2008, I had the opportunity to attend a workshop in Dakar, Senegal, organized by WWF and the Lenfest Ocean Program (LOP), which was devoted to the interaction between the great whale and fisheries of northwest Africa. The workshop was titled *Whales & Fish Interactions: Are Great Whale a Threat to Fisheries?* and was attended by officials from the fishery ministries of half a dozen countries in the region, from Mauritania to Guinea, WWF and LOP staff, a few scientists, and, most interestingly, by parliamentarians from the host country.

Two whales off Nosy Be island, Madagascar, July, 2007. Copyright: IRD, M.-N. Favier

The great whales in that part of the world come to reproduce and there are no live observations or stomach content analyses indicating that they actively feed (even from several decades ago, when there was some occasional whaling off Northwest Africa). This is in line with what is known about great whales elsewhere in the tropics. Baleen whales, when they feed, rely mostly on krill and other small plankton organisms, and thus they would not, in any case, interact with the demersal and tuna fisheries prevailing off northwest Africa. So why a workshop on this outlandish topic? Why not Fisheries *vs* the Martians?

The reason for the workshop was not only the fact that the countries in the Northwest African region increasingly vote with Japan at meetings of the International Whaling Commission. Rather, it was the fact that their delegates justify such votes on the grounds that their fisheries are negatively impacted by baleen whales. Indeed, they argue that the whole ecosystem is "out of balance": a balance that can be re-established only by killing whales - which flies

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... the top fisheries officials of West African countries appear to have thrown in their lot with their Japanese advisors, and their whales-eat-our-fish mantra

in the face of everything known about the fisheries of the region, whale biology and common sense. And it does get better when it is tailored for local consumption.

This was a very awkward situation for me to be in. I have worked for years on West African fisheries, with colleagues from the region, and have supported their countries' interest vis-à-vis people justifying the activity of EU-based or other distant-water fleets operating in West Africa on the basis of questionable 'agreements', which the coastal countries were blackmailed into signing, and through which their fisheries resources were made available at less than bargain prices (see Kaczynski and Fluharty 2001). These distant water fleets, jointly with the local, totally unmanaged and overgrown 'small-scale' fisheries have reduced the fisheries resources off West Africa to shadows of their former selves, which makes management of these fisheries, and especially a reduction of their aggregate effort, a priority.

This, in fact, was the main result of the EU-funded international research project called '*Système d'Information et d'Analyse des Pêches de l'Afrique du Nord-Ouest*' (SIAP). This project provided for West African scientists and others to collaborate on the analysis of over half a century's worth of catch time series and other data, with the results presented at an international conference held in Dakar in 2002 (see Chavance *et al.* 2004), amidst a flurry of articles in the local press.

This was not the first time, obviously, that such findings were reported. In fact, the SIAP project was largely based on gathering and analyzing the vast literature, spanning several decades, which tracked the declining trajectory of the fisheries off West Africa. This literature, and the syntheses which resulted from the SIAP project, are available to inform local policy-makers interested in reforming fisheries policies. The most crucial reform would be moving from a situation where West African waters are seen as larder from which an endless supply of fish can be extracted to supply foreign markets (Alder and Sumaila 2004) to one where West African countries could build on export and processing of fish to strengthen their own economy, and benefit their own people.

The government positions that I heard at this meeting suggest, however, that such reforms are not being contemplated. Instead, the top fisheries officials of West African countries appear to have thrown in their lot with their Japanese advisors, and their whales-eat-our-fish mantra, for reasons that are either obscure, or too obvious to mention. The excellent scientific presentations at the workshop, by Drs Kristin Kaschner and Lyne Morissette, dealt with the identity of the great whales off West Africa, their behaviour, their incorporation in (Ecopath) trophic models, and the results of some preliminary simulations (with Ecosim), which suggested that killing all the whales off West Africa – even if it could be done - would have little effect on the fishery resources and catches.

At every step, their findings and assumptions were questioned by one or the other government officials, using concepts (such as 'ecosystem balance') and

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arguments ('you have not studied the stomachs of newborn calves off West Africa, so you don't really know that they don't eat our fish') originating in the Tokyo-based Cetacean Research Institute. The only evidence they presented was evidence of bad faith, the whole line of arguments being based on absent data. These purely negative arguments, indeed, are of the same kind as those that advocates of the so-called 'intelligent design' use to criticize evolution by natural selection, but who (for good reasons) never offer a positive argument for the case they attempt to make.

There was a ray of hope, though. The participating Senegalese parliamentarians, both from the Senate and the Lower House, were united in their questioning of their government's position, and in mentioning their surprise at a government policy that has never been publicly debated and which is actually alien to the culture of their constituents. Indeed, this very point was emphasized by a parliamentarian and mayor of a fishing town, who mentioned that her constituents, far from considering whales to be their competitors, consider them their guardians and want to see them protected. This view was echoed by participants from other West African countries.

Still, I left Dakar with a heavy heart. To see that such a great country as Japan has twisted its entire development aid, and corrupted fisheries officials of an entire region for the sake of its tiny, heavily-subsidized whaling industry is sad. It will probably be years before the countries targeted by these delusional policies will see through these manoeuvers, and free themselves from the officials who mislead them. Also, the real potential of whale eco-tourism is not being explored, although it has become a serious source of foreign currency in various other countries, e.g., in Argentina.

Foremost, however, the countries successfully targeted by the whales-eat-our fish delusion fail to concentrate on the real problem they have. This was brutally recalled by the senior parliamentarian at the workshop, who put the issue of the mismanagement of fisheries in the general context of food production in Senegal. He recalled that only a few years

Continued on page 4 - Dakar

... the countries successfully targeted by the whales-eat-our fish delusion fail to concentrate on the real problem they have

Clockwise from top left:
1. Participants at the workshop Whales & Fish Interactions: Are Great Whale a Threat to Fisheries? *in Dakar, Senegal. See www.lenfestocean.org/Dakar_Participants_List_ENG.pdf for a full list of participants.*

2. His Excellency Mr Souleymane Ndéné Ndiaye, State Minister of Maritime Economy, Fisheries and Aquaculture of Senegal, gives a press conference after the first day of the workshop.

3. (L-R) Lyne Morissette (Arizona State University) with a local child; Margaret Bowman (Director, Lenfest Ocean Program); Rémi Parmentier (Workshop Joint Secretariat, Lenfest-WWF WAMER); and Mamadou Diallo (Program Manager, WWF-WAMER in Senegal) in front of the WWF office in Dakar.

Photos: Lyne Morissette

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ago, his country allowed its own rice production to be destroyed by cheap imports from Taiwan, only to be hit a few years later with massive price increases, which have put the now-imported staple out of the reach of most of his compatriots. And he warned that the whales-eat-our-fish issue could have similar effect, by diverting attention from the task of putting Senegalese fisheries on a sustainable track.

... the whales-eat-our-fish issue could divert attention from the task of putting Senegalese fisheries on a sustainable track

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Welcome

This summer, the *Sea Around Us* project employed five new research assistants to work with Dirk Zeller on various catch reconstruction projects. Please join us in making them all feel very welcome.

Former student **Peter Rossing** has joined us to work on an exciting new project. The *Sea Around Us* project recently entered a partnership with the Baltic Sea 2020 Foundation to reconstruct fisheries catch time series from 1950 to the present for all the Baltic countries (see *Sea Around Us* Issues 28, 35, 39 and 45 for descriptions of similar projects for other regions). This work will help provide a better baseline for analyzing long-term trends in fishing and management by providing data that reflect a more accurate picture of historical catches in the Baltic Sea.

In addition to this work, Peter recently travelled to Japan to collect fifty years' worth of Japanese import and export trade statistics, generously provided by the Japanese Ministry of Finance. This was to assist Rashid Sumaila and Wilf Swartz, who are engaged in a project to evaluate economic impacts of the international fish trade globally. As Tokyo remains one of the few places in the world where communicating in English is virtually impossible, Peter would not have been able to complete this work without the help of his wife Miki, who acted as a translator. It was probably an unusual sight for the Japanese Ministry staff to see Peter and Miki travelling the Ministry's corridors with their two young children in tow!

Kenneth Buck has joined us as a summer research assistant, working with Shawn Booth and Dirk Zeller on catch reconstructions for the Pacific islands. He recently completed his BSc at the University of Calgary and plans to begin a computer science degree in the fall.

Rhona Govender is reconstructing Israeli fisheries catches for the Red Sea and Mediterranean and Jordanian catches from the Red Sea. She has just finished her undergraduate degree at UBC in Animal Biology, and will begin an MSc with Daniel Pauly in 2009.

Lo Persson is a student from Sweden and is working this summer with Peter Rossing on the Baltic Sea catch reconstruction project, with particular focus on Swedish fisheries. She will continue this work when she returns to Sweden in the fall and hopes to use the project as the basis of her Master's thesis.

Liane Veitch is working with Shawn Booth and Dirk Zeller on catch reconstructions for the Pacific islands and French territories (French Guiana, Guadelupe and Martinique). She hopes to begin an MSc in conservation science in the UK next fall.

Sea Around Us

West African marine protected areas network

by Colette Wabnitz, Charlotte Karibuhoye and Moussa Fall

From July 15-17, I (the first author of this article) had the remarkable opportunity to participate in a workshop[1] on West African Marine Protected Areas (MPAs), held in Dakar, Sénégal, and convened by the Secretariat for the Regional Marine Protected Areas Network in West Africa (RAMPAO – Réseau Régional d'Aires Marine Protegées en Afrique de l'Ouest).

The ecoregion of "West Africa" officially includes Mauritania, Sénégal, Cape Verde, the Gambia, Guinea Bissau, Guinea (Conakry) and Sierra Leone. In 2002 a regional strategy, aimed at establishing a functional and representative network of MPAs in the region was endorsed by 10 ministers in charge of environment and fisheries in six countries. Since then, although some protected areas in the region such as the National Park of the Banc d'Arguin have benefited from substantial financial and technical support, most countries still suffer from insufficient funds, limited human capacity and weak monitoring systems. It is in light of these limitations and to strengthen regional cooperation that the MPAs of the ecoregion decided to establish a network – RAMPAO. Officially recognized in April 2007, and further endorsed at a special event at the recent IUCN World Conservation Congress, the network currently includes 15 out of the region's 24 MPAs (three biosphere reserves, eight national marine parks and 13 other MPAs, of which two are community based MPAs). Together they cover less than 1% of the region's EEZ.

The workshop convened 30 participants from the Secretariat's seven member countries and included individuals from diverse backgrounds and with a wide range of expertise (e.g., MPA representatives, policy makers and researchers from local institutions). As an overarching goal, the group was tasked with identifying priorities and 'next steps' for making West Africa's network of MPAs operational.

The mornings of the first two days were allocated to a number of presentations focusing on existing ecosystem management and/or analysis tools and resource-databases developed locally:

1. The web portal CIAO (Catalogue d'Information pour l'Afrique de l'Ouest) for West African coastal zone data – chiefly six MPAs;
2. An 'Observatory' for the Banc d'Arguin National Park; and
3. A primarily fisheries focused database (regulations; effort; industrial catch data), held by the CSRP (Commission Sous-Régionale des Pêches www.csrpsp.org). Focus was also given to more international approaches (e.g., Ecopath with Ecosim, Marxan).

During the afternoon breakout sessions participants were asked to:

1. Draft a list of MPA network performance indicators in accordance with RAMPAO's overarching goals and identify data required for their assessment; and
2. Define what participants see as the most functional RAMPAO

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information system set-up and define a set of utilisation criteria for it, whilst ensuring that synergies with existing databases and partners are maximised.

It was wonderful to witness the high level of motivation expressed by all participants

It was wonderful to witness the high level of motivation expressed by all participants during these breakout sessions. Discussions were incredibly lively, often highlighting the different needs of, and approaches employed by, individual countries, as well as points of view stemming from individual participants' backgrounds (i.e., government, research institution, etc). An essential element to the success of the workshop was the time allotted to participants to reconvene and allow them to reach common ground when drafting the overarching resolutions.

Other points of discussion that stood out and are worthy of note include:

1. The importance of governance in the successful implementation of MPAs;
2. The importance of conducting scientific studies on the 'spillover' effects of MPAs in tropical non-reef areas. Many of the potential benefits communicated to communities are in part based on science that has been conducted in tropical *reef* areas, with only limited evidence to date for 'spillover' effects in tropical non-reef areas;
3. Although it is indeed important than the regional MPA network be 'biologically' representative and thus conserves species, ecosystems and important ecological processes, all participants underlined the importance of social and economic aspects of MPA management, particularly their role in maintaining sustainable fisheries. Indeed, many, if not most, coastal communities throughout the region derive their livelihoods from fishing. As such it is essential that MPA performance indices and any potential plan for new MPA-implementation include socio-economic valuations;
4. There is a disparity in experience and capacity at the scale of the region. Participants therefore stressed the importance of exchange programmes between individual countries and/or MPAs;
5. In the development of its own information system, RAMPAO needs to capitalise on existing efforts and prioritise information collection; and
6. It is vital that MPAs contribute to conservation as well as reinforce cultural and social values.

Participants at the workshop came from the RAMPAO Secretariat's seven member countries and included individuals from diverse backgrounds and with a wide range of expertise.

Overall, the workshop was successful in achieving what it had set out to accomplish: (i) getting participants to agree on a list of performance indicators for a regional MPA network; and (ii) laying out clear terms of reference

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for the development of a RAMPAO information system. It is now critical for RAMPAO to feed on the momentum generated at the workshop and start implementing activities highlighted as crucial 'next steps'.

On a personal note, this trip was also of sentimental value to me (the first author). I spent eight of my formative childhood years in Sénégal, but had not been back since 1989, when we had to leave the country due to violent civil unrest at the time. From the moment I stepped onto Sénégalese soil, it felt like I was coming home; and although Dakar has changed so much since my growing up there, I found myself still able to easily navigate the streets and find my way back to my old house – a lovely feeling!

Footnotes

[1] Made possible with technical support provided by FIBA (the International Foundation of the Banc d'Arguin - Fondation Internationale du Banc d'Arguin) and financial assistance provided by the MAVA and Oak foundations.

Reef fisheries and reaching out

by Jennifer Jacquet

The *Sea Around Us* Project sent three members to the 11th International Coral Reefs Symposium (ICRS) in Ft. Lauderdale, Florida, where more than 3000 scientists gathered to discuss the science and fate of coral reefs. As one suspect, the news was grim - one scientist described corals as the living dead - the zombies of the sea.

In his keynote address, Daniel Pauly confirmed the same is also true for many species of coral reef fishes. Reef fishes conform to the general trend of fishing down marine food webs, due to human overpopulation and overly efficient fishing gears now used in many tropical nations. He also pointed out that while many social scientists studying fisheries might observe such trends, these observations often go unnoticed or unrecorded - to the disadvantage of managers seeking information for data-poor fisheries. Daniel highlighted some of the results of the *Sea Around Us* project's catch reconstructions in the tropics, some changes in fish distributions we can expect to see as a result of climate change, and the need for a faster pace in the creation of marine protected areas (MPAs). Following Daniel's address, Dirk Zeller and I both presented on underreporting and catch reconstructions for a handful of tropical nations in the section on reef-associated fisheries.

Despite the number of presentations outlining the ill fate of coral reefs and their fisheries, the news at ICRS was not all bad, particularly if one takes a historical perspective of coral reef scientists. Given that this was my first coral reef conference, my baseline was that week. But scientists such as Daniel Pauly, Dirk Zeller, and Jeremy Jackson from the Scripps Institution of Oceanography, all of whom have attended ICRS for decades, noticed a real shift in values in the scientists. Not too long ago, the majority of ICRS attendees were disinclined toward political activism and media attention. This year, there was resounding support for policy action, media awareness for reefs, and to form something akin to the Union of Concerned Scientists (who unified for climate change) for coral reefs. After applauding the efforts of Greenpeace in her keynote address, one scientist added: "I'm ready! You can chain me to an Acropora."

The *Sea Around Us* project members also showed commitment to media outreach as part of a panel of speakers that also included Hawaii-based scientist Alan Friedlander. Hosted by the Communication Partnership for Science and the Sea (COMPASS), we were each given four minutes to convey our perspective on underreporting coral reef fisheries catches to the room full of journalists. Daniel described the phenomenon of studying coral reefs while ignoring fisheries as similar to studying a butterfly in a cornfield. The butterfly is indeed beautiful and of scientific importance but its future depends on its ecosystem, which has been severely altered. Likewise, in the case of coral reefs, reef-associated fisheries cannot be ignored. Dirk described results from several countries in the South Pacific, including the dramatic results in American Samoa, where reported catches for the FAO period were 1525 metric tonnes, but catch reconstructions resulted in an estimated annual catch of 25,380 tonnes. I reported my findings from reconstruction small-scale fisheries catches in Mozambique and Tanzania, where foreign fishing boats compete with local fishers for the same fish resources. I described the licensing of European shrimp

This year, there was resounding support for policy action [and] media awareness for reefs

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trawlers in East African waters as the antithesis of the Robin Hood parable. Rather than stealing from the rich to give to the poor, these agreements facilitate stealing seafood from the poor to give to the rich.

The fact that several news outlets, including *Nature*, *The L.A. Times*, *The Guardian* and *The Telegraph* reported on the problem of underreported fish catches is testament to the importance of the findings. Equally important, the news coverage shows the value of good communications and the effectiveness of the COMPASS group in arranging the event.

Overall, our time in Ft. Lauderdale was well spent. The media outreach and talks were without incident, save one. I brought a life-size cardboard cutout of Senator Barack Obama with me and, just before I was to present, he was carted away. I ran after him and his apprehenders and was told that the conference organizers had received complaints about him being in the room. Although I made assurances that the cardboard Senator Obama would not say anything, the powers that be insisted he was folded up and stowed away. Coral reefs, scientists, concern for coral reefs or not. Florida is still Florida.

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Sea Around Us

Japan's fisheries and the whales - not

by Daniel Pauly

Visiting the Tsukiji fish market in Tokyo is a unique experience, but I did it twice: during the Second Asian Fisheries Forum, in April 1989, and on October 16 of this year, prior to the International Marine Environment Symposium organized by Greenpeace Japan, and held at the Tokyo headquarters of United Nations University (UNU).

This long-planned conference came at the right time for Greenpeace, whose recent anti-whaling actions, intended to prove that the crew of Japanese whaling vessels were illegally mailing whale meat to friends at home, had featured breaking into the warehouse of a courier firm.[1] What were they thinking?

After the opening, I spoke about global fisheries going the way of the dodo unless they accept conservation measures, then went back to my seat, hoping to work on a terrible attack of jet lag. But I could not do the dastardly deed: I was kept awake by neat presentations by Ellen Pikitch and Callum Roberts, both of which developed further the theme that we shouldn't assist the fishing industry in committing suicide. But it was the irrepressible Mr. Masayuki Komatsu, speaking on the "Future of Japanese marine industry", who really alerted me.

In Tsukiji market, October 16, 2008. Photo by Callum Roberts.

Mr. Komatsu, who must be presented here, is now at Japan's National Graduate Institute for Policy Studies; he recently retired from Japan's Fisheries Agency, where, over time, he developed a line of imaginative, if completely absurd, arguments in support of Japan's "scientific" whaling, culminating in the claim that whales are responsible for the worldwide decline of fisheries resources (see Komatsu and Misaki 2003). As lies go, this is a humongous one, but this did not prevent it from sabotaging several FAO-sponsored conferences (e.g., that on Responsible Fisheries and Marine Ecosystems, held in 2001 in Reykjavik, which Mr. Komatsu single-handedly turned into a train wreck), and successive meetings of the International Whaling Commission (IWC), which this argument and the bribing of a few delegations (Stringer 2006) has split right down the middle (see Pauly 2008, and Swartz and Pauly 2008).

I had an inkling of what Mr. Komatsu was going to talk about because he had visited the Fisheries Centre a few weeks before the conference, and, during a very positive discussion, mentioned that he was a member of a "Regulatory Reform Council", formed by the Office of the Cabinet of the Government of Japan to find solutions (including in foreign countries if need be) to the deep trouble the

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... the resources exploited by Japan's coastal fisheries are in steep decline

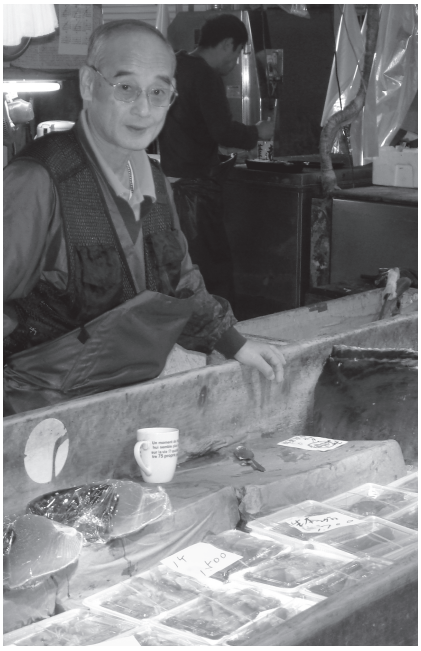
coastal fisheries of Japan find themselves in. Still, I was not prepared for the vehemence with which he presented his case that the resources exploited by Japan's coastal fisheries are in steep decline, and that these subsidy-bloated fisheries have become hotbeds of seemingly intractable conflicts. In fact, this was a presentation the like of which I have never seen, in any country. But the whales… No, they were not mentioned! Mr. Komatsu correctly assigned the blame where it belongs, to a complacent government that has relied on both the vaulted self-management of Japan coastal fisheries (Ruddle 1987) and on subsidies to solve a problem that can be solved only with intelligent governance, i.e., with connecting fishing rights with duties, and providing incentives to limit fishing effort.

The day's subsequent speakers further reinforced the point Mr. Komatsu had made. Thus, Mr. Yasuyuki Yamamoto, of the Aeon Topvalu supermarket chain, noted that his firm is forced to purchase Alaskan fish to ensure product quality, and Mr. Atsushi Sasaki, a rather garrulous fisherman, noted that he is not surprised the young Japanese prefer big macs, given the antibiotic-ridden farmed fish on the markets.

Overall, the tone of the conference was one of real worry (hence the absence of whales), perhaps bordering on panic: how is Japan, under these conditions, going to maintain its enormous consumption of seafood?

Which brings us back to Tsukiji's market, featuring both locally-caught and imported seafood. Japan presently imports over 50% of its seafood (lest we forget: this is less than the EU countries, which import about 70-80%), and Tsukiji's market is one of the gates through which this enormous number of fish and invertebrate bodies that this entails must pass.

During this visit on the day prior to the conference, I had the vague feeling that the Tsukiji market looked less neat, and was in fact dingier than I remembered, and that the fish on display (e.g., groupers and rockfish, and even sardines) were smaller than before. As it then turned out, Ellen Pikitch and Callum Roberts, who had also visited earlier, had the same impression. But we knew that one shouldn't give too much credence to subjective impression.



In Tsukiji market, October 16, 2008. Photo by Callum Roberts.

And then I met Dr. Tatiana Gadda, who did her PhD at UNU, analyzing a long time series (1953-2003) of sale records from the Tsukiji market. She had asked me in 2002 where she

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could get trophic level estimates and I had responded ("in FishBase", obviously). From these, and sale records for nearly 400 species, she computed decadal mean tropic level of the seafood sold at Tsukiji market, and lo and behold, her results are unequivocal: the mean trophic level of this seafood is going down, at about the same rate estimated by various authors for large marine ecosystems.

There is more to this story, and it will be told elsewhere. Suffice here to say that one of the richest countries on earth, home to a people of seafood connoisseurs, is not capable of maintaining its catches and imports of high trophic level fish, neither from its own EEZ, nor from the High Sea or the EEZ of other countries. There is a lesson in this, and not only for Japan.

Footnote

[1] See the New York Times article of Sunday, Nov 23, 2008 (www.nytimes.com/2008/11/23/world/asia/23whale.html?_r=1 &ei=5070)

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... the mean trophic level of this seafood is going down

Power in diversity: Bringing people together and putting ideas out

by Megan Bailey and Rashid Sumaila

Jakarta, the capital of Indonesia, was the setting for an international, multi-stakeholder workshop to address economic security and sustainable tuna fisheries in the Coral Triangle. The workshop was organized and funded primarily by the Asia-Pacific Economic Cooperation (APEC) group and the World Wildlife Fund (WWF), and hosted by the Indonesian government. The APEC workshop brought together about 80 individuals from nine countries, including the two of us from the Fisheries Centre. The participants included fisheries government officials, international diplomats, academics, conservation groups, aide organizations, and industry representatives all with a common interest: ensuring the sustainability of tuna resources in the region.

The Coral Triangle (CT), a region bounded by the countries of Indonesia, Malaysia, Papua New Guinea, the Philippines and the Solomon Islands, has gained recent attention from conservationists and academics due to its rich coral reef and reef fish biodiversity. The focus of the APEC workshop was not on corals at all, but rather on the fate of the region's tuna fisheries. The Western and Central Pacific Ocean is home to many commercially important tuna species, including albacore, skipjack, yellowfin and bigeye tuna. The CT is believed to house important spawning and nursery areas for these species, and also for the Southern Bluefin Tuna, which migrates into the Triangle from the Indian Ocean. Some of these tuna resources are threatened due to overfishing, which can be linked to the lack of sustainable financing of management measures in CT countries.

The first day included keynote presentations, one of which was given by Rashid Sumaila, covering: the legal challenges omnipresent in international fisheries management; tuna trade issues; biological circumstances of certain gear types; alternative valuation possibilities; current status and challenges of tuna fisheries in Indonesia; successful management measures in Papua New Guinea; and the possible

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The Western and Central Pacific Ocean is home to many commercially important tuna species

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gains to the system from economic cooperation. Speaker abstracts can be found at www.dkp.go.id/upload/DJPT/Abstracts_of_Papers.pdf. Day two provided the opportunity for discussion on these presentations, with break-out groups forming to help construct recommended regional actions. The group was to reconvene on the third day to choose from these possible actions a set of regional priorities for economic security and sustainable tuna fisheries.

Participants at the APEC meeting on Economic Security and Sustainable Tuna Fisheries in the Coral Triangle. *Photo by Aulia Rahman.*

Ensuring sustainable tuna fisheries in the Coral Triangle should be a global goal that needs to be tackled urgently by all stakeholders...

Now, one could imagine that bringing 80 very diverse experts together to agree upon a set of priorities for a complex issue could be a daunting exercise. But most would agree it is also necessary. Megan Bailey joined a task force lead by Sian Owen on contract to WWF. Our objective was to summarize and categorize the second day's possible actions. What came out of the task force meeting were about 70 recommendations listed under nine categories, including science, policy, communication, economics, and capacity building. These suggestions were posted around the meeting room on the morning of day three and all participants were asked to choose their top five recommendations. The priority recommendations were pooled during a coffee break, with the overall top nine displayed for everyone to observe.

This method for expert agreement turned out regional priorities that are complex, interdisciplinary, and aggressive, a testament to those present.

Some ideas sparked lively debates, and these included: 1. Formation of a tuna coalition to enhance the bargaining power of producer countries; 2. Management of tuna fisheries according to diverse targets, including economic, instead of just biological; 3. Development of a standardized regional database (publically available) for tuna-producing countries in the CT; and 4. Creation of a tuna trust fund to help ensure sustainable financing of regional tuna management.

Discussion around the publically available regional database was particularly interesting. While decision-makers requested development of models to show the outcomes of various management scenarios, modellers called for better data to be made available by those very groups. A regional database would allow decision-makers in the area to share information and better understand their neighbours' needs. It would also allow academics access to this information to assist with biological and economic modelling. One important point that was raised by Rashid was that a limited supply of data is not a reason to delay action. The local ecological knowledge of regional fishers is a largely underutilized resource that could help in both modelling and decision-making.

Lists can be boring, and they can even seem obvious, but agreement on a list is a substantial first step. One of the most resonating agreements from this workshop was that coastal states have not only the right to enjoy coastal resources, but also the responsibility to ensure they are managed sustainably. Tuna resources in the CT, and in the Western Pacific Ocean at large, are caught by several fishing nations, contribute to food and economic security in many countries, and are eaten all over the world. One might therefore conclude that the responsibility for ensuring sustainable tuna fisheries in the CT should be a global goal that needs to be tackled urgently by all stakeholders – under the leadership of governments of both fishing and consuming nations.

Congratulations and Welcome!

Grace Ong has been promoted to Administrative Coordinator in the *Sea Around Us* Project. Grace has been providing her expertise to the project for over six years. The *Sea Around Us* project welcomes **Marina Campbell**, who is taking over as Administrative and Financial Clerk.

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Sea Around Us

President John Atta-Mills of Ghana and the *Sea Around Us* Project

by Ussif Rashid Sumaila

Professor John Atta Mills was elected on December 28, 2008, to serve as Ghana's President for the period from 2009 to 2013. On January 7, 1997, Atta Mills, who was then an Associate Professor of Law at the University of Ghana, was appointed and sworn-in as the Vice President of the Republic of Ghana, under the then-elected government of President John Jerry Rawlings. Atta Mills was later elected by his party to be its flagbearer, and led them into the 2000 elections, which he lost.

Once a professor always a professor: Atta Mills decided to go back into academia after his electoral defeat, and used the opportunity to reflect on his future and do some writing (Atta Mills, 2002). In 2001, Prof. Atta Mills came to the Liu Centre for the Study of Global Affairs (www.ligi.ubc.ca/), here at the University of British Columbia (UBC) as a Visiting Professor. I met the law professor for the first time, at a meeting organized by the Liu Institute for UBC persons who are interested in Ghanaian and African issues. The aim of the meeting was to have a conversation with the former Vice President and Presidential Candidate of Ghana. The connection between Atta Mills and me was made during introductions. As soon as I mentioned that I was at the Fisheries Centre and explained the work we do, the professor's face lit up. He went on to say that fisheries are a big issue in Ghana, and revealed that for years during his tenure at the University of Ghana, he had been advising and working to defend small-scale fishers against the actions of large fishing companies. Over the years, he saw the misery in the fishing communities increase because of dwindling catches, to the extent that many did not even bother to go fishing anymore. He further added that as Vice President he has worked to create a new national fisheries law that attempted to stem the tide and put Ghanaian fisheries on a sustainable path.

President of Ghana John Atta Mills. Photo: attamills2008.com

Following this meeting, I invited Professor Atta Mills to give a talk at the Fisheries Centre, which he did enthusiastically. Given the global focus of our work at the *Sea Around Us* Project, and the fact that we were then planning a symposium in West Africa, Jackie Alder and I co-authored a paper with the professor from Ghana (Atta Mills, Alder and Sumaila, 2004), the highlights of which were presented by Atta Mills as a keynote address at the Dakar Symposium on West African fisheries in 2002 (www.seaaroundus.org/Dakar/index.htm).

We at the *Sea Around Us* Project can only wish the new president every success as leader of Ghana at a time

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... help make fisheries in Ghana and Africa work for the people in a sustainable manner.

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when Africa needs to demonstrate to the world that the continent can run flourishing democracies that work for its people. With respect to fisheries, I believe that President John Atta Mills is, most probably, the current sitting president in the world with the best understanding of the problems of fisheries in his or her country. I am optimistic that he will use his considerable influence as President of an important African country to help make fisheries in Ghana and Africa work for the people in a sustainable manner.

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NCEAS: Finding common ground

by Dirk Zeller and Reg Watson

The National Center for Ecological Analysis and Synthesis (NCEAS) in Santa Barbara, California, encourages cross-disciplinary research that utilizes existing data to address major issues in ecology and related fields, generally with application to management and policy. As part of this mission, NCEAS hosts and sponsors working group meetings that bring together experts from around the world. In December, Dirk Zeller and Reg Watson from the *Sea Around Us* Project participated in a working group meeting on '*Finding common ground in marine conservation and management*'. This working group is led by Boris Worm and Ray Hilborn, and seeks to find common approaches between marine ecologists and fisheries scientists for assessing the state of global marine resources. This is in the hope of creating a more cohesive front to address marine resource use and current issues in ocean management. To reach this, the group is:

(1) developing a unifying terminology and a common analytical framework for assessing marine fisheries and ecosystems;

(2) applying this framework to a number of representative marine ecosystems; and

(3) assessing management successes and failures to identify tools that have been shown to reverse trends of degradation in marine fish stocks and ecosystems.

The central question the working group is trying to answer is: *how can we merge contrasting objectives, tools, and scientific criteria among marine ecology, fisheries science, and management into a unifying framework.*

In essence, papers published by Worm and others, together with members of the *Sea Around Us* Project (e.g., Worm *et al.*, 2006; Halpern *et al.*, 2008) were considered controversial by some members of the marine assessment community. They could not, and did not, rely on traditional stock assessment methods. There was much debate about the application of the meta-methods developed by these authors and groups (some through the NCEAS working

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Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Megan Bailey, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group. The Pew Environmental Group is the conservation arm of the The Pew Charitable Trusts, a non-governmental, non-profit organisation. Pew applies a rigorous, analytical approach to improving public policy, informing the public and stimulating civic life.

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NCEAS- Continued from page 2

group approach), and the different views that these formed about the status of marine stocks both generally and specifically. NCEAS sponsored the present working group in an effort to bring together proponents of the different approaches. The *Sea Around Us* Project is an active partner in this NCEAS group. Mapped global catch data and other information provided by the Project have made a significant contribution to several publications discussed by the group. A mutual understanding is developing of why perceptions about the status of marine resources can differ so much and what can be done to incorporate more approaches and information. The work to date promises some very interesting and useful results; watch the literature for upcoming publications.

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The Sea Around Us Project is an active partner in this NCEAS group.

GCFI: Good science and management, but where is the public outreach?

by Dirk Zeller

In November, I was invited to give the keynote address for the 2008 Gulf and Caribbean Fisheries Institute (GCFI) annual conference in Guadeloupe. The GCFI provides information exchange among governmental, non-governmental, academic, and commercial users of marine resources in the Gulf and Caribbean region (www.gcfi.org). The conference provided opportunities to present science and management research and issues.

After the usual opening ceremonies, attended by numerous local, regional and national dignitaries, I presented the keynote address on '*Caribbean versus global fisheries: marine ecosystems, food security and the data connection*'. Throughout the rest of the conference I was approached by many participants expressing their support for, and understanding of, our work at the *Sea Around Us* Project, and also their surprise at learning how widespread fishing concerns and overfishing problems appear to be. For me, other highlights of the conference were Jeremy Jackson's special session keynote address on '*Coastal habitat degradation and fisheries*', and Yvonne Sadovy's '*Management and conservation of spawning aggregations: lessons learned and future perfect*'.

Throughout the conference, I engaged in the role of placing the presented local or regional findings in a global context. Interesting discussions and questions arose from this. However, I increasingly became concerned by the observation that no media were present (at least once the opening ceremony dignitaries left). I tried to make the point that the GCFI has many important scientific stories to tell the general public (the ultimate stakeholder in marine resources and ecosystems), yet it was apparent before, during, and immediately after the conference, that they had no active outreach program or initiative. I made the comparison with the International Coral Reef Symposium held in July in Fort Lauderdale, which had a well organized and successful outreach program, resulting in good message transfer to the general public. My point was that GCFI may be missing an opportunity to inform the public about science and management issues in their region of interest, and should seriously consider including an active outreach presence at their next event in Venezuela in 2009. This concern, as well as my presentation on global fisheries issues, led to several interesting discussions, both during sessions, but especially during the very friendly and sociable networking scene. In (typical French?) manner, email reception was only available while sitting around the hotel bar! This contributed to a very enjoyable social-science experience which was excellently managed by the very competent and professional organizing committee.

...GCFI is missing an opportunity to inform the public about science and management issues...

To William Cheung, on the completion of his Postdoc with the *Sea Around Us* Project (2007-2008)

by Daniel Pauly

Wai Lung 'William Cheung, on December 31, 2008, completed his Postdoc in the best manner possible: by moving on to become a 'Lecturer' (the British way of pronouncing 'Assistant Professor'), at the University of East Anglia.

This was not surprising. In his work as a postdoc, William had managed to exceed the already huge expectation we had, based on his doctoral work. As part of our team, he was tasked with developing a generic 'climate envelope' model to simulate (predict) the shift towards higher latitude that marine fishes and invertebrate (will) experience as a result of global warming. The model was developed, written and documented (Cheung *et al.* 2007), then applied to the over 1000 species of marine fishes and invertebrates for which the *Sea Around Us* Project has distributions (and FAO catch statistics).

...the first paper ever to present maps of expected impact of different global wamring scenarios on the biodiversity of the world's oceans...

This led to the supporting study of Cheung *et al.* (2008), which established, for the first time, a robust relationship between the distribution area of fish and the potential production, other things being equal (their trophic level, primary production in their habitats, etc), and to the first paper ever to present maps of expected impact of different global warming scenarios on the biodiversity of the world oceans

Former post doc William Chueng. Photo by Sherman Lai.

(Cheung *et al., in press*). And a fourth paper, building on the first three, predicting changes in global and country-specific catch potential is under review, all this being done while at the same time completing the publication of papers from his doctoral thesis, and patiently and admiringly helping other people with their research.

This work saw us closely collaborating, and I can't express how much I appreciate the thoughtful exchanges this generated. Fortunately, William has promised to continue our collaboration, particularly on global warming impact. The next paper is planned to include the effect of declining dissolved oxygen, which we expect to be very strong, but have so far ignored. Watch this space, therefore, for more news about William and his path-breaking work.

In the meantime, we shall wish him good luck in his new home. And in order to avoid him embarrassment with his new colleagues, I won't conclude by quoting the words he used when describing the local food (I did warn him).

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Dumb as a cod: Fisheries in the Baltic Sea

by Peter Rossing and Dirk Zeller

Historic chronicles from the monk Saxo in the 12th century suggest that the oars from fishing boats would get stuck in large schools of herring during their migration through the Sound of Denmark. The abundance of herring was such that they could be caught with bare hands and literally shoveled into barrels (Grammaticus, 1980).

Magnus, Olaus. (1555) Historia de Gentibus Septentrionalibus. Description of the Northern Peoples. Image obtained with thanks from Callum Roberts, University of York, UK

Herring was a highly valued export commodity, and was an important part of people's diet during Catholic fast. Cities like Copenhagen and Lübeck, if not founded on herring, drew much of their early wealth from the sale of Baltic Sea herring, and of their control of the salt required for preservation (Grammaticus, 1980). The historic importance of fishing in the Baltic Sea is such that many metaphors commonly used today relate to fish. In Danish, something worthless is '*not worth five sour herrings*', a beautiful woman is a '*delicious herring*', and if somebody calls you '*dumb as a cod*' you have likely done something of the lowest intelligence. A major newspaper even has the '*new year cod prize*' that is given to the politician who made the biggest blunder during the year.

Ironically, this appreciation of cod is a fitting description for how the management of the fisheries resources in the Baltic Sea has gone awry. The once abundant cod is now at risk of stock collapse as the Baltic countries (Denmark, Sweden, Germany, Poland, Russia, Lithuania, Estonia, Latvia and Finland) continue to sidestep and ignore International Council for the Exploration of the Sea's (ICES) scientific recommendations for a complete moratorium, because they cannot agree on terms (WWF, 2008). Other species also in trouble are eel, which have gone nearly commercially extinct, and salmon, which now contain so much dioxin that fish over 4.4 kg are deemed unfit for human consumption (Lövin, 2007). Eutrophication is also a substantial problem as the Baltic Sea is now regularly hit by massive toxic blooms of blue-green algae and by anoxic events which leave large areas lifeless during the summer season (ELME, 2007).

A Swedish businessman, Björn Carlson, decided in 2006 to actively contribute to reversing these disastrous developments by setting up the *Baltic Sea 2020 Foundation* (www.balticsea 2020.org). His 500 million SEK (US$ 60 million) person donation represents the single largest ever made in Sweden. The entire capital is to be used by 2020, hence the name of the foundation. The aim is to stimulate concrete measures to improve the environmental quality of the Baltic Sea.

The *Sea Around Us* Project is contributing to the work of the *Baltic Sea 2020 Foundation* by reconstructing total catch time series for all Baltic countries from 1950. Only the landings from commercial fisheries have traditionally been reported from the Baltic countries, and incompletely at that. It is therefore widely recognized that the region's official statistics underestimate true catch (although formal stock assessments do account conservatively for discarding), as they do not take into account Illegal, Unreported and Unregulated (IUU) catches. Policy makers have therefore historically underestimated the impact of fishing on stocks, and hence on the decline seen in some of the Baltic fisheries.

Our work, when completed in April 2009, will provide a better baseline for analyzing long-term trends by going beyond what is officially reported by the Baltic countries' governments (and hence ICES) from 1950 to the present.

The basic approach to, and philosophy behind, catch reconstructions is described in

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The once abundant cod is now at risk of stock collapse as the Baltic countries continue to sidestep and ignore ICES recommendations.

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Zeller *et al.* (2006; 2007). In essence, we utilize every data- and information-source available to us (including grey literature, media sources and expert knowledge) to obtain data 'anchor points' in time regarding nominal and IUU catches (including recreational), as well as discards. We have also endeavored to establish collaborations with local in-country experts in the Baltic region, as local input, knowledge and experience are particularly valuable in helping us to develop reasonable data time series. Therefore, Peter Rossing has been busy over the last 8 months establishing and nurturing, relationships with scientists in the Baltic region that share an interest in collaborating with us. We have successfully established collaborations in Sweden, Finland, Germany, Russia, Lithuania and Latvia, and have been able to get access to material and sources from Poland. As a Dane, it has been a particular privilege for Peter to travel around the Baltic region. Generally, our request for collaboration and advice has been well-received, as most people appreciate the relevance of what we are trying to achieve. The goodwill and information generated from these meetings and collaborations cannot be underestimated.

However, a substantial problem has been the political sensitivity over access to existing spatially disaggregated discard and illegal catch data, despite the fact that most government institutions in the Baltic and ICES have access to such data. ICES, for example, utilizes such discard data to improve their yearly stock assessments and fisheries advice to the European Union. However, they are under considerable political pressure not to disclose the country-specific disaggregated data, as Baltic country governments would be embarrassed if singled-out as a major culprit of illegal activities, or for wasting resources by throwing dead fish back into the sea.

Peter found another example of how politics can interfere with the common good when he visited the Institute for Baltic Sea Fisheries in Rostock, Germany. Since 2004, this institute has been conducting extensive recreational catch surveys. This apparently benign project became a political hot potato when the results indicated that current German cod catches would be 50% higher if recreational catches were included. Initially, the German government wanted to close down the project, however the results had already been published. Instead, the German government is now possibly faced with the uncomfortable situation of making an informed decision about how to divide their total cod quota between the recreational and commercial fishing sectors. It is amazing, given such shenanigans, that there are still cod left in the Baltic. Dumb Cod!

The Baltic Sea

There are approximately 100 fish species living in the Baltic Sea Region comprising Denmark, Sweden, Germany, Poland, Russia, Lithuania, Estonia, Latvia and Finland. The fish fauna include marine (e.g., cod, flatfish, sprat, herring), anadromous (e.g., Atlantic salmon, and Sea trout) catadromous (e.g., European eel) and fresh water species (e.g., pike and perch). The diversity, composition and distribution of the Baltic fish fauna is influenced by the brackish-water and enclosed nature of the Baltic Sea. The number of marine species is therefore highest in areas near the Danish Straits and diminishes eastwards and northwards as salinity decreases. The catches of cod, herring and sprat has, in recent times, accounted for approximately 95% of the reported commercial catches in the Baltic (ICES, 2007).

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Sea Around Us

Sea Around Us Project's climate change project at the 2009 AAAS annual meeting in Chicago

by William Cheung

On 12 and 13 February, I participated as a symposium speaker at the American Association for the Advancement of Science (AAAS) annual meeting in Chicago. I presented the findings from our study on the impact of climate change on marine biodiversity and fisheries. These findings are some of the major products from my two years of exciting and rewarding post-doctoral experience with the *Sea Around Us* Project (see The *Sea Around Us* Project Newsletter Nov/Dec 2008 issue for details about this work). In a sense, it also marked a successful completion of the first phase of this project.

The symposium titled "Facing Our Uncertain Future: The Reality of Climate Change Adaptation in the Ocean" was organized by Emily Pidgeon of Conservation International and Les Kaufman of Boston University as part of the overall theme of the AAAS annual meeting "Our Planet and its Life – Origins and Futures". The symposium aimed to discuss the latest science in studying current and future impacts of climate change on marine ecosystems and the development of adaptation policy to climate change in marine environments. My contribution to the symposium was though presenting climate change studies that highlight major developments in our ability to project climate change impacts on species distributions, marine biodiversity and fisheries catch. This is obviously an important step towards developing adaptation policy to climate change impacts in the ocean.

Emily Pidgeon of Conservation International opened up the session by highlighting the overall messages of the session: the effects of climate change on major groups of marine organisms have been observed and tools are available and continuously being improved to make projections of these impacts;

Former Sea Around Us Project member William Cheung is interviewed.

Photo by Liz Neely, Compass.

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thus we should start incorporating this knowledge and information into the design of marine conservation policies that are adaptable to climate changes.

... combined changes in primary production and species distribution may cause large reduction in catch potential in the tropics

Dee Boersma, Professor at the University of Washington, presented some stunning results on the impacts of climate change on the Magellanic penguin in Argentina. In her talk titled "Mare Nova: Climate Change – An Adaptive Challenge to Ocean Ecosystems", she showed that penguins are swimming 60 km farther north from their nests during incubation now than they did a decade ago. Some penguins even shifted their colonies which caused them to move from protected to private land. Such changes are likely a result of shifts in prey distributions because of climate change and fishing. This affects the effectiveness of existing marine protected areas in protecting these penguins.

My presentation showed that marine fishes and shellfishes would face similar problems as the penguins. I presented the projected global shift in species distributions and the large-scale redistribution of fisheries catch potential. Specifically, based on modelling the distributions of 1,066 species of fishes and shellfishes, we predicted that their distributions would shift towards the Poles at a median rate of about 40 km decade^{-1}. As a result, a high rate of species invasion may occur in the high latitude region while local extinction may concentrate along the tropics. Species with limited range or at habitat margins (e.g. polar species) may face a high risk of extinction under climate change because of the reduction in available habitats. Also, the combined changes in primary production and species distribution may cause large reduction in catch potential in the tropics, although high latitude countries such as Norway may gain in catch potential. Results like these highlight the need to incorporate these potential changes when designing fisheries management and conservation policies.

Patrick Halpin, Professor at Duke University, then presented the findings from his latest research which showed that there is a mis-match between ocean areas with high projected climate variability (a proxy of climate change impact) and the existing coverage of marine protected areas. His works suggested the need to consider climate change in designing networks of marine protected areas.

A highlight of our symposium was a press conference on the day before the scientific session. In particular, this press conference coincided with the publication of the paper in *Fish and Fisheries* that reported our study on climate change impacts on marine biodiversity (Cheung *et al.* 2009). Overall, our paper, and the session in general, attracted considerable media coverage.

My participation in this year's AAAS annual meeting highlighted my experience working with the *Sea Around Us* Project over the past years. I enjoyed very much working

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The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group. The Pew Charitable Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organizations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Group committed over $235 million to 302 nonprofit organizations.

ISSN 1713-5214 Sea Around Us (ONLINE)

Impacts of the oil crisis on commercial fisheries in the Southern Philippines

by Stuart Green

In the Philippines, the use of boats exceeding 3 tonnes defines `commercial', as opposed to `municipal' fisheries. Municipal fisheries employ over 1.3 million small scale fishers, about 5 times more than the commerical sector, but generate roughly similar catches. A decade ago, the aggregate Philippine commercial fishing capacity was 2.09 million horse power (HP), 45% above the optimum level of 1.14 Million HP.

The Philippine commercial fleet is highly subsidized by the government. Some of this consists of infrastructure development and tax windows on imported boats and equipment. Also, commercial fishing boat registration fees that account for about 1/1000th of the value of fish caught by commercial fishers in 2000 (Green et al., 2003) are not reflective of true resource rents for the country's fisheries. Still, the Philippine fisheries suffered from the 2008 oil price increase. Table 1 below highlights some of the reactions within the commercial fishing industry.

...Tuna Reps: Government fuel subsidy would be very much welcome during these difficult times.

Table 1: Chronology of events related to fuel price increase in the Philippine commercial fishery, July – September 2008

Date (2008)	Event	Additional information
July	Members of largest commercial fishing group in western Mindanao (which accounts for 90% of the supply of sardines in the region) stop operating.	Dispute with canning firms over higher fish prices that commercial fishers are demanding due to increasing fuel prices, with canneries unwilling to pay.
Last week of July	Staff of the Bureau of Fisheries and Aquatic Resources argue with industry representatives to reinitiate fishing. Industry gives its recommendations on what is needed for it to go back to fishing.	Industry representatives have 3 demands: (1) Exemption from 12% value added tax on fuel; (2) Discount on diesel bought from Government owned company; (3) Agreement between canneries and fishing firms on linking fish and diesel price.
Early August	Tuna fishing industry representatives stated a Government fuel subsidy would be very much welcome during these difficult times..	Tuna fishers: "it is not only the sardine industry that is reeling from the skyrocketing prices of fuel products. The tuna industry is also feeling its effect".
Mid August	Increase in sardine price agreed upon between catchers and canneries.	Further adjustments planned to compensate for rising prices of inputs.
September 4th	10th National Philippine Tuna Congress in General Santos City, Mindanao.	To help the tuna industry through difficult times, the government is considering a plea by fishing operators to directly import cheaper fuel from Malaysia.
September 5th onwards	Oil prices have decreased and operations are currently back to normal	The Government agrees to pay the Philippine tuna industry's membership in the Western and Central Pacific Fisheries Commission (US $130,000).

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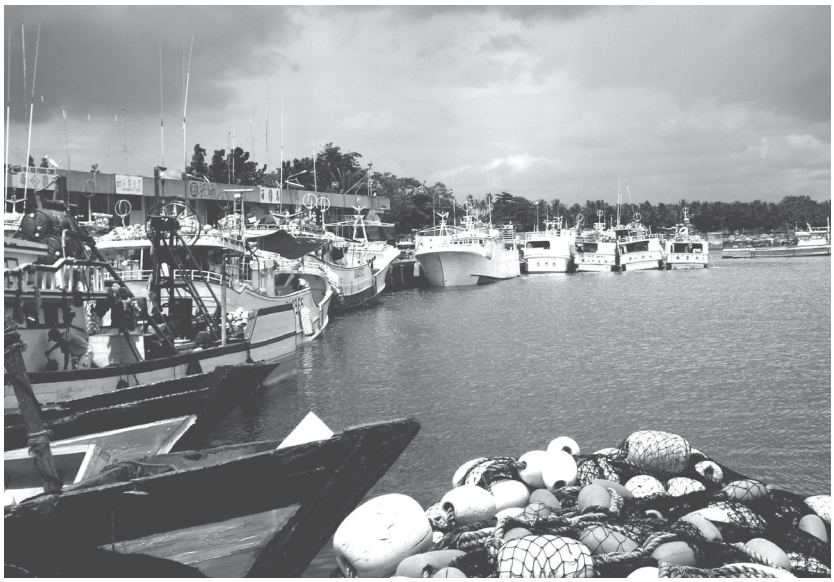
... a return to sailing or even row-boats by small scale fishers has been seen of late.



Tuna fishing boats docked at port in the city of Davao, Philippines. Photo by Megan Bailey.

The commercial fishers have tried to save fuel costs by fishing closer to shore in those grounds which are reserved for small scale fishing. In response, the fuel costs for fisheries enforcement vessels, i.e., to keep commercial fisheries out of the inshore 'municipal' fishing grounds, have increased significantly for small scale fishers and the municipal governments.

On the other hand, in some parts of the country, small scale fishers appear to be benefitting from the increased fuel prices, if indirectly: as their operating costs have increased, some commercial fishers have temporarily docked their boats, or fished less frequently, giving both fish stocks and small scale fishers a temporary reprieve. Also, a return to sailing or even row-boats by small scale fishers has been seen of late

Although the worst of the oil price increase is temporarily over, it did bring into focus some fundamental problems in Philippine fisheries. The strong lobbying position of the commercial fishers and the subsidies that the industry gorges on, have led to huge overcapacity and have accelerated stock declines.

Fortunately, the Government did not heed the call for more fuel subsidies. Subsidies for commercial fishers to decommission their boats and leave the fishery may be more helpful, as may fuel subsidies for the law enforcement patrols needed to keep commercial fishers out of small scale fishing grounds and manage the no-take areas of the country.

The world's financial crisis and the respite it offers (via reduced fuel prices) is an opportunity to find a solution to the structural problems of Philippine fisheries. Notably, subsidies to commercial fisheries must cease, emphasis being instead given to law enforcement and to strengthening and expanding the existing network of marine protected areas. Otherwise, noodles will be all that people will have to eat, and sardines will be unavailable.

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with every colleague at the *Sea Around Us* Project. Particularly, working with Prof. Daniel Pauly and learning from his teaching widened my horizons and accelerated my growth, both academically and personally. In my new position at the University of East Anglia, I will continue to collaborate with the *Sea Around Us* Project on climate change studies as well as other projects. So, you may see me again in the *Sea Around Us* Project newsletter in the future.

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Re-visiting international fisheries subsidies

By Andrew J. Dyck

Since 2002, the Fisheries Economics Research Unit (FERU) has been busy investigating the economic incentives that lead to overfishing. While there are many economic factors at play, one issue that has been central to FERU and, in part, the *Sea Around Us* Project, is the impact of government subsidies on the fisheries sector. Subsidies are important to the study of marine capture fisheries because they can directly affect and alter the economic incentives faced by fishers, and therefore, the level of fishing they might take.

The aim of fisheries subsidies is, in the most general sense, to improve the livelihoods of fishers. Governments attmept to do this by increasing the total revenue that fishers receive, reducing their fishing costs, or both. Unfortunately, these programs, which are often designed to help fishers through tough times can create an incentive to overfish – likely the reason why incomes are low for fishers to begin with – and exacerbate the financial problems faced by fishers. Quite simply, when a government chooses to reduce fishing costs through subsidies, total catch will be even higher than without government intervention.

Many recognize that fisheries subsidies are not only harmful for biological stocks but can also hinder international trade. This places subsidies to the fishing sector within the World Trade Organization's (WTO) guidelines on actionable subsidies – those that have adverse effects on a nation's trading partners. For this reason, the *Sea Around Us Project* and FERU's work on subsidies has drawn a great deal of attention from the international community, with the result that our research outputs (e.g., Khan et al., 2006) have been used by parties at the ongoing Doha Round talks.

Within the realm of international subsidies, the fishing industry can be overshadowed by other industries, like agriculture, that are thought to have very high levels of subsidies. However, year 2000 estimates of Khan et al. (2006) and Sumaila et al. (2008) suggest that fisheries subsidies total between $US 30 and 34 billion per year. Not only is this a staggeringly large number in absolute terms, but the problem is even more apparent when we consider that this represents roughly forty percent of the total landed value of ocean-caught fish. In simple terms, 40% of each fish caught is, on average, subsidies.

Visitors to the FERU section of the *Sea Around Us* Project website, www.seaaroundus.org/, will find that subsidies have been re-estimated for the year 2000 using the most recent catch allocation from the *Sea Around Us* Project reflected in the column reporting subsidies proportionate to the landed value of catch. Furthermore, the subsidy re-estimation has allowed us to disaggregate subsidy data that was previously estimated for a geo-political entity such as France, among its dependencies like Crozet Island, Guadeloupe, or St. Pierre et Miquelon.This disaggregation is simply based on an entity's catch relative to total catch for the larger geo-political entity. So, in the above-mentioned cases, Crozet Island is assigned a share of France's previous subsidy estimate based on its contribution to France's total landed value.

In pursuit of increasing our knowledge of fisheries subsidies, we are currently expanding the database of government financial transfers to include spending from the year 1989 to the present. This will result in a new re-estimation of the data for the year 2000 using the upcoming catch allocation as well as an estimate for the year 2003, which is the base year for the Global Ocean Economics Project*. To compile subsidy data for the year 2003 and, with continued work, for additional years, we have relied on information from various sources including a world-wide campaign directed at collecting data from fisheries ministers, WTO negotiators, and other governmental figures.

Publishing data on the extent of government subsidies to the fishing sector is just one step toward building a climate where fisheries management can be discussed with transparency. Given the extent of government spending in the fishing sector mentioned above, we feel that building the subsidies database is a very important part of advancing the discussion on fisheries management at the global level, now and in the future.

Continued on page 6 - Subsidy

... building the subsidies database is a very important part of advancing the discussion on fisheries management.

Billfish conflicts in recreational and commercial fisheries in Mexico

by Andrés M. Cisneros-Montemayor and Gakushi Ishimura

... It is undeniable that a collapse of billfish resources would result in a negative impact on the entire tourism industry.

Fishing is one of the main economic activities in Baja California Sur (BCS), Mexico. The Gulf of California has always been a very important area for fisheries, and the tropical climate and short travel distance make the Gulf of California a popular destination for vacations by Americans and Canadians. Recreational fishing, mainly targeting billfish, has grown along with tourism in the region and has developed into a large industry with a significant role in the local economy and relatively stable catches since the mid-1980s (DOF, 2004). Most recreational fishing effort takes place on the eastern coast of BCS, mainly in the Los Cabos region and in Buenavista.

Billfish are regarded as prize fish by sport fishermen, with international tournaments held every year, marlin and sailfish being the most targeted species. Billfish captures total to around 23,000 fish a year (DOF, 2004). Billfish are exclusively reserved for recreational fishermen, but due to by-catch in commercial fisheries, these two sectors in BCS have been in conflict over billfish resources. Revenues from recreational fishing licenses alone in BCS increased to 1.5 million USD in 2006 and the government of Mexico estimated the total value of recreational fishing direct expenditures in BCS at around 8 million USD in 2007. A separate study initiated by the Billfish Foundation used input-output analysis to estimate the effects of recreational fisheries on the local economy, suggesting a total of 1.12 billion USD in total economic activity was generated by the recreational fishing industry (Southwick Associates, 2008).

A critical issue of the Mexican recreational billfish fishery is the ongoing conflict with commercial shark fisheries over billfish resources. Recently, these conflicts have been brought to a head by the approval of a new fisheries law, NOM-029 (2007), in which objectives are set to improve the management of commercial shark fisheries in Mexico. The law's main points are to limit the type and use of shark-fishing gear and to regulate by-catch of marine mammals, birds and sea turtles. The government's rationale is that, while not perfect, the law will do much for the management of shark fisheries and it can be improved over time to protect other fish species. The recreational billfish fisheries sector has very strongly opposed the law (see www.billfish.org/new/news article. asp?ArticleID=66), stating that, by neglecting the explicit by-catch limit on billfish resources, by default this law will allow shark-fishing vessels to capture billfish 'incidentally', then sell them on the market.

After much political debate, a 30% billfish by-catch limit was set for the commercial shark fishery, with varying region-specific by-catch rates for different billfish species. This by-catch limit is based on data from on-board observers, but it is unclear how the limit will be enforced, or what the consequences of exceeded by-catch limits would include. It is undeniable that a collapse of billfish resources would result in a negative impact on the entire tourism industry, which is key for the BCS economy. However, if our aim is to improve the state of fisheries and ecosystems, management policy should be shaped around sound scientific advice and not around the most influential stakeholder.

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Subsidy - Continued from page 5

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Sea Around Us

Integrated Multi-Trophic Aquaculture: The way of the future?

by Sarika Cullis-Suzuki

I spent the last week of April on the east coast of Canada, investigating IMTA, Integrated Multi-Trophic Aquaculture, at Cooke Aquaculture, off the shores of New Brunswick. I spoke to various scientists studying IMTA, and was even able to go out on a boat to inspect the underwater setup and get answers to my many questions.

IMTA is a way of farming multiple marine organisms from different trophic levels at the same time. The goal is to create a balanced system, essentially mimicking what already occurs in the ocean. In the case of Cooke Aquaculture, the primary harvest is Atlantic salmon. Yet, in addition to salmon, they cultivate mussels to filter the organic nutrients, and seaweeds to absorb the inorganic nutrients that accumulate from the salmon waste and feed. Even sea urchins and sea cucumbers are included in the system, working to consume macro particles that fall to the bottom of the salmon net pens. In an attempt to reflect what `naturally' occurs in the sea, they incorporate all of these players into their farming—the mollusks, the seaweeds, the invertebrates— creating a healthier farming system… *and* more commercial product. Sounds great so far. So the question then becomes: is this where aquaculture should be headed?

Dr. Thierry Chopin explains the role of seaweeds in IMTA to Cullis-Suzuki.. *Photo by John Badcock.*

Here, on the west coast of Canada, we are already familiar with some of the problems of salmon farming. Such problems extend to the east coast as well, including those associated with fishmeal, waste, lice, disease, and escapees. Cooke Aquaculture tries to mitigate wasteful feed by using remains of other fish in their fishmeal (bones, guts, etc.), and by decreasing the actual amount of fish in their feed altogether; in fact, today, they now claim to use less than 1 pound of wild fish for every pound of farmed salmon.

Waste from salmon nets is taken very seriously. By positioning an underwater video camera below the nets, the amount of fish feed can be controlled, i.e., feeding is stopped as soon as pellets begin accumulating on the bottom. In this way, fish feed waste is minimized. Any other waste from the salmon nets is moderated by nutrient `scrubbers', mussels and seaweeds that are positioned down-flow of the

Continued on page 2 - IMTA

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IMTA- Continued from page 1

nets, as well as invertebrates that live below the nets. By taking up waste matter, the scrubbers accomplish two goals at once: they filter the water, and they grow quicker (enabling more efficient harvesting). Regarding sealice, Mr. Cooke explained that they do not consider it as big a problem as out west—although whether or not that has to do with the extremely low wild Atlantic salmon stock populations was not clear.

... I was struck with the size of the net in relation to the number of salmon—put simply: I didn't see many fish in the nets!

Later that day, while diving in the mussel farm and salmon nets, I searched the water for debris; though I never made it to the ocean floor to inspect the amount of waste buildup, I was struck with the size of the net in relation to the number of salmon—put simply: I didn't see many fish in the nets!

The nets themselves, set up in a series of large rings in the ocean, are not fixed, meaning they are rotated, as in land-based farming, allowing certain areas to be left fallow. Also, the nets contain a comparatively low count of salmon per net (hence my disappointingly uneventful dive), thereby reducing both the inception and spread of disease amongst organisms. In order to execute an operation like this, a lot of space is needed.

But the spread of disease from farmed fish to wild Atlantics (well, what's left of them), is still a reality, and a significant case against allowing the replication of such a system on the west coast of Canada. And escapement, although said to be low, cannot be completely prevented without closed containment. However, by farming Atlantic salmon on the east coast, this avoids culturing an alien species, and they use genetic stock from wild salmon in the area.

Glenn Cooke, founder of Cooke Aquaculture, was very candid about the operation, agreeing that there remain problems to work through; his company is still in the initial stages of the system, though moving fast. Back in 1985, when the company was just starting off, Mr. Cooke remembers that taking the larger ecosystem into consideration was simply not done, let alone incorporating other creatures into the harvesting plan. "Things are very different now," he reflects. Today, his company has been lauded as a model in progressive aquaculture, and has received numerous awards. Employing 1,500 people, Cooke Aquaculture is no longer a small operation; indeed it has become a thriving, big business.

But Mr. Cooke still feels that by being a locally-owned family company, this operation is more sustainable than most large-scale fish farm companies. Certainly, as a New Brunswick native, and as a parent raising his children in this community, he feels much more accountable for his business, and his actions: "For example: if I were a large company from Spain, with no interaction or connection to the place where I was farming, I wouldn't feel the same responsibility to that community." Mr. Cooke acknowledges that, if he wants to live comfortably in his own neighbourhood, community involvement and acceptance aren't just desirable, they're essential.

Back at the restaurant, I sampled freshly-harvested seaweeds and mussels; but for some reason couldn't bring myself to try the farmed salmon. At least, not yet. Perhaps it's simply the west coast stigma that goes along with farmed salmon; but, there are still a few issues that need to be worked out under the water. Future or not, IMTA certainly offers fish for thought.

The ***Sea Around Us*** project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Megan Bailey, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the project.

The *Sea Around Us* project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organizations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organizations.

ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

Life in Chesapeake Bay: an animated documentary

by Villy Christensen, Sherman Lai, Mike Pan, Dalai Felinto and Howard Townsend

The Chesapeake Bay is the largest estuary in the continental United States, located midway along the Atlantic coast. Because of its location near Washington, DC, the Chesapeake ecosystem is not only important ecologically, but also the subject of much political concern. Thus, quantitative tools with user-friendly outputs to help understand the implications of management actions and human behaviour on the ecosystem are useful for providing information to a wide-ranging audience. Researchers at the *Sea Around Us* project and the US National Marine Fisheries Service are en route to developing such tools using the gaming interface of the new version 6 of the Ecopath with Ecosim approach and software. As an intermediate step, we have developed a 6-minute documentary of life in waters of the Chesapeake Bay. The documentary is developed using a 3D gaming engine, and tells the story of how the oyster populations have plummeted, gives viewers an idea of the current state, and it finishes with a 'dream-scene' expressing how the Bay may look in the future if we were able to restore it. The power of the animation is that we are able to communicate scientific information to a much wider range of people than what our normal scientific products allow. We believe that this form for communication has a very strong potential in an educational setting, and anticipate that the underlying methodology – which includes linking a scientific ecosystem model of the Chesapeake Bay to a gaming engine – will be a very powerful tool for communicating scientific simulations in a management context.

Continued on page 2 - Bay

Screenshot `dream-scene' of Chesapeake Bay from the animated documentary.

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Bay - Continued from page 1

... sharks and rays, and giant sturgeons used to roam the waters in abundance.

Interestingly, on May 12 an Executive Order was issued by President Obama for the US's federal agency, the National Oceanic and Atmospheric Administration (NOAA), "to strengthen scientific support for decision-making on Bay restoration issues" (see www.chesapeakebay.net/news_execorder.aspx?menuitem=36188).

NOAA Chesapeake Bay, a close and long-standing partner to the Fisheries Centre, has included Lenfest Ocean Futures Program's (LOFP) group decision support for stakeholders as one of the solutions to this Executive Order. This is a timely Order, as Sherman Lai will be demonstrating a development concept of the LOFP decision support system during the Ecopath 25 Years conference to be held at the UBC Fisheries Centre in August.

Viewers of the animated documentary, which can be viewed at www.ecopath.org/LifeInTheChesapeakeBay/, will be treated to life-like animations of the underwate ecosystem, and interesting facts about the Bay. Its vast watershed covers 64 thousand square miles and is shared by six states. It is estimated that over 16 million people live and work in this region. The Bay is one of the country's most valuable natural treasures, offering rich recreational opportunities and supplying millions of pounds of seafood every year.

There is a sizeable menhaden fishery active in and around the Bay. It is believed that the fishery may be removing too much of this prey species that it is impedeing the recovery of one of its main predators, striped bass.

Some surprising species were once abundant in Chesapeake Bay. A seemingly-unlimited supply of oysters once provided jobs and food to many, and the oysters were actually considered a hazard to marine navigation. Today, those oyster beds are virtually non-existent, which has rendered the ecosystem far less productive than it once was.

Marine mammals, such as the manatee and gray whale, as well as sea turtles, also used to call Chesapeake Bay home. Furthermore, sharks and rays, and giant sturgeons used to roam the waters in abundance. It is obvious that the ecosystem has changed, and the combination of gaming visualization with ecosystem modelling will most likely be a valuable tool to decision makers in the area.

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Screenshot of a degraded Chesapeake Bay ecosystem from the animated documentary.

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Help the *Sea Around Us* improve: A questionnaire

The Sea Around Us project is currently reviewing how project information is communicated to the public. This review includes evaluating this newsletter, including decisions regarding print versus electronic format. Below we have prepared 6 questions for our readers. We would greatly appreciate reader input, in an effort to provide a valuable and enjoyable news source. Please respond to these 6 questions by filling out the printed questionnaire and mailing it to Jennifer Jacquet, *Sea Around Us* Project, Fisheries Centre, 2202 Main Mall, University of British Columbia, Vancouver, BC, V6T 1Z4, Canada. Alternatively, readers can respond online at www.seaaroundus.org/news.htm. The *Sea Around Us* project appreciates your support of and participation in this review process. We hope you continue to read and enjoy our newsletter.

1) Over the past year, have you read at least one issue of the *Sea Around Us* newsletter in its entirety?

2) Would you prefer to read the *Sea Around Us* newsletter online or in print?

3) Would you continue to read/examine the newsletter if it was only available electronically?

4) In the newsletter, what do you enjoy most (please rank)?

_____ articles about project members
_____ articles about project research
_____ articles about conferences
_____ small blurbs on recent happenings/additions to the project

5) Are there types of articles you would like to see more of?

_____

_____

6) Please list other types of media (digital or print) and/or specific newsletters you read:

_____

_____

THANK YOU!

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Toward a conservation ethic for the sea: Steps in a personal and intellectual odyssey[1]

by Daniel Pauly

Since 1971, when I did my first intercontinental travel (from Germany, where I was studying, to Ghana, to do the field work for my Masters), I have had the privilege of experiencing a multitude of countries, cultures, and modes of exploiting aquatic ecosystems in Africa, Asia, Oceania and the Americas. (This came along with a huge carbon footprint, as I now know.)

As a student, I learnt that we can 'manage' fisheries, and hence I saw my role as fisheries scientist (but also as a citizen of the world) and contributing to the progressive mastery that such management implies. Such mastery, one should think, should lead to a mosaic of management outcomes, depending on the local culture, and hence management choices. The resource declines I saw in various countries were boringly similar between countries, however, except for the fact that they sometimes were lagging in time, depending on the country's level of development'.

The 1980s and 1990s were also the period when science established the recent emergence of *Homo sapiens*, along with the descent of all non-Africans, from a small group which left Africa some 70,000 years ago. This re-enforced my belief in a basic similarity of the way humans interact with nature ("eat it if you can"), beyond superficial differences due to local constraints.

Now that our technology has essentially removed all constraints (distance offshore, depth, unpredictable storms, perishability of the catch, inability to accumulate capital, etc.) which earlier, along with limited markets, limited fisheries, the way we interact with nature has been simplified ("eat it"), and we are at the onset of a catastrophic decline of marine biodiversity.

We are, however, a species that believes in and acts on myths (as evidenced by those that define our tribal, 'racial' or religious identity), and I believe that we will get out of the biodiversity crisis we are in only if we embed the fauna and flora around us into a mythology, a shared ethics of the sea, one that could be shared among all people on Earth, and which also could motivate political action (as myths generally do). This, I suggest, has the potential to reach beyond narcissistic consumers in rich countries, the present targets of our 'market-based' initiatives. This is where I am now.

Footnote

[1] This is the abstract of a Keynote address from the International Marine Conservation Congress, given at the, Baird Auditorium, Smithsonian Museum of Natural History, May 20, 2009. I did it without PowerPoint for a change, and the result was fun. Try it! (See also:http://scienceblogs.com/guiltyplanet/2009/05/daniel_pauly_keynote_imcc.php.)

... the way we interact with nature has been simplified ("eat it"), and we are at the onset of a catastrophic decline of marine biodiversity.

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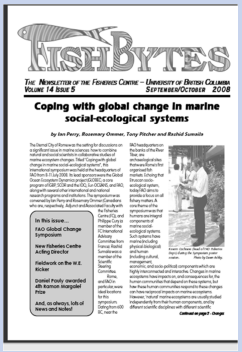

FISHBYTES

THE NEWSLETTER OF THE FISHERIES CENTRE – UNIVERSITY OF BRITISH COLUMBIA
VOLUME 14 ISSUE 5 SEPTEMBER/OCTOBER 2008

Coping with global change in marine social-ecological systems

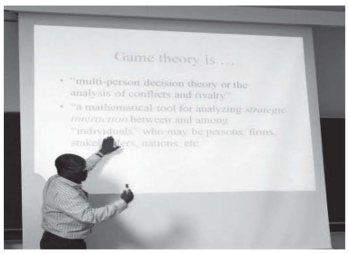
by Ian Perry, Rosemary Ommer, Tony Pitcher and Rashid Sumaila

In this issue...
FAO Global Change Symposium
New Fisheries Centre Acting Director
Fieldwork on the W.E. Ricker
Daniel Pauly awarded the Prince Albert Monégasque Prize
And, as always, lots of news and notes!

In 2010, FishBytes, a newsletter published by the Fisheries Centre, will be going fully electronic. We want to thank all of our readers for their continued support over the years. We kindly request those readers who are receiving hard copy versions of our FishBytes and *Sea Aroud Us* newsletters to email the editor, at FishBytes@fisheries.ubc.ca, with their electronic address, if they wish to continue reading FishBytes. The *Sea Around Us* is also reviewing their newsletter distribution. Please see the questionnaire on page 3. Having a fully electronic newsletter will allow us to use colour for visual aides to communicate with our readers, such as photos and graphs. We appreciate your cooperation and patience as we make this transition. We hope you will continue to read and enjoy FishBytes! If you have any comments or suggestions for us regarding this transition, please email the editor at FishBytes@fisheries.ubc.ca.

Global games: FAME hosts game theory workshop

by Megan Bailey



Rashid Sumaila (left) and Megan Bailey (right) give talks at the FAME Game Theory and Fisheries workshop in Esbjerg, Denmark. Photo by Thong Tien Nguyen.

In fisheries economics, game theory came onto the scene in 1979...since then, over 150 articles have appeared...

Game theory is a tool for analyzing strategic interaction. The famous John Nash, a Nobel Prize winner (1994) for his work on cooperative and non-cooperative games in the 1950s, brought this theory from the depths of esotericism, to the light of the practical day. Well kind of. It has been applied to military planning, business situations, political science, evolutionary biology and economics, including resource economics. But like most theories, it has requried time to be accepted by the general public as a worthy approach to be taken seriously.

In fisheries economics, game theory came onto the scene in 1979, when Gordon Munro, Professor Emeritus in the Economics Department at UBC, and Associate Professor at the Fisheries Centre, published the first application[1]. Since then, over 150 articles have appeared that apply game theory, both analytically and empirically, to many fisheries worldwide (see www.mm.helsinki.fi/~mjlindro/gamefish.html for a list of these publications). Game theory is a valid tool to apply to fisheries because many of the world's fisheries are targetted by more than one country, and the fishing actions of one country affect the the actions taken by other countries. This is known as dynamic externality.

Workshop attendees are treated to a boat trip around Ho Bay. Photo by Thong Tien Nguyen.

In June, the Fisheries and Aquaculture Management and Economics group (FAME), based in Denmark, hosted a game theory and fisheries workshop that brought together some of the leaders in the field to share their work and methods with students. The *Sea Around Us* project's Rashid Sumaila gave a keynote lecture outlining the general ideas behind the application of game theory to fisheries. Other keynote presentations were given by Lone Kronbak (University of Southern Denmark), and Pedro Pintasillgo (University of Algarve), both of whom, along with Marko Lindroos from the University of Helsinki, and our own Gordon Munro, are really pushing the field forward. These individuals are combining forces with game theorists in other fields, to find better approaches to facilitate cooperative management of internationally -shared fish stocks.

All workshop attendees were encouraged to give presentations of their work. It was during these talks that we learned just how global the application of game theory to fisheries is. I presented on our work, funded by World Wildlife Fund and Pew Charitable Trusts, which is applying game theory to skipjack, yellowfin, and bigeye fisheries in the Western and Central Pacific Ocean. We heard how game theory could be applied to studying egalitarian fisher cooperatives in Japan. Two presentations focused on applying the theories to the use of territorial use rights in fisheries (TURF) schemes in Europe and in Chile. We also saw a presentation outlining an analytical model of applying game theory to the effective use of marine protected areas (MPAs) by multiple countries. Game theory has also been applied to fisheries in Canada, the US, in the Baltic and Barents Seas, in the Patagonian ecosystem, and to the Northern Atlantic bluefin tuna and Norwegian spring-spawning herring fisheries, among many others. It is truly a theory that has been picked up by fisheries economists and applied to some of the biggest challenges in fisheries management: namely how to cooperatively share a joint a resource.

Footnote

[1]Munro, G. 1979. The optimal management of transboundary renewable resources. *The Canadian Journal of Economics* 12: 355-376.

Publications Mail Agreement No: 41104508

Sea Around Us

SeaLifeBase assists the Red List Assessment Workshop on Philippine Marine Mammals

by Patricia Sorongon

A workshop on the conservation status assessment of Philippine marine mammals, the first of a series, was conducted August 13 to 15, 2009 at the New Eurotel, North Edsa, Quezon City, Philippines. This was to facilitate specialists at the national or regional level to contribute their knowledge, based on field experience, in an effort to identify, monitor and develop appropriate management measures by the Philippine Red Listing Training Group. Marine mammal experts who participated in the workshop will become members of the Philippine marine mammal Red List sub-committee, which will provide technical assistance to the Philippine Red List Committee (PRLC) and the Philippine Wildlife Committee, as stipulated in RA 9147 (The Wildlife Act of the Philippines).

Dr Louella Dolar gave an overview of the information on Philippine marine mammals, as well as the status of available information per species, while Moonyeen Alava presented an overview of the IUCN Red List process (International Union for Conservation of Nature), including definitions, criteria, and the matrix to be followed during the assessment. Edna Sabater introduced the database structure to be used during the assessment, while five other presentations summarized the results of the studies conducted for various species of marine mammals in the Philippines.

The group, chaired by Dr Louella Dolar and William Perrin, applied the current Red List global status of each marine mammal species to the Philippine national level for the following data categories: Philippine and depth distribution, habitat and ecology information, life history, population, longevity and reproduction, and

Participants of the IUCN-sponsored workshop on "Red List Assessment of Philippine Marine Mammals" held in Quezon City, Philippines. Photo provided by the SeaLifeBase Project.

Continued on page 2 - Mammals

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The SeaLifeBase Project provided data on maximum size, maturity, ecology, Philippine distribution, food, and predators.

Mammals - Continued from page 1

major threats and conservation measures. The SeaLifeBase Project provided data on maximum size, maturity, ecology, Philippine distribution, food, and predators. Each category was discussed thoroughly by the participants, with inputs based on their expertise (referenced as personal communication) or from published literature, and the Red List Status assigned and finalized in the IUCN database.

Gaps in the group's knowledge on the biology of Philippine marine mammals were identified; about 80% of the 27 species are data deficient. This will hopefully lead to more research initiatives on Philippine marine mammals, or perhaps more SeaLifeBase collaborators on marine mammals of the Philippines.

A Response to End of the Line

The End of the Line — a documentary film on overfishing that featured many scientists, including two Fisheries Centre members/faculty — has sparked a lot of discussions, one of which occurred on the pages of SEED Magazine online (July 16). The *Sea Around Us* Project's Daniel Pauly and Jennifer Jacquet were among the six scientists to respond to how to alleviate overfishing in the article written by Maywa Montenegro. Daniel suggests that a global crisis was inevitable, given that most nations had overfished their exclusive economic zones years ago. He provides two main ways to improve fisheries sustainability: 1. remove harmful subsidies, and 2. promote effective gear restrictions. Daniel also concludes that the small percentage of ocean that is protected, currently at 1%, is far too small to ensure long-term sustainability of many stocks. Jennifer points out that overfishing is really about overeating. She suggests reforming the fishmeal industry, as one third of fish and seafood is currently turned into food to feed other animals. She also highlights the already-popular eat locally campaigns, and suggests that consumption of locally-caught fish could help. The full article is available at http://seedmagazine .com/content/article/finding_fish/P1/.

The ***Sea Around Us*** Project newsletter is published by the Fisheries Centre at the University of British Columbia. Included with the Fisheries Centre's newsletter *FishBytes*, six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Megan Bailey, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the Project.

Contributors

This issue features stories from three new contributors to the newsletter. Patricia Sorongon contributed the first article, and works with the SeaLifeBase Project, at the WorldFish Center, in Los Baños, Philippines.

Les Watling and Ken Sulak cowrote the second piece. Les is a member of the Department of Zoology at the University of Hawaii at Manoa, Honolulu. Ken is lead scientist of the Coastal Ecology and Conservation Research Group, U.S. Geological Survey, Gainesville, Florida.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organizations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organizations.

FishBase, the Internet, and a deep-sea octocoral cruise in the Bahamas

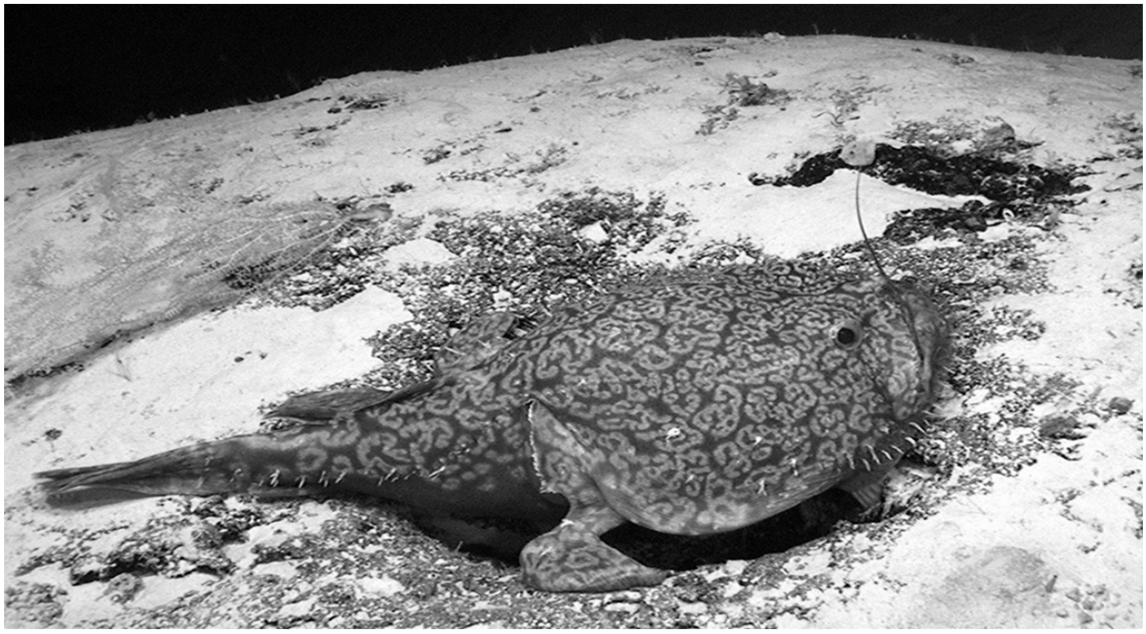
by Les Watling and Ken Sulak

At the end of March, 2009, we set sail from Ft. Lauderdale on the University of Miami's research vessel, the R/V *F.G. Walton Smith*. Our mission was to sample and document deep-sea octocoral communities from the Bahamas escarpment, mostly at depths from 800 to 2500 m. This project was a continuation of work we started in 2003 on the New England Seamounts (NES), and continued with cruises to NES and Corner Rise (CR) in 2004 and 2005. In all we visited 15 seamounts and collected more than 400 specimens. Our primary sampling tool has been either the research submersible, *Alvin*, or the remotely operated vehicle (ROV) *Hercules*. Both were equipped with manipulators to collect specimens, and boxes to store them in for the ride to the surface. In addition, both were also well-equipped with video cameras, so we always took the opportunity to record on video all of the interesting things we saw, especially the fish, and we always have had, as a member of our team, a person who could identify the fish.

One of us (KS) had sampled this Bahamas area for fish when he was a graduate student. Of course, in those days he used a trawl and sometimes the specimens would be a little beat-up. For this cruise, we had two technological advantages: a superb ROV (the *Global Explorer*) with hi-definition television camera, and live access to the Internet. When a fish came into view, the general protocol was to try to get very good lateral views of the whole body, but especially the `face', so that the prospect of identifying the fish was high. With the video camera we had, and excellent piloting on the part of the ROV crew, we were almost always able to fully image the fish such that identification would be possible. Such images were often taken close enough so that the number of rays in the fins could be counted, or other diagnostic features verified, if that was needed.

... images were often taken close enough so that the number of rays in the fins could be counted.

Having studied the fish in the area before, Ken could identify



The rare *Sladenia shaefersi*, identified at sea using FishBase. Image taken by the ROV *Global Explorer*, and courtesy of Bahamas Deep-Sea Coral Expedition Science Party, NOAA-OE.

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FishBase - Continued from page 3

Existing images in FishBase were extremely helpful in definitive identifications during the mission.

most of what we saw. But there were several that he had not seen alive and unbattered before or recognized but wondered whether they had been encountered in this area of the ocean before. This is where having an Internet connection was valuable. Whenever a question like this came up, Ken logged on to FishBase, searched the taxon of interest, pulled up a list of known species, then checked if the known geographic and depth distribution of the suspected species matched the study area. He could also determine which similar species occurred in the dive area, pull up an archived FishBase photograph, and check descriptive and diagnostic details. The issue was often settled in a matter of minutes, sometimes while we were still observing the fish on the video screen.

Access to FishBase also allowed Ken to ensure that the latest scientific name changes and spellings were used in our cruise database. On previous cruises, he has typically gone to sea with a large chest full of reference texts and faunal guides. However, he observed that it is physically impossible to bring all the taxonomic reference books and papers that one would need to facilitate visual identifications and validate taxonomic names at sea for the diversity of the deep-sea fishes encountered. Equally, it would be impractical to scan all such books as portable pdf files, and impossible to stay current with name changes for all taxa. However, with online access to FishBase, he will be able to leave many heavy and valuable books in his home office on future ROV missions, and able, as well, to access the latest taxonomy. Existing images in FishBase were extremely helpful in definitive identifications during the mission. For example, FishBase images of the angler, *Photocorynus spiniceps*, enabled a species-level identification, where our determination otherwise was simply family Linophrynidae. Again, FishBase information was instrumental in confirming the identification of a second very rare fish, *Sladenia shaefersi*, Family Lophidiidae (pictured on page 3). He noted that more comprehensive inclusion of good quality layout and underwater images of each species would be a very desirable FishBase upgrade.

Thus, FishBase should more vigorously encourage scientists to contribute images; the experience recalled here shows why.

Editor's note: FishBase was developed at the World Fish Center, in collaboration with the Food and Agricultural Organization of the UN. The database holds information on over 30,000 fish, and can be accessed at www.fishbase.org.

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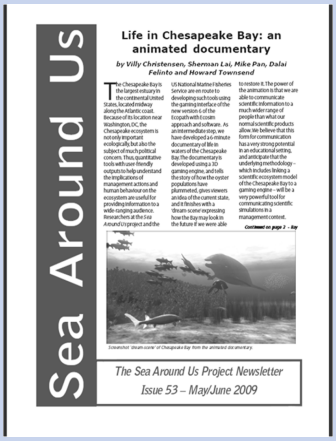
Sea Around Us

Life in Chesapeake Bay: an animated documentary

by Villy Christensen, Sherman Lai, Mike Pan, Dalai Felinto and Howard Townsend

The Chesapeake Bay is the largest estuary in the continental United States, located midway along the Atlantic coast. Because of its location near Washington, DC, the Chesapeake ecosystem is not only important ecologically, but also the subject of much political concern. Thus, quantitative tools with user-friendly outputs to help understand the effects of fishery management actions and human behaviour on the ecosystem are useful for providing information to a wide-ranging audience. Researchers at the Sea Around Us project and the US National Marine Fisheries Service are en route to developing such tools using the gaming interface of the new version 6 of the Ecopath with Ecosim approach and software. As an intermediate step, we have developed a 5-minute documentary of life in waters of the Chesapeake Bay. The documentary is developed using a 3D gaming engine, and tells the story of how the oyster populations have plummeted, gives viewers an idea of the current state, and it finishes with a 'dream scene' expressing how the Bay may look in the future if we were able to restore it. The power of the animation is that we are able to communicate scientific information to a much wider range of people than what our normal scientific products allow. We believe that this form for communication has a very strong potential in an educational setting, and anticipate that the underlying technology – which includes linking a scientific ecosystem model of the Chesapeake Bay to a gaming engine – will be a very powerful tool for communicating scientific simulations in a management context.

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Snapshot 'dream scene' of Chesapeake Bay from the animated documentary

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In 2010, the *Sea Around Us* newsletter, as well as FishBytes, a newsletter published by the Fisheries Centre, will be going fully electronic. We want to thank all of our readers for their continued support over the years. We request that those readers who are receiving hard copy versions of our FishBytes and *Sea Aroud Us* newsletters kindly email the editor, at FishBytes@fisheries.ubc.ca or SeaNotes@fisheries.ubc.ca, with their electronic address, if they wish to continue reading our newsletters. Having a fully electronic format will help us to be more sustainable by reducing our reliance on paper, and will allow us to use colour for visual aides to communicate with our readers, such as photos and graphs. We appreciate your cooperation and patience as we make this transition. We hope you will continue to read and enjoy our newsletters! If you have any comments or suggestions for us regarding this transition, please email the editor at FishBytes@fisheries.ubc.ca, or SeaNotes@fisheries.ubc.ca.

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Sea Around Us

Global warming: effects on sea-food security

by Daniel Pauly and William W.L. Cheung

There are various ways that scientists of diverse disciplines can contribute to the debate on global warming. The first, obviously, was to establish the reality of the greenhouse effect, and this was achieved well over a hundred years ago, through the work of Svante Arrhenius (1896). However, it is only in the last three decades that the work of Charles Keeling, James Hansen and others, systematized in successive IPCC assessments, established empirically that humans not only could change the climate, but were indeed engaged in doing so, with potentially catastrophic outcomes.

The mechanisms at work are mainly physical and chemical, and notwithstanding numerous exceptions (see e.g., Wilson *et al.* 2009) and feedback loops, this mainly means that the systems biologists study are at the receiving end of climate change. In other words, we must study how ecosystems and the species therein are going to respond to physical forcing. Terrestrial ecologists have taken a lead on this, not least because they could build on spatial information on natural (forests, savannas, etc.) and agricultural systems, for which numerous global databases exist.

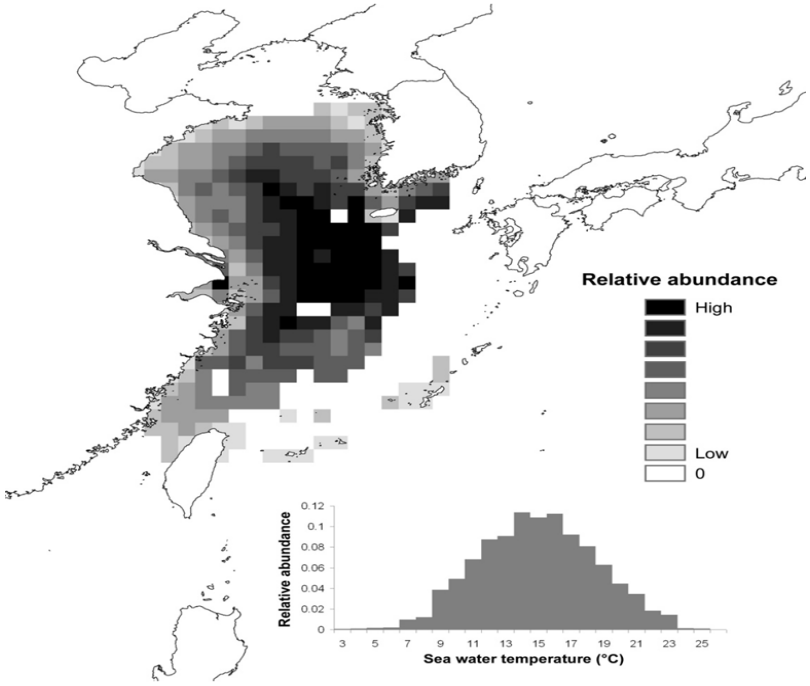

Figure 1. Example of a distribution range map for yellow croaker Larimichthys polyactis *and (as insert), the resulting temperature preference profiles. Similar maps, pertaining to well over 1000 species and higher taxa may be found at www.seaaroundus.org.*

This is different for marine biologists and fisheries scientists, two disciplines whose practitioners are accustomed to working at a local level on one, or a few, species at a time, and to testing narrow hypotheses (Peter 1991). Thus, their main response to the global warming challenge so far

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... insights gathered in the course of this work enable us to tackle global climate change issues.

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has been local studies, highlighting, e.g., the poleward movement of selected species (see Perry *et al.* 2005), from which global inferences are then drawn. This approach is fraught with problems, especially considering the representativeness of the species and locales studied.

The *Sea Around Us* Project has a global mandate, however. This is the reason why we have mapped the growth and decline of global catches since 1950 (Pauly 2007; Watson *et al.* 2004), and the data and insights gathered in the course of this work enable us to tackle global climate change issues. The following account briefly discusses steps that we used to produce a number of papers on the impact of global warming on marine biodiversity and fisheries on the world's marine ecosystems, and to lay a strong foundation for future contributions. We proceeded in four steps.

Step 1 was the elaboration of a model for shifting the species distributions (generally poleward, and into deeper water) as temperature increased, building on the over one thousand range maps we constructed, in the course of the *Sea Around Us* Project, for mapping fisheries catches. (We have a map for all 'commercial species', these being defined as fish or invertebrate species for which at least one member country submits catch data to the FAO; Figure 1). From each of these maps, a temperature preference profile was derived (Figure 1, insert), defined by the water preferentially inhabited by that species. (Note that we avoided circularity, because we never used temperature to define species range maps; see Close *et al.* 2006). Then, for each (half degree lat./long.) cell of a species distribution range map, a population dynamics model was set up, featuring the (bi)annual broadcasting of reproductive propagules whose survival is determined largely by the water temperatures they encounter. Given increasing temperatures, this generates amoeboid poleward movement of the species in question, lasting as long as the initial temperature preference profile is not re-established (see contributions in Cheung *et al.* 2008a). The projected temperature data we used for this originates from outputs of the Ocean-Atmosphere coupled general circulation model (GCM) CM 2.1 of NOAA's Geophysical Fluid Dynamics Laboratory and provided by our partners at Princeton University, led by Jorge Sarmiento. These output account not only for temperature changes, but also for changes in currents. We examined the effects of changes in ocean conditions under three greenhouse gas emission scenarios: 720 ppm, 550 ppm, 370 ppm CO_2 concentration by 2100, but we limited our projections to 2050.

Step 2 consisted of establishing a strong predictive relationship between the area of distribution of a species and its productivity, as required to reflect the changed distributions generated in Step 1. Such a strong relationship is documented in Cheung *et al.* (2008b) and has the form

$$\log C_p = -2.881 + 0.826 \cdot \log PP - 0.505 \cdot \log A - 0.152 \cdot \log TL + 1.887 \cdot \log CT + 0.111 \cdot \log HCT + e$$

where C_p is the potential catch (in $t \cdot year^{-1}$, estimated as the mean of several years with the highest catch); PP is the annual

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Climate - Continued from page 2

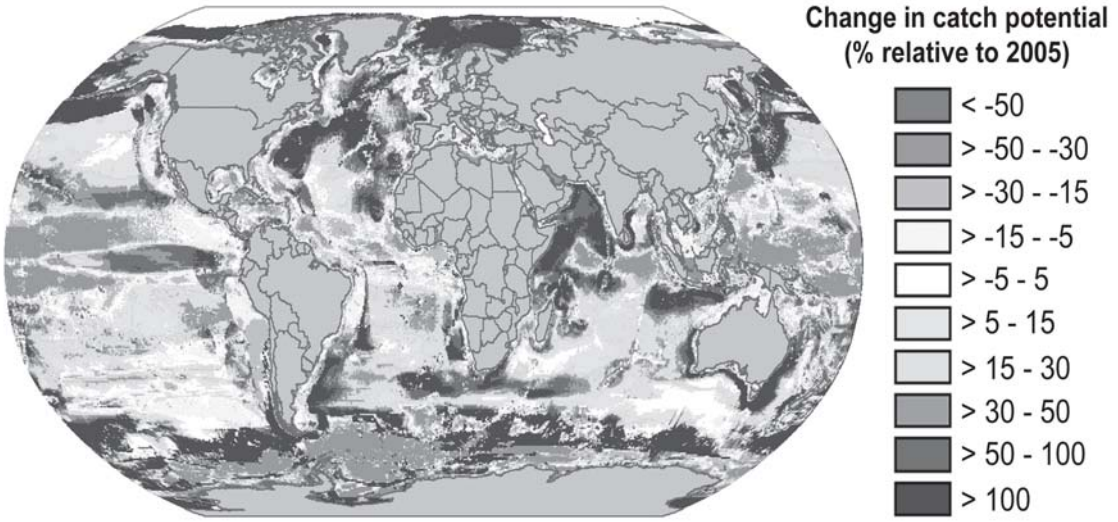

Figure 2. Predicted change in the potential of fisheries, given the distribution range shifts induced by global warming. Some high-latitude countries (e.g., Norway, Iceland) are predicted to see increases (20-40 %) in their catch potential, while tropical countries are predicted to see decreases (10-30 %) from such changes (Cheung et al. 2009b). However, these predictions do not account for change in oxygen distribution in, and acidification, of the oceans, and hence represent an optimistic scenario (see text).

primary production in the area of distribution (g·C); A is the area of distribution (km^2); TL is the trophic level; CT is number of years used from the computation of C_p; HCT is the catch reported in the corresponding genus or family (to account for reporting in taxa other than species) and *e* is the error term of the model, which explains 70% of the variability in a data set comprising 1066 species, covering animals as diverse as Antarctic krill *Euphausia superba* and yellowfin tuna *Thunnus albacares*.

Step 3 then consisted of applying the shift model in Step 1to over 1,000 species as defined above (857 species of finfish and 229 species of invertebrates).This led to global maps showing areas dominated by species extirpations (near the poles, and in the inter-tropical belt), areas dominated by invasions (Arctic and Southern Ocean), and areas with high turnover (extirpation + invasions). They represent the first global maps of threats to marine biodiversity (see Cheung *et al.* 2009a). Moreover, because they were based on a large sample size and on species with a large biomass, we believe that the pattern they identify is representative and thus can guide future work about the impact of global warming on marine biodiversity.

Step 4, by combining the catch potential in Step 2 with the species shifts in Step 3, generated maps of change in catch potential for the world oceans (Figure 2). When these were overlaid with the outlines of countries' Exclusive Economic Zones, the main result was that a few high-latitude countries (e.g., Norway, Iceland) may benefit from the large scale redistribution of fish species, i.e., see increases of their catch potential of up to 40%, while low-latitude, tropical countries may suffer declines of 10-30% in their catch potential (Cheung *et al.* 2009b). In countries covering a large latitudinal range, such as the USA and Australia, the positive changes in high latitude areas would offset negative changes in low latitude areas, as revealed by soon-to-be submitted national-scale studies for the US and Australia. Here again, we anticipate that our result will inspire international research on this topic because our inferences are based on huge datasets and do not represent solely local conditions.

This work also allowed identification of limitations in our coverage of the world's biodiversity, as there are numerous countries which, in their reports to FAO, omit the catch of artisanal fisheries (i.e., coastal species), important as they usually are (see contribution in Zeller and Pauly 2007). In the future, we will remedy this by ensuring that every EEZ in the world is represented by at least several

...a few high latitude countries (e.g., Norway, Iceland) might benefit from the large scale redistribution of fish species ... while low latitude, tropical countries would suffer declines of 10-30 % in their catch potential.

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coastal species. However, the major limitation of our study probably is the non-consideration of four important factors, which we assess will be critical to future research.

One factor so far neglected is dissolved oxygen, which generally will be reduced in future oceans because stronger temperature gradients with regards to depth will reduce mixing. We will account for this potentially strong effect on fish productivity by explicitly taking account of the impact of oxygen on fish growth (Pauly 1981).

The second neglected factor is acidification. Lower pH is generally perceived as affecting only organisms with calcium carbonate shells, but in reality it is likely to affect all water-breathing organisms, by reducing the gradient which allows them to get rid of carbon dioxide as they exhale. Empirical evidence exists that a reduction of this gradient will impact performance of water-breathers, and hence the productivity of fish (e.g., Munday *et al.* 2009).

The third factor we must consider is that, while primary production is generally predicted to remain similar in the next decades, it may actually consist of smaller cells (picoplankton; various flagellates) and less of the larger phytoplankton (especially diatoms), which fuel productive marine food webs. We plan to account for this by inserting a trophic level between the small phytoplankton and the zooplankton, which will account for the microbial food web (where much of the small phytoplankton ends up), and reduce the primary production supporting fisheries yields.

Finally, the current version of coupled GCM does not represent well the dynamics along the coast and on the continental shelf, where many exploited species are found, which adds considerable uncertainty to our finer-scale projection in some regions. Thus, we are undertaking regional case studies (e.g, in Western Australia) in which higher-resolution physical outputs from regional oceanographic models are used to drive our biological models. The results so far suggest that the general patterns of range shift that we showed in the global analysis remain robust at the regional scale. Nevertheless, we will, in the future, use outputs from GCMs with finer resolution and better coastal representation.

A paper outlining these four steps is in progress and we expect that it will generate estimates of potential catch devoid of 'winners': the world fisheries will lose out, and the effect will be strongest in the tropics.

Overall, this global modelling exercise will gradually include much of what we know about important physiological and trophic mechanisms. Also, it will be enriched when the work of Villy Christensen, working with Ecopath with Ecosim and the *Sea Around Us* databases, adds a food web perspective to this (see Christensen *et al.* 2009). Overall, with this work, the *Sea Around Us* Project is positioning itself to be a major player in the scientific study of the effect of global warming on ocean biodiversity and fisheries. This will often make us the bearer of bad news, as it appears that the more we build into our model the worse the predictions become.

On the other hand, our work – already now - indicates that the faster the root cause of global warming is addressed, the better it will be for the millions of people who depend directly or indirectly on seafood for their subsistence or their enjoyment.

The Sea Around Us *Project is positioning itself to be a major player on the scientific study of the effect of global warming on ocean biodiversity and fisheries.*

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High times, high seas, high blood pressure: completing an MSc at the Fisheries Centre has it all

by Sarika Cullis-Suzuki

This fall 2009, I closed the door on part of my life: I finished my three-year MSc at the Fisheries Centre at UBC. Unfortunately, what was not put to an end: all the ocean's problems.

Certainly one of the most overwhelming things I dealt with early in my studies was becoming aware of the global crisis of fisheries, and the resultant feeling of being so small as to be completely ineffectual in the face of it. I definitely remember my early days at the Fisheries Centre, rushing over to my supervisor's office, plunking myself into a chair and asking: how do the oceans even stand a chance? And how do you maintain your composure?? I suppose Dr Daniel Pauly has witnessed (or been the victim of) such a reaction before. He calmly explained to me how you do what you can: you put the parts back, tiny piece by tiny piece[1]. And so that's what I tried. As we all do, as members of the *Sea Around Us* Project.

Initially for my research, I began working on global Marine Protected Areas (MPAs), continuing on with the work of Dr Louisa Wood, who graduated from UBC in 2006. While this did lead to some interesting results (see Alder *et al.* 2009; Cullis-Suzuki and Pauly *in press*), after a year it was time to move on to something new.

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Yet while we continue to blanket the seas with RFMOs, the question of whether or not these management bodies are even effective remains unanswered.

While taking a course in marine resource law, I became very intrigued with the concept of an ocean 'commons', and the idea that there could still be areas of the sea essentially unowned by people. What happens to the resources in these areas? Who is responsible for them? Comprising about 60% of the ocean's surface, the high seas are often left out of the global fisheries discussion.

This is what led me to my thesis topic: the effectiveness of global regional fisheries management organizations on the high seas. Regional fisheries management organizations, RFMOs, are currently the only fishery bodies mandated to manage and conserve the fish resources in the high seas (United Nations 1995). Currently, RFMOs cover the majority of the global oceans (Figure 1). Through increased management, RFMOs are touted as being part of the solution to overfishing; thus calls to increase their numbers have been made, and as a result, more are slated to come into existence soon[2].

Yet while we continue to blanket the seas with RFMOs, the question of whether or not these management bodies are even effective remains unanswered.

I conducted a two-part study. The first part examined the state of RFMOs in theory, i.e., how well they did when compared to guidelines (see Lodge *et al.*, 2007). The second part examined the effectiveness of RFMOs in practice, i.e., how well they scored in relation to the status of the stocks which they manage.

The average score across RFMOs in the first part of the study was 57%: the majority of RFMOs fail to meet the best-practices requirements. Scores were particularly low regarding schemes to promote compliance. The results of the second part of the study were even more shocking: two-thirds of the stocks examined under RFMO management were either depleted or overexploited, which matches with FAO's current estimate (FAO 2009). These results show that high seas stocks are worse off than those within EEZs, and with a much shorter fishing history, too[3]. The RFMOs scored predictably worse in this half of the study, averaging 49%.

There appeared to be no correlation between how RFMOs scored in the first assessment, and how they scored in the second; in other words, what an RFMO says it's doing does not necessarily reflect what is actually happening in the sea.

My study concluded that RFMOs face many organizational problems which can account in part for their low scores, but generally, the most pressing concern is our failure to accept

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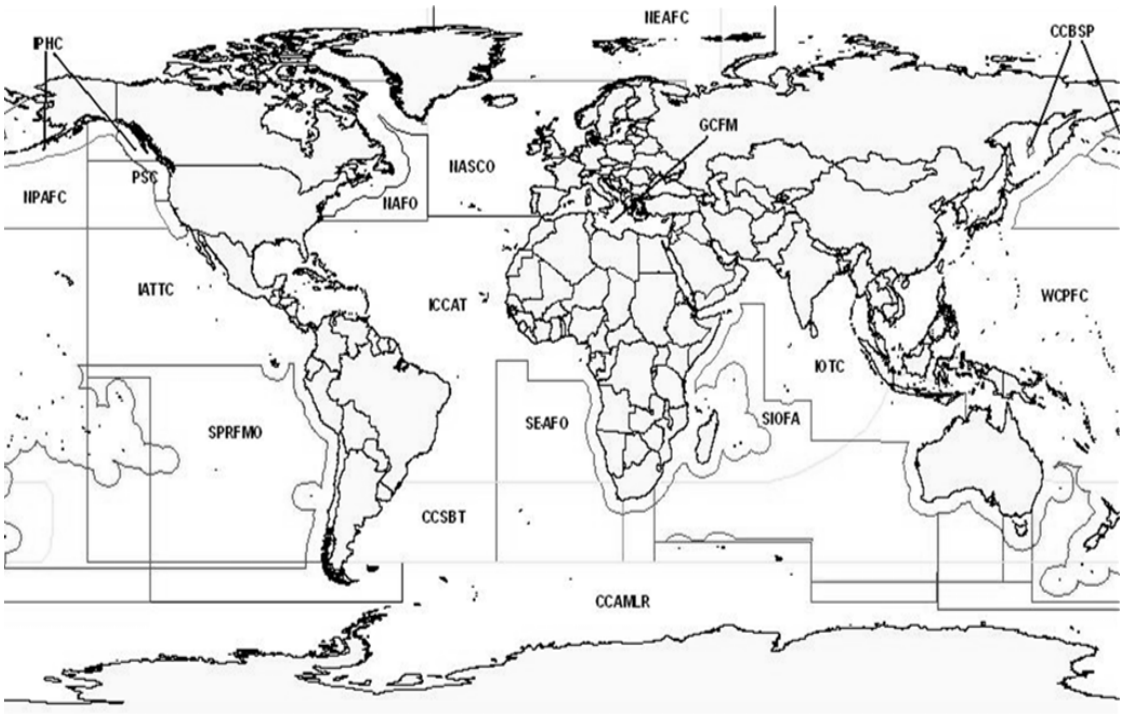

The global distribution of RFMOs. The IWC covers the entire ocean.

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that the 'Freedom of the Seas' exists no longer. "First, the principle of freedom of fishing could be retired from the pantheon of fundamental principles. Indeed, the continued articulation of the principle is both inaccurate and misleading, if not downright disingenuous" (Rayfuse 2007). And because we don't accept this, we continue to treat the high seas like a global commons. Flags of convenience, IUU, and high rates of bycatch are all rampant on the high seas, illegal acts aided easily by their immensity and unmonitored state.

Until we succeed in giving RFMOs both full responsibility and accountability for managing and conserving fish in the high seas, their state- and that of the fish- can only be expected to get worse.

These findings will soon be submitted to a journal. Yet while valuable, they are overwhelmingly depressing. It's a strange feeling: part triumphant at finishing one's degree, part despair upon realizing just how bad it is for the oceans.

Ah, the ups and downs; they definitely get one's blood flowing.

Thankfully, there were other, more uplifting parts of my time at the Fisheries Centre. Like what it's like to be at the epicentre of cutting-edge global fisheries research, or to exchange ideas with an incredibly diverse and competent international group of people. Or to have conversations with the leading minds in fisheries science… and sometimes, even to disagree with them. Or to shrink in one's seat in a classroom, surrounded by professors, post-docs, and students, all people of imposing analytical capacity. Or to collect an eminent scientist at the airport because she is scheduled to give a lecture at your institution- a scientist who will soon go on to work for the Obama Administration, becoming the first female in history to head NOAA[4]. Or to have your hero write to you because he read an article you wrote in *FishBytes*. Or, to have the freedom to do science while acting on the responsibility we have as scientists and as citizens.

My time at the Fisheries Centre has been replete with opportunities and intellectual stimulation (and exhaustion). These things have all made my three years here matchless in scope, and very, very full. For all this, I am grateful and proud. Thanks to all who have been part of it.

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Notes

[1] 'Tiny' being relative: the topics of theses supervised in the context of the *Sea Around Us* Project, being global in scope, are notoriously ambitious!

[2] For a list of current and future RFMOs, see www.fao.org/fishery/rfb/search.

[3] Unlike coastal fisheries, high seas fishing only really began in the 1950s.

[4] Dr Jane Lubchenco gave a FISH 500 seminar at the Fisheries Centre as part of the lecture series in March 2008, exactly a year before she became administrator of NOAA.

And because we don't accept this, we continue to treat the high seas like a global commons.

The vaquita and selective trawling by shrimpers in Mexico

By Edaysí Bucio[1]

The Upper Gulf of California (UGC) is Mexico's most important fishing ground (Acosta, 2008). The bulk of the fisheries since the 1930s have targeted shrimp. Two sectors coexist: an artisanal and a commercial shrimp fishery. The latter use trawlers, while the former uses a multitude of small boats or 'pangas', with a length of less than 7.5 m and an outboard motor. The gear used to catch shrimp is a gillnet or 'chinchorro de linea', forming a curtain in the water column. This generates huge bycatch, including of protected species, for example the giant croaker *Totoaba macdonaldi*, as well as marine turtles.

The modified gear catch generates less bycatch, and if widely adopted, would reduce the threat to vaquita, totoaba and marine turtles.

Thus, this fishery is viewed as a major cause for the decline of *Phocoena sinus*, or 'vaquita' (literally: 'little cow'), a small endemic porpoise whose low population (of about 400 individuals) suffers an anthropogenic mortality of 40-80 individuals per year (WWF, 2006).

A number of Mexican and international agencies are attempting to mitigate this problem. Among the former, the Escuela Nacional de Ingeniería Pesquera (Universidad Autónoma de Nayarit) runs, jointly with the Comisión Nacional de Acuacultura y Pesca, a project to evaluate the possibility of converting pangas from using gill nets to using modified trawls equipped with fish-excluding devices, which would reduce or eliminate the vaquita and other bycatch.

Fishing tests performed in the buffer zone of the biosphere reserve that is part of the UGC (including the delta of the Colorado) were encouraging. Consecutive 30-minute hauls were performed in areas selected by fishers, with and without modified gear, and catch samples were obtained which were then separated into the shrimp catch and bycatch species (CONAPESCA, 2009). The main result: the modified gear catch generates less bycatch, and if widely adopted, would reduce the threat to vaquita, totoaba and marine turtles.

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Note

[1] In 2009 Ms Bucio, from Universidad Autónoma in Mexico, spent July and August as a volunteer with the *Sea Around Us* Project.

Sea Around Us newsletter print version will cease

In 2010, the *Sea Around Us* and FishBytes newsletters will be going fully electronic. We want to thank all of our readers for their continued support over the years. We request that those readers who are receiving hard copy versions of our *Sea Around Us* newsletter kindly email the editor, at SeaNotes@fisheries.ubc.ca, with their electronic address, and their preference to receive url or pdf mailing. Having a fully electronic format will help us to be more sustainable by reducing our reliance on paper, and will allow us to use colour for visual aids to communicate with our readers, such as the use of photos and graphs. We appreciate your cooperation and patience as we make this transition. We hope you will continue to read and enjoy our newsletters!

Sea Around Us

Dumb as a Cod Part II: The Case of IUU in the Baltic Sea

by Dirk Zeller, Peter Rossing and Sarah Harper

In a previous issue, we reported on fisheries in the Baltic Sea (Rossing and Zeller, 2008) and on our collaboration with the Baltic Sea 2020 Foundation in undertaking catch reconstructions for the nine coastal countries surrounding the Baltic Sea: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. The purpose was to obtain time series of total catch estimates, including so-called Illegal, Unreported and Unregulated fisheries catches (IUU), and compare these to officially reported statistics. The aim of the Baltic Sea 2020 Foundation is to stimulate concrete measures to improve the environmental quality of the Baltic Sea. In order to derive such policy measures for fisheries, one has to have an understanding of the scale and magnitude of the IUU problem. Our work, now completed (Rossing *et al.*, in press) and will soon be freely available at www.fisheries.ubc.ca/publications/reports/fcrr.php, provides a baseline of total fisheries catches, compared to officially reported statistics from 1950 to the present. The basic approach to, and philosophy behind, catch reconstructions is described in Zeller *et al.* (2006; 2007). In essence, we utilize all data- and information-sources available (including grey literature, media sources and expert knowledge) to derive time-series data on reported and IUU catches (including discarded and recreational).

The Baltic Sea is often referred to as one of the most studied seas in the world (Kononen *et al.*, 2001). Ironically, relatively little seems to be known about the magnitude of IUU catches, and even less of that information is readily available to the interested public. While the International Council for the Exploration of the Sea (ICES), with responsibility for advising the European Commission on Total Allowable Catches (TACs) for the main commercial species caught in the Baltic Sea, does include its own estimates for unreported landings and discards in its annual stock assessment working group reports, these data are not transparent to the public, and therefore the reports avoid identification of countries and individual magnitudes involved.

Our study clearly illustrated this practice (for 1950-2007), as our total reconstructed catches for the Baltic Sea were around 30% larger than the official statistics reported publically by ICES on behalf of its member countries (plus Russia). When the total reconstructed catches peaked in 1997, total catches were likely 43% higher than the reported statistics, while for the most recent period (2000-2007), total catches were around 35% higher than the reported data. All coastal Baltic Sea countries were implicated, but our analysis suggests that the top three offenders were those with the largest share of the TAC: Poland, Sweden and Denmark. Respectively, these countries represented 36%, 13% and 14% of our total reconstructed IUU (unreported landings,

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Overall, the magnitude and preponderance of unreported landings by all countries strongly suggests considerable management and enforcement failures.

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discards and recreational catches). Poland's large share of the IUU was driven by unreported cod catches estimated to be up to 300% higher than reported landings for some years, making it the main culprit during this period.

Without exception, unreported landings were the most serious IUU fishing activity, followed by discarding. For example, our estimates of unreported cod catches for 2000-2007 were 5 times higher than the unreported landings data used by ICES stock assessment working groups. It was not possible to determine which country data were driving this discrepancy, as ICES unreported landings data are not reported in a transparent manner. This seems to illustrate the problem of non-transparent data use by these assessments, which is bound to influence management advice and policy decisions. Overall, the magnitude and preponderance of unreported landings by all countries strongly suggests considerable management and enforcement failures.

Discarding was also substantial, and is an entirely wasteful practice. Given the move to ecosystem-based management, such practices need to be phased out. The EU should seriously consider a discard ban on all fisheries, an approach successfully attempted by Norway. Such a move would require comprehensive observer coverage (ideally 100% and utilizing video system approaches) to ensure compliance and fairness.

Until recently, IUU issues have often been considered primarily a problem for developing countries (but see Coleman *et al.*, 2004). However, as the present study illustrates, IUU fisheries happen even in the most developed and richest countries, confirming that these highly developed countries with their substantial resources and well-established scientific, administrative, legal and management institutions have so-far failed to address IUU issues in a transparent and comprehensive manner.

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Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries (including reprint requests), subscription requests, and address changes should be addressed to Megan Bailey, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the project.

The *Sea Around Us* project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group. The Group supports nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, Pew makes strategic investments to help organizations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Group committed over $235 million to 302 nonprofit organizations.

The *Sea Around Us* is ten years old

by Daniel Pauly

The Sea Around Us is a collaboration between the University of British Columbia in Vancouver, Canada, and the Pew Environment Group, Washington, DC, devoted to assessing the impact of fisheries on the world's marine ecosystems, and proposing policies to mitigate these impacts.

The project started in mid 1999, and thus celebrated its tenth anniversary in July 2009. We are now preparing a retrospective for our years of activity (available at http://www.seaaroundus.org/about/index.php/5-10-year-retrospectives/). Through the years, our scope has increased, with more emphasis on fisheries economics and public policy, and our productivity has increased more that threefold – at least as measured by the number of peer-reviewed contributions authored and co-authored by our members. The reason for this massive increase is obvious: it took us several years to create the complex of layered databases that allow inferences on the global ocean (Figure 1). Now that this complex is in place, it has become more straightforward to detect regional or global trends that were previously not visible, to assess them, and to develop policies to deal with them.

Thus for example, we can now deal with global catches not only in term of the 'official' global landings assembled and disseminated by the Food and Agriculture Organization of the United Nations, but in terms of their Illegal, Unreported and Unregulated (IUU) components, which add to the global catch (see p. 1-2, this issue), and with the fishing effort, the gears and the costs (including subsidies) required to generate that catch, along with its economic value and its disposition through international trade. Also, we can infer long-term trends, because most of our databases start in 1950, and thus span over half a century. Moreover, in some cases where the science allows this, we project these trends into the future, as we are now beginning to do in our studies of global change impacts on biodiversity and fisheries potentials (see, e.g., Pauly, D. and W.W.L. Cheung. 2009. *Sea Around Us* Newsletter No. 55, Sept./Oct..)

The availability of the *Sea Around Us* databases not only allows for more, deeper work by project members, including a host of productive graduate students, but has also generated a flurry of offers of collaboration, resulting in a spectrum ranging from the very fruitful (e.g., with *National Geographic*) to the sensitive, requiring diplomacy ("No, you can't have ALL our data, but we can talk about what you actually need, and which you can use given that you give proper credit"). They establish that the *Sea Around Us* has become an internationally respected player in both the scientific and policy arenas of global fisheries. Not too bad for a ten-year old!

Note: From 2010 on, the *Sea Around Us* Newsletter will be available only online.

Also, we can infer long-term trends, because most of our databases start in 1950, and thus span over half a century.

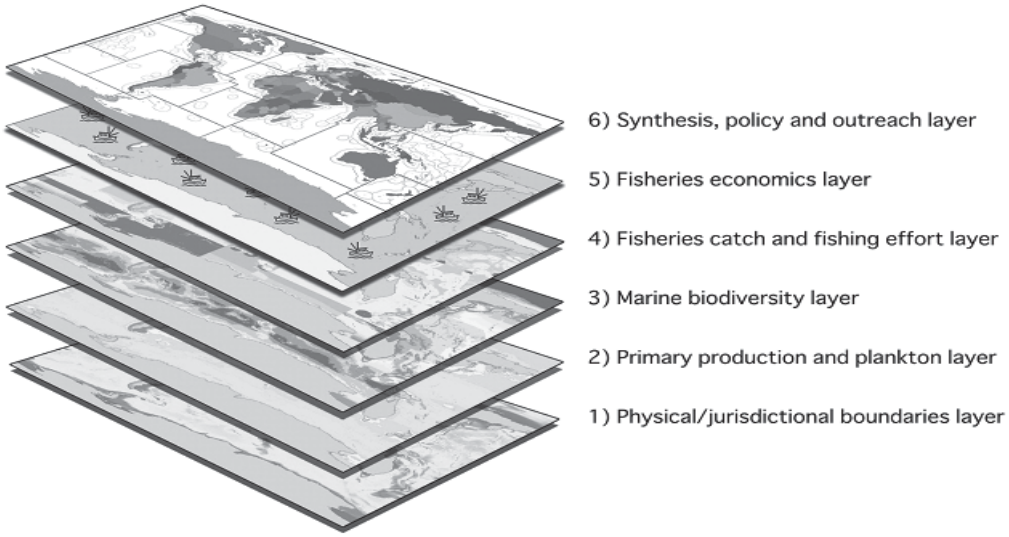

Figure 1. *Illustrating the scope of the* Sea Around Us *through global 'layers', each representing types of data used and/or contributed to, and which, when jointly analyzed, represent the entire range of ocean issues.*

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Sea Around Us

Building bridges and making maps at AAAS

by Jennifer Jacquet

So much of what the scientists do is less relevant than it could be. This was the motivation behind the theme at the 2010 AAAS annual meeting, Bridging Science and Society, and *Sea Around Us* members delivered on this theme in three different sessions.

Daniel Pauly presented on a panel that showed the growing consensus among fisheries scientists. Although global overfishing is becoming an accepted premise, questions inevitably arose on the future of aquaculture. Pauly explained that it would be wrong to look at gladiator tournaments and vilify sports, when there is curling; similarly, it would be wrong to look at salmon farming and vilify aquaculture, when there are oyster farms.

Metaphors are powerful communication tools. So are 3-D visualizations, especially in a world that is already too big and too fast-paced to keep track of information. Can we help manage the future by allowing people to see it? To address this question, Villy Christensen co-organized a panel on the use of visualizations to bridge science and society for sustainability.

The *Sea Around Us* Project's Sherman Lai showed the game-like tool he and Christensen developed to allow users to visualize the real-time effects of their fishing decisions. Multiple players can watch how their choices would play out in the underwater world using a video game interface that can also display the embedded EcoSim models. George Basil from Arizona State University showed models of local water consumption to stakeholders in Phoenix and emphasized the need to become aware of water usage at the regional scale rather than a city block.

Sherman Lai and Villy Christensen present fisheries visualizations at the 2010 Annual Meeting of AAAS held in February in San Diego, CA. Photo by Jennifer Jacquet.

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Rather than simply talking about various climate change predictions, UBC's Steven Sheppard presented a visualization of Richmond, B.C. under several feet of water. These tools, currently used in immersion labs like our own in the Fisheries Centre, are designed to allow managers to experience the results of potential policies. The panel also discussed the potential for these tools online.

The AAAS theme of bridging science and society was commendable, but there is still hesitation from scientists who try to avoid being perceived as advocates.

A panel I organized showed the importance of keeping track of information so that we can gauge cooperative use of common goods like freshwater, greenhouse gases, and fisheries. We discussed non-regulatory means of enhancing cooperation – namely through reputation and shame. Ralf Sommerfeld, a recent graduate who worked with the Max Planck Institute, presented several of his new game-theoretical studies showing that gossip and reputation can lead to increases in overall cooperation (Sommerfeld *et al.* 2007, 2008). This theory underpinned my presentation proposing that we migrate away from guilt-based efforts in conservation (e.g. eco-labels) toward shame-based strategies, which we can use to motivate large-scale resource users — a more effective conservation strategy. To show evidence of this in the real world, John Hocevar, head of oceans campaigns for Greenpeace USA, presented how they affect retailer reputation to encourage greater cooperation. In particular, he focused on the seafood scorecard, which has been released in 15 countries around the world and ranks major supermarkets according to their seafood procurement policies. As a result, many large retailers have stopped selling certain fish, like Orange roughy and sharks, and have engaged in discussions with the 'good cops' of conservation, like WWF.

The AAAS theme of bridging science and society was commendable, but there is still hesitation from scientists who try to avoid being perceived as advocates. For instance, Chris Clark, head of the Bioacoustics lab at Cornell University and an expert on sound in the ocean, showed that the oceans are three times louder than they were in the 1960s – much of it on account of shipping. For acoustic feeders like right whales, this means greater difficulty locating food and each other, as noise disturbance causes "frequent tears in their social fabric". The evening before, at the COMPASS marine mixer between scientists and journalists, Clark mentioned to me that a potential solution was to slow boat speeds, which was also more fuel efficient and cheaper for shipping. A Norwegian firm had, in fact, already committed to slowing their ship speeds. Clark has also made progress in installing 'smart buoys' that alert ship captains to the presence of right whales to help them avoid collisions (http://www.listenforwhales.org/) . The following day, Clark made a very compelling presentation of the problem of acoustic disturbances, but he did not mention any solutions in his presentation.

This is why scientists need to build bridges and they need to make maps. I am not necessarily referring to literal `map making', which is what a colleague dubbed the spatial planning session at AAAS. I refer to an action map to guide the audience where they might go if they want to know more or do something with the science they just learned.

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Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries, subscription requests, and electronic address changes should be addressed to Megan Bailey, *Sea Around Us* Newsletter Editor.

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The *Sea Around Us* project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group. The Trusts support nonprofit activities in the areas of culture, education, the environment, health and human services, public policy and religion. Based in Philadelphia, the Trusts make strategic investments to help organizations and citizens develop practical solutions to difficult problems. In 2000, with approximately $4.8 billion in assets, the Trusts committed over $235 million to 302 nonprofit organizations.

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Since the 1960s, studies have shown that behavior does not change merely as a result of information, even if it is fear inducing. Behavior can change if information is combined with an action plan. In a 1965 study on tetanus inoculation, researchers showed students the somewhat terrifying results of contracting tetanus, which resulted in 3 percent of the students getting a tetanus shot. Other subjects were given the same lecture but were also given a copy of a campus map with the location of the health center circled. They were then asked to make a plan for when they would get the shot and look at a map to decide what route they would take to get there. In this case, 28 percent of the students managed to show up and get their tetanus shot. The medical message seemed to influence attitudes but a specific plan influenced action (Leventhal et al. 1965).

In bridging science and society, scientists need to consider avenues to give their audience an action map. One obvious solution could be for scientists to incorporate policies and actions that would deal with the issues they study, like Chris Clark's recommendation to slow shipping speeds to reduce ocean noise. In some cases, scientists can *take* action, as happened in 1974 after two chemists at the University of California Irvine proposed a hypothesis that related CFC use to the depletion of the atmosphere. Sherwood Rowland and Mario Molina did not stop there but advocated for the ban of CFCs, which occurred regionally just three years later and, globally, with the 1987 Montreal Protocol (Haas 1990).

However, many scientists feel uncomfortable with action plans or, what many call 'advocacy'. In this case, scientists can team up with people who already have action plans, which is why AAAS supported a panel that included a main player at Greenpeace. It is why coral reef ecologist Terry Hughes, who presented about the fish biomass improvements within no-take zones, presented alongside Jay Nelson from Pew who is working to establish large marine reserves in an ocean where less than 0.08 percent of the area is no-take. Hughes also nicely exhibits the benefit of having scientists to examine the effects of action plans themselves. Like the scientists who examined the effects of a map on tetanus shots, Hughes has studied the biomass improvements in certain fish, like the coral trout, afforded by society's decision to re-zone and protect a greater area of the Great Barrier Reef (McCook et al. 2010). His research was a nice reminder that the bridge between science and society is a two-way street.

In bridging science and society, scientists need to consider avenues to give their audience an action map.

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'Jellyfish Burger' by Jennifer Jacquet and David Beck received Honorable Mention in the 2009 International Science and Engineering Visualization Challenge. See the next article to learn more about the potential of jellyfish burgers landing on the menu.

What's for dinner?

by Lucas Brotz

If the thought of eating a jellyfish burger leaves a bad taste in your mouth, you might just have to get used to it. While they aren't available at drive-through windows quite yet, we may discover that our future seafood options are more jelly than fish, especially if we can't break our bad habits.

Unless we change how we treat our oceans, a more gelatinous future may be inevitable.

Over the last two decades, jellyfish have increased in a number of locations around the world including Asia, Europe, and the eastern United States. Unfortunately, knowledge of jellyfish from most marine environments is limited, making it difficult to understand how jellyfish and ecosystems are responding to changes at regional and global scales (Mills 2001).

In an attempt to see the bigger picture, jellyfish scientists from around the world are starting to pool their data, and I am privileged to be collaborating on the project. The first in a series of meetings was recently held at the National Center for Ecological Analysis and Synthesis (NCEAS) in Santa Barbara, California. NCEAS is an ideal host for the Jellyfish Working Group, as it facilitates the synthesis of existing data in order to advance ecological understanding. Over the next two years, the project will strive to develop a composite picture of jellyfish populations and their associated effects around the globe.

The population dynamics of jellyfish can impact more than just your day at the beach. Jellies are important members of ecosystems, and their exceptional ability to form massive blooms can have dramatic consequences for food webs and carbon cycling. Large `smacks' of jellyfish are also directly interfering with human activities, resulting in significant economic losses and even putting human lives at risk. In several locations, nets that normally catch shrimp and fish are coming up full of jellyfish. If the massive weight of the jellies doesn't split the net or break hauling equipment, any useful catch is spoiled. Last year, one such haul even caused a Japanese trawler to capsize, tossing the three crewmen into icy waters. Thankfully, they were all rescued, but the event is a sobering reminder that we truly are "fishing down the food web" (Pauly *et al.* 1998). And major socioeconomic impacts of jellyfish are not limited to fisheries. Shipping, mining, aquaculture, power generation, and tourism have all been negatively affected by jellyfish blooms, and the list of incidents continues to grow.

Ironically, we may have only ourselves to blame for certain increases in jellyfish populations. Effects from overfishing, climate change, pollution, aquaculture and coastal development have all been linked to increases in jellyfish (Purcell *et al.* 2007). While such cause and effect relationships are still being investigated, it is clear that humanity is not on a sustainable path. Unless we change how we treat our oceans, a more gelatinous future may be inevitable.

If the idea of a jellyfish burger seems outlandish, you may be surprised to know that vast amounts of jellyfish are consumed by humans everyday, mostly in Asia. Over the last ten years, annual jellyfish production has averaged over 350,000 tonnes, exceeding the global catch of many other fisheries, such as lobster. Jellyfish salad is celebrated as a delicacy, and there's evidence to suggest that eating it may even be good for you. For those with a sweet tooth, a company in Japan adds jellyfish to candy, cookies, and even ice cream. But simply shifting our diets won't solve the world's jellyfish problems. While there are thousands of gelatinous species around the globe, only a handful are sought after for human consumption. Even an expansion of the fishery is unlikely to result in fewer jellyfish, as some edible stocks are now being enhanced. One such example comes from China's Liaodong Bay, where a hatchery

Participants at the first meeting of the NCEAS Jellyfish Working Group. Back row (L-R): Craig Carlson, Carlos Duarte, Lucas Brotz, Hermes Mianzan, Steve Haddock, Rob Condon; Middle row (L-R): Kelly Robinson, Alenka Malej, Jennifer Purcell, Cathy Lucas; Front row (L-R) Monty Graham, Mary Beth Decker, Kylie Pitt; Absent: Mike Dawson, Shin-ichi Uye, Kelly Rakow Sutherland, Ric Brodeur, Mark Gibbons.

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Jellies - Continued from page 4

program releases hundreds of millions of juvenile jellies every spring in the hopes of harvesting them in the fall (Dong *et al.* 2009).

Given the current state of world fisheries and the global need for protein, our oceans are in a crisis of supply and demand. Jellyfish cannot fill the gap, but if we don't change our behavior they will be one of the few items on the seafood menus of tomorrow. While we may have to get used to telling our kids to eat their jellyfish, let's hope they have another choice.

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Latest version of the *Sea Around Us* Catch Database casts a wider net

by Wilf Swartz and Reg Watson

One of the key objectives of the *Sea Around Us* Project is to provide spatially referenced estimates of global marine fisheries landings (Watson *et al.* 2004, Pauly 2007), allowing us to determine who caught what where. This involves assigning the over 3 billion tonnes of catch landed since 1950 into 180,000 half degree 'cells' that make up our global ocean grid system using a series of constraints, including the statistical areas used in the source dataset (e.g. the 18 FAO major statistical areas), the known distribution of nearly 1500 exploited taxa and a database of fishing access agreements that, taken together, provide information on the likely distribution of fishing fleets.

Such a task requires an immense amount of work by humans and machines, with countless challenges as we continuously test and refine our methodology. The previous version of the catch database was released in late 2007. Now, after two years of intense work led by Reg Watson and assisted by a skilled team including National Geographic-funded scientist Sean Tracey on loan from the Tasmanian Aquaculture and Fisheries Institute, and Grace Pablico, we are proud to announce that the new and improved version of the database is available online at www.seaaroundus.org (Figure 1).

Our methodology for spatial disaggregation of fisheries catch has evolved since it was first described in Watson *et al.* (2004). Some of the most noteworthy changes are documented below.

The first of the major updates to the database are its data sources. Previous versions of the database have relied almost exclusively on the official landings reported by international (e.g. NAFO, ICES) and by national (e.g. NMFS) agencies. However, we now realize that official catches, particularly from small island states and generally less-developed countries can severely underestimate actual catches. Hence, the project has developed and applied a methodology for 'reconstructing' the catches of such countries based on detailed analyses of secondary data (Zeller & Pauly 2007). Catch reconstructions have been completed or are underway for over 80 countries, and we considered such reconstructions for 12 countries in the present version, plus China, whose catch was, as in the previous version, adjusted downward (see Watson and Pauly 2001).

We have also implemented some changes to the ancillary databases that serve as constraints in the spatial allocation of catch. The fishing agreement database, for example, has undergone a major overhaul, with records from the original, FAO-supplied, fisheries agreement database re-examined and, where possible, validated with alternative sources as to the nature of the recorded agreements and their durations. While the contents of many private fishing agreements, if not their existence, remain a mystery, we were encouraged to see that an increasing number of governments are making the contents of their fisheries agreements available online. This trend toward

Continued on page 6 - Catch

We are proud to announce that the new and improved version of the database is available online at www.seaaroundus.org.

Catch - Continued from page 5

increased transparency will greatly improve our understanding of the nature of distant water fisheries.

The updated database also represents a major shift in our assumptions about distant water fishing activities in the years leading up to the United Nations Convention on the Laws of the Sea (UNCLOS) and to the Exclusive Economic Zones (EEZ) that it allowed for, i.e., the late 1970s-early 1980s. Previously, we operated under the assumption that distant water fleets did not operate in these 'undeclared' EEZs unless there were documented observations of fleets in such regions; such assumptions were deemed necessary in order to prevent catches from being 'smeared' across the world. However, with improvements in our knowledge of species distributions (which now use key ecological information such as depth and habitat preferences to derive predicted distribution: see Close *et al.* 2006) and reconstructed catch estimates, we can apply rules that allow the assignment of the catch of distant water fishing fleets to cells later assigned to host EEZ areas (provided they meet the constraints based on the species distribution and the source data reporting), up to the year of EEZ proclamation by coastal countries. We believe such assumptions better represent the 'Freedom of the Sea' principle that these fleets operated under during the pre-UNCLOS period, and better capture the offshore displacement of fishing that followed the UNCLOS.

We hope that our database will prove to be an even better tool for researchers and governments as they struggle to resolve the many issue that impact global fisheries sustainability.

We hope that as a result of these and other changes our database will prove to be an even better tool for researchers and governments as they struggle to resolve the many issue that impact global fisheries sustainability. We also acknowledge that this kind of database can only be useful through constant update and improvement, and are already at work on the next version. We are encouraged to find that our global methodology has yielded results that conform with local datasets, e.g. for Mauritania (Gascuel *et al.* 2007) and look forward to feedback and continued support from the fisheries research and NGO communities.

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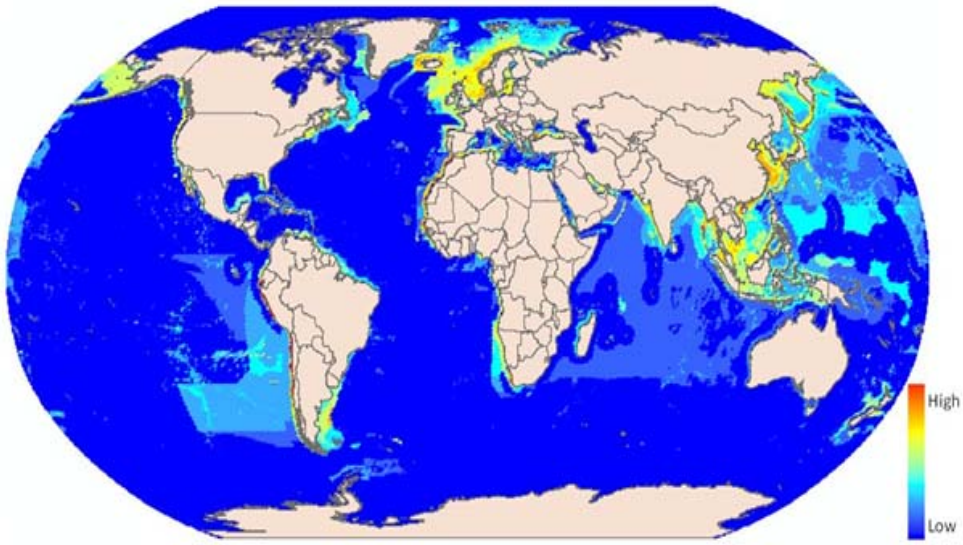


Figure 1. Map of world's marine fisheries catch (annual average 2000-2005).

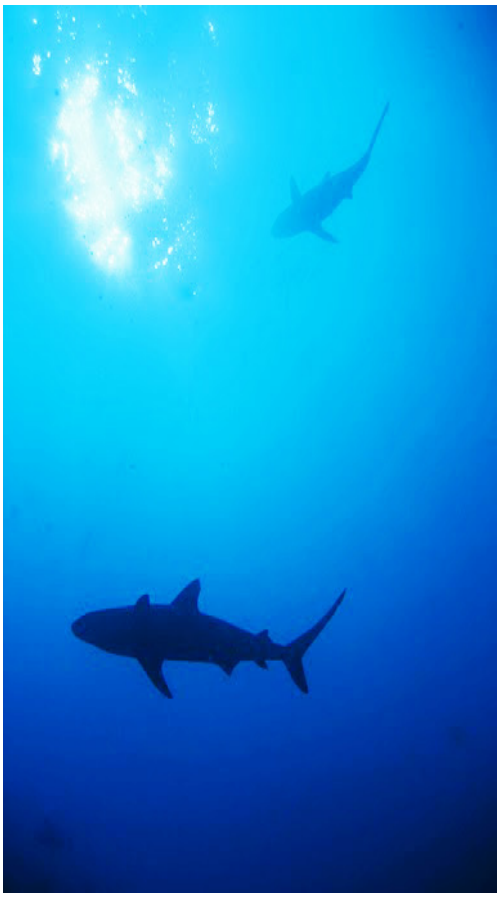
Sea Around Us

A Predatory Paradox

by Dalal Al-Abdulrazzak

In 2007-2008, I was a recipient of a Thomas J. Watson Fellowship, which provides recent college graduates a year of independent, purposeful exploration and travel outside the United States and their home country. Unlike most fellowships, there is no tangible output required, emphasizing that the grant is an investment in a person, rather than a project. Over the course of the year, I traveled to Panama, the Bahamas, New Zealand, Fiji, Palau, the Seychelles and South Africa, to assess how cultural context affects shark conservation. One of my goals was to gather folklore and stories of shark encounters in order to better understand the relationship between humans and sharks. One way I did this was by shadowing shark-diving operations and conducting informal interviews with the operators and tourists. I envisioned an exciting year, full of close calls, startling stories, and electrifying adventures.

However, what I found was much more frightening and dangerous: boredom. Like toddlers in a room full of toys with nothing to do, it's now all too easy for your average tourist to come face-to-face with an apex predator, take some snapshots for proof, and head home. I recall a dive off Dyer Island, South Africa where after a phenomenal encounter with a fifteen-foot great white shark, I was left buzzed and awed, willing to stay underwater until my lips turned blue from the cold in hopes of another glimpse. It has taken me over three hundred dives to see a great white in the wild! However upon surfacing, I was amazed at the somber tone on the boat. On surveying the other divers about their experience I was mainly greeted with comments about the cold water, poor visibility, and seasickness. There was no discernible emotion about having just survived breathing through a hose in the presence of something with teeth the size of carving knives. The nuances of these great animals and their place on the planet—alongside us—seem entirely lost on most people.



Grey Reef Sharks. Viti Levu, Fiji.
Photo by D. Al-Abdulrazzak

Though western society often sensationalizes sharks in negative ways, other societies admire them, viewing them as symbols for justice and divine ancestral

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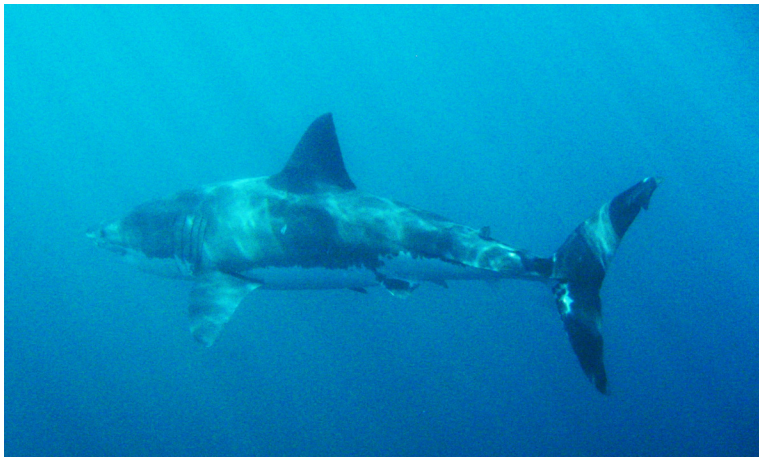
Sadly, many of the traditional myths and folklore that have long served as a reminder of our place in nature have been lost.

power. Sadly, many of the traditional myths and folklore that have long served as a reminder of our place in nature have been lost. In most of the villages I visited, I found that shark encounters have become so rare that many of these stories are not preserved. Elders no longer incorporate sharks into their story-telling traditions. In fact, while spending time with a Kuna family in San Blas, Panama, I was offered a consolation prize for my unfruitful attempts to uncover the myth of *Tio Tiburon*; the matriarch would instead make me a *Mola* (traditional reverse-appliqué cloth panel) of a shark. A week later, I was presented with a *Mola* depicting a creature resembling a cross between a porpoise and sturgeon. I graciously accepted the gift, despite the irony of the situation.



Great White Shark. Dyer Island, South Africa. Photo by D. Al-Abdulrazzak.

Perhaps it is up to the dive operators, the very people who are putting the last of these wild animals on daily display, to either truly feel the thrill for the first time, or to at least to pretend to feel it. Too often they shrug their shoulders with cool machismo at how "well-trained" the sharks are, rather than marveling at their restraint. Their promotional line is that no one has ever been bitten, but of course we all know that it is not true. While in Fiji, I witnessed a shark handler get bitten by a grey reef shark. The handler attempted to continue to feed the sharks, despite the alarming amount of blood seeping out of his wound. After some initial confusion, the show was stopped, and we were frantically herded onto the boat. The injured handler spent the return boat ride in the cabin, away from our sight. There was no debriefing and not a single word was uttered about the incident. I later found out that the handler nearly had his thumb bitten off and needed several stitches.

Although shark-diving encounters have done much to dissipate the "ferocious man-eater" myth that prevails around the world, perhaps it has gone too far. Perhaps, we have taken these magnificent creatures, which for centuries have invoked feelings of wonder and awe, and paraded them around in aquariums and `eco-adventure' tours to the point of dullness. We have demystified the mystical. This is why story-telling is so important. Stories counteract the prevailing nonchalance surrounding alpha predators. They serve to help us rediscover our place in nature and revel in the remarkable intimacy of a rare encounter.

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Understanding the role of green turtles in the Caribbean and Hawai'i

by Colette Wabnitz

Following the submission of my doctoral dissertation for external review, I packed my suitcase and boarded a flight to Hawai'i. I was following up on the kind invitation that had been extended to me by George Balazs, Leader of the Marine Turtle Research Program at NOAA, National Marine Fisheries Service (NMFS), to give a presentation at NMFS in Honolulu and visit some of the sites at which he and his team conduct turtle research. The plan specifically included a visit to Kaloko Honokôhau, a National Historical Park located on the Kona coast (west coast of the Big Island) and the focus of one of my dissertation chapters.

At the start of my PhD, I, together with my co-supervisors Drs Karen Bjorndal and Alan Bolten from the University of Florida, submitted a proposal to NMFS to model the potential ecosystem effects a recovering Caribbean green turtle population, in response to their protection throughout the region, would have on seagrass communities. In the Caribbean, green turtles' preferred forage is seagrass, a flowering plant that occurs in shallow coastal environments. My research focus was therefore to be on the likely impacts brought about by the increased grazing activity of a large number of green turtles, and concomitant decline in habitat complexity at the ecosystem level (i.e., reduction in refuge capacity of seagrass for small fish and invertebrates). NMFS offered to financially support the study[1], but asked that my research also include the investigation of the role of green turtles on reefs in Hawai'i, where, unlike the Caribbean, green turtles primarily forage on algae, and ancillary data demonstrate the population is approaching carrying capacity.

Harvesting of sea turtles for the trade of their meat, oil, shells, and eggs has reduced populations that once numbered in the millions to the brink of extinction. While many countries now have regulations in place to limit this trade, or have banned it altogether, an increasing demand for subsistence and local markets, and a suite of other threats contribute to the continued decline of a number of sea turtle populations. With a few notable exceptions, many populations are considered depleted or declining.

Harvesting of sea turtles for the trade of their meat, oil, shells, and eggs has reduced populations...

In response to these dramatic declines, scientists and conservation practitioners throughout the world have accelerated their attempts to aid in the recovery of sea turtle populations. Given currently depleted green turtle numbers, their importance and likely impact at historic abundance levels is difficult to imagine (and oft forgotten). To answer the question of whether sea turtle species are central to healthy ecosystem processes, knowledge of their ecology needs to be integrated into the trophic matrix of the system within which they are found. Important aspects to consider are their (a) direct impact as consumers, including their dietary preferences and food consumption rates; and (b) indirect impact resulting from foraging behaviour (e.g., changes to the structure of their foraging habitat and associated behavioural changes in other species). I addressed (a) focusing on the green turtle aggregation at Kaloko and (b) looking at a seagrass/reef/mangrove system and green turtle population in Puerto Rico and the US Virgin Islands.

At Kaloko Honokôhau with a green turtle in the foreground.

Caribbean

Results from a Caribbean ecosystem model (developed using the free software Ecopath with Ecosim – www.ecopath.org) showed that

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recovery of a species whose grazing activity strongly alters habitat structure at the ecosystem level may lead to potentially dramatic changes in species biomass and composition. Findings also demonstrated that by considering multiple predator-prey interactions, *in addition to* the refuge capacity of a primary producer, simulated ecosystem responses are more complex than suggested by simple predator-prey experiments. Results underscored the importance of inter-habitat exchanges (i.e., between reef, mangrove and seagrass) and how recovery of green turtles may potentially affect these linkages and/or the role of individual habitats as nursery areas for a variety of species, including commercially important fish. These findings demonstrate that the recovery plans for sea turtle populations need to be more detailed than merely aiming for a target of species' abundances. Using green turtles as an example, they should explicitly acknowledge the role that green turtles play in structuring seagrass beds, and highlight the need to (i) gain greater understanding of what the implications of this role may have for the 'functioning' of seagrass beds today and into the future, and (ii) perhaps help redefine at what levels green turtle populations may be considered to have made a full recovery.

The fact that green turtles feed on non-native algae, including macroalgae, further strengthens their contribution to the promotion of reef resilience...

Hawai'i

Hawai'i represents a unique setting to investigate the role of green turtles as consumers. As noted earlier, these eastern Pacific green turtles feed chiefly on algae rather than seagrass, as in the Caribbean. A turtle fishing ban implemented in the late 1970s has resulted in a dramatic increase in the number of green turtles at foraging areas, with several lines of evidence suggesting that aggregations are reaching carrying capacity.

Results from an Ecopath model developed to represent trophic connections at Kaloko demonstrated that the combined grazing pressure of the different herbivorous groups (i.e., reef fish, sea urchins, and green turtles) matched total algal production. Numerous studies have highlighted the role that large herbivores (e.g., parrotfish in the Caribbean) play in maintaining reef resilience. The results presented here underscore that, at healthy abundance levels, green turtles contribute to the resilience of reefs in the face of disturbance. The fact that green turtles feed on non-native algae, including macroalgae, further strengthens their contribution to the promotion of reef resilience, as herbivorous fish often show a preference for filamentous algae, limiting the ability of

Holding a green turtle in company of one of the students from the Hawai'i Preparatory Academy who regularly help out with turtle tagging campaigns.

macroalgae-dominated reefs to revert to coral dominated states. Green turtles' functional role thus needs to be explicitly included in future studies of reef dynamics.

The Hawai'i model also provided a functional tool for Kaloko managers to make informed decisions about natural resource management in the light of coastal urban expansion plans, while incorporating an ecological perspective. By integrating known information from a wide variety of sources, and helping to organise and track information that would not be possible otherwise, the model also highlighted future research foci. These included the collection of more detailed consumption and diet information for some of the grazers, their spatial distribution on the reef and nutrient input time series data. Such data will increase the model's ability to produce realistic projections, particularly in light of ongoing development, and the desire by park managers to use the model to highlight future management opportunities as well as trade-offs.

Notes

[1]Sections of my thesis were also supported by the *Sea Around Us* Project, a scientific cooperation between UBC and the Pew Environment Group, a Mia Tegner Grant, and a Disney Wildlife Conservation Fund grant.

Sea Around Us

Cleaning oiled seabirds: Highly overrated

by Michelle Paleczny

Since the Deepwater Horizon explosion of April 20th, millions of litres of oil continue to gush into the Gulf of Mexico every day, intensifying what will turn out to be the largest oil spill in history. The environmental impacts are highly visible, and images of dolphins, sea turtles and seabirds struggling in oil are making headline news. Emergency facilities have been established to clean the oiled wildlife. Seabirds are the most frequent visitors at these facilities, especially vulnerable to oil spills due to their large marine ranges and feathered bodies which lose insulation and flying ability once oiled. However, through my seabird studies, I have come to realize that this effort to relieve the seabirds of their suffering may actually do little more than alleviate our guilt, and here is why:

Oiled gull and pelican at East Grand Terre Island, Louisiana. Photos by Charlie Riedel, The Boston Globe.

First, a cleaned seabird is not a saved seabird. Survival rates of cleaned seabirds range from 1% to 80%. Survival of a cleaned seabird depends on many factors, including: severity of starvation and hypothermia when collected, amount of oil ingested (oil can be cleaned externally but not internally where it causes chronic poisoning), stress caused by contact with humans, species-specific characteristics that determine resilience (e.g., size, foraging method), methods used to assess survival rate, and condition of the remaining habitat. Furthermore, there is little evidence that survivors breed successfully. Although cleaning oiled seabirds may reduce some suffering, it often has little or no benefit at the population level.

Second, the seabirds saved from this oil spill are a drop in the bucket. Cleaning oiled seabirds will save a fraction of the thousands of seabirds oiled in this spill, yet we kill hundreds of thousands of seabirds every year when we entangle them in our fishing gear, deplete their food stocks, introduce predators to their breeding islands, destroy their breeding habitat, eat them, cull them, and poison them with various chemicals, plastic, and oil. Seabird decline is a global problem that requires global action. I find it hard to believe that paying $4,000 to $18,000 per cleaned seabird is the best approach for advancing seabird conservation.

If we value seabirds and other marine life, we can better show this through actions that prevent oil spills, such as banning oil exploitation in wildlife-rich areas (e.g., the Gulf of Alaska, where the smaller Exxon Valdez spill killed hundreds of thousands of seabirds) and reducing our dependence on oil altogether.

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Issue 59 – May/June 2010

Better baselines: Workshop highlights role of historical ecology in ocean policy

by Jennifer Jacquet

... analyzing only fish biomass from, say, 2005 onward, we could erase the problem of overfishing around the globe.

What we can't see, can hurt us. The use of inadequate baselines in ocean policy and management has allowed for a steady erosion of both our perception and use of marine resources [1]. As an example, let's look at the New England Fisheries Management Council's 2007 stock assessment for monkfish (*Lophius americanus*) in the Northwest Atlantic, which reversed the scientific community's previous proclamation that monkfish were overfished and in great need of rebuilding. There was a perverse reason for the reversal: the new analytic model ("SCALE") for monkfish used to generate the stock assessment was done considering data using a shorter assessment time frame (1980-2006) rather than the previously-used time frame (1963-2006), when biomass indices from surveys were approximately two times higher than 1980s estimates [8]. Using similar techniques analyzing only fish biomass from, say, 2005 onward, we could erase the problem of overfishing around the globe.

Many ocean policies call for baselines but they also allow management to consider a timeframe that best suits certain interests and not necessarily society as a whole. Improving baselines by taking an early industrial or pre-industrial perspective of the ocean could lead to more precautionary policies regarding fisheries quotas, pollutant discharges, and habitat modification as well as the implementation of no-entry oceanic zones, which could all demonstrably benefit humanity, even in the short term. How to make the connection from historical ecology to policy?

This question was the premise of a five-day May 2010 workshop led by Drs. Jeremy Jackson and John Pandolfi and hosted at the Smithsonian Natural History Museum. I participated alongside 19 others, including environmental lawyers (e.g., Kathryn Mengerink of Environmental Law Institute and Steve Roady of Earthjustice), marine managers (e.g., John Day, Director – Ecosystem, Conservation and Sustainable Use, Great Barrier Reef Marine Park Authority and Billy Causey, Southeast Regional Director for the U.S. National Marine Sanctuary Program), and scientists (e.g., Loren McClenachan, Terry Hughes, and Julia Baum). Based on our collective experience and a review of the literature, we compiled marine-related examples of U.S. and Australian legislation that is guided by baselines, the misuse of baselines, and policy recommendations.

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As research uncovers the species abundance and richness of the past [3-8], there is a tendency toward disbelief. This is because many historical ecological baselines contradict a functional but fictitious bias: that the world is getting better. This is not true in many places, including many parts of the ocean. How can we use existing legislation to turn back the clock even a little and regain some of the ocean's past bounty? Watch for a paper coming soon with some possible answers to this question.

Photo of the group in the Sant Ocean Hall of the Smithsonian Natural History Museum.

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UN meeting - Continued from page 4

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Sea Around Us

Cleaning oiled seabirds: Highly overrated

by Michelle Paleczny

Since the Deepwater Horizon explosion of April 20th, millions of litres of oil continue to gush into the Gulf of Mexico every day, intensifying what will turn out to be the largest oil spill in history. The environmental impacts are highly visible, and images of dolphins, sea turtles and seabirds struggling in oil are making headline news. Emergency facilities have been established to clean the oiled wildlife. Seabirds are the most frequent visitors at these facilities, especially vulnerable to oil spills due to their large marine ranges and feathered bodies which lose insulation and flying ability once oiled. However, through my seabird studies, I have come to realize that this effort to relieve the seabirds of their suffering may actually do little more than alleviate our guilt, and here is why:

Oiled gull and pelican at East Grand Terre Island, Louisiana. Photos by Charlie Riedel, The Boston Globe.

First, a cleaned seabird is not a saved seabird. Survival rates of cleaned seabirds range from 1% to 80%. Survival of a cleaned seabird depends on many factors, including: severity of starvation and hypothermia when collected, amount of oil ingested (oil can be cleaned externally but not internally where it causes chronic poisoning), stress caused by contact with humans, species-specific characteristics that determine resilience (e.g., size, foraging method), methods used to assess survival rate, and condition of the remaining habitat. Furthermore, there is little evidence that survivors breed successfully. Although cleaning oiled seabirds may reduce some suffering, it often has little or no benefit at the population level.

Second, the seabirds saved from this oil spill are a drop in the bucket. Cleaning oiled seabirds will save a fraction of the thousands of seabirds oiled in this spill, yet we kill hundreds of thousands of seabirds every year when we entangle them in our fishing gear, deplete their food stocks, introduce predators to their breeding islands, destroy their breeding habitat, eat them, cull them, and poison them with various chemicals, plastic, and oil. Seabird decline is a global problem that requires global action. I find it hard to believe that paying $4,000 to $18,000 per cleaned seabird is the best approach for advancing seabird conservation.

If we value seabirds and other marine life, we can better show this through actions that prevent oil spills, such as banning oil exploitation in wildlife-rich areas (e.g., the Gulf of Alaska, where the smaller Exxon Valdez spill killed hundreds of thousands of seabirds) and reducing our dependence on oil altogether.

The Sea Around Us Project Newsletter

Issue 59 – May/June 2010

Better baselines: Workshop highlights role of historical ecology in ocean policy

by Jennifer Jacquet

... analyzing only fish biomass from, say, 2005 onward, we could erase the problem of overfishing around the globe.

What we can't see, can hurt us. The use of inadequate baselines in ocean policy and management has allowed for a steady erosion of both our perception and use of marine resources [1]. As an example, let's look at the New England Fisheries Management Council's 2007 stock assessment for monkfish (*Lophius americanus*) in the Northwest Atlantic, which reversed the scientific community's previous proclamation that monkfish were overfished and in great need of rebuilding. There was a perverse reason for the reversal: the new analytic model ("SCALE") for monkfish used to generate the stock assessment was done considering data using a shorter assessment time frame (1980-2006) rather than the previously-used time frame (1963-2006), when biomass indices from surveys were approximately two times higher than 1980s estimates [8]. Using similar techniques analyzing only fish biomass from, say, 2005 onward, we could erase the problem of overfishing around the globe.

Many ocean policies call for baselines but they also allow management to consider a timeframe that best suits certain interests and not necessarily society as a whole. Improving baselines by taking an early industrial or pre-industrial perspective of the ocean could lead to more precautionary policies regarding fisheries quotas, pollutant discharges, and habitat modification as well as the implementation of no-entry oceanic zones, which could all demonstrably benefit humanity, even in the short term. How to make the connection from historical ecology to policy?

This question was the premise of a five-day May 2010 workshop led by Drs. Jeremy Jackson and John Pandolfi and hosted at the Smithsonian Natural History Museum. I participated alongside 19 others, including environmental lawyers (e.g., Kathryn Mengerink of Environmental Law Institute and Steve Roady of Earthjustice), marine managers (e.g., John Day, Director – Ecosystem, Conservation and Sustainable Use, Great Barrier Reef Marine Park Authority and Billy Causey, Southeast Regional Director for the U.S. National Marine Sanctuary Program), and scientists (e.g., Loren McClenachan, Terry Hughes, and Julia Baum). Based on our collective experience and a review of the literature, we compiled marine-related examples of U.S. and Australian legislation that is guided by baselines, the misuse of baselines, and policy recommendations.

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Baselines - Continued from page 2

As research uncovers the species abundance and richness of the past [3-8], there is a tendency toward disbelief. This is because many historical ecological baselines contradict a functional but fictitious bias: that the world is getting better. This is not true in many places, including many parts of the ocean. How can we use existing legislation to turn back the clock even a little and regain some of the ocean's past bounty? Watch for a paper coming soon with some possible answers to this question.

Photo of the group in the Sant Ocean Hall of the Smithsonian Natural History Museum.

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Sea Around Us

Mi Querida Argentina (My Beloved Argentina)

by Lucas Brotz

The Third International Jellyfish Blooms Symposium, organized by Dr. Hermes Mianzan and his colleagues, was held in Mar del Plata, Argentina from July 14-16, 2010. I was extremely fortunate to attend, as travel to South America can be both expensive and protracted. Although I met with numerous flight delays and lost luggage, my experience in Argentina was not to be dissuaded, thanks primarily to the gracious and affable hosts.

Previous International Jellyfish Blooms Symposia were held in Alabama (2000) and Australia (2007). As jellyfish have been raising their prominence in both scientific and popular media of late, there was much to discuss. Over 100 delegates attended the symposium, representing more than 25 countries. This diversity was reflected in the extensive variety of posters and presentations, which ranged from understudied microscopic digenean parasites, to the increasing frequency of blooms of the giant jellyfish (*Nemopilema nomurai*). The latter - behemoth jellies which can reach over 2 metres in size and can weigh over 200 kilograms - used to bloom roughly every 40 years in Asia. But since 2002, swarms of the giant jellies have been wreaking havoc for fishers in China, Korea, and Japan on an almost annual basis (Uye 2008). Other jellies also appear to be blooming more frequently in select locations around the globe, and were predictably the focus of many discussions.

The keynote address was given by Dr. Daniel Pauly, who also gave the keynote at the 2007 symposium. Dr. Pauly will be the first to admit he is no medusologist, but the small community of jellyfish scientists is

Lucas dives with jellyfish in Indian Arm, B.C.
Photo by Conor McCracken

keenly aware that knowledge from neighbouring disciplines can be extraordinarily informative and valuable. Dr. Pauly spoke about new investigations uncovering links between destructive fishing methods and increased jellyfish populations. While the exact mechanisms underlying these relationships still remain to be understood, it appears that the removal of jellyfish predators and the alteration of marine food webs may ultimately lead to more jellies (Pauly *et al.* 2009).

A potentially more important factor affecting jellyfish populations is the removal of benthic communities through bottom-trawling. Fish are active, visual predators and therefore require reasonably clear, oxygenated water to forage. Jellies on the other hand, are mostly tactile feeders and have a much higher tolerance for low

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... a global picture of changes in coastal jellyfish populations is beginning to emerge.

Delegates at the Third International Jellyfish Symposium.

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oxygen conditions. As benthic communities typically help filter the water and keep the bottom consolidated, the removal of these organisms through trawling and dredging may therefore benefit jellyfish populations. As we continue to plunder our marine ecosystems and remove excess amounts of fish and other marine wildlife, it appears that jellyfish may be moving in to fill the void.

I was also granted the opportunity to present at the symposium and further expound on our work. In order to identify the correlations between increased numbers of jellyfish and destructive fishing methods, we first need to understand the scope of changes in jellyfish abundance. While the dearth of longterm datasets makes this a challenge, we are using methods that allow the inclusion of anecdotal information. Marine professionals such as scientists and fishers observe local environments on a frequent basis and are therefore in a unique position to identify changes and expand the limited knowledge of jellyfish population dynamics. To account for a wide range of observational data, we are weighting information based on space, time, and reliability. Those weighted data are then stratified and pooled by Large Marine Ecosystem, and a global picture of changes in coastal jellyfish populations is beginning to emerge. While methods incorporating anecdotal data are not accepted in all scientific circles, we found encouragement and support for our approach at the symposium. A final endorsement came near the end of the symposium when I was awarded runner-up in the student presentation category. Judging by the quality of other presentations at the symposium, this was a most humbling honour.

The three days of conference activities were well-organized and executed, facilitating endless dialogue and continual collaboration between colleagues. The festivities culminated with a celebratory feast which highlighted not only renowned Argentinian wine, but also their *asador* – a massive barbeque where entire racks of beef are grilled over hot coals. It was evident to all who attended that Argentinians are impeccable hosts, and I became even more aware of this fact after the conference ended.

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Jellyfish - Continued from page 2

As this was my first visit to South America, I chose to stay in Mar del Plata after the conclusion of the symposium to extend my Argentinian experience. Mar del Plata is the unofficial surf capital of Argentina, and I had brought along my wetsuit with the hope that I might have a chance to experience my first waves in the southern hemisphere. Any surfer knows that a surfboard is a precious and easily-damaged possession. But upon hearing of my interest, I was promptly loaned a board without hesitation by a local who I'd barely met. This Argentine generosity was demonstrated even further when I returned the surfboard and was invited in for tea. However, this was not just any tea, but South America's famous *mate*.

More than a hot drink, *mate* is a tradition and a ritual. Made from the dried leaves of *Ilex paraguayensis*, *yerba mate* is placed in a small gourd by the *cebador* (server) and filled with hot water. The tea is then sipped through a *bombilla*, a silver straw which filters the tea leaves. The gourd is passed clockwise among friends and family, and each has a turn sipping the potent brew, after which the *cebador* refills the gourd with hot water and passes it on. It is rare to share a beverage in any culture, and with *mate*, that is almost entirely the point. It is seldom served in cafés or restaurants, and many tourists can spend an entire trip without sampling the potion. I felt privileged to be invited into this circle, and as I shared tea and stories with my new friends, I revelled in Argentinian hospitality.

I have since returned home to Canada, again trading hemispheres and thankfully, seasons. Fortunately, I brought some *yerba mate* back with me. Now, whenever I share this ceremony with my friends and family I will fondly remember the productive symposium, our gracious hosts, and *mi querida Argentina*.

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Has BP "made it right"?

by Jennifer Jacquet

The April 20th explosion of the Deepwater Horizon oil rig (leased by BP) and subsequent failure of Halliburton construction (responsible for plugging holes in the pipeline) resulted in an unfettered flume that released an estimated 172 million gallons of oil into the Gulf of Mexico. For comparison, the 1989 Exxon Valdez tanker spill was estimated at 11 million gallons. That the U.S. uses around 20 million barrels of oil each day is even more useful for perspective. The oil spilled by BP could fuel the American machine for just nine days.

I spent two weeks of July in the Gulf of Mexico trying to better understand the ecological and political issues around the BP oil spill, which President Obama called "the worst environmental disaster America has ever faced." Beside the equivalent of nine U.S. days of oil, BP used more than 1.8 million gallons of dispersant (Corexit) in the cleanup (hopefully the irony of using dispersal for cleanup is self-evident), even though similar products are banned in Europe. Many people I spoke to were equally concerned about the Corexit as they were about the oil. Will consumers want to buy Corexit fish from the Gulf in the future?

BP used more than 1.8 million gallons of dispersant in the cleanup.

The platform explosion killed 11 workers, injured 17 others, and the tally of wildlife deaths currently includes more than 80 mammals, 550 sea turtles, and 5500 birds. I visited the International Bird Rescue's Buras, LA operation, where they took many of the oiled pelicans, gulls, and terns in an Orwellian process involving Dawn dish soap, high-pressure hoses, tender loving care, and at least four vet techs, followed by a week of rest and a flight or long ride to Georgia or Florida for release; and just when things were getting better for the Brown pelican (*Pelecanus occidentalis*), too. In November 2009, the Brown pelican was delisted from the U.S Endangered Species List and pointed to as an icon of success for legislative actions like banning DDT and protecting bird habitat. The BP oil spill is impacting the recovered pelican population (an estimated 16,000 pairs nest along the Louisiana coast) and their nesting sites, which has sparked talks of a relisting.

Continued on page 4 - Gulf

A team of vet techs washes a Brown pelican at the IBRRC in Buras, LA (left)., and a shrimp boat in BP's Vessel of Opportunity program hauling boom to clean up oil off of Grand Isle, LA (right). *Photos by Jennifer Jacquet.*

Gulf - Continued from page 3

In addition to the immediate ecological losses, there are economic losses with most fishermen and seafood processors out of work due to fishing closures (high-end restaurants and condos are also losing money due to a decline in tourism). The seafood processors (e.g. Alabama's Bayou le Batre community, the largest seafood processing industry in the Gulf and more than 50% Vietnamese) seem to be hurting most. Although BP is obligated to compensate for these economic hardships, I heard there are complications due to the fact that a lot of fishing business is done under the table and BP does not acknowledge economic losses without the paperwork.

BP is aware of every data insufficiency because of their involvement in every discussion related to clean up and future recovery. This is their spill.

But many fishermen are making more money than they would have fishing. This was also true after the 1989 Exxon oil spill, Exxon transferred "life-changing sums of money" into the hands of fishermen and created "spillionaires" by commissioning fishing boats for the clean up, explained Charles Wohlforth, a former reporter on the Exxon spill, in his recent book *The Fate of Nature*. BP has adopted a similar strategy and euphemistically call it the Vessels of Opportunity program, which is short-term but financially attractive. I heard one fisherman in the Vessel of Opportunity program say that the BP oil spill was God's way of redistributing wealth.

While some outcomes of the oil spill, like blackened birds, out of work fishermen, and clean-up costs, make headlines, other outcomes are less obvious. Scientists I spoke with, such as Ken Heck at Dauphin Island Marine Station, are concerned about increased mortality during the larval phases of fish and invertebrates, which are planktonic and not able to avoid patches of oil the way free-swimmers might. Experiments conducted after Exxon Valdez have shown that very small amounts of oil can have sublethal affects as well. Fortunately for BP, the ecology of the Gulf was already crippled, and they know it. Other scientists, including a few from The US Fish & Wildlife Service, say this is their major point of concern. They worry BP will subvert the recovery process because there is inadequate baseline data. BP is aware of every data insufficiency because of their involvement in every discussion related to clean up and future recovery. This is their spill.

While we're comparing the Exxon and BP spills, it's worth noting a recent headline in the New York Times about how "BP's Oil Spill Bill Could Dwarf Exxon's Valdez Tab". In both nominal and real terms, this headline is true. In U.S. dollars, the cost of the Exxon clean up was $2 billion (1989 dollars), corresponding to $3.58 billion today. This is in comparison to the cost of the BP clean up, estimated at $6.1 billion. However, this headline greatly ignores the fact that the BP oil spill dwarfed Exxon's. If we standardize for size of the spill, BP's tab is much lower. Given that the BP spill is more than 15 times larger than the Exxon spill, we could assume BP should spend 15 times more on cleanup than Exxon did, or around $53.7 billion dollars — $47.6 billion more than BP has spent.

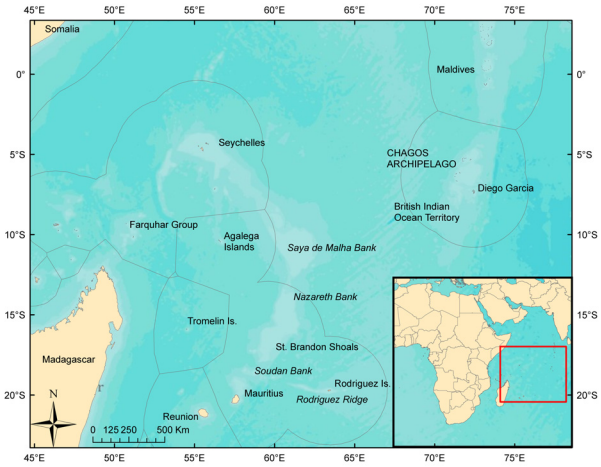
Soon after the spill, BP began strategizing and spending on a major ad campaign to convince the public that BP "will get this done" and "make it right". There are plenty of reasons to doubt that BP will make the Gulf right. As we all know, talk is cheap - even if their communication campaign has cost BP more than $50 million.

Publications Mail Agreement No: 41104508

Reconstructing the catches of Mauritius

by Léa Boistol, Sarah Harper, Shawn Booth and Dirk Zeller*

In early 2010, we undertook a catch reconstruction study of Mauritius and its outer Islands. Our group's task was to estimate likely total removals of marine resources by Mauritius from 1950 to 2008. The method for catch reconstruction aims to account for Illegal, Unreported and Unregulated fisheries catches (IUU) through estimation approaches (e.g., Zeller *et al.*, 2007). Indeed, although countries are often aware of such unreported catches, they are generally not taken into account in the officially-reported statistics. However, when considering the effects of fisheries on marine ecosystems, knowledge of total fisheries removals is important. In addition, small-scale fisheries are the mainstay of inhabitants of many small island countries worldwide, and therefore knowledge of their importance in terms of catches is essential if a sustainable future for fisheries is the goal.

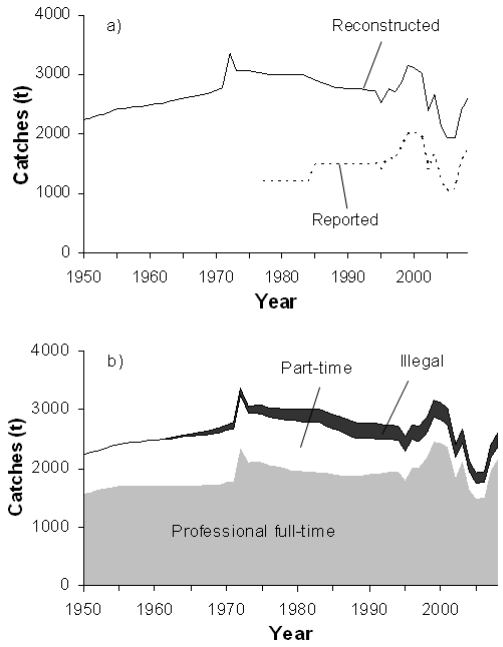


Map of the western Indian Ocean region with Exclusive Economic Zones (EEZ) represented. By Kristin Kleisner.

Mauritius is located some 850 km east of Madagascar, and is an island state comprising several dependencies in the western Indian Ocean, namely the islands of Rodrigues, St Brandon shoals and islets, and the twin islands of Agalega. On Mauritius and Rodrigues, the main populated islands, lagoon and inshore fisheries remain an important source of employment and food security. On both islands, most of the people who exploit the inshore areas are not commercial, but subsistence fishers, i.e., people in search of a meal, or to supplement their income. Also, in response to an increasing demand for seafood, coupled with reduced catches and new regulations, many fishers have recently resorted to illegal fishing methods, using fine-meshed nets, illegal spearguns and landing undersized fish (Hollup, 2000). Moreover, Mauritius is visited by an increasing number of tourists each year, and these visitors, partly through their recreational activities, add to the fishing pressure on marine resources. Although such catches have been mentioned previously (Pearson, 1988), they have never been estimated over a long time period, even though long time series of fisheries catches are necessary to evaluate the ecological effect of fisheries on marine ecosystems.

For 1950-2008, our total reconstructed catches for the state of Mauritius were 42 percent higher than the official statistics reported by Mauritius to FAO. This discrepancy was largely due to the under-reporting of small-scale catches for Mauritius and Rodrigues islands, which represented 25 and 23 percent of the total reconstructed catches, respectively. For both islands, this discrepancy was largely due to the inclusion of part-time fishers in our estimated catches. Also, one of the advantages of our study is that it permits the discrimination of the Mauritian fisheries catches by islands and fishing areas, whereas the publically reported catches for Mauritius do not.

One of the advantages of our study is that it permits the discrimination of the Mauritian fisheries catches by islands and fishing areas.



Reconstructed small-scale catches for Rodrigues Island 1950-2008. Top: reported and total reconstructed small-scale catches; Bottom: total reconstructed small-scale catches by category of fishers with nearshore illegal catches.

Continued on page 6 - Mauritius

Mauritius - Continued from page 5

Apart from the small-scale catch component, our total reconstructed catches include estimates of catches for the important Mauritian fishery carried out on offshore oceanic banks, sport fisheries for pelagic species, near-shore recreational catches, and discards of the industrial tuna purse seine fishery.

Our study illustrates the urgent need for better reporting of catches for the various fisheries sectors of Mauritius, especially for the small-scale fisheries sector, which provides food and a source of income for a large portion of the population. In Mauritius, depletion of marine resources is a concern. Although management legislation exists since colonial days, it only limits the use of specific gears, and suggests fish reserves and closed seasons for nets (Hollup 2000). Regulations should include access limitations to the fisheries resources of the lagoon area. However, alternatives are also needed for the numerous fishers who depend on these resources for their livelihoods.

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*Léa Boistol joined the *Sea Around Us* project from January to June 2010, as part of her graduate studies at the Centre d'Océanologie de Marseille, France.

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Sea Around Us

Understanding impacts of the Gulf of Mexico oil spill: How will fisheries fare?

by Ashley McCrea-Strub

As devastating images of oil in the Gulf of Mexico streamed across virtually every media outlet during the months following the explosion of the Deepwater Horizon on April 20th, 2010, many experts in the fields of marine ecology and fisheries science have found themselves faced with the question, "What will be the impacts of this disaster?" As a native of South Florida with memories of family vacations to Gulf-coast beaches and an appreciation for delicious Gulf seafood, I have been eager to participate in any efforts to better understand the problem.

Attempting to answer this question is no simple task. Estimates of the quantity of oil, natural gas and associated methane, and chemical dispersants released into the Gulf of Mexico are plagued by uncertainty. The U.S. government-appointed team of scientists, a.k.a. the Flow Rate Technical Group, estimated that a total of 4.9 million barrels of oil were released from BP's Macondo well [1] while an independent study suggested between 4.16 and 6.24 million barrels [2]. According to BP's records, approximately 1.8 million gallons (i.e., about 6.8 million litres) of dispersant were applied at the site of the leak as well as the sea surface, though the validity of this amount has been questioned [3]. Complex oceanographic processes have made it extremely difficult to determine the current and future distribution of these toxic substances from the surface to the sea floor, and the duration of their persistence in the marine environment. Most importantly, there are no immediate answers to questions concerning short- and long-term impacts on habitats and marine organisms in the path of this disaster. This uncertainty is particularly troubling for fisheries dependent on economically valuable species.

Despite the geographic distance separating the Fisheries Centre from the Gulf of Mexico, the databases developed by the

Continued on page 2 - Gulf fisheries

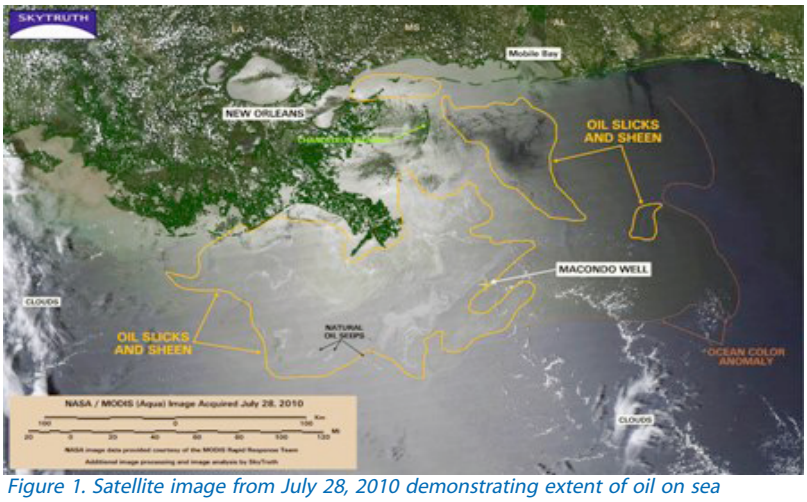

Figure 1. Satellite image from July 28, 2010 demonstrating extent of oil on sea surface. (www.skytruth.org).

The Sea Around Us Project Newsletter

Issue 61 – September/October 2010

From 2000 to 2005, an average of 850,000 tonnes of fish, crustaceans, molluscs and other invertebrates, were commercially caught in the Gulf of Mexico.

Gulf fisheries - Continued from page 1

Sea Around Us Project provide a unique opportunity to explore potential effects of the spill on commercial fisheries in this Large Marine Ecosystem (LME). While these databases supply detailed information on a global scale, they may be easily queried to understand trends occurring in smaller geographic regions, such as the Gulf of Mexico. Using data detailing the location and quantity of species reportedly caught by fishers throughout the Gulf [4], in addition to information regarding the price that they receive when they sell their catch [5], spatial maps illustrating recent trends in catch and landed value were generated for this study. From 2000 to 2005, an annual average of approximately 850,000 tonnes of fish, crustaceans, molluscs and other invertebrates, primarily inhabiting the highly productive continental shelf area, were commercially caught in the Gulf of Mexico. The majority of this catch originated within the 200 nautical mile limit of the United States' Exclusive Economic Zone (EEZ), followed by landings within Mexican waters. The total landed value of this catch was estimated at approximately $1.38 billion US.

As oil slicks visible on the sea surface grew in size following the spill (Figure 1), the U.S. National Oceanographic and Atmospheric Administration (NOAA), as well as the States of Florida, Alabama, Mississippi and Louisiana, declared portions of federal and state waters closed to commercial fishing in an effort to promote seafood safety and ensure consumer confidence. The location of this closed area in relation to mapped average catch and landed value was analyzed to provide clues regarding potential economic losses to commercial fisheries in the region (Figure 2).

As of July 22, 2010, over 10% of the total surface area of the Gulf and nearly 25% of the US Gulf EEZ was closed to commercial fishing operations. Figure 2 demonstrates that this closure overlapped with highly productive and economically valuable shelf habitats accounting for 18% of the total annual value of reported commercial landings within the Gulf of Mexico. This represents a potential annual loss of

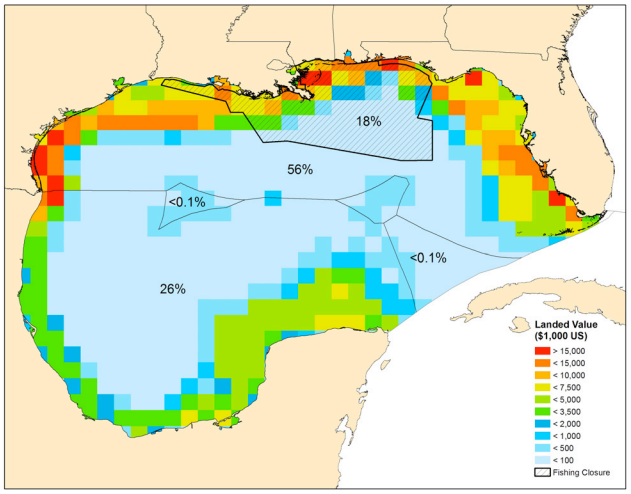

Figure 2. Spatial distribution of the average (2000-2005) annual landed value of reported commercial fisheries catches in the Gulf of Mexico. The area closed to commercial fishing (including both federal and state within the US EEZ as of July 22nd 2010) accounts for approximately 18% of the total value of landings within the LME. The remainder of the US EEZ still open to fishing accounts for 56%, while Mexican waters account for 26% of total landed value. Less than 0.1% of the annual landed value is derived from the two High Seas areas and Cuban waters.

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The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the project.

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Gulf fisheries - Continued from page 2

$247 million to be suffered by U.S. commercial fishers. While the majority of US catch within the closed area during 2000 to 2005 was composed of Gulf menhaden, landings of brown and white shrimp generated the greatest value (12% of the annual US total in the Gulf, combined) due to high consumer demand and associated prices, followed by blue crabs (4%), Gulf menhaden (3%), and eastern oysters (1%). Potential impacts on valuable invertebrate fisheries may be compounded by the fact that relatively immobile, benthic organisms are likely to suffer higher rates of mortality as a result of the toxic effects of oil compared to more mobile fish species [6]. In addition, the capacity of habitats and species to recover from the effects of oil, methane, and dispersants may have already been compromised due to pre-existing sources of stress, including nutrient-laden freshwater discharge from the Mississippi River resulting in periodic oxygen-depleted 'dead zones', and bottom habitat destruction due to extensive shrimp trawling.

While this study does not attempt to address the full range of biological and economic consequences of the Deepwater Horizon oil spill on fisheries in the Gulf of Mexico, it does provide a preliminary perspective on one aspect of the puzzle, given pre-oil spill trends. It is evident that the oil spill has clearly impacted an area of crucial economic importance within the Gulf of Mexico. Missing from the situation presented here are the values to recreational fishers, an important sector in the region.

During the months following the spill, my head has been filled with nostalgic thoughts of flour-like sand squeaking beneath my feet while playing on the beaches of Seaside, Florida, hours spent searching the seashore in Captiva for the beautiful shells that still sit in a bowl in my living room, and devouring a 10 lb bag of steamed clams bought from a fishers by the side of the road in Cedar Key. How will future generations of vacationing families, Gulf-coast residents and fishers remember this region? Hopefully, expectations of environmental resilience along with a continued dedication to clean-up operations will facilitate a swift recovery.

It is evident that the oil spill has clearly impacted an area of crucial economic importance.

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Oil dispersants: The easy way to clean house

by Leah Biery

At the end of August, I moved to Vancouver from Sanibel Island, Florida. Sanibel is a tiny island in the Gulf of Mexico, where millions of litres of oil have spilled since the Deepwater Horizon explosion on April 20, 2010. When people learn that I am from the Gulf region, they usually ask how much oil I saw on nearby beaches. Surprisingly, the answer is none.

Oil has washed ashore in the northern region of the Gulf, closer to the spill, but southern Florida's coast appears largely oil-free. The absence of visible oil in southwest Florida is probably due to a combination of natural and anthropogenic factors. The Loop Current flows relatively far offshore, so it has not played a significant part in carrying oil or tarballs to SW Florida's coastal areas (see figure). Also, major storms with the potential to push oil inland have bypassed the area so far this hurricane season.

Despite the pristine beach conditions in SW Florida, it is important to remember that the lack of visible oil does not necessarily indicate a lack of presence. Chemical dispersants played a key role in hiding surface oil that might otherwise have washed up on beaches today.

Dispersants are chemicals that break oil into small droplets, which are then distributed throughout

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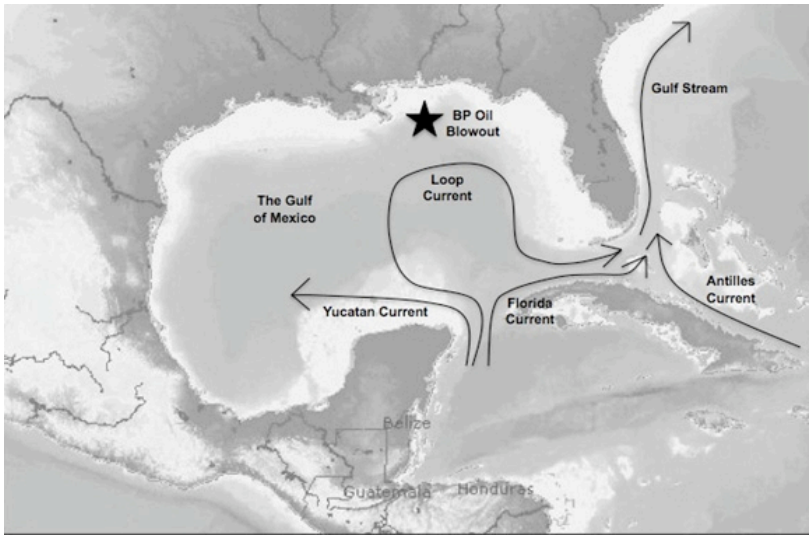
Dispersant - Continued from page 3

the water column by wave action and currents. Dispersants do not clean up or get rid of the oil – they simply spread it out. In July alone, the US dropped one third of the world's supply of dispersants into the Gulf of Mexico, effectively making the oil difficult to find.



Major currents in the Gulf of Mexico. Near SW Florida, the Loop Current flows far enough offshore that it has not carried oil to beaches.

You can compare the use of dispersants to a common scenario that most everyone experienced as a child – hiding a mess from your parents. Your mom is angry about the messy state of your room, so she tells you to clean it up. Instead of cleaning up the right way – putting each item where it belongs – you shove everything under the bed, hiding the problem. By using dispersants, the responsible parties were hiding the oil spill instead of cleaning it up.

Hiding the mess is an attractive temporary solution, but the problem becomes apparent when your mom looks under the bed. Now you are in big trouble. The consequences are much worse than if you had just initially taken the responsibility and time to clean up correctly.

Using dispersants to hide the oil was a fast and easy way to maximize the number of clean beaches and keep the general public happy.

A recent study of core samples taken from multiple locations in the Gulf revealed as much as 5 cm layers of oil on top of normal bottom sediments. Samantha Joye, a professor from the University of Georgia who collected the core samples, said in an interview with NPR, "The sheer coverage here is leading us all to come to the conclusion that it has to be sedimented oil from the oil spill, because it's all over the place." (http://www.npr.org/templates/story/story.php?storyId=129782098&ps=cprs)

Using dispersants to hide the oil was a fast and easy way to maximize the number of clean beaches and keep the general public happy by making the unpleasant effects of the oil spill appear to go away. However, the long-term environmental and ecological effects of spreading oil throughout the water column are unknown. The Obama administration's leader of the scientific response to the oil spill, Marcia McNutt, admitted last week that the government decided to use dispersants without prior knowledge of the potential environmental effects, saying "there was no science when you apply [chemical dispersants] in the deep sea — we didn't know the impacts on sea life." She also acknowledged that it may be years before we know the full impact of the decision (http://www.poptech.org/blog/marcia_mcnutt_on_uncertainty_in_the_flow). There is a strong chance that the combination of oil and chemical ingredients in the dispersants will have harmful effects on marine life and potentially the humans who choose to consume that seafood in the near future.

Naturally, oil floats on the surface. This makes it possible (although difficult) to clean up. Sending oil to the bottom of the ocean makes it virtually impossible to remove. It also damages sea grass beds and coral reefs, and the oil is inadvertently consumed by mussels and other filter feeders – many of which make up the base of the Gulf food web. The chemicals in the oil (mixed with the mysterious chemicals in the dispersants) could accumulate up the food chain over time until high levels are found in commonly-consumed species. The U.S. Food and Drug Administration is monitoring seafood from the Gulf of Mexico carefully, and a number of independent studies are in progress.

The long-term effects of dispersants in the Gulf of Mexico are unclear at this point. The Gulf is one of the world's top food-producing regions, so dispersants could have huge implications for fisheries. Thanks to dispersants, people in southwest Florida can enjoy the beaches now, but they may not be able to enjoy local seafood safely in the years to come.

Publications Mail Agreement No: 41104508

The SeafoodPrint and the revival of the primary production required

by Wilf Swartz and Daniel Pauly

The October issue of the National Geographic magazine featured a story titled 'Time for a Sea Change' [1] with contributions from the *Sea Around Us* Project. The focus of the story was the ecological footprint of our seafood consumption, or SeafoodPrint. Much like the Ecological Footprints of Rees and Wackernagel [2], the SeafoodPrint is an attempt to express the impact of seafood consumption in terms of the productivity of the ecosystems from which they are derived. For this purpose, we revived the concept of the Primary Production Required (PPR) to sustain global fisheries, originally proposed by Pauly and Christensen in 1995 [3].

the current level of seafood consumption. We used the PPR conversion (based on the mean trophic transfer efficiency of marine systems, estimated as 10% by Pauly and Christensen 1995) to compute the ecological footprints (i.e., SeafoodPrints) of fish-consuming countries. The higher on the food web a fish is, the larger the footprint resulting from consuming such fish (Figure 1). Consuming 1 kg of northern bluefin tuna, at a trophic level 4.43, would be equivalent to 2,700kg of SeafoodPrint. Compare that with the SeafoodPrint for consuming 1 kg of Peruvian anchovies, at a trophic level 2.7, calculated as the equivalent of 500kg.

It has been widely recognized that seafood is one of the most traded food commodities in international markets...

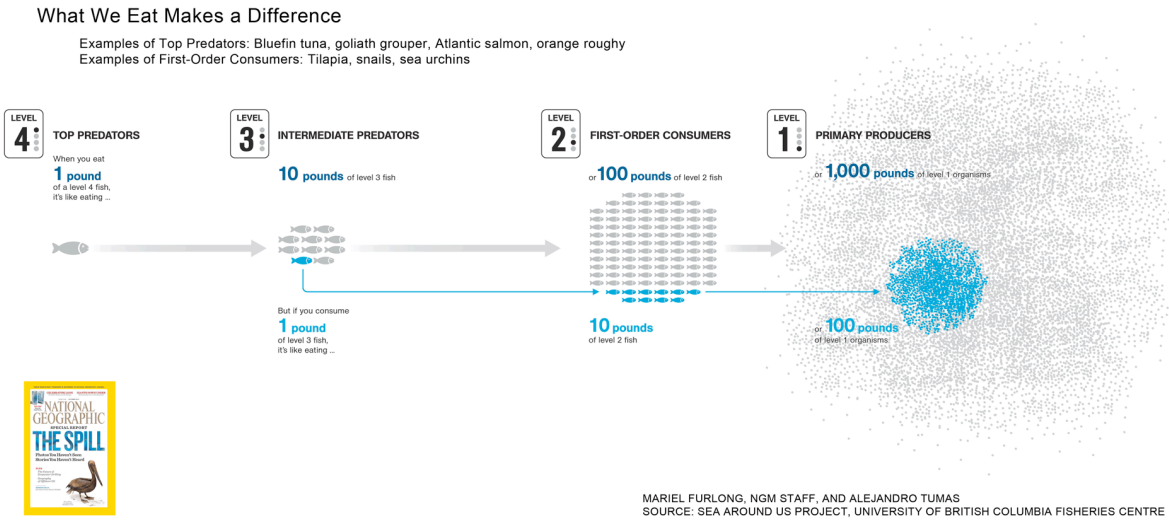


Figure 1. Schematics for computation of Seafood Print, estimated using 10% transfer efficiency between trophic levels, i.e., SeafoodPrint = (consumption)*$10^{(TL-1)}$.

PPR was designed to overcome the fact that every fish is different. Or more anthropocentrically, every kind of seafood is different. Since seafood covers a wide spectrum of species across marine food webs, the ecological impacts of seafood consumption also vary. While recognizing that assessments of the true ecological impacts of seafood consumption would require tremendous amounts of information about the status of each stock, fishing practices *etc.*, we defined, for our purpose, the ecological impacts (i.e., footprints) as the amount of marine primary productivity required to sustain

For the National Geographic piece, we computed the SeafoodPrint for all seafood consuming countries using the information on their fisheries landings, imports and exports. It has been widely recognized that seafood is one of the most traded food commodities in international markets, with the markets of the industrialized countries increasingly dependent on imports from foreign waters to meet their domestic demands [4]. Hence, rather than simply examining the fisheries of each country, it was important that the

Continued on page 6 - Seafood print

Seafood print - Continued from page 5

SeafoodPrints were applied to consumption. The result was not surprising with China as the largest consumer of seafood, followed by Japan and the United States. With benchmarks now established, we hope that the concept of SeafoodPrints will resonate with consumers and encourage a shift in demand from high trophic species to species that are sustainable and have lower ecological footprints.

... a third of the world's oceans and two-thirds of continental shelves are currently exploited at a level where PPR of fisheries exceeds 10% of local primary production

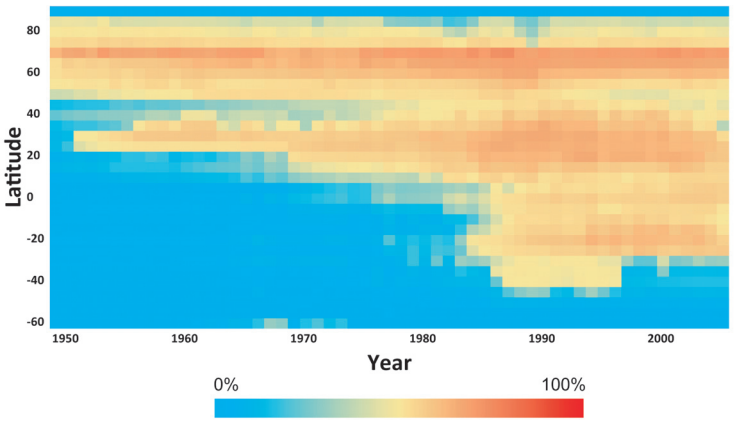


Figure 3. Time series of areas exploited by marine fisheries (PPR>10% PP) by latitude class, expressed as a percentage of the total ocean area.

Another outcome from the revival of the PPR is our new article in PLoS ONE [5] which applied the PPR of global fisheries for assessing the rates of their spatial expansion. For this study, we used three different threshold levels of PPR as percentage of local primary production to define 'fisheries exploitation,' and applied them to the *Sea Around Us* catch database (Figure 2). This approach allowed us to assign an exploitation status to each square of our ocean grid (exploited vs. unexploited) and trace the changes in their status over the years (Figure 3). Our analysis shows that fisheries expanded at the rate of about one million km^2 per year from 1950 to 1980, but this increased by 3-fold, following the series of EEZ declarations in the 1980s, with a large proportion of new fishing grounds coming from southern oceans.

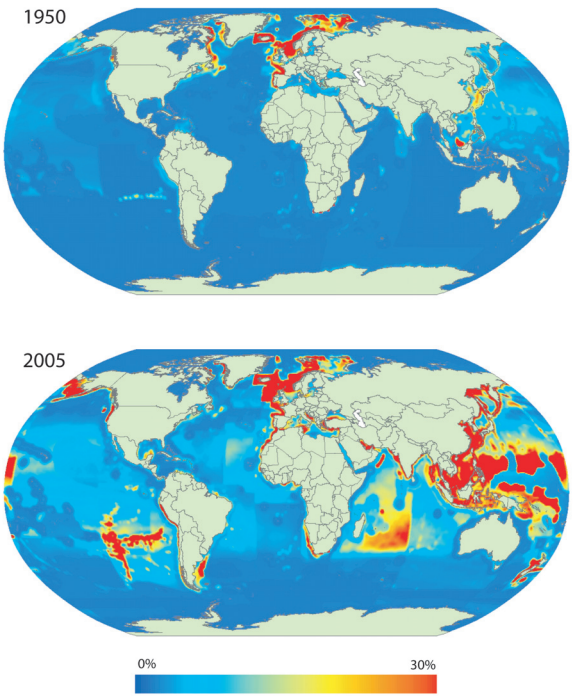


Figure 2. Primary production required to sustain global fisheries landings expressed as percentage of local primary production.

We also found that a third of the world's oceans and two-thirds of continental shelves are currently exploited at a level where PPR of fisheries exceeds 10% of local primary production, leaving relatively inaccessible waters in the Arctic and Antarctic as the last remaining 'frontiers.'

All of this should come as no surprise. The decline of newly exploited areas since the 1990s, which corresponds with the decline in the global landings, implies that the era of great expansion has come to an end. With limited room for expansion, the path toward sustainability of global fisheries must come through reduction of our SeafoodPrint. So let us hope that the article in National Geographic will raise a trickle then a flood of concerned citizen voices insisting that it is indeed "Time for a Sea Change".

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Sea Around Us

Student Conference on Conservation Science New York (SCCS-NY)

by Dalal Al-Abdulrazzak

Increasingly, interdisciplinary approaches are needed to confront the myriad of conservation problems. That was a central theme of the Student Conference on Conservation Science (SCCS-NY) held recently at the American Museum of Natural History's Center for Biodiversity and Conservation in New York City. Andrés Cisneros-Montemayor and I both participated and presented speed talks on our MSc and PhD research, respectively.

Dr Martha Groom from the University of Washington gave the opening plenary talk on enhancing interdisciplinary partnerships. Building successful partnerships requires an exploration of the connections and tensions between biodiversity conservation and human welfare, fostering a culture of interdependence among solutions.

The links between human health, environmental integrity, and conservation were addressed by Andres Gomez from the American Museum of Natural History. As we gain a more detailed understanding of biodiversity, the linkages between wildlife species, transmission of emerging pathogens, and the effects of disease on conservation efforts become more apparent. This integrative understanding of a complex problem conveys the need for further multidisciplinary conservation strategies.

During a panel entitled "A Life in Conservation: Diverse Perspectives" the "pigeon paradox" concept was discussed. An increasing majority of the world's population lives in cities, interacting with urban ecosystems that have been drastically altered by human activity (Dunn et al. 2006). Most of these interactions tend to occur with organisms and habitats with negative cultural connotations such as pigeons, roaches, house sparrows, and rats. Studies show that people are more likely to conserve nature when they have direct experience with the natural world, especially during childhood (Tanner 1980; Chawla 1999; Dunn *et al.* 2006). So while we are faced with thousands of potential species extinctions, and extreme changes to many of the world's ecosystems, paradoxically, the majority of people's direct experiences

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The author presents at SCCS. *Photo by A.M. Cisneros.*

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Sea Around Us Collaborates with FAO on Bay Of Bengal Project

by Devon O'Meara, Kristin Kleisner, Sarah Harper and Dirk Zeller

Today, with 400 million people dependent on the marine resources of the Bay of Bengal for their food security and livelihoods, the magnitude and importance of the project is apparent.

The *Sea Around Us* Project has gained recognition as a global research leader in fisheries science, conservation and policy through publications and collaborations with institutions around the world. However, the United Nations Food and Agriculture Organization (FAO), a key player in the global fisheries arena, has, until recently, had relatively little collaboration with the *Sea Around Us* Project. The FAO Regional Office for Asia and the Pacific has asked the *Sea Around Us* Project to assemble the Project's spatially allocated fisheries data, ocean health indicators, and fisheries reconstructions to be used as a part of the FAO Bay of Bengal Large Marine Ecosystem (BOBLME) project (www.boblme.org).

The FAO BOBLME project is a multi-government collaboration between the Maldives, India, Sri Lanka, Bangladesh, Myanmar, Malaysia, Thailand and Indonesia, with the mandate to "*improve the lives of coastal populations though improved regional management of the Bay of Bengal environment and its fisheries*". The project was initiated by the FAO in 1979 following concerns over the rapidly increasing coastal population and the simultaneous depletion of the Bay of Bengal ecosystem due to overexploitation of fish stocks, pollution, and habitat degradation. Today, with 400 million people dependent on the marine resources of the Bay of Bengal for their food security and livelihoods, the magnitude and importance of the project is apparent.

The Large Marine Ecosystem (LME) for the Bay of Bengal as defined by the National Oceanographic and Atmospheric Association (NOAA, www.lme.noaa.gov/) does not include the Maldives as a part of the Bay of Bengal Large Marine Ecosystem (BOBLME); however, these islands were incorporated in the BOBLME by the FAO due to their location within currents that influence the Bay of Bengal's ecology.

The *Sea Around Us* will provide the BOBLME project with spatially allocated data on fisheries catches and landed values, ocean health indicators for all eight countries in the BOB, and fisheries catch

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Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries, subscription requests, and electronic address changes should be addressed to Megan Bailey, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the Project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environment Group that began in July 1999. The Pew Environment Group works around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

ISSN 1713-5214 Sea Around Us (ONLINE)

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reconstructions for India, Myanmar, and Sri Lanka.

The spatial allocation of catches uses a rule-based process (Watson *et al.*, 2004) that combines taxa caught by country and area fished (e.g., from FAO's landing statistics or reconstructed catch, where available) with ecological species distributions and fishing access information, resulting in catches being assigned to smaller spatial units (30-minutes of latitude by 30-minutes of longitude). For each country, the catches taken within that country's Exclusive Economic Zone (EEZ) waters are estimated as the sum of the catches taken in spatial cells that fall within the area claimed by that country as its EEZ.

The ocean health indicators for the region will measure the socio-economic status of the BOBLME countries (i.e., fisheries subsidies to GDP ratio, economic impact factor to GDP, etc.), the biodiversity in the region (i.e, the Seabird Protection Index and the Marine Mammal Protection Index), and the level of commitment of each country to protecting their marine waters (i.e., the area coverage of MPAs within the EEZ waters). Our ocean indicator work is part of a global collaboration with Conservation International and other research groups, and the BOBLME project will be the first regional project to benefit from this research.

Fisheries catch reconstructions for Myanmar, India, and Sri Lanka, based on the reconstruction approach outlined by Zeller *et al.* (2007) and previously described in this newsletter (Issues 23, 28 and 35) will be included in the report. Catch reconstructions build upon the officially reported landings data (often dominated by or exclusively consisting of commercial fisheries data) by estimating unreported catches (e.g., subsistence and other small-scale fisheries catches) and discards. Thus, reconstructed catches represent a more accurate picture of total catches extracted from the ocean than reported landings data do. The FAO has requested these catch reconstructions in order to provide a more realistic baseline of fisheries extractions in the BOBLME. The next phase of this collaboration with FAO will include reconstructions of additional countries in the BOBLME.

We feel it is a great step forward for global fisheries if the knowledge, experience and recognition of FAO can be combined in collaborations with the *Sea Around Us* such as the one outlined here. This can only improve global data and evaluations of the status of fisheries worldwide.

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SCCS - Continued from page 1

with nature tend towards pestiferous species. This interesting theme, that urban conservation has important implications for global conservation, was explored throughout the conference, and it is increasingly a theme that needs to be included in our discussions of sustainability.

... urban conservation has important implications for global conservation...

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At left, SCCS attendees. Photo courtesy of Conference organizers.

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Sea Around Us

The sustainable special: Can restaurants encourage sustainable seafood consumption

by Leah Biery

When you dine out, how do you decide what to order? Do you head to the restaurant with a clear idea of what you want to eat, or are you influenced by the daily specials and suggestions from your server? While living in Southwest Florida, where the tourism-based economy revolves largely around seafood restaurants, I became interested in how vacationers decide which seafood items to consume. I frequently overheard people announce that they were going out for grouper (or oysters or snapper…), apparently already certain of what they would order before even sitting down at a table. Others seemed less sure about what they would eat, but knew that after a long day at the beach, they were in the mood for some kind of seafood. Around the time I made these observations, I was working on a local sustainable seafood initiative, so I wondered if and how those who sat down in a restaurant without a specific dish in mind could be influenced to choose a sustainable option.

After considering the many factors that influence customer choices in a restaurant, I decided to look at server suggestions and daily specials, two elements of the dining experience that often influence my own menu decisions. I recruited two high school students associated with the organization I was working for to help me design and distribute a survey for tourists on Sanibel Island. What follows is a summary of what we learned.

Of the tourists surveyed, 52% usually or always order seafood when they dine out on Sanibel Island. An additional 33% sometimes order seafood. This indicates that the local demand for seafood is high, so even a small increase in the proportion of people who make sustainable choices could contribute to the recovery of popular, rapidly declining species like grouper and queen conch (in 2008, queen conch and five grouper species were listed as overfished or subject to overfishing in the Southeast region of the U.S.[1]).

We found that 43% of tourists surveyed rarely or never knew which seafood they were going to order before dining at a restaurant. These consumers have not made a decision before sitting down, so some of them would likely be receptive to seafood recommendations from restaurant staff. On this note, 45% of tourists surveyed responded that they were sometimes or usually influenced by server suggestions. Furthermore, 45.5% responded that they were sometimes influenced by the seafood specials. An additional 14% were usually or always influenced by the seafood specials. Eating seafood near the ocean is undoubtedly an essential part of the beach vacation experience, but for many people, the specific type of seafood may not really matter. Our results indicate that server suggestions and daily specials could potentially be used as effective tools

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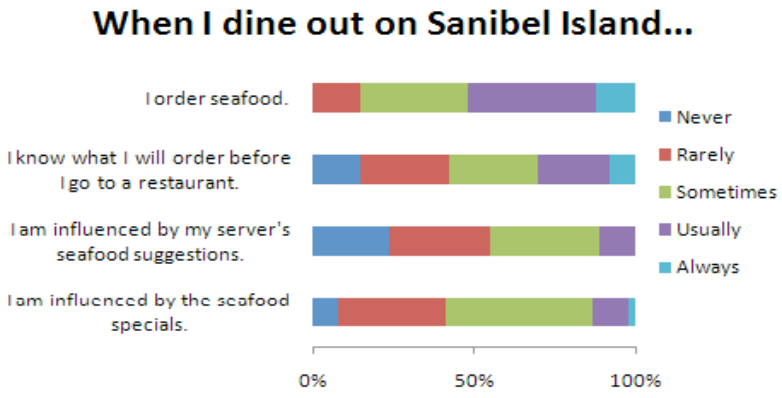
for influencing diners to make sustainable choices. As a means of boosting sustainable seafood sales and reducing the demand for red list species, sustainability initiatives could educate local restaurant management about sustainable seafood and encourage them to advertise only sustainable options as daily specials. Additionally, servers could be trained to routinely suggest sustainable options to customers. This would only work with sufficient interest and participation from dining establishments. Although our findings are specific to Sanibel Island, a similar approach might be effective in other locations as well.

... dining establishments should take more responsibility for protecting the future of ocean resources.



Sanibel island survey results suggest that seafood restaurants have the power to influence consumer choices.

While working to promote sustainable seafood in a tourist town, it became apparent to me that most vacationers want to relax and not obsess over sustainability. First and foremost, consumers want their meals to be tasty, so I am not implying that restaurants should recommend certain items solely on the basis that they are sustainable. Restaurants interested in operating sustainably could take a backstage approach by purposely selecting and buying sustainable items for special recommendation, but presenting them to customers as they would any suggestion – delicious. Sustainability should be mentioned as an additional perk, but not forced upon patrons as the only reason to choose the special. If a proportion of diners will order the special whether it is sustainable or not, it makes sense that restaurants concerned about the future of fish should always offer a suggestion or special that is.

These ideas are just small steps on the path to recovery for depleted fish stocks, but it is apparent that seafood restaurants hold important influential power when it comes to which menu items they recommend to patrons. Especially in areas frequented by tourists who are often on vacation from the stress of thinking about sustainability, dining establishments should take more responsibility for protecting the future of ocean resources. Restaurants with good foresight should be willing to use their power to reduce pressure on overfished species so that eating seafood can remain an essential part of beach vacations for generations to come.

Thank you to Sanibel Sea School and Lena and Natalia Horvath for their help with survey design and data collection.

Endnotes

[1] NMFS, 2009, Annual Report to Congress on the Status of U.S. Fisheries-2008, U.S. Department of Commerce, NOAA, Natl., Mar. Fish. Serv., Silver Spring, MD, 23 pp.

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Lionfish invasion: An opportunity for collaboration, creativity and growth in marine conservation

by Nicola S. Smith[1]

People from diverse sectors of society have lamented the invasion of lionfish in the Western Atlantic, and for good reasons. The effects of the establishment and spread of the species (*Pterois volitans* and *P. miles*) on the ecology, economy and human health in the region are uncertain, but are likely to be negative. The ongoing range expansion, which includes the US southeast seaboard, most of the Caribbean, and parts of the Gulf of Mexico, Central and South America, is an important emerging global conservation issue.

Figure 1. Invasive Pacific lionfish on a Bahamian coral head. Photo by Lad Akins, REEF.

Native to the Indian and Pacific Oceans, lionfish are venomous coral reef fishes that feed on a variety of smaller fishes and crustaceans. First documented in the Atlantic off the coast of southern Florida in the 1980s, lionfish were likely introduced via aquaria releases. Some concerns surrounding the invasion include:

1. *The direct, negative impact of lionfish on native reef species via predation.* Lionfish are efficient carnivores that use a novel predation strategy in the Atlantic by herding and cornering prey with its enlarged, fan-like pectoral fins. A study by Albins and Hixon (2008) found that a single lionfish reduced recruitment of native fishes to experimental reefs in the Bahamas by roughly 80% in five weeks.

2. The potential threat of lionfish to human health and its subsequent, negative effect on public perception of the safety of beaches and other marine areas. Lionfish have venomous dorsal, anal and pelvic spines that inflict a painful sting to humans. The most common symptoms and signs of envenomation are pain and swelling at the puncture site, but rare systemic effects like respiratory distress, vomiting and convulsions can also occur. This spells bad business for the recreational diving and tourism industries in highly invaded regions like the Bahamas, where current lionfish densities are nearly five times higher than reports in its native range (Green and Côté 2009), and where the misconception that a lionfish sting can be fatal is still common.

3. The challenge of implementing an effective lionfish control strategy in a marine environment occupied primarily by developing nations. The vast spatial extent and connectivity of the ocean to various ecosystems (e.g. mangrove systems) and political regions make attempts at population control difficult. Lionfish eggs and larvae are dispersed by ocean currents, while juveniles and adults are habitat generalists that have been reported in a smorgasbord of Atlantic habitats including mangrove systems, coral reefs, rocky bottoms, seagrass meadows, and artificial structures. Additionally, because of its venomous nature, lionfish have few predators. The task of slowing the invasion is therefore daunting, particularly for the many small island developing countries of the Caribbean, where lionfish densities are high but the availability of scientific expertise and financial resources is low.

In the Bahamas, the formation of novel partnerships has given rise to a wave of creativity and collaboration in the small nation...

Despite these concerns, responses to the invasion in at least one region of the Atlantic have been optimistic. In the Bahamas, the formation of novel partnerships has given rise to a wave of creativity and collaboration in the small nation of more than 700 islands and cays' approach to marine conservation. In one attempt to raise awareness and reduce local lionfish populations, fisherfolk, local and international environmental NGOs, the coral reef

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fisheries industry, and academic institutions have teamed up with the Department of Marine Resources to organize a series of lionfish derbies. Since 2009, a total of nine derbies on four island groups throughout the Bahamian archipelago have occurred, resulting in the culling of thousands of lionfish.

Bahamians have received comprehensive training in areas such as native fish identification and marine survey methodologies and techniques.

Figure 2. Some local and international participants of the experimental branch of the Bahamas' lionfish control pilot project. (L-R): Nicola Smith, Lad Akins, Krista Sherman, Frederick Arnette, Lindy Knowles, Jared Dillet, Trueranda Cox, David Bethel, LaKeshia Anderson, Christopher Dunkley, Ancilleno Davis; Kneeling: Stephanie Green.

In the Pacific, lionfish are marketed as a food fish since only the spines, and not the flesh, contain venom. Likewise, Bahamians are attempting to develop a lionfish commercial fishery as another means of invader control. Lionfish cooking and handling demonstrations are frequently held while several local restaurants now offer lionfish on their menus. Aiming to protect highly sought-after, native Nassau grouper stocks and at the same time reduce invasive species populations, one local environmental NGO launched a clever campaign encouraging consumers to eat lionfish as an alternative during times when the grouper fishery is closed.

Perhaps the greatest irony of the lionfish invasion is that this potential ecological disaster has accomplished what years of traditional marine conservation advocacy in the Bahamas could not. It has attracted sufficient attention and concern, both locally and internationally, to mobilize resources that can be used to directly confront the invasion and at the same time, aid in building national capacity to address other environmental issues. Funded primarily by the Global Environment Facility (GEF) with the United Nations Environment Programme (UNEP) as the lead executing agency, the Bahamas launched a lionfish control pilot project in 2009. The project involves several local and international partners from governmental, non-governmental and academic institutions. It focuses on (1) lionfish ecological research, (2) invasive species policy and legislation development, and (3) public outreach and education. The project is part of a larger, regional effort involving five Caribbean countries, titled "Mitigating the Threat of Invasive Alien Species in the Insular Caribbean" (MTIASIC).

Because of the experimental branch of MTIASIC, Bahamians have received comprehensive training in areas such as native fish identification and marine survey methodologies and techniques. Lionfish and native species monitoring in selected coral reefs, mangrove systems and a variety of other near shore habitats now occurs on a quarterly basis in three island groups throughout the archipelago. Monthly proficiency dives are also conducted in order to reinforce recently acquired skills. Given these accomplishments, the lionfish invasion appears to have a silver lining: it has provided an opportunity for collaboration, creativity and growth in marine conservation in the Bahamas. However, it remains to be seen whether such momentum can be sustained over the long-term, especially once the generous funding and interest of the international community have dried-up.

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[1]Ms Smith recently completed her Masters at UBC, for which Dr Daniel Pauly was a committee member. She is now the experiment coordinator of the Bahamas Lionfish Control Pilot Project, part of the GEF program.

Sea Around Us

Atlantic cod: Past and present

by Ashley McCrea Strub and Daniel Pauly

In February, Dr Pauly was contacted by Maya Lin, esteemed artist and architect best-known for designing the Vietnam Veteran's Memorial in Washington D.C. She is creating an exhibit to illustrate severe declines in species due to human exploitation, and asked Daniel if the *Sea Around Us* could provide ideas and information for a fish species. When considering overfishing and the collapse of fisheries, Atlantic cod (*Gadus morhua*) is typically one of the first species that springs to mind. Cod occurs throughout the North Atlantic, along the shores of the first countries to develop industrial fisheries, notably England. The different cod stocks, (e.g., in the North Sea), are generally in parlous states, and those of the Northwestern Atlantic, off the coast of the United States and Canada, are no exception. Indeed, the collapse of eastern Canadian stocks off the coast of Newfoundland in 1992 had devastating economic, social and ecological consequences still visible today.

At the end of the last ice age, nearly 10,000 years ago, the availability and expansion of capelin and herring following the retreat of sea ice provided an abundant food source enabling the proliferation of Atlantic cod in the Northwest Atlantic (Rose 2007). The great abundance of this predator in ecosystems had a dominating influence over the community. Historical records indicate that massive populations of this predominantly bottom-feeding species were targeted by fisheries as early as the 15th century (Hutchings and Myers 1994). Technological advances allowed fisheries for cod to develop from hook-and-line to cod traps in the 1860s, the latter becoming larger and more efficient over time. The traps were then complemented by gill nets, but the key change was the introduction of bottom trawling early in the 20th century in New England as well as during the mid-20th century in Eastern Canada. As the vessels supporting these various domestic operations grew in size and power, distant-water factory trawlers, mostly from Europe, but some from as far as East Asia, were added to the fishery and generated catches in excess of 800,000 tonnes in the late 1960s and early 1970s. However, Atlantic cod is a relatively long-lived, slow growing species whose productive capacity could not keep up with the increasing rate of mortality due to fishing. As the great majority of spawning adults were packed into ships' freezers, catches began to decline. By 1975, Canada and the United States declared national jurisdiction over what later became their 200 nautical-mile 'Exclusive Economic Zones', indirectly claiming ownership over the dwindling cod stocks and forcing out foreign fleets. The reduction in fishing, and recovery of cod that followed, was short-lived as overly optimistic fishery management measures and excessive subsidization led to record-low levels of biomass and a resultant fishing moratorium on the largest Canadian stocks in 1992. Despite significantly reduced fishing pressure, most stocks of cod in the Northwest Atlantic are still struggling to rebuild, and remain classified as 'overfished.'

To help Maya Lin with the creation of her art exhibit, we conducted a study to help us better understand the extent of overfishing and the recent state of Atlantic

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Despite significantly reduced fishing pressure, most stocks of cod in the Northwestern Atlantic are still struggling to rebuild, and remain classified as 'overfished.'

cod off the eastern coast of Canada and the U.S., relative to a time when this species was still the most abundant predator in the region. To begin, information regarding the relative abundance of Atlantic cod from the northern coast of Labrador to Cape Hatteras, North Carolina was obtained from the global fisheries database developed and maintained by the *Sea Around Us* Project at the Fisheries Centre, University of British Columbia. Using historical spatial distribution data, as well as biological data including preferred depth, latitudinal limits and proximity to critical habitat, the likely geographic distribution of over 1000 commercially fished species, including Atlantic cod, has been defined (Watson *et al.* 2004; Close *et al.* 2006). This database enables the production of maps illustrating the relative abundance or likelihood of locating a particular species in a spatial grid of cells measuring 0.5° latitude by 0.5° longitude. Populating such a map to reflect the actual numbers or biomass of fish present in a given area during a specific time period is then possible given suitable data on fish density.

Information regarding the size of the Atlantic cod population in approximately 1850 was gathered from an analysis of mid-19th century logbooks maintained by a handline fleet that fished the Scotian Shelf, the centre of the range of Northwestern Atlantic cod, prior to the industrialization of fishing (Rosenberg *et al.* 2005). Due to the relatively low level of fishing pressure, this population was assumed, for the purposes of this study, to be relatively close to its unfished maximum at this time. Using detailed, spatially specific logs, Rosenberg *et al.* (2005) estimated the historical biomass of cod on the eastern and western Scotian Shelf (encompassing an area of over 160,000 km^2) as 1.26 million tonnes. Accordingly, the average biomass density of cod on the Scotian Shelf in 1850 was approximately 8 tonnes per km^2. In the absence of similar information for other areas, this estimate of average density was assumed to be representative of the entire region considered here. To create a map of the density of cod biomass in 1850, this average density was scaled according to spatially specific estimates of the relative abundance of cod, resulting in values defining the density of cod in each grid cell included in the study region.

To estimate recent biomass, the results of stock assessments conducted by the U.S. National Marine Fisheries Service (NMFS) and Fisheries and Oceans Canada (DFO) were assembled. As stock assessments have not been performed for every Northwestern Atlantic cod stock in the past year, and to avoid uncertainty associated with the most recent assessments, biomass estimates for 2005 were collected for each stock.

This process enabled the production of maps of cod biomass density as well as the approximation of total biomass for the years 1850 and 2005. As estimates of fish population size are typically based partially or wholly on records of catches from previous years, the population considered usually includes those individuals that are vulnerable to fishing gear (e.g., age 3-4+ Northwest Atlantic cod) or sexually-mature individuals (i.e. the spawning stock, age 5-7 in the case of Northwest Atlantic cod). Unless otherwise noted, population size estimates calculated in this study refer to the portion of the Northwest Atlantic cod population vulnerable to fishing.

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The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the Project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environment Group that began in July 1999. The Pew Environment Group works around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

Cod - Continued from page 2

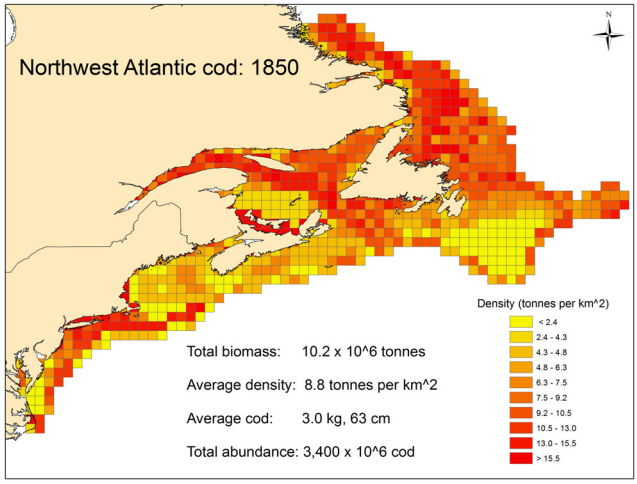

***Figure 1**: Map of the spatially variable density of Northwest Atlantic cod biomass estimated for 1850, a time when the stock was assumed to be similar to its unfished, 'pristine' state. The study region extends from the northeastern coast of Labrador southward to Cape Hatteras, North Carolina.*

In addition to the total size of the Northwest Atlantic cod stock during these contrasting time periods, the change in size of an 'average cod' since 1850 due to the effects of (over)fishing was also estimated. Calculating average cod size first required biological information describing the rate at which this species grows in length and weight over its lifetime (Sinclair 2001). When used in conjunction with the approximate total mortality rate (due to both natural causes and fishing) during 1850 and 2005, the average length and weight of a cod during each of these time periods was calculated[1].

The maps created as a result of this study provide very different pictures of the abundant cod population in the Northwestern Atlantic prior to the onset of industrial-scale fishing in 1850 (Figure 1) and the severely depleted population following decades of intense fishing pressure in 2005 (Figure 2). In 1850, the total biomass of Atlantic cod was approximately 10.2 billion (10.2 x 10^6) tonnes. By 2005, it was estimated that this biomass had decreased by over 96% to 0.36 x 10^6 tonnes. Thus, the average density of cod biomass across the study region fell from 8 tonnes/km^2 to 0.3 tonnes/km^2, 3.5% of the initial value.

Fishing not only reduces population abundance, but also the size of an average fish in the population. Thus, in 1850, the average cod more than 3 years in age would have been about 63 cm in length and weighed 3.0 kg, while the average mature adult was 78 cm and weighed nearly 6 kg. By 2005, the size of an average cod greater than age 3 had fallen to 58 cm and 1.3 kg, and an average mature cod measured 68 cm and weighed 3.6 kg. It is important to note that the 'average cod' size in 1850 presented here is conservative and may be an underestimate of the true average size during this time period. This is due to the fact that most studies of Northwest Atlantic cod growth were relatively recent and parameter estimates were based on fish sampled from stocks already affected by many years of fishing. Thus, potential fisheries-induced changes in growth rate were not considered here.

Knowledge of population biomass and average weight enables an approximation of the number of Atlantic cod during each time period. In 1850 the population of Atlantic cod in this region was composed of roughly 3.4 trillion (3,400 x 10^6) individuals, and had decreased by approximately 92% by 2005 (i.e., to 285 billion or 285 x 10^6 cod). As younger, smaller individuals tend to be more abundant in a population, particularly in the case of heavily fished populations, merely analyzing the change in abundance of cod masks the true effects of overfishing; biomass was nearly 30 times lower in 2005 relative to 1850, while the abundance of cod was only 12 times lower in 2005 compared to 1850. At a time when healthy, under-exploited fish stocks appear to be the exception rather than the rule across the globe and the 'shifting-baselines' syndrome has become widespread, numbers such as those presented here provide a perspective on the extent of human impacts on species and ecosystems, and of what we have lost. The data and maps generated as a result of this study will be used by Maya Lin to guide the design of her upcoming exhibit, providing an exciting vehicle for the *Sea Around Us* Project to communicate our work to a broad audience.

Cod biomass was nearly 30 times lower in 2005 relative to 1850...

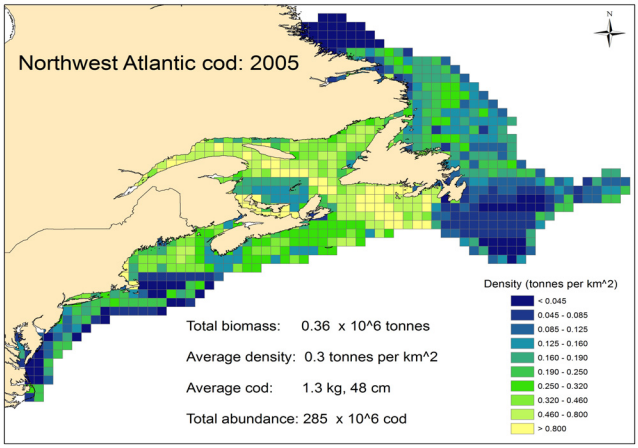

***Figure 2**: Map of the spatially variable density of Northwest Atlantic cod biomass (including the proportion of the population vulnerable to the fishery) estimated for 2005, following decades of intense fishing pressure.*

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Endnote

[1] Cod were assumed to grow in length according to the von Bertalanffy growth equation, where L_{inf} = 118 cm, K = 0.11 $year^{-1}$, and t_0 = -0.44 yrs. (Sinclair 2001). Total length (cm) was then converted to weight (kg) using the relationship $W = 0.0081*L^{3.03}$ (www.fishbase.org). The natural mortality rate (M) was assumed to equal 0.2 $year^{-1}$. Fishing mortality (F) for the entire study region was calculated using the mean F reported by each stock assessment, weighted according to the estimated biomass of each assessed stock, resulting in an estimate of 0.3 $year^{-1}$ for 2005.

Daniel sails through his 65th onboard the *Eloquent*

by M.L. Deng Palomares

Daniel, mentor to some of us and professor to many, had an aversion to celebrating his own birthday...

Our birthday celebrant, Dr Pauly, was born in post-war Paris in May 1946 and to this day carries a French passport (though he wishes to be Canadian sometime in the future). But, he never really lived in Paris, because Daniel's roller coaster life seems to always involve traveling. In his younger years, these travels were undertaken as a quest for meaning (which at certain points in his life included religion), purpose and education leading to a doctorate from the Institute für Meereskunde in Kiel, Germany. This degree started Daniel's journey to far and distant lands, e.g., Indonesia (GTZ project), the Philippines (ICLARM, Manila), Peru and Tanzania (FAO/DANIDA training courses), New Caledonia, Trinidad and Tobago, Kenya and Namibia (FishBase training courses), to name a few. And finally, to Vancouver, where he had the permanent task of being an advisor to graduate students and leader of *Sea Around Us* team members since the mid-1990s. Still cranking out a long list of publications like a paper mill and still going places as an invited speaker, (the 'guru') Daniel, mentor to some of us and professor to many, had an aversion to celebrating his own birthday for some reason he never really identified. This earned him the name 'KJ' (for 'Kill Joy') among staff at ICLARM in the early days (because Filipinos like parties and especially the food!). We at the Fisheries Centre are lucky that Daniel now seems to enjoy these

Daniel Pauly celebrates his 65th birthday with his wife Sandra, and surrounded by Sea Around Us *Project volunteers, colleagues, students and post docs. Photo by Ben Neal.*

celebrations (remember his 60th with that big event?). And this year's birthday (total surprise) bash for our bashful celebrant is unique, his first birthday party onboard a cruise! Daniel had no clue that preparations were under way for his party, thanks to the deft planning committee (Grace, Aylin), those who avidly put their art and cooking skills to work (Leah, Sarah, Kristin, Fred, Veronica) with special mention to Sandra Pauly who provided us with lunch, those who provided the materials for the artwork, the poems and baking paraphernalia, him who told Daniel lies to get him out of the office (Dirk), the photographers and film makers (Dawit, Dalal, Ling Huang) and to all of you who came to the party! It was well worth a sunny afternoon out on a boat, wasn't it!

Sea Around Us

The *Sea Around Us* at the 2nd International Marine Conservation Congress

by Devon O'Meara, Debbie Shon and Frederic Le Manach

The UBC Fisheries Centre was unusually quiet May 14-18th, the week of the 2nd International Marine Conservation Congress (IMCC2). Members of the *Sea Around Us* Project made a prominent appearance, with over 25 representatives attending the conference, held at the Victoria Conference Centre on Vancouver Island in British Columbia. This conference was a big event in marine conservation, and drew over 1,300 academics and professionals from universities, governments and NGOs around the world.

Drs Daniel Pauly and Ashley McCrea-Strub participated in a special session on marine protected areas .

The theme of the conference, "Making Science Matter", was aimed at creating discussion between policy makers and scientists through sessions of themed symposia, workshops and talks. Many members of the *Sea Around Us* Project experienced this interchange, as evidenced during the session on the Gulf of Mexico's oil spill led by Ashley McCrea-Strub, where Jennifer Jacquet and Kristin Kleisner also presented. Following the talks, a U.S. representative with the Bureau of Ocean Energy Management, Regulation and Enforcement expressed his concern for hasty predictions regarding the economic and environmental impact of the oil spill on fisheries in the Gulf of Mexico. "Science is not truth but it allows us to get closer to it" remarked Daniel Pauly, who was in the audience. The interchange was respectful and informative, and it underscored one of the fundamental problems between science and policy makers that the conference aimed to address: a communication gap.

Among the many presentations by Sea Around Us members during IMCC2, media coverage essentially focused on marine protected areas (MPA) and the implications for the ambitious deadline set by the Convention on Biological Diversity to protect 10% of marine habitats by 2020. Daniel Pauly was quoted by *Nature News* for commenting on the recent political fad of MPA establishment: "Now we have a competition for politicians to see who can have the biggest one" he said. The article goes on to explain Pauly's stance that it will take more than appealing to a politicians competitive side to get MPAs established. Ashley McCrea-Strub was also

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"We shouldn't say we should never have small MPAs. Some countries don't have large EEZs [Exclusive Economic Zones] or the funds to establish large MPAs"... Ashley McCrea-Strub on MPAs.

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credited in the article for estimating it would cost $2 billion per year to run current MPAs at full capacity compared to the $16.2 billion already spent on negative subsidies resulting in increased fishing pressure. Ashley McCrea-Strub was additionally mentioned by *Discovery News* in an article calling attention to her research on the economic benefits of investing in large MPAs - "We shouldn't say we should never have small MPAs. Some countries don't have large EEZs [Exclusive Economic Zones] or the funds to establish large MPAs".

Sea Around Us post-docs Jennifer Jacquet, Kristin Kleisner and Ashley McCrea-Strub, along with Jon Hocevar from Greenpeace, gave talks on the Gulf oil spill.

The conference centre - and surrounding bars! - were also a great opportunity for many *Sea Around Us* students to widen their network, by taking advantage of the conference to make contacts around the world. Following Leah Biery's presentation on estimating global shark catches, a small line-up formed of individuals waiting to exchange information and ask more questions - a common story for many presenters. *Sea Around Us* members collaborating with the Ocean Health Index (OHI) project were also able to put a human face to an email contact for the first time at an OHI reception hosted by the managing director of OHI and senior scientist from the New England aquarium, Steven Katona.

Red Fish Blue Fish, an Oceanwise supporter in the Victoria Harbour, was a popular lunch spot for conference participants.

The next edition of the IMCC will take place in the UK in 2014, and we hope it will be as successful as IMCC2 for *Sea Around Us* members.

News story links

Nature News article:
http://www.nature.com/news/2011/110516/full/news.2011.292.html

Discovery News article:
http://news.discovery.com/earth/marine-reserves-110516.html

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It Takes a Project

by Daniel Pauly

For a few days this May, we moved the *Sea Around Us* Project to Victoria, B.C. for the 2nd International Marine Conservation Congress (IMCC). It would be easier (although not wiser!) to list the Project members who did not attend, than those who did. Furthermore, given the breadth of the presentations, almost every single member's work – past and current-- was represented. Preparing the more than 20 conference talks, coordinating travel to Victoria, as well as setting up and staffing the *Sea Around Us* booth for the duration of the conference took an extraordinary amount of foresight, effort, and positive energy. Each and every attendee met this challenge with the usual generosity of spirit that keeps the *Sea Around Us* cohesive and productive – and exceeded expectations with additional initiatives, such as the BBQ hosted by Michelle Paleczny. Many members even helped with both the Project's activities and also volunteered for IMCC itself. Thank you everyone for your contribution and for making IMCC2 a success.

Each and every attendee met this challenge with the usual generosity of spirit that keeps the Sea Around Us *cohesive and productive...*

Sea Around Us Project: IMCC 2 presentations

Sarah Harper: The fisheries of small island countries
Leah Biery: Estimating the global distribution and species composition of the shark fin supply from the bottom up
Rhona Govender: Small but mighty: The real contribution of small-scale fisheries to global catch
Ashley McCrea-Strub: Global financial investment in marine protected areas
Daniel Pauly: Big reserves are better
Mark Hemmings: Changes in Maldivian fisheries
Colette Wabnitz: The ecological role of green turtles (*Chelonia mydas*) in Hawaiian and Caribbean marine ecosystems and implications for conservation
Megan Bailey: Do Europe's reduction fisheries contribute to sustainability?
Vicky Lam: Climate change and the economics of global fisheries
William Cheung: Global changes in body size, distribution and productivity of marine fishes under climate change: implications for conservation
Daniel Pauly (on behalf of Wilf Swartz): The spatial expansion of the world's marine fisheries: 1950 to present
Michelle Paleczny: Are global marine fisheries starving seabirds?
Marta Coll: Spatial overlap between marine biodiversity, cumulative threats and marine reserves in the Mediterranean Sea
Jennifer Jacquet: Public vs. personal impressions of the Gulf oil spill
Ashley McCrae-Strub: Oil and fisheries in the Gulf of Mexico: potential impacts on catch
Kristin Kleisner (on behalf of Rashid Sumaila): Impact of the Deepwater Horizon oil spill on the economics of U.S. Gulf fisheries
Dirk Zeller Arctic fisheries catches in Russia, USA and Canada: Baselines for neglected ecosystems
Frederic LeManach Magnitude of missing catches in official fisheries statistics and implications for the local population – the example of Madagascar
Jennifer Jacquet Intimacy through the Internet: Why Conservation Needs the Web
Sarika Cullis-Suzuki Regional fisheries management organizations: effectiveness and accountability on the high seas
Pablo Trujillo See-Food from Space
Kristin Kleisner Exploring indicators of fishing pressures in the context of the OHI with a focus on correcting the Marine Trophic Index for geographic expansion
Dalal Al-Abdulrazzak Gaining Perspective on What We've Lost
Megan Bailey (on behalf of Rashid Sumaila): MPA cost-effectiveness study

Fishing at the edge of collapse: 27 Years of Common Fisheries Policy in Europe

by Rainer Froese

Why were their considerable research efforts not dedicated to determining fishing regimes that maximize benefits for society while minimizing negative impacts on the stocks and the marine ecosystems?

In 2001, I returned to Germany from the Philippines, where I had worked for 10 years mostly on tropical fish and fisheries. I soon realized that the status of European fish stocks was no better than that in developing countries. Despite considerable efforts by hundreds of European fisheries scientists, data were lacking for most stocks, and even for the best researched ones, internationally agreed reference points, such as the maximum yield that can be taken sustainably (MSY), and the stock size required to support such catch were just not available. So, in the winter of 2008/2009 I sat down and analyzed the available data myself. The results made me want to cry. With few exceptions, fish stocks in Europe had been systematically decimated, even more so than in the rest of the world. In stock after stock, excessive fishing of 3 to 5 times above the internationally agreed reference point had reduced biomasses to 10 - 20% of their unexploited size. Extreme fishing pressure had shrunk cod to half of the length that our parents were used to. It had also reduced the natural adult lifespan of many years to a single spawning event, at best. Such fishing had effectively turned multi-spawning cod into single-spawning salmon.

It took me a while to realize that the sad state of European fish stocks was not a natural or societal failure that management just could not overcome despite its best efforts. No, the fact that most fish stocks balanced on the edge of collapse was the desired outcome of the Common Fisheries Policy of Europe (CFP), in force since 1984. In September 1996, the European Commission had asked the Council for the Exploration of the Seas (ICES), its main scientific advisory body for fisheries, to provide reference points that carry a low probability of stock collapse. ICES obediently provided limit reference points for stock size and fishing pressure and so-called 'precautionary reference points' slightly away from those limits. Fisheries management subsequently used these boundary posts of viable stock sizes as targets for fisheries management, but overshot the precautionary boundary for catches by 40 - 50% on average, effectively aiming for stock sizes on the slope to collapse.

Much of European fisheries research was dedicated to determining these boundary posts and next year's stock size with the highest possible precision. But why had my hard-working colleagues accepted such a questionable role, which strikes me as being similar to that of a medical doctor at a water boarding session? Why were their considerable research efforts not dedicated to determining fishing regimes that maximize benefits for society while minimizing negative impacts on the stocks and the marine ecosystems? Why were economists and social scientists not welcome in ICES advisory bodies? Why was the public not fully informed about the dismal state of European fish stocks? Why were fishers not informed about sustainable high catches and profits that healthy stocks could provide? Why were the internationally agreed reference points for sustainable fisheries management not made available and promoted by ICES?

These questions go to the root of the failure of fisheries management in Europe. The fishes in Europe's seas are owned by the citizens of Europe. These citizens have entrusted responsible management of this public good to their national Governments, where it is typically given to the Ministry of Agriculture with its associated research institutes. These institutes employ the fisheries scientists. Typically the ministry-approved heads of such institutes or someone from the ministry are the national delegates to the ICES Council, which determines ICES policies. ICES working groups give advice on stock sizes and potential catches to the European Commission. After extensive consultations, the Commission makes recommendations for fisheries management and for next year's catches. At several annual meetings in Brussels, the 27 EC ministers decide about fisheries management rules and also decide for each of the European stocks the catches that may be taken in the following year. Back at home, the ministries and their agencies administer the implementation of the decisions made in Brussels. They also control compliance by fishers. Such concentration of explorative, legislative and executive power within one ministry does not

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CFP at the edge - Continued from page 4

exactly resemble what we learned in school about the importance of separation of powers in a democratic system.

If this system was working in the interest of those who paid for it, fine. But clearly, it is not. ICES has blocked inclusion of social sciences (including economics), effective public outreach, and anything resembling ICES taking a stand on behalf of European fish stocks. It also has limited ICES advisory outputs to what the ministers deem useful for their negotiations in Brussels. Enforcement of fisheries management by member states is lax, with cases where actual catches exceeded the agreed amount by more than 100%. Fisheries in Europe are subsidized to an amount that in some cases equals the value of the landed fish. Without these subsidies, European fisheries would be bankrupt, because the cost of hunting the few remaining fish exceed the income from selling the catch.

Why did the ministers not act in the interests of the citizens who have elected them and who pay their salaries? Because the ministers are under constant pressure by the fishing lobby and only under occasional, if any, pressure by the public, which is made to believe that fisheries management is decided by bureaucrats in Brussels. The degree to which the European fishing lobby has infiltrated the system is astounding. Although the economic contribution of the fishing sector is less than, e.g., that of the industry producing sewing-machines, their political influence is considerable, probably because the public still has romantic notions about fishing, and because the media are drawn to stories of fishers blocking ports or dumping fish in the streets of Brussels. The European Commission has set up Regional Advisory Councils (RACs) which, among other, give recommendations on how to implement the scientific advice given by ICES. In these RACs, the fishing lobby has 2/3 of the seats, with the remaining seats being shared by all other stakeholders. If no consensus is reached, then decisions on recommendations are taken by simple majority, such as held by the fishing lobby, while other stakeholders may submit their minority opinion. But the main influence of the fishing lobby is probably exercised through their cozy personal relationships with the civil servants in charge of national fisheries, many of whom firmly believe that it is their job to protect the rights of their national fishing sector, including the rights to obtain subsidies and to overfish.

The role of the European fishing lobbies is a particularly unpleasant one: In order to increase allowable catches, the lobby routinely discredits the scientists and their advice, denies the depleted status of stocks, fights the establishment of protected areas, defends the usage of destructive gears, insists on the right to catch juvenile fish, and requests the abandonment of closed spawning seasons and areas. In doing so, they destroyed the very foundation that fishing depends upon. As a result, profit margins of European fishers are about 3-6%, whereas profit margins of their colleagues in New Zealand, which has successfully reformed its fisheries, are about 40%. Given the considerable influence of the European fishing lobby on the system, why do they not act in the interest of their fishers, whose profits could multiply in a few years if stocks were allowed to recover? The answer to this question eludes me.

Without these subsidies, European fisheries would be bankrupt, because the cost of hunting the few remaining fish exceed the income from selling the catch.

Fisheries management in Europe culminates in the closed-door meetings of the Council of Ministers. While the public is exclude from this debate about a public resource, the fishing lobby is always only a cellphone away and often physically present in the building, being supplied with press cards by their national delegations. Decisions in the Council are typically taken by a 2/3 majority but need consensus if the Commission feels that its proposal has been ignored. That was recently the case in a preparatory meeting dealing with the threatened Atlantic bluefin tuna. The member states were unhappy with the proposal by the Commission which followed the scientific advice. They asked the Commission to leave the room, and then agreed unanimously with a few abstentions on much higher catches.

While the ministers may change every few years, their civil servant advisors with their cozy relationships to the fishing lobby stay on and oppose any true change. As a result of years of midnight micro-management, the CFP has accumulated over 600 regulations, many of which contradict each other. For example, regulated mesh sizes catch smaller fishes than the fishers are allowed to land. These fish are then dumped dead at sea. The setting of next year's catches has been described as political horse trading, with unholy alliances supporting each other in an effort to secure the highest possible share for the national fishing sector. Thus, Germany and Poland will support higher French catches in the Atlantic, and France will support higher catches in the Baltic. As a result of such coalitions, the cod and herring stocks in German waters are more strongly

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CFP at the edge - Continued from page 5

overfished than adjacent stocks. Since the proceedings of the meetings remain secret, the ministers can happily go home and wear blue ties at the next 'Save the Oceans' event, because clearly, they themselves fought hard for healthy oceans and ecosystem-based fisheries management, but others prevailed.

The situation described above is what Maria Damanaki was confronted with when, in 2010, she took over the post of Commissioner of DG Mare, the European Directorate General in charge of European fisheries. Building on the excellent Green Paper on the Reform of the Common Fisheries Policy of 2009, which officially documents much of what I have described above, she confronted the Council of Ministers with clear demands for rebuilding European fish stocks until 2015, in accordance with international agreements.

Europe is gradually abandoning the fishing at the edge of collapse, and ICES now provides at least one of the international reference points (Fmsy) for 39 out of 190 commercial stocks.

Her courage has shown some success: Europe is gradually abandoning the fishing at the edge of collapse, and ICES now provides at least one of the international reference points (Fmsy) for 39 out of 190 commercial stocks. The number of stocks that are known to be on the slope to collapse has also slightly decreased. But will this be enough to overcome overfishing in Europe and in the rest of the World, where much of the European fleet is operating and where Europe plays a crucial role as the largest importer of seafood products?

The proposal of the Commission for the reform of the CFP will be officially published on 13 July this year. Considering the mess that we are still in, it proposes big steps in the right direction. The internationally agreed reference points will finally be recognized in Europe, allowing the stocks to grow away from the edge of collapse. Discarding of perfectly good fish for bureaucratic reasons will be phased out. But the proposal clearly falls short of similar reforms that have been enacted in New Zealand, Australia and the USA. These countries have precautionary fishing targets, slightly away from the reference points to account for uncertainty, and they close fisheries when stocks enter the slope to collapse. In contrast,

Europe will have no precautionary margins and will gradually reduce fishing pressure only when stocks are on the slope to collapse, with no default rule for closing a fishery. Where the other countries have phased out or drastically reduced subsidies, the Commission only proposes to reshuffle subsidies. Also, the root causes of the CFP failure will not be addressed, i.e., the concentration of power with the agriculture ministers and the excessive influence of the fishing lobby. Such restraint may not be surprising, because the Commission is well aware that these very ministers and their lobbies will decide the implementation of the proposal and the future of fish and fishing in Europe.

Do I have a final wish? Yes. Given the systemic failure of fisheries management as enacted by the ministries of agriculture, I wish Europe would leave them in charge of aquaculture, but give the management of wild fish to the ministers of environment. The Marine Strategy Framework Directive of 2008 shows that they have understood that only healthy ecosystems can support healthy fish stocks, which, in turn, can provide healthy profits from environmentally-friendly fisheries.

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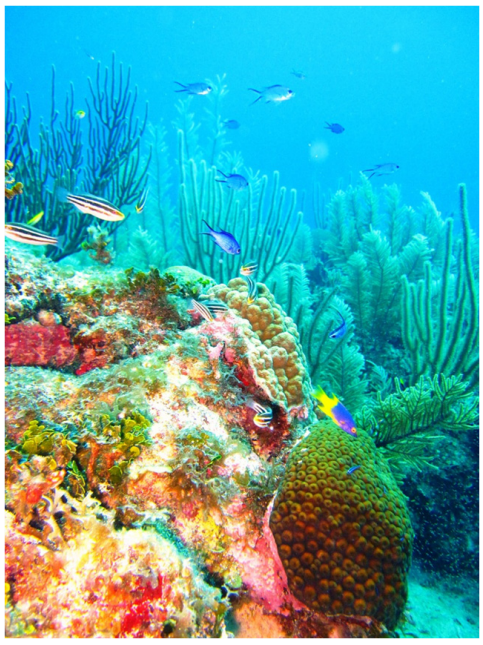
Sea Around Us

Applying science in Belize: From taxonomy to policy

by Sarah Harper

The *Sea Around Us* project and Oceana teamed up for a conference to discuss what's at risk, from a marine biodiversity perspective, if plans go ahead to drill for oil off the coast of Belize. The conference, co-hosted by Daniel Pauly and Deng Palomares, held in Belize City on June 29 and 30th was titled "Too precious to drill: The marine biodiversity of Belize". At the conference marine biologists, taxonomists and economists provided an exhaustive list of reasons why the precious and pristine marine environment of Belize could be at risk. With some of the healthiest coral reefs, manatee populations, shark diversity and reef fish spawning aggregations in the Caribbean, Belize would lose a lot from an oil spill[1]. Tourism and fisheries are particularly at risk as these both rely on a healthy marine environment, and provide jobs, revenue and food to the people of Belize.



A typical Belizean reef. Photo by Gordon Kirkwood.

Just over a year ago, the International NGO Oceana, which recently opened an office in Belize City, caught wind of plans to develop an offshore oil industry in Belize. Leaked government documents revealed a map of the waters off Belize that were a checkerboard of oil exploration consessions. Oceana, the largest international NGO focused solely on ocean conservation, raised the alarm bell and decided that quick action was needed to engage and empower the people of Belize to stand up to these plans and protect their precious natural wealth. A campaign was launched with a petition to be signed by the people of Belize demanding a referendum on oil exploration offshore and in protected areas on land. Oceana met their target with over 10% of the voting population signing the petition (17,000+ signatures), the minimum requirement for a referendum to be called, and continues to raise awareness throughout the country with their colourful campaign bus and heavy media engagements.

Further to their in-country efforts to engage the public, Oceana teamed up with the *Sea Around Us* project to deliver the scientific evidence required for a strong case against offshore drilling in Belize. A conference was set for the end of June 2011 and international scientists selected to share their expertise, including Andrés Cisneros-Montemayor, Dirk Zeller and myself. One of the goals of the conference was to repatriate the

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This professional statement re-iterated the importance and value of the marine evironment and the need to protect it from anthropogenic threats; offshore oil drilling in particular.

Oceana's colourful campaign bus. Photo by Sarah Harper

knowledge and expertise that had been gleaned from years of scientific study within Belize but that had not necessarily stayed within its borders. Many detailed studies have been conducted on diverse aspects of the Belizean marine environment but have been published abroad. The conference aimed to bring this knowledge back to Belize and use it as a tool to inform and improve decision-making.

Attendance at the two-day conference included fishers, government delegates, the US ambassador to Belize, media, NGO's and citizens of Belize. While the conference was well-attended, the main outlet for disseminating this information to the general public was the media, via breakfast television shows, radio, talk shows, etc.

The conference concluded with a letter to the government of Belize signed by 20 scientists from 10 nationaltities, most with decades of experience studying the marine environment of Belize. This professional statement re-iterated the importance and value of the marine evironment and the need to protect it from anthropogenic threats; offshore oil drilling in particular.

With the conference concluded, a scientific report just released[2], and a flurry of media exposure, the question remains: to drill or not to drill? The hope is that the government wakes up to an informed public who are now asking the tough questions.

Starfish image captured at Caye Caulker. Photo by Gordon Kirkwood.

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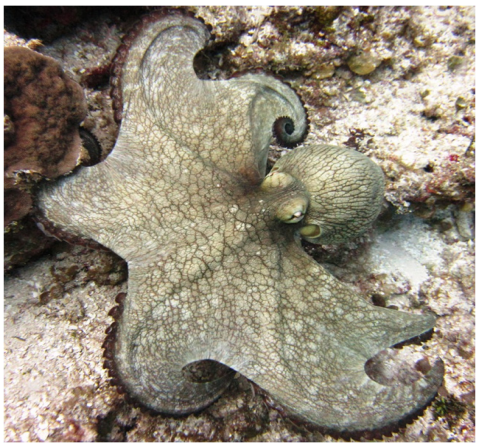
Belize - Continued from page 2

Who will benefit from offshore oil drilling? Who will pay the price for the high environmental costs associated with this industry?

Perhaps I am biased, given my background in marine conservation, but I think that in the waters of Belize, drilling for oil just doesn't make sense. On the last day of the conference, the scientists and media adventured offshore to Turneffe Atoll, a typical reef for this area known for its excellent diving, snorkeling and sportfishing opportunities. We stopped for lunch at a lodge nestled in amongst the mangroves lining the atoll and heard about the decade long struggle to get it designated as a marine reserve in order to better preserve its natural beauty. Unfortunately, this atoll lies within the largest of the oil consessions, owned by Princess Petroleum Ltd. , and is likely to be one of the first areas drilled. This atoll alone brings in 40 million USD annually from flyfishing for bonefish, tarpon and permit. This is money that goes directly into the Belizean economy and to the people of Belize. Conversely, the majority of oil revenue from drilling in the waters adjacent to this popular fishing hole would go mainly to the international investors of the oil companies. Simply looking at the economic picture, drilling for oil would likely not improve the economic situation in Belize and the risk in terms of losses both in fisheries and tourism are huge.

On the biological side, Belize also stands to lose a lot. The conference highlighted over 2,000 marine species of fish, invertebrates and plants, found in the waters of Belize and now documented in FishBase and SeaLifeBase. I was able to experience first hand some of this incredible diversity and abundance of life with a snorkel through the reef at Hol Chan marine reserve, not far from Turneffe Atoll. A glance around the marine reserve revealed a tremendous array of sharks, rays, turtles, reef fish, dolphins, corals, and much more. Belize has arguably the healthiest Antillean manatee population in the world and still has relatively abundant shark populations, including whale sharks. Looking around as I snorkeled through the reef, I could see that an oil spill in the waters of Belize would have an incredibly devastating effect. A catastrophic oil spill, given recent events in the Gulf of Mexico and other parts of the world, is quite possible. Drilling for oil offshore is much riskier than onshore, and in a biologically rich and diverse marine environment such as Belize, the risks are too high—in my opinion. An oil spill could wipe everything out and Belize would be left with nothing-no tourism, no fishing!



An octopus shows off for the camera.
Photo by Gordon Kirkwood.

A sponge serves as a home for this banded coral shrimp.
Photo by Gordon Kirkwood.

Looking around as I snorkeled through the reef, I could see that an oil spill in the waters of Belize would have an incredibly devastating effect.

Throughout the conference, Audrey-Matura Shepherd, VP of Oceana Belize, emphasized the importance of the reef in providing food security and jobs, "Think about Belize without the reef? Where would we be without that?". The Belize barrier reef, the largest barrier reef system in the northern hemisphere and a UNESCO World Heritage Site, is a sense of national pride, a source of livelihoods, food security and jobs for the people of Belize. That is definitely worth protecting!

For more information visit the website: http://www.seaaroundus.org/conference/belize/home.htm

Endnotes

[1] McCrea-Strub, A. and Pauly, D. (2011) Oil and fisheries in the Gulf of Mexico. Ocean and Coastal Law Journal [in press].

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Dreams can come true

by Robin Ramdeen

Skeletons of sea mammals, a picture of a salmon, a project called 'Seahorse', it is a blossoming marine scientist's dream come true.

Last year, from a porch on a tiny Caribbean island called Carriacou, I vowed to learn everything about fisheries, especially in the Caribbean context. There, I had been placed for 6 months on a CIDA internship as a Marine Protected Area Management Assistant for the new Sandy Island Oyster Bed MPA. My island upbringing – I am a native of Trinidad and Tobago - and affinity for seawater made a career as a marine scientist a good fit for me. Upset and confused by a scarcity of choice and prohibitive prices at the fish markets in the Grenadines Islands- I wondered….where are all the fish going?

The Author (right) at the International Marine Conservation Congress, with Jahson Alemu (Research Officer, Institute of Marine Affairs, T&T) and Daniel Pauly. Photo by Aylin Ulman.

Unfortunately, reading material on fish and other foods was as scarce as the food items themselves in these secret islands. But one sunny day I happened upon a National Geographic magazine. It was a special Gulf of Mexico edition and it detailed the suffering and strife facing the marine life in the Louisiana wetlands, as a result of yet another oil rig disaster. Somewhere towards the centre of the magazine I stumbled upon an article entitled Seafood Print. It was a clever term for the ecosystem impacts that we bring about by our piscivorous choices. Like the fate of many a fish, I was hooked! The field of ecology was very interesting to me and soon I began to learn about a scientist named Dr Daniel Pauly and the work of a project named after a phenomenal book by Rachel Carson (which I am in the middle of reading), the *Sea Around Us.* From my CIDA intern peers, I also heard about the International Marine Conservation Congress, taking place in Victoria, Canada, in May 2011 – which I did attend (see photo evidence above).

In Trinidad and Tobago, we say "yuh reach" when you have attained something really big, and that is the feeling I have being at the UBC Fisheries Centre. Skeletons of sea mammals, a picture of a salmon, a project called 'Seahorse'; it is a blossoming marine scientist's dream come true. Here, I will be working with Sarah Harper and the talented *Sea Around Us* team to piece together the puzzle of how the current and deplorable state of Caribbean fisheries came to be. Caribbean fisheries are threatened by the same factors that are affecting global fisheries, including collapsing fish stocks resulting from overfishing and environmental degradation.

'Bacchanal' or confusion is an inherent part of island life, where our small populations compete for limited resources. Issues like the disregarding of CITES recommendations on trade and under-reporting fish catches to the FAO, the selling flags of convenience and fighting over flyingfish will all be dissected in the Caribbean context. To say that every fish in the Caribbean will be counted would be exaggerated, even in this technological age. I will, however, say that we are working like dogs to use every bit of accessible data (FAO and national, grey and white), and transforming market data into landings data. We hope to dispel the notion that there is insufficent information to enable proper management of our precious fisheries resources. From Algeria to Zanzibar, we are the *Sea Around Us.*

Sea Around Us

The fishers of Jamaica are making change mon!

by Stephanie Lingard

Left: Learning to clean lionfish at the lionfish handling workshop. Right: Typical catch dominated by small herbivorous fish.

Jamaica, the land of wood and water, famous for its warm people, reggae music, jerk chicken and overfished reefs. Jamaica lives up to its reputation in every aspect. The people are some of the kindest, warmest and funniest you could hope to meet in your life. The landscape is an impossibly beautiful green, the food is flavourful, and… the reefs are desolate. However, there are many reasons to expect a better future for Jamaica's fishers and fishes.

During the winter of 2010 and spring of 2011 I was given the opportunity to live in Jamaica on an internship funded by the Canadian International Development Agency (CIDA). Having worked at the Fisheries Centre for the summer of 2010, I was delighted to find I would be working alongside the Fisheries Division of Jamaica's Ministry of Fisheries and Agriculture. I was working with an initiative called Improving Jamaica's Agricultural Productivity Project (IJAPP). The fisheries aspect of the project, funded in part by CIDA, had three focus points: market facilities, enhancement of fisheries resources through artificial reefs, and capacity building with fishers in six south coast fishing villages. The project also worked to establish co-management bodies within each of the fishing villages. These bodies would be responsible for managing the new markets, and community organization tasks. Capacity building included workshops concerning all aspects of life: money management, conflict resolution, ecological knowledge, fisheries management, and safety at sea, to name a few. During the workshops, fishers faces lit up, and they absorbed the information eagerly. Community members were deeply thankful to have the opportunity to learn how they could care for their resources and improve their livelihoods. Working with fishers during workshops was by far the most rewarding aspect of my time there, and I'm happy to report: progress is being made.

A long list of challenges is faced by the ecosystems of Jamaica: invasive lionfish, pollution, overfishing, destructive fishing habits, lack of regulation, hurricanes, and coral disease. Initially, working among these challenges made it difficult to stay positive and understand why we were building fish markets while previously donated gear sheds, from the European Union, sat unused. Why were new reefs,

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The more I got involved with the fishing community and meeting fishers and fisheries officers the more I felt things could be changed.

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sure to be targeted by destructive fishing practices, being built? In my mind, enforcement of fish sanctuaries (MPAs), and other regulations were clearly a priority. I often asked myself what the solution was to the myriad of problems, often feeling like I had nothing to offer the fishers or the fish.

Then, as time went on, my attitude changed. The more I became involved with the fishing community, and after meeting fishers and fisheries officers, I felt things, like my attitude, could be changed. The fishers themselves provided inspiration. Despite hauling up empty pots (Antillean Z traps) day after day, they continued to smile and laugh. At community meetings hosted by the project, many fishers were outspoken with other community members about the need to stop dynamite fishing, and other destructive practices. Many fishers I spoke with also expressed that, while they may not see the benefits of their changed behaviour, it was important to keep working at it for the next generation of fishers. The fisheries division staff, Dr. Karl Aiken (the Jamaican fish expert with the University of the West Indies), and members of local NGOs provided constant inspiration as well. All of these dedicated people have worked for years amongst funding cuts, broken government promises, destructive fishers, and natural disasters, and yet they persist in good spirits.

My friend Nakhle Hado, who works with Food for the Poor, teaches lionfish handling workshops around the island. He works tirelessly with fishers to teach them less destructive fishing techniques (like deep water handlining vs. trap fishing), as well as encouraging them to catch lionfish. Along side this work, he promotes a market for lionfish by selling it on the menu of his family's restaurant in Kingston. The fried lionfish is amazing! The trend appears to be catching on as I had several fishers tell me they prefer lionfish to other types of fish, and that they have customers who will come to them specifically for the prickly fish. In time, it may just become a Jamaican delicacy.

The Nature Conservancy is currently working with the Fisheries Division to set up enforcement of the Pedro Bank Fish Sanctuary. Pedro Banks is a large fishing ground with several small sandy cays which host a transient community of fishers approximately 60 km off the south coast of Jamaica. Although funding is slow to come through, all are hopeful this will commence before the end of this year, or in early 2012.

The Oracabessa Fish Sanctuary was finally launched on October 9, 2011, Dr. Aiken giving me the good news. There is a wonderfully dedicated group of local NGOs working to get the rest of the 8 designated fish sanctuaries off the ground: Caribbean Coastal Areas Management Foundation, Blue Fields Bay Fishermen's Friendly Society, St. Mary Fishermen's Cooperative, Oracabessa Foundation, The Negril Coral Reef Preservation Society, The Montego Bay Marine Park Trust, Fisheries Division, Alloah fisher group and Business Community.

Despite several decades of hardships, and slow-moving political action, there is a strong community of fish-friendly organizations and individuals in Jamaica. I hope the return of the herbivorous long-spined sea-urchin (*Diadema antillarum*), combined with the much anticipated launch of the fish sanctuaries, and a burgeoning lionfish market signal a recovery of Jamaica's marine resources.

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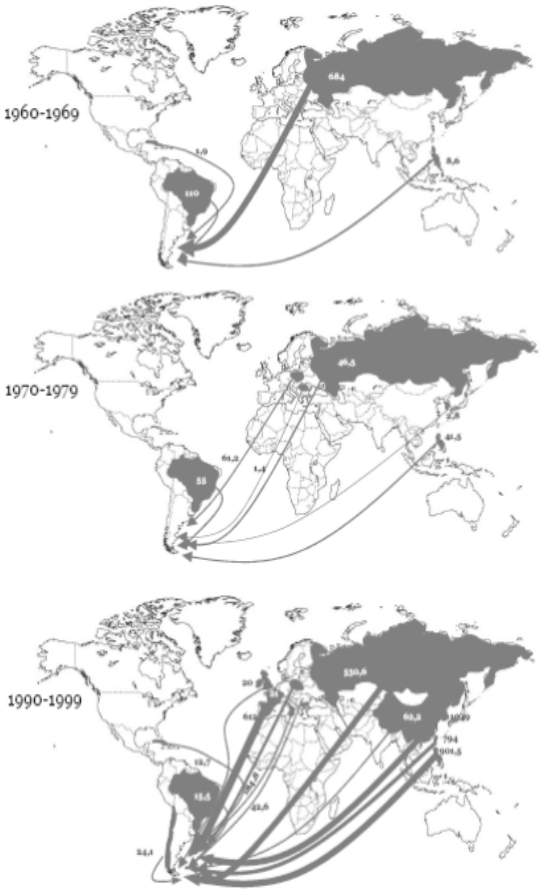
Why cooperate in the management of the Argentine shortfin squid fishery?

***by* Sebastián Villasante and Rashid Sumaila**

How to sustainably manage shared fish stocks for the benefit of present and future generations is one of the key issues currently being investigated by the scientific community. We participated in a World Bank Conference in Development Economics titled "*Development Challenges in a Post-Crisis World*" in Stockholm, Sweden. Several Nobel laureates in economics (Erik Maskin, James Mirrlees, Elinor Ostrom, Joseph Stiglitz, and Robert Solow) and other well-recognized worldwide experts in natural resource economics participated as speakers. We presented our paper "Linking environmental economics, game theory and fisheries: an estimation of the economic benefits to sharing the *Illex argentinus* fishery in the Patagonian marine ecosystem".

The research described in our paper was financially supported by the Latin American and Caribbean Environmental Economics Program (LACEEP), the Canadian International Development Research Center (IDRC), and the Swedish International Development Cooperation Agency (SIDA), as well as by Pew Environment Group through the *Sea Around Us* project. Our paper was presented in the session titled "New Findings in Common Property Management" organized by Dr. Scott Barrett, which included the participation of Drs. Ostrom and Mirrlees. The experience of sharing our results with distinguished economists in the stimulating academic environment of this Conference was highly productive.

The Patagonian marine social-ecological system supports one of the most productive shared fish stocks in the world, and it includes important commercial species such as the Argentine shortfin squid (*Illex argentinus)*. This resource is exploited by different foreign fleets that operate both within the Argentine exclusive economic zone, and within the adjacent area beyond the 200-mile limit, as well as in Falkland (Malvinas) Island waters. Hence, the countries involved face what is known as stock externality, in which one nation's catch negatively impacts that of another country. However, to date only biological and management aspects of this fishery have been studied, and a better understanding of the economic factors of the fishery is needed.



Catches by DWFN and other coastal states from the Patagonian marine ecosystem by decade (in thousand tonnes). The lines indicate the intensity of foreign fishing fleet activity in terms of catches.

Therefore, the main objective of this research was to estimate the economic benefits of the squid fishery under both cooperative and non-cooperative management scenarios. The bioeconomic model that we used was based on Munro's (1979) pioneering work on transboundary fishery stocks, and from later works. According to the *Sea Around Us* catch database, total catches in the ecosystem increased from 45.7 tonnes in 1950 to 1.19 million tonnes in 2002. The peak catches occurred in 1997, with 1.8 million tonnes. It is worth noting that the catch of distant water fishing nations (DWFNs) inceased by over 240% between the 1980s and the 1990s, with a peak catch of 751,500 tonnes in 1988. Moreover, in the

Continued on page 4 - Cooperation

The main objective of this research was to estimate the economic benefits of the squid fishery under both cooperative and non-cooperative management.

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last three decades, catches by Argentinean vessels in the high seas have declined from about 44% to 17% of the 15 million tonnes caught by all countries between 1970–2000. This despite the increase in the overall catch volume, as shown in the figure.

Experience from around the world demonstrates that strong political commitments, at the highest level of government, are required to make joint management work.

The countries (or *players*) participating in the squid fishery are Argentina, the Falkland Islands, and DWFNs from Spain, Japan, South Korea, Taiwan, and China. However, at present data are not readily available on the activities of the foreign fleets, so the most important players included in the model were Argentina and the Falkland Islands.

Before estimating the economic benefits of the fishery under both cooperative and non-cooperative scenarios, the parameters related to the biomass and catches were first calculated. It then was possible to calculate the solutions to the model associated with the prevailing prices, fishing costs, and discount rates. We used a parameter, *beta*, to represent the sharing program of the two players. A *beta* equal to 0 or 1, would mean that one of the two countries was the sole owner of the resource, whereas a *beta* of 0.5 would represent equal rights.

When using a seasonal horizon of 10 years, results of the model indicate that the greatest economic benefits are obtained when there is sharing arrangement of between 30-70% between the two countries. When considering catch, the non-cooperative scenario yields the greatest benefits, with a catch volume close to 335,000 tonnes.

Under the cooperative scenario, the largest catches are obtained when a 50/50 sharing rule is in place, providing catches of 227,000 tonnes. Results indicate that as the value of *beta* increases, Argentinean catches increase while those in the Falklands decrease.

The best catches would be obtained in a situation with a single owner (where *beta* equals 0 or 1), both for Argentina and the Falklands. With respect to the average yearly fishing effort for the fleet of the Falklands, catches are always higher in the competitive scenario compared to the cooperative one, including under a single owner, most probably because of the short time horizon of the model (10 years).

For Argentina, the highest levels of effort are reached in the competitive scenario, in which the Argentinean fleet adopts a dominant position in the fishery. The best results in terms of the amount of standing biomass, however, are obtained in the cooperative scenario. Biomass is always lower in the competitive scenario when comparing the results of the simulation with current trends of the last fifteen years of the fishery. That is, the closest solution to current exploitation pattern of the fishery corresponds to a non-cooperative situation.

In summary, the results of this study are well-correlated with what has occurred in the fishery recently under non-cooperative management. Game theoretic models provide the necessary tools and conditions to estimate the net present value of the current regime and the potential benefits for Argentina and the Falkland Islands to exploit shortfin squid in a sustainable way. It should be noted that both players would obtain better economic benefits in the cooperative scenario because both would reduce their fishing effort and the stock would remain above the reference points recommended by biologists. Experience from around the world demonstrates that strong political commitments, at the highest level of government, are required to make joint management work. Therefore, if both countries decide to develop a more cooperative framework, they would need to have political reinforcements.

To potentially achieve primary and secondary cooperation levels within a long-term perspective, different outcomes should be explored. Firstly, both theory and empirics demonstrate that all who enter long-term relationships benefit, although in an unequal manner (Dasgupta, 2008). Secondly, free riding and compliance should be analysed in detail in order to have a full understanding of the results presented here (Barrett, 2001).

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Sea Around Us

On the use of catch reconstructions out there

by Frederic Le Manach

During my initial stay in Vancouver, between September 2010 and June 2011, I was tasked with reconstructing fisheries statistics for the country of Madagascar. This is the type of project many of us at the *Sea Around Us* deal with on a daily basis; however, a cascade of events made this one a bit different, at least from what I had expected.

*A Malagasy fisher processes an endangered shark (*Stegostoma fasciatum*). Fins will be sold to a Chinese collector, while the meat will be consumed locally. Photo by F. Le Manach.*

When I started, I knew very few things about Madagascar. I knew about those cute lemurs, and I knew it was a big island off the east coast of Africa. But I knew nothing about its fisheries. I quickly became immersed in the project, and made many contacts at various fisheries institutions and NGOs. Everybody seemed excited about the study, and they were more than happy to provide data, insightful comments, and assistance in putting everything together. As a result, the reconstruction produced something expected: un-reporting is indeed occurring!

We quickly published a paper that caused quite a stir in Madagascar. The United Nations heard about it and the elite of the world decided that something should be done. One day, I received an email from the World Bank, asking me whether I would like to get involved in a global project aimed at producing a framework for ecosystem wealth accounting (WAVES http://go.worldbank.org/1FM01NZUO0). I would be the "World Bank fisheries expert for Madagascar"; quite a big deal for a student who had just completed his MSc, and was waiting to start his PhD. I accepted the position, and thus started my 'career' as a consultant with a lot of excitement, and even more fear. The job was tricky: based on my knowledge of Madagascar's fisheries and further studies, I had to come up with recommendations in order to help produce a new national framework ensuring sustainable practices, effective accounting, and improved food security. I must admit that it seemed easier said than done, but I hope that my work will be useful.

Continued on page 2 - Madagascar

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Madagascar - Continued from page 1

It was mind-opening to see how political, economic and environmental goals interact with each other in an effort to move towards sustainability.

For me, the most enjoyable part of the job came when the World Bank sent me to meet with - and involve - key fisheries stakeholders, in an effort to ensure that the work would be accepted by a wide range of professionals. I stayed for ten days in the capital city, Antananarivo, where I met on occasion with a steering committee, and filled the rest of my schedule with meetings at the Ministry of Fisheries, and other institutional and NGO offices. It was mind-opening to see how political, economic and environmental goals interact with each other in an effort to move towards sustainability.

Upon leaving the city, it took me four days to get to the beach office of an NGO that I had worked with for the past year, Blue Ventures. Their goal is to involve local communities in natural resources management, and it was interesting to see how they make that happen. Progress is being made, which is good news for a country that seems paralyzed by political turmoil and a lack of funds. There are still barriers to address, however, for example, the fact that fishers consider endangered sharks as meat and fins, and not as endangered species.

This job – part of my PhD – was a great opportunity, and if I happened to receive similar invitation, I would say yes again. Our work will soon be available through a technical report and a book chapter. It will also be presented at the International Society of Environmental Economics meeting in Rio next June. Meanwhile, the reconstruction is available as part of a Fisheries Centre Research Report (19(4), 2011), and in a paper published in Marine Policy (36, 2012).

New *Sea Around Us* Project Newletter Editor!

The *Sea Around Us* Project aims to be global in the scope of its work. I am happy to report that it is also global in its readership. A quick glance at our distribution list yields names from Australia, Ascension Island, Belgium, China, Denmark, Ecuador, France, India, Indonesia, Japan, Mexico, New Zealand, Norway, South Africa, Tanzania, United Arab Emerates, United Kingdom, United States, and Zimbabwe, among others.

I am happy to let our readers from near and far know that we now have a new Newsletter Editor. Lisa Boonzaier (pictured) will be taking over from me, Megan Bailey, as Editor effective February 2012. Lisa was born and raised in Cape Town, South Africa, and brings with her ample experience from her work as the Editor of a digital magazine produced in association with WWF. She has a passion for science communication, and began as a Masters student with the Project in September 2011. I hope you will join me in offering Lisa a warm global welcome!

The ***Sea Around Us*** Project newsletter is published by the Fisheries Centre at the University of British Columbia. Six issues of this newsletter are published annually. Subscriptions are free of charge.

Our mailing address is: UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, Vancouver, British Columbia, Canada, V6T 1Z4. Our fax number is (604) 822-8934, and our email address is SeaNotes@fisheries.ubc.ca. All queries, subscription requests, and electronic address changes should be addressed to Lisa Boonzaier, *Sea Around Us* Newsletter Editor.

The *Sea Around Us* website may be found at www.seaaroundus.org and contains up-to-date information on the Project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environment Group that began in July 1999. The Pew Environment Group works around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

ISSN 1713-5214 Sea Around Us (ONLINE)

The *Sea Around Us* project wins UBC award

by Dirk Zeller, Ar'ash Tavakolie and Daniel Pauly

The University of British Columbia recently announced the *Sea Around Us* Project Portal (www.seaaroundus.org) as the winner of ***2012 UBC Library Innovative Dissemination of Research Award***. The *Sea Around Us* Project won out against 25 other UBC candidates.

As most readers of this newsletter know, the purpose of the Project, initiated in mid-1999, is to assess, document and communicate the impact of fisheries on the world's marine ecosystems, and propose strategic mitigation measure to ensure globally sustainable fisheries. The underlying, fundamental philosophy and approach of the *Sea Around Us* Project and its associated website (www.seaaroundus.org, see Figure 1 for homepage) is to combine the extractive, biological, legal and economic realms of fisheries resource use in a comprehensively interlinked and transparent manner, and present this in an ecosystem context. This is what makes our project globally unique. Our databases and website have now become the major source of spatially allocated fisheries information for the international scientific and environmental conservation communities, as well as many of the intergovernmental agencies. It is accessed by thousands of users every month, and is used for a wide range of products. The success and progress of our project and the associated public face has also been documented in our 10-year retrospective, available at www.seaaroundus.org/retrospective/10yr/web_SAUP10YearRetrospective.pdf.

Figure 1: Homepage of the Sea Around Us *project web portal (www.seaaroundus.org), allowing access to over 18,000 pages containing fisheries and fisheries-related data by various geographic entities (e.g., EEZs, LMEs, High Seas etc.), as well as access to general news components of project activities.*

The Project portal at www.seaaroundus.org was created to raise awareness on the effects of fishing on the world's marine ecosystems and to disseminate the scientific findings and the activities of the *Sea Around Us* Project . Our efforts are aimed at tackling the following six issues:

1. What are the total fisheries catches from marine ecosystems, including reported and unreported landings and discards at sea?
2. What are the biological impacts of these biomass withdrawals for the remaining life in the ecosystems?
3. What would be the likely biological and economic impacts of continuing current fishing trends?
4. What were the former states of these ecosystems before the expansion of large-scale commercial fisheries?
5. How do the present ecosystems rate on a scale from healthy to unhealthy?
6. What specific policy changes and management measures should be implemented to avoid continued worsening of the present situation and improve the health of ecosystems?

Unlike previous efforts meant to support fisheries science and fisheries conservation, which are often species-specific, we created the first and still only database which assigns catch and derived information, such as catch values, to biological and politically meaningful geographic areas, by linking and filtering the fisheries data with the biological distributions of all exploited species, Exclusive Economic Zone (EEZ) fishing access agreements, as well as High Seas spatial fishing effort. Thus, our data are unique in that they can present, for any area in the world, fisheries data in space (i.e., who takes what, where and when, and how much it is worth).

Continued on page 4 - Award

Our databases and website have now become the major source of spatially allocated fisheries information for the international scientific and environmental conservation communities.

Award - Continued from page 3

Through our emphasis on predefined spatial entities, we have bridged the gap between scientific research and publication of the results in a manner which is more user-friendly

The *Sea Around Us* Project web portal and its suite of supporting applications and databases, dynamically summarizes the raw data (over 1 billion rows of data) into over 18,000 analysis-based web pages (Figure 1 for homepage). These user friendly snapshots of data and time series present fisheries, economics, and governance data for the 240 EEZs of the 154 maritime countries of the world (e.g., Figure 2a), and by the 66 globally defined Large Marine Ecosystems (LMEs), as well as 18 High Seas areas. This platform recently went through a major technological overhaul, and now uses state-of-the art architecture to automatically test and maintain this flow of information, ensuring quality dissemination of large-scale scientific data to the public.

What we currently present on the over 18,000 pages on our website is only the first step in our data- and information-access and dissemination efforts. Work is in progress to provide enhanced and customizable user access and selectivity of spatial data presentation.

The underlying philosophy of the *Sea Around Us* Project to combine the diverse realms of fisheries resource use is what makes this project globally unique. Conceptually and physically, we have organized our knowledge base in a way which is more conducive to use for sustainable policy development, ecosystem-based fisheries management, and general scientific and educational exploration, sharing and learning by the general public as well as secondary and tertiary educational institutions.

Through our emphasis on predefined spatial entities, we have bridged the gap between scientific research and publication of the results in a manner which is more user-friendly for many globally leading NGOs such as WWF, Nature Conservancy, Oceana, MAVA and many of the leading inter-governmental agencies, such as UNEP, FAO, World Bank or the WTO. At the same time, we heavily emphasize maintaining a high profile and credibility in the scientific community by insisting on publishing extensively in the scientific peer-reviewed literature. Since 2000, *Sea Around Us* team members have published or co-authored over 160 articles in peer-reviewed journals, including several contributions in the high impact journals *Nature* and *Science*. Noteworthy is that, with the increasing maturity of our project, our scientific output has increased more than threefold in the second 5-year project period.

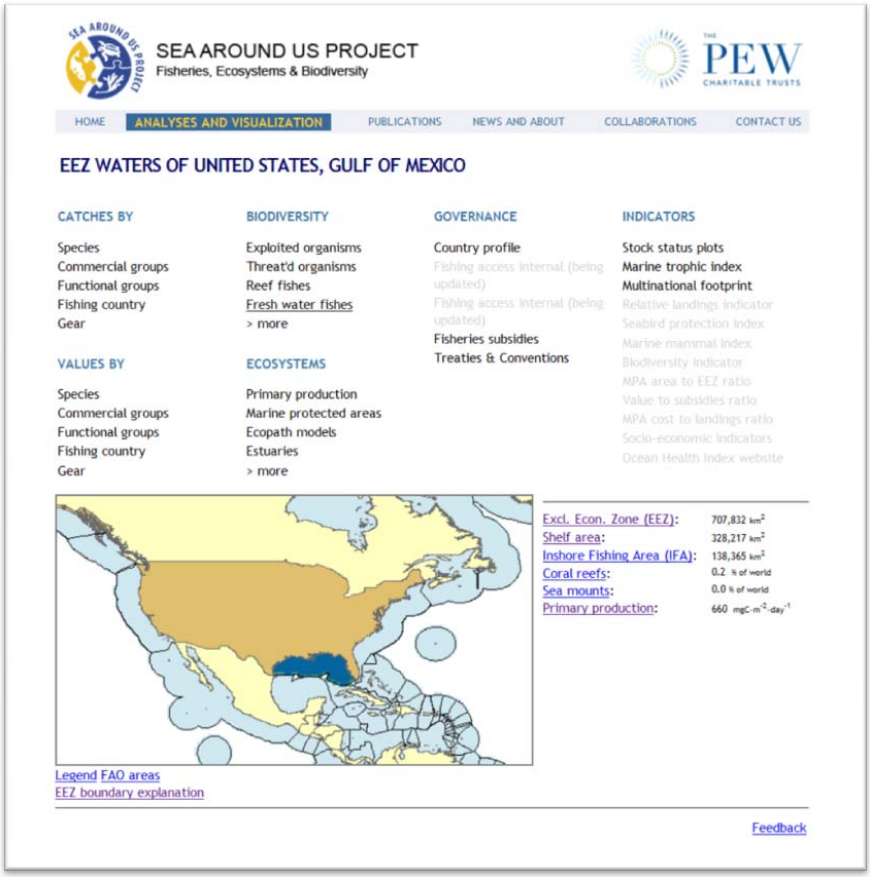

Figure 2: Examples of data menus for selected geographic entities, here the Exclusive Economic Zone of United States (Gulf of Mexico section).

Thus, it is with great pleasure that we congratulate the entire *Sea Around Us* team. This award is a clear sign of UBC's recognition of our success!

Publications Mail Agreement No:
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Sea Around Us

From the front lines of the 2012 AAAS meeting

by Claire Hornby, Sarah Harper, Robin Ramdeen, Dyhia Belhabib, Frédéric Le Manach and Aylin Ulman

The Sea Around Us *Project booth at the AAAS meeting, held in Vancouver earlier this year, was a big success and attracted attendees of all ages. (Photo: Yoshi Ota)*

The American Association for the Advancement of Science (AAAS) held its 178th Annual Meeting in Vancouver from February 16-20, 2012. The theme of this year's conference was "Flattening the world: building a global knowledge society". *Sea Around Us* Project members were among the 8,000 attendees, participating and presenting in numerous symposium sessions and volunteering at the Project's booth in the exhibition hall. Additional notable sessions were presented by other members of the Fisheries Centre.

Highlights from the conference included a symposium titled "Underreported yet overoptimistic: fisheries catch reconstructions and food security", organized by *Sea Around Us* Project members Dr Dirk Zeller and Sarah Harper. Dirk gave an informative presentation outlining the methods used in reconstructing countries' fisheries catches, while Frédéric Le Manach expanded on the importance of this task for tackling issues of human rights and ethics. Frédéric explained that fishing access agreements between the European Union and host countries, citing the example of Madagascar, are perpetuating socio-economic inequalities between most- and least-developed countries. The catch reconstruction work for Madagascar made the first step toward revealing some of these inequalities, which suggest that fishing access agreements need to be revised to be more ethical.

In the final part of the session, Nicola Smith, a graduate of the University of British Columbia now working in the Caribbean, described her reconstruction of the catches

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of the Bahamas. She found that recreational fisheries catches, which account for a large proportion of the country's total catches, are entirely missing from official statistics. As is the case for much of the Caribbean, the economy of the Bahamas is dominated by tourism – visitors want to fish and eat seafood as part of their holiday experience. This places intense demand on the local marine environment. The take-home message of this symposium was that proper accounting of all fisheries sectors is a key component of managing fisheries resources in both a sustainable and ethical manner. The examples that Dirk, Frédéric and Nicola presented are just a handful of the 150 or so countries that will be reconstructed by the end of this year. There will definitely be many more interesting stories to tell once the reconstruction of catches for all fishing countries is complete!

Proper accounting of all fisheries sectors is a key component of managing fisheries resources in both a sustainable and ethical manner

Another successful symposium was "Whole-ocean economics" organized by Dr Rashid Sumaila. He revealed the newly developed Eco2 Index, which measures the economic and environmental health of developed and developing countries. Dr William Cheung also presented a conservation risk index that combines economic figures and fisheries population growth rates to reveal the economics/conservation trade-offs of fishing. It was clear from the model that not all developed countries are doing well in terms of conservation. The audience showed a particular interest in the "Whole-ocean economics" session and there was plenty of participation by professors, researchers, non-governmental organization representatives and students. A roundtable session followed the presentations and questions relating to fisheries, marine protected areas and governance generated stimulating discussions. This session succeeded in highlighting the commitment of the Fisheries Centre members to global research and collaboration.

Another symposium organized by the *Sea Around Us* Project was titled "Leveling the global playing field: global inferences from reliable global samples". Dr Kristin Kleisner, a postdoctoral fellow with the *Sea Around Us* Project and organizer of the session, explained how to design sampling methods and why it is important to infer scientifically sound global trends. Dr Thomas Lovejoy, from the H. John Heinz III Center for Science, Economics, and the Environment in Washington DC, then discussed the use of technology to monitor biodiversity trends and species extinction. Closing the symposium, Dr Molly Jahn, from the University of Wisconsin, stressed the need to build a global information system to meet our future needs.

The *Sea Around Us* Project booth was also a major success. It allowed Project members to share their work with a diverse audience. For Claire Hornby, the AAAS was her first major science conference, and she was excited and nervous to have a chance to interact with scientists of various disciplines from all over the world. It was amazing to see the wide range of people that approached the booth, eager to hear about the Project's work. Surprisingly, it seemed everyone – no matter if they were a budding scientist of five years old or an established professor – wanted to learn something about fisheries. The majority of attendees that approached the booth knew about the current state of the world's oceans and the decline of many commercial fisheries.

Family day at the AAAS brought many up-and-coming scientists to the booth. Robin Ramdeen,

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Our mailing address is UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, The University of British Columbia, Vancouver, BC, Canada, V6T 1Z4. Our fax number is +1 (604) 822-8934. Our e-mail address is SeaNotes@fisheries.ubc.ca. All queries, subscription requests and address changes should be sent to Lisa Boonzaier, the *Sea Around Us* Project Newsletter editor.

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Robin Ramdeen explains the catch reconstruction work of the Sea Around Us *Project to an interested attendee at the AAAS Annual Meeting. (Photo: Claire Hornby)*

who volunteered that day, described how wonderful it was to see so many primary school children intrigued by the *Sea Around Us* Project's display of ocean primary productivity. Their level of understanding of the importance of plankton for producing the energy upon which marine food webs are based was astounding. These inquisitive junior scientists answered their own questions about where energy comes from, both on land and at sea, and about how phytoplankton and zooplankton are essential to the diet of fish via the food web. Importantly, they were able to connect how changes in primary production could affect one of the ocean's top predators: humans.

These were just a some of the highlights of *Sea Around Us* Project's and the Fisheries Center's contributions to the 2012 AAAS meeting. The conference was yet another example of how committed the *Sea Around Us* Project is not only to doing good research, but also to communicating its work to the world.

Everyone – no matter if they were a budding scientist of five years old or an established professor – wanted to learn something about fisheries

Welcome and farewell!

We're pleased to welcome new *Sea Around Us* Project members to the team. **Danielle Knip** and **Boris Jovanovic** have joined as postdoctoral fellows. Danielle comes from Australia where she recently completed her PhD tracking sharks. Boris completed his PhD in Fisheries Biology and Toxicology at Iowa State University.

A number of new research assistants have started working at the *Sea Around Us* Project. **Anna Garland** is currently on leave from her position as a Fisheries Resource Officer in Queensland, Australia, where she coordinates ecological sustainability assessments. A graduate of UBC's Bachelor in Conservation Biology program, **Claire Hornby** has worked with marine resources in places as diverse as Bamfield Marine Science Centre, Alert Bay and Chile. **Carmen Mok** studied Physical Geography at Simon Fraser University. **Ava Mai** graduated from Iowa Wesleyan College with a major in Accounting, and previously worked as an accounting and admin clerk.

We also have a student, **Isaac Trindade Santos**, visiting us for six months from Brazil, where he studies with Kátia Meirelles Felizola Freire. He has a scholarship from the Science without Borders Program.

On a sadder note, the *Sea Around Us* Project Newsletter is also saying farewell to **Megan Bailey** who has been the dedicated and enthusiastic editor of this newsletter for almost four years. We wish her all the best in her future endeavours!

Honoring a great mind

by Claire Nouvian

During February of this year, Dr Daniel Pauly was acknowledged for his outstanding professional achievements by the French Ecological Society (Société Française d'Ecologie), which awarded him their 2011 Grand Prize. Following is a summary of the address that Claire Nouvian, president and founder of the nonprofit conservation organization BLOOM, presented at the Natural History Museum in Paris when Daniel was officially awarded the prize. Claire and Daniel have collaborated on a number of conservation projects in the past.

Thank you to the French Ecological Society for rewarding this native of France whose talent has been expressed beyond our country's borders

Daniel Pauly (center) with the president of the French Society of Ecology (left) and Claire Nouvian, president of the nonprofit organization Bloom. (Photo: © C. Thébaud 2012)

Daniel Pauly is well-known for his high-impact scientific work, which has led to an overhaul of thoughts and systems. A French-born scientist, he is gifted with vision. He has, like no other, the ability to detect and demonstrate trends at work in the world. Like Darwin following his intuitions about the great dynamics structuring nature, Daniel has deployed his workforce around a consistent axis: the identification of global trends from a cloud of seemingly insignificant data points.

Daniel was the first to describe the global fisheries crisis as catastrophic. He convincingly demonstrated that the Tragedy of the Commons, as described by Hardin in 1968, was taking place in the oceans. We must be grateful to him for taking on the role of the Prophet of Doom, because, to paraphrase philosopher Jean-Pierre Dupuy, knowing does not necessarily result in action; our ability to blind ourselves in front of sheer evidence is the main obstacle that the Prophet of Doom must overcome, or at least circumvent.

Probably the main difficulty Daniel has had to face is the incredulity of his peers regarding the advent of the disaster. The role of the Prophet of Doom is to avoid the worst – provided it is still possible. It is a thankless task because if the Prophet fulfills his mission, the worst is avoided, but when the worst is avoided, the Prophet's detractors will relentlessly denounce exaggerated and unjustified claims. This is despite the fact that it was the Prophet's "enlightened catastrophism" that doubtless provided the jolt without which no system, human or other, could rethink its behavior and adjust accordingly.

Solitude threatens any messenger of doom, because the revelation of a frightening situation is inaudible to most. Daniel has managed to avoid this threat thanks to the robustness of his work and his charismatic personality, which attracts people to him like moths to a flame.

Anyone who has worked with Daniel, read his literature or heard him speak can only praise the wit, joviality and timely sense of humor of this legendary "iconoclast", as the New York Times called him. Only a great mind can dare to use striking mental images to make a point. While today such shortcuts are a pretty sure indicator of embryonic thought, with Daniel they are raised to the rank of art – a sign of multi-disciplinary erudition belonging to times past. They allow him to sum up complex processes in a catchy allegory that is deeply anchored in reality and therefore universal in effect.

It is easy to understand why this great mind has received numerous prestigious awards, and why Daniel has become a Fellow of the Royal Society of Canada, but it is difficult to understand why his work has not been recognized by any French award committee up to now. Thank you to the French Ecological Society for rewarding this native of France whose talent has expressed itself beyond our country's borders.

Ultimately, it is Daniel's tenacious spirit, as well as his radical resistance to injustice, consensual thought and any form of mediocrity that I want to congratulate. I believe that beyond the objective elements which justify praising Daniel, it is also the moral value of his defiance that makes him a figure capable of surviving the work of time.

ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

Down at the summit

by Daniel Pauly

The British magazine *The Economist* hosted a huge "World Ocean Summit" in Singapore earlier this year, designed to find solutions to the ills that beset our oceans. And more precisely, to identify remedies that entrepreneurs could find ways to invest and profit from. It sounded like a reasonable goal, because we tend to live in democratic countries with market economies shaped by private enterprise, so I accepted their invitation.

The head of the World Bank attended, as well as ministers from various countries, CEOs of big fishing companies, heads of international environmental NGOs, hedge fund managers, scientists… It should have worked, but it didn't really, despite the beautiful resort where the event took place and the flawless organization. I think it was because – mostly subtly, sometimes not so subtly – our very determined hosts, from the Editor-in-Chief to the lowliest of *The Economist* staffers, were pushing for "market solutions," insisting that the remedies we identified had to make money for hedge fund managers and other investors. It sounded all right at first – but how would this work if a health care system, for example, was designed this way? Wouldn't it leave too many people untreated, because no money can be made off them? Also, are fisheries not a gigantic example of a

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"market failure," as economists call the mess we are in? (Although it is a small mess compared with that of our banking system.)

But there was no space at the summit to discuss any of these things, and the complementary roles of governments and civil society. Everything that moves had to be turned into a commodity, and even some things that don't move, like marine protected areas, which were identified as one of the places for profitable investments. Thus my disappointment and perhaps that of Fisheries Centre Director Dr Rashid Sumaila too, who also attended.

Everything that moves had to be turned into a commodity, and even some things that don't move, like marine protected areas

I did have the opportunity to address one of the summit's working groups where I mentioned that the invitation of *The Economist*, besides being a compliment, also was a challenge, because I am often accused of spreading gloom and doom, in spite of being neither gloomy nor doomy. The point is that a doctor – and I am one, if not of medicine – must correctly diagnose the disease at hand before being able to propose solutions leading back to health.

The disease of industrial fisheries, I suggested, is "expansionitis" and it is caused largely by demand for fish in rich countries. Indeed, industrial fisheries have gone so far that we're expanding into the world's oceans at a rate of 1 million km^2 and southward by 0.8° of latitude per year. Expansionitis is feeding essentially insatiable markets in Europe, North America and Northeast Asia, from finite fishing grounds in Africa, Latin America and Tropical Asia. Japan and the US import 60% to 70% of their food, the EU 70% to 80%. Industrial fishing is not about feeding the world's poor.

Then, because we were supposed to emphasize remedies, I listed those remedies for expansionitis about which there is widespread agreement:

- Reduce and eventually abolish subsidies to fisheries – they are what feeds expansionitis;
- Rebuild fish stocks in developed countries, so that they need not grab so much of the developing countries' fish, and export the lessons learned to the developing world;
- Allow developing countries to catch and process their own fish, and export a part of the value-added products to the developed world;
- Create arrangements providing exclusive access (to coastal resources in both developing and developed countries) to small-scale fisheries, which catch far more than industrial fisheries and could catch even more if not exposed to competition from industrial vessels;
- Reduce and eventually ban discards (Norway does it) and consume small fish directly, rather than turning them into fishmeal. There is a huge reserve there.

But let's face it: these remedies (all "market solutions," incidentally) if implemented, would be the result of mostly public policy, which then would benefit the fishing industry in the long-term. In the short term, however, these remedies will be fought against tooth and nail by our friends from the private sector, that is those *The Economist* wants us not only to work with (which is a good thing), but to put in the driver's seat. These are the reasons why I felt down at the Ocean Summit.

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Our mailing address is UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, The University of British Columbia, Vancouver, BC, Canada, V6T 1Z4. Our fax number is +1 (604) 822-8934. Our e-mail address is SeaNotes@fisheries.ubc.ca. All queries, subscription requests and address changes should be sent to Lisa Boonzaier, the *Sea Around Us* Project Newsletter editor.

The *Sea Around Us* Project website can be accessed at www.seaaroundus.org and contains up-to-date information on the Project.

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The Pacific Rim Whale Festival

By Aylin Ulman and Claire Hornby

Aylin Ulman (right) stands with her mother (centre) and Wendy Hainstock, coordinator of the Pacific Rim Whale Festival. (Photo: Claire Hornby)

Tofino's Pacific Rim Whale Festival celebrates whales and their intimate connection with the ocean. This year, the festival's 26th, featured presentations at locations scattered around the Pacific Rim National Park both in Tofino and Ucluelet. A variety of other events also took place, such as educational beach walks, whale watching, art shows, barbeques and live local music.

I, Aylin Ulman, gave a presentation I had wanted to put together for some time called "The top 40 most interesting marine creatures." From my experiences teaching scuba diving, working as a naturalist for a whale-watching company and being part of the education team for the Vancouver Aquarium, I have learned countless fascinating animal facts. I love educating people about some of the world's most amazing creatures, and hopefully, encouraging them to help take care of the marine realm by strengthening their sense of wonder about it.

Some of my favourite animals from the talk include the peacock mantis shrimp, which has the most highly developed eyes on the planet and also one of the fastest strikes in the world – it's said to rival a .22-calibre speeding bullet! I also included the pelagic, neutrally buoyant and elusive argonaut with its paper-thin shell; the toxic striped pyjama squid that appears to be wearing a Yankees baseball uniform; and the ocean's supreme ambush predator, the hairy frogfish. A few of my other favourites include the sawfish that uses its chainsaw-like snout to cut through prey; the alien-looking hooded nudibranch that somehow smells of fresh watermelon after it's been handled; sea otters and their power to transform their ecological niche; and the giant Pacific octopus with its amazing skin, eyes and surprising intelligence.

To finish off, I chose the killer whale, because it is the ultimate apex predator in our ocean. I went on to describe the three different killer whale ecotypes

Some of my favourite animals from the talk include ... the alien-looking hooded nudibranch that somehow smells of fresh watermelon after it's been handled

It costs nothing to be polite

Being consistently friendly is the best policy, as this design from Bertrand Gaumer of the website Totem 2 Mer shows.

Totem 2 Mer is an online space that divers use to express their opinions and inform the public about the exploitation of marine resources along the French coast. Bertrand contacted Dr Daniel Pauly to ask for advice, but Daniel – in a friendly reply – explained that he was unable to assist with the particular request. Despite his potentially disappointing response, Daniel was kindly presented with this personalized Totem 2 Mer design as a sign of gratitude.

How fitting!

we have living off of our coast, and how they have each adapted to consuming different types of prey.

Three surfers head out into Tofino's breakers. (Photo: Claire Hornby)

On the last day of the festival, there was a "Sea Change" panel discussion, which involved four panelists who were asked to discuss how the changing oceans have affected human culture in their communities, and altered their careers in the process. The panelists were Wendy Szaniszlo, a marine mammal biologist, Leah Thorpe of the Cetus Research and Conservation Society, Dave Hurwitz of the Ucluelet Aquarium and the *Sea Around Us* Project's very own Daniel Pauly.

Once an important fishing village, Tofino transformed into a tourist destination as most commercial fish stocks in the area declined

Each panelist had five minutes to freely discuss their work and how it has changed over time as a result of climate change, overfishing, and the improved knowledge of the general public and their transformed perspective of the ocean as compared to 30 years ago. Wendy Szaniszlo discussed how her work as a marine mammal biologist changed as the public came to learn about marine animals. Although people used to know very little about local marine mammals – removing them from the wild to put into aquariums for entertainment – they have come to realise that whales are not "killers" and that it's important to protect these intelligent species. Both Wendy and Leah Thorpe discussed the changes they have seen in BC's growing eco-tourism sector and how this has shaped the work they do.

Dave Hurwitz told an interesting story of his life as a commercial fisherman and the changes he has seen in the community of Tofino. Once an important fishing village, Tofino transformed into a tourist destination as most commercial fish stocks in the area declined and many fishermen, Dave's friends, lost their livelihoods. His respect and passion for the ocean has now propelled him into a position of activism in his community – eating locally, living sustainably off the ocean, and hoping for a future without fish farms and oil tankers in his "backyard."

Finally Daniel spoke of changing oceans at the global level, particularly with respect to commercial fleets expanding from utilizing near-shore waters to harvesting on the high seas. He discussed how our actions as consumers are intimately linked to the future of important wild fish stocks, such as salmon and herring.

Once each panel member had spoken, the public was allowed to present questions and comments. This turned into an engaging and inspiring opportunity for people to discuss their fears of future aquaculture projects, concerns over sustainable seafood choices, changes to policy and management from the provincial to the federal level, proposed oil pipelines, and the ways that we can start encouraging more stewardship and education in our own communities.

It was a treasure to see how everyone in Tofino is so connected to nature, and seeks ways to prevent negative impacts on the environment. One great example of this is the new Ucluelet aquarium, which is set to open this spring. It will only "borrow" its marine animals from the sea for short periods of time before they can return to the freedom of the ocean. What a fantastic concept! If only we all were as connected to the natural world as the Tofino-ites.

The Pacific Rim Whale Festival has historically been dominated by the topic of whales and other marine mammals, but this year there was a prominent shift to include fisheries. Daniel's profound knowledge and expertise in this area added a necessary element to the 2012 festival. It seems as if people are beginning to understand that whales rely on fish, we rely on fish, and that if we continue to freely purge the ocean of its resources, nothing will be left for us, or for the whales.

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Sea Around Us

Of leatherbacks and lion's manes

by Lucas Brotz

Lucas Brotz (right) helps DFO crew aboard the CCGS W.E. Ricker *sort the catch of the day: juvenile salmon and lion's mane jellyfish.*

I study jellyfish, so you can imagine my surprise when I received an e-mail last year from a recovery planner for the Canadian Species at Risk Act (SARA). I am certainly not aware of any jellyfish in the world that is classified as threatened or endangered, let alone in Canadian waters where we know very little about our gelatinous fauna! On the contrary to being at risk, many jellyfish are in fact increasing in coastal ecosystems around the world. However, the subject of the recovery plan in question was not jellyfish at all, but rather the leatherback sea turtle (*Dermochelys coriacea*). What did I know about reptiles? Well, not much, but I was aware of one fact about leatherbacks: they are known to eat jellyfish. The reasons behind the e-mail were starting to materialize, and I was intrigued.

As their name suggests, leatherbacks do not have a hard shell like the other six species of sea turtles alive today. Rather, their shell consists of smooth, leathery skin with seven ridges running its length. Such reptiles first appeared in the fossil record about 100 million years ago when their family branched off from other hard-shelled turtles, underlining the fact that these are truly ancient mariners. Leatherbacks are massive creatures. They frequently grow to hundreds of kilograms and can potentially surpass a tonne. From tip to

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tail the largest exceed three meters, with their flippers spanning more than four meters.

The leatherback's list of superlatives is nearly as large as the animals themselves! Among reptiles they are the fastest growing, fastest moving, and except for a few crocodiles, the heaviest. They are also among the most widely distributed animals in the world, mainly due to migrations that put all but a few marine mammals and bird species to shame. Surprisingly, they are also warm-blooded, and are therefore able to survive in environments far beyond the reach of their cold-blooded relatives. Believe it or not, leatherbacks have been sighted north of the Arctic Circle! To top this off, leatherbacks have been recorded diving deeper than a kilometer, plunging further into the abyss than almost all other air-breathers.

The leatherback's list of superlatives is nearly as large as the animals themselves!

But perhaps the most astounding fact about this fascinating species (although I will admit, I am biased) is that leatherbacks can grow so large, travel so far and dive so deep on a diet consisting almost exclusively of jellyfish!

Why is this surprising? Jellyfish are roughly 95% water, therefore obtaining sufficient nutrition from them requires some serious feasting. A leatherback can consume hundreds of kilograms of jellyfish in a single day, which not only appears to supply all of their energetic demands, but also allows them to fatten up for return migrations to breeding areas. Part of the success of such a strategy relies on the fact that jellyfish often occur in dense aggregations known as blooms. In addition, jellyfish have virtually no escape response, especially from an animal as fast and maneuverable as a sea turtle. Therefore, locating dense blooms of jellies is likely key for leatherback feeding success and appears to be the sole reason why they embark on vast migrations from breeding areas in the tropics to more temperate areas, including Canadian waters.

So now you can understand why someone who studies jellyfish would receive an e-mail about endangered sea turtles. And endangered they are. While there are a number of reasons for optimism regarding leatherbacks in the Atlantic, the Pacific populations appear to be on an alarming trajectory. Their numbers are uncertain, but it is estimated that there are fewer than 3,000 nesting females left – a precipitous crash of more than 97% in only a few decades. Numbers continue to decline, and Pacific leatherbacks appear dangerously close to extinction.

As one might imagine, sightings of leatherbacks in Canadian Pacific waters are relatively rare, averaging only about one per year. While that is not a lot, members of the population *do* visit here. And in order to survive unthinkable migrations from remote breeding sites in Indonesia and the Solomon Islands, those turtles visiting Canada's west coast are likely the largest and heartiest of the population. Therefore helping or saving just a few of these individuals could be crucial for a subpopulation's survival. The areas used by leatherbacks to feed on jellyfish blooms in British Columbia represent critical habitat,

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Dr Carl Safina, author of Voyage of the Turtle, *poses with a giant, nesting leatherback (TOP). Lion's mane jellyfish (*Cyanea capillata*; Photo: Conor McCracken)*

but unfortunately we know relatively little about the jellyfish living in Canadian waters. Migrating leatherbacks are likely feasting on an abundance of large "true jellyfish" (class Scyphozoa), including lion's mane jellies (*Cyanea capillata*), sea nettles (*Chrysaora fuscescens*) and moon jellies (*Aurelia labiata*). In order to better understand the abundance and distribution of these species, I began working with Department of Fisheries and Oceans (DFO) scientists and technicians.

Interestingly, most of the scientists I worked with are salmon specialists. This is mainly because salmon scientists possess one thing that pretty much all marine biologists and oceanographers covet: ship time. DFO crews conduct integrated ecosystem surveys several times each year in the coastal waters of British Columbia and have implemented consistent sampling methods since 1998. These sustained, year-round surveys along repeat transects are a rarity in an age of funding cuts, and the resultant datasets provide a wealth of valuable information. In addition to collecting oceanographic data, these surveys involve tows using large trawl nets to collect and study juvenile salmon populations. The unwanted by-catch in these trawls can include large jellyfish. Properly identifying and monitoring these jellyfish catches could provide new and valuable insights into these organisms in our coastal waters. This information may also be indispensible, I believe, for understanding the relationship between critically endangered leatherbacks and their gelatinous prey.

Properly identifying and monitoring these jellyfish catches could provide new and valuable insights into these organisms in our coastal waters

All of the scientists I worked with recognized the importance of collecting such information, and together we developed a procedure that we hope will create a permanent record of all future jellyfish catch. While I was eager to convince those I collaborated with to gather as much data as possible, I had to keep in mind that jellyfish were not the focus of the surveys and any procedure too onerous was unlikely to be adopted. Therefore, the protocol was designed to minimize the effort required for jellyfish processing, while at the same time maximizing the amount of useful information collected. In addition, a step-wise approach to jellyfish monitoring was recommended, whereby scientists and technicians can collect a minimum amount of data on jellyfish if they are analysing other catch, or obtain more

detailed information if processing time allows. Thanks to this collaboration between DFO, SARA recovery planners and the Fisheries Centre, we should be able to rapidly increase our understanding of jellyfish in coastal waters in the coming years, as well as identify those regions that might be most important for foraging leatherbacks.

While eating jellyfish appears to have been a successful strategy for leatherbacks for millions of years, there are disadvantages to having a gelatinous diet in the contemporary world. Plastic debris, which now litters the oceans, often looks very much like jellyfish. Studies have found more than a third of examined leatherbacks have plastic in their intestines and the proportion for dead leatherbacks is double that. But perhaps the largest threat to leatherbacks is as a result of their trans-oceanic migrations between breeding and feeding areas. These epic journeys bring leatherbacks into repeated contact with the ocean's most fearsome predator – humans. Leatherbacks are frequently caught as unintended by-catch or become entangled in the miles of fishing gear that crisscross the oceans. Anything that prevents turtles, which are air-breathers, from reaching the surface will cause death in less than an hour. Compound these dangers with poaching for turtle meat and eggs, global warming and an overall lack of awareness about the problems, and you start to read the Pacific leatherback's epitaph.

I find it especially tragic to see such a charismatic animal that has survived for so long, pushed to the brink of extinction in only a few decades

An individual leatherback endures what seems like a life of hardship – swimming thousands of miles across oceans of hazards, only to have cold, stinging jellyfish for breakfast, lunch and dinner. As a species, leatherbacks have persevered through unimaginable times, including ice ages and major extinctions. In fact, they are often referred to as Earth's last dinosaur. But it seems that leatherbacks may have finally met their match during this era dominated by the human species. I find it especially tragic to see such a charismatic animal that has survived for so long pushed to the brink of extinction in only a few decades. I have yet to be lucky enough to look into the eyes of a wild Pacific leatherback, something I long to do. I only hope that such an experience will remain a possibility.

wild whales
b.c. cetacean sightings network

You can help!

If you see a jellyfish, on the beach or in the ocean, report it to the citizen-science database at www.jellywatch.org. And if you spot a sea turtle, you can help by reporting your sightings at www.wildwhales.org. Scientists depend on information from people like you in order to understand species distributions and develop recovery plans for species at risk.

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Igniting the public's interest in fisheries science

by Leah Biery

Dr Daniel Pauly joined the ranks of world-class storytellers including Jane Goodall, Walter Cronkite and David Attenborough during May 2012, when he was presented with the Nierenberg Prize for Science in the Public Interest at the Scripps Institution of Oceanography in San Diego, California. The prize, which honors the memory of underwater researcher, physicist and former Scripps Director William A. Nierenberg, is awarded annually to a person who has made outstanding contributions to awakening the public's interest in science throughout their career.

Guests at the event enjoyed the Southern California ocean breeze, hors d'oeuvres and live music at a rooftop reception, which was followed by the award presentation and an engaging public lecture given by Dr Pauly himself.

Nico Nierenberg, son of the late William Nierenberg, was joined by Scripps Institution of Oceanography Director Dr Tony Haymet in presenting Dr Pauly with the award. They highlighted some of Dr Pauly's major contributions to fisheries science, many of which have improved the way in which global fisheries are understood and managed today. As Principal Investigator of the *Sea Around Us* Project, Dr Pauly has revolutionized the online sharing of fisheries data by making information easily accessible to scientists and the general public through the *Sea Around Us* Project database and FishBase, an online encyclopedia of fish species that he co-founded. His efforts to document and publicize global fisheries trends in recent decades have greatly increased public awareness of declining fisheries and the importance of sustainable seafood initiatives. He was also recognized for acting as a leader in the international movement to protect marine ecosystems by expanding marine protected areas around the globe. Dr Pauly continues to share his message with the public through numerous publications in both academic and mainstream outlets, and through global travels to meet and converse with leaders and citizens around the world.

Dr Daniel Pauly helps his audience imagine the future of seafood if overfishing continues at its current pace. (Photo: Leah Biery)

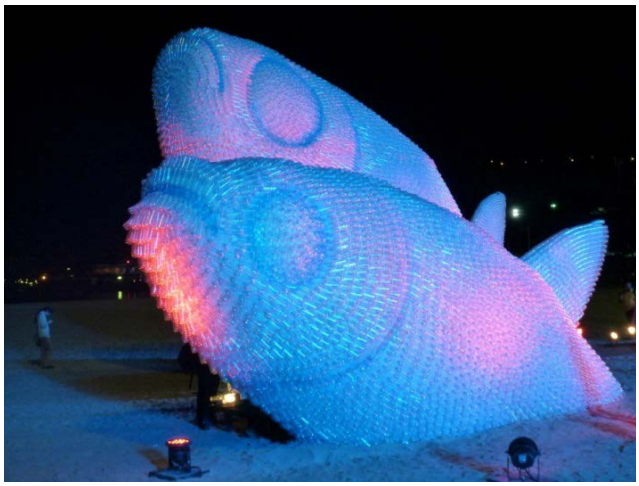
Dr Pauly's lecture, titled "Jellyfish burgers, or how we changed the oceans and they changed us," served as a perfect example of his ability to pique the public's interest in ocean conservation. His talk addressed a variety of topics including shifting baselines, overfishing and declining catches, also outlining their implications for the future. Despite the seriousness of these issues, he maintained a sense of humor and received many laughs; using Dr Jennifer Jacquet's clever image of a jellyfish burger to help the audience imagine a future where it is the only seafood on the menu. Based on their reactions, it is safe to say that most listeners would be reluctant to trade their halibut sandwich for a "JBLT"! The lecture was followed by an enthusiastic round of applause and an interesting dialogue with the audience about current fisheries problems and how we might work together to solve them.

Congratulations, Dr Pauly!

Dr Pauly has revolutionized the online sharing of fisheries data by making information easily accessible to scientists and the general public

Rio: my experience

by Frédéric Le Manach



Fish sculptures made of plastic bottles, visible during the Rio+20 events at Praia de Botafogo. (Photo: Frédéric Le Manach)

During June I had the opportunity to go to Rio de Janeiro, Brazil, to participate in a panel on green accounting. It was organized as part of the 12th Biennial Conference of the International Society for Ecological Economics in support of the United Nations Conference on Sustainable Development, Rio+20. This offer was extended to me based on my previous work on Malagasy fisheries for the World Bank.

Did you know that 50% of Bhutan is actually within protected areas?

Although my presentation was on a topic that many fisheries scientists deal with on a daily basis and find extremely delightful – fisheries accounting – it was quite disappointing. Indeed, only two panelists out of five (including me) were present. And because a plenary session involving Dr William Rees, who is also from UBC and part of the Fisheries Centre's associated faculty, and His Excellency Lyonchoen Jigmi Yoezer Thinley, Prime Minister of the Kingdom of Bhutan, was organized at the same time, attendance was low and the session short.

Thereafter, I quickly rejoined my colleagues to attend the second half of the plenary session and enjoyed learning about Bhutan. As Bhutan is a landlocked and relatively small state (smaller than the Netherlands), it is safe to assume that most fisheries scientists do not know much about it. For example, did you know that Bhutan is the first country to have dropped the very controversial yet ubiquitous gross domestic product (GDP) as a measure of living standard? In its place Bhutan has adopted the Gross National Happiness (GNH) index, which it uses for policy making. If it fails the GNH test, so be it – next proposal. Perhaps as a result of this revolutionary stance, the country now benefits from free health care and education. Also, did you know that 50% of Bhutan is actually within protected areas? That its forests cover 80% of its surface? Or that the country is willing to become the first 100% organic country in the world? I found this talk enlightening and the highlight of the conference. (You can find out more in the document available here.)

Bhutan was recently chosen to be part of the World Bank Group-facilitated 50:50 Campaign, in which 50 countries and 50 corporations are to fully implement natural capital accounting. Perhaps this will turn out to be a good way to promote Bhutan's work and convince other countries to adopt the GNH index.

During my stay in Rio, I managed to find some time to visit Rio+20 – at least some of the few events open to the public. Unfortunately, the conference centers were very far from the city center and it took about two hours to get there by bus. I was particularly looking forward to a session by a friend and colleague from Madagascar, who was presenting on family planning as a conservation tool, but the session was unfortunately cancelled due to the absence of any public but me!

Because I did not have any official accreditation, I did not see much more of Rio+20 than you did, and I followed most of it via internet. Although I did have the added excitement of being on location and seeing all the delegates running around like crazy in their fine suits! Overall, similarly to the Biennial Conference of the International Society for Ecological Economics, I was quite disappointed by Rio+20.

Ocean-wise, although the States "committed to think about dealing with" subsidies and the high seas, it is likely that nothing will be achieved before 2015, at which time they have decided to meet again to take action – hopefully. On a positive note, this is better than nothing, and at least these countries have not completely disregarded the oceans. Let's hope this is a positive omen for the future.

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Sea Around Us

What can MPAs do for sharks?

by Danielle Knip

I had the opportunity to attend the annual American Elasmobranch Society (AES) conference this year, which was held here at the University of British Columbia from August 8-14. The conference was very well attended and attracted researchers from all over the world. The sessions covered topics in elasmobranch anatomy, development and physiology, genetics, ecology, conservation, and behaviour.

Danielle Knip releasing a juvenile pigeye shark (approximately 2 years old) after surgery to insert a tracking device. (Photo: Fishing and Fisheries Research Centre, James Cook University)

Some of the highlights for me included talks from Chris Lowe (California State University, Long Beach), who is using autonomous underwater vehicles equipped with hydrophones and receivers to define fine-scale movement patterns of sharks while simultaneously characterizing the sea floor and water column – referred to as "smart shark-tracking robots"; Steve Campana (Department of Fisheries and Oceans, Canada), who is using satellite tags to examine the long distance migrations of Greenland sharks (*Somniosus microcephalus*) both in the Canadian Arctic and off the east coast of Canada; and John Carlson (NOAA/ National Marine Fisheries Service) and Lucy Harrison (IUCN Shark Specialist Group), who are conducting research on the seven Critically Endangered sawfish species.

Another feature of the conference was the Deepwater Chondrichthyans Symposium, where I was encouraged to see the amount of research being done on these deepwater shark species that we know so little about. Cassandra Rigby (James Cook University) gave a new and insightful review on the life history differences between species using shelf, oceanic and deepwater habitats. In addition, Jim Gelsleichter (University of North Florida) and Dean Grubbs (Florida State University) presented preliminary results on the effects of the Deepwater Horizon oil spill on deepwater shark species in the Gulf of Mexico. They are comparing shark assemblages throughout the

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Gulf including community structure, species richness, and relative abundances, as well as examining the effects of toxins from oil exposure.

I gave a talk as part of the Elasmobranch Conservation Session on the effectiveness of marine protected areas (MPAs) for sheltering shark species using coastal habitats. The question of how MPAs can be used to protect sharks and potentially contribute to fisheries management was first addressed more than a decade ago. In 1999, Ramón Bonfil reviewed the protection status of sharks and the applicability of MPAs for their species and concluded that MPAs could be effective for some species and key life stages, though they are likely not a sole solution but rather an aid for management [1]. Since then, MPA research on sharks has been limited. Most MPA-related shark research has focused on coral reef-associated species living on insular reef systems (for examples see [2] and [3]), and MPA research on sharks using coastal habitats has been pretty much non-existent.

I used presence and movement data to quantify the degree of shelter MPAs offer coastal sharks

The results I presented were from my PhD, which I completed last year. For my research, I used an array of 58 acoustic receivers to track two coastal shark species, the pigeye shark (*Carcharhinus amboinensis*) and spottail shark (*Carcharhinus sorrah*), within two MPAs in Cleveland Bay, which is a part of the Great Barrier Reef Marine Park in north Queensland, Australia. Using passive acoustic telemetry, I identified factors influencing the distribution and movement patterns of pigeye and spottail sharks in this coastal region, and evaluated the effectiveness of MPAs for sheltering their populations from exploitation, such as fishing pressure.

I used pigeye and spottail sharks as my study species because of the differences in their life histories and ecologies. For example, pigeye sharks are slow-growing, large-bodied fish that use coastal habitats mostly as juveniles, whereas spottail sharks are fast-growing, medium-bodied fish that use coastal habitats during all life stages. Both species are susceptible to fishing pressure and are taken in the commercial net fishery that operates along the east coast of Australia. However, the spottail shark is much more heavily targeted than the pigeye shark, as it is a commercially valuable species and makes up the second largest component of shark catch in the net fishery [4].

My over-arching research question for this study was, "Are MPAs effective at protecting sharks in coastal regions?" I used presence and movement data to quantify the degree of shelter MPAs offer coastal sharks. Specifically, I calculated how much time sharks spent inside MPAs, how many times and where they crossed the boundaries, and the amount of MPA space they used [5].

To summarize, I tracked 37 juvenile pigeye sharks and 20 adult spottail sharks over the course of two years (2009-2011). These species were at different life stages due to the opportunistic nature of sampling; pigeye sharks were most prevalent as juveniles and spottail sharks as adults in this coastal region.

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The *Sea Around Us* Project website can be accessed at www.seaaroundus.org and contains up-to-date information on the Project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group that began in July 1999. The Pew Environment Group works around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

Measuring and tagging a spottail shark. (Photo: Fishing and Fisheries Research Centre, James Cook University)

However, all sharks were of the same size range. Both juvenile pigeye and adult spottail sharks were in Cleveland Bay for long periods (some for more than 600 days), and they tended to spend a large part of their time inside MPAs (mean ~30%; for more detailed information on the methods and results of this study please refer to [5]).

Overall, these results demonstrate that MPAs in coastal regions may have conservation benefits for shark populations by providing protection across different species and life stages. A subsequent study found that both pigeye and spottail sharks have very low rates of mortality in Cleveland Bay [6], which suggests that MPAs in this region may provide both targeted and non-targeted coastal shark species with some shelter from fishing pressure. Perhaps most interesting, it appears that MPAs might have benefits for the protection of not only juvenile sharks that tend to use coastal habitats as nursery areas, but also for adults of species that have a relatively high degree of residence within them.

There are many elasmobranch species found in Cleveland Bay in addition to pigeye and spottail sharks, and there are other studies currently using the same acoustic array as I did. Look out for results from other students and researchers who are tracking scalloped and great hammerhead sharks (*Sphyrna lewini* and *S. mokarran*), blacktip reef sharks (*Carcharhinus melanopterus*), giant shovelnose rays (*Glaucostegus typus*), whitespotted guitarfish (*Rhynchobatus australiae*), and creek whalers (*Carcharhinus fitzroyensis*), among other species.

The entire AES conference was live-tweeted on Twitter, and the tweets were organized using Storify by David Shiffman (University of Miami). To access these tweets, see: http://www.southernfriedscience.com/. For more information about AES, see: http://www.elasmo.org/.

MPAs in this region may provide both targeted and non-targeted coastal shark species with some shelter from fishing pressure

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The Sea Around Us Project returns to West Africa

by Duncan Copeland and Dyhia Belhabib

Healthy and well-managed marine environments are essential for ensuring food security, reducing poverty and promoting marine conservation in West Africa. Yet the region faces enormous challenges in achieving these goals, not least of which are poor or even non-existent data relating to fisheries, biodiversity and the impact of human activities.

The region has seen limited national and international resources put towards adequate assessments of marine capture fisheries and biodiversity

The *Sea Around Us* Project is increasingly focusing on data-deficient regions of the oceans, particularly in the developing world. West Africa has been highlighted as a priority region, and in the past few months, the "*Sea Around Us* Project and PRCM: Marine Conservation Research, Collaboration and Support in West Africa" has been launched. Funded by the MAVA Foundation, the project will address the serious deficiency of adequate data in areas such as capture fisheries and biodiversity at the local, national and Large Marine Ecosystem levels in West Africa.

The Regional Marine and Coastal Conservation Programme for West Africa (PRCM) brings together an important coalition of non-governmental organizations to work with local and regional stakeholders and coordinate efforts to preserve the littoral zone of coastal countries in the region, which includes Mauritania, Senegal, The Gambia, Cape Verde, Guinea-Bissau, Guinea and Sierra Leone. Crucially, the PRCM has promoted cooperation with public sector and civil society organisations to achieve marine conservation, fisheries and integrated management support goals.

However, the challenges facing the success of these initiatives are significant. Limited government capacity and poor regulation; illegal, destructive and over-fishing by industrial fleets; high local dependence on marine resources for livelihoods and food security; and the limited number of marine protected areas in the region all contribute to a difficult environment for achieving effective fisheries and marine conservation. Yet perhaps the greatest impediment to sustainable fisheries management and marine conservation in West Africa is the current deficiency, accessibility and usage of adequate data.

Both artisanal and industrial fisheries in West Africa are poorly regulated and reported, and have the highest rates of illegal fishing in the world. As a result, the region is considered one of the most data-deficient globally. (Photo: Duncan Copeland)

The region has seen limited national and international resources put towards adequate assessments of marine capture fisheries and biodiversity. As a result, decision-making in fisheries management at the local, national and regional levels, as well as in a variety of conservation projects, is often based on limited science. The imperative is to improve the data upon which fisheries management and conservation depends, and ensure that PRCM stakeholders receive support in the utilisation of data within specific marine conservation and fisheries management initiatives.

The *Sea Around Us* West Africa programme aims to accomplish three complementary objectives, all directly contributing to regional marine conservation, fisheries management and integrated management support objectives. These are to:

- Increase the quality of available data relating to existing and new initiatives promoting marine conservation and fisheries management in West Africa through the development of catch and effort reconstructions.
- Develop strong collaborative relationships between the *Sea Around Us* Project and proposed project partners; engagement of a wider number of government, research and non-governmental partners will be achieved.
- Raise broader international awareness and support for marine conservation in the region via the publication of peer-reviewed articles and engagement of media.

To achieve these aims, the project is supporting targeted research on catch, effort and catch values, biodiversity, marine protected areas, and other related issues. Crucially, this information will be developed within a partner support framework, ensuring that PRCM member and partner initiatives benefit not only from the generated data, but also have improved organisational expertise to integrate the data into existing and future initiatives. These partners include the Sub-Regional Fisheries Commission (SRFC), local research institutions and the members of the PRCM (WWF, IUCN, Wetlands International and International Foundation for the Banc d'Arguin). Data analysis and visualisation models will be used to achieve these goals in collaboration with PRCM members and other relevant stakeholders.

Through these partnerships, the *Sea Around Us* Project and PRCM project provides an innovative and supportive approach that will directly contribute to strengthened national, regional and international cooperation in the short and longer term. The programme is specifically designed to offer potential extension beyond the initial proposed two-year period and a model for replication in other regions of the developing world with data-deficient fisheries. In addition, the project will work as much as possible with individuals that are nationals of the target countries, improving expertise in the region.

The Sea Around Us West Africa programme aims to accomplish three complementary objectives

Marine habitats in West Africa are considered among the most data-deficient globally. With an increased focus on the developing world and growing experience working in the West African region, the *Sea Around Us* Project is uniquely placed to collaborate with project partners to generate strategic data and support that will directly benefit conservation, fisheries and management goals.

The Sea Around Us *Project's new programme in West Africa will work with local partners to address the data-deficiency challenges, which should ultimately contribute to their marine conservation and fishery management initiatives. (Photo: Duncan Copeland)*

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Sea Around Us

To everything there is a season

by Wilf Swartz

Japanese call it *shun* (旬), the seasonality of food. It refers to the time of year when a specific type of food is at its peak, either in terms of harvest or flavour. It is not unique to Japanese culture, as The Byrds reminded us in the mid-1960s with their, now classic, rendition of "Turn! Turn! Turn! (to Everything There Is a Season)."

Unfortunately, at least in our modern culture, *shun* seems to apply to many kinds of food, but not to fish. Although we do enjoy various seasonal foods out of season, often the associations are still there. Strawberries bring to mind the early days of summer. Pumpkins, especially in pies – and sadly, Brussels sprouts – trigger the whisper of falling leaves, thoughts of turkey and Thanksgiving. Yes, turkey itself is seasonal, although in medieval times it might have been venison instead, roasted over a roaring fire on a cold winter's night. And the list goes on, and on, and on, for all but seafood, or most seafood, which has somehow fallen through the cracks.

As for the ocean's bounty, what *is* the best time of year to eat, or not to eat, herring or cod or tuna, or you-name-it? We've stopped viewing fish as seasonal.

And it's epidemic. Living in Vancouver, which is more attuned to fish and fisheries than most other cities in Canada, many of us are aware when salmon is in season; yet, few of us would hesitate to order salmon rolls at a local sushi joint in the middle of February.

The reality is not that seafood lacks seasonality. In fact, as one of the few remaining, large-scale forms of hunting wild foods, marine fisheries are, without doubt, more susceptible to seasonal variations in productivity than other major food sources. We've simply found it convenient to overlook that fact for a number of reasons.

Fish stocks migrate in and out of local fishing grounds. Sometimes they are locally plentiful, and sometimes they're not. During the spawning season, a fish's body chemistry changes, e.g. fat content declines, and consequently for the consumer, flavour differs throughout the year. However, with the advancement of freezing technology and the expansion of global distribution

*During the harvest season, wild British Columbia spot prawns (*Pandalus platyceros*) are available live for a short six to eight weeks each year. (Photo: Island Vittles/flickr.com)*

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networks [1], retail markets are now able to supply select species (and their close substitutes) throughout the year from all corners of the world. This, in effect, masks seasonal variations in local fisheries. Our seafood consumption has gone from "fish of the day" to "fish of whenever" and doesn't take its bearing from the season.

What is the best time of year to eat, or not to eat, herring or cod or tuna, or you-name-it?

Furthermore, there are benefits to eating seafood in season that we're not reaping.

Ecologically speaking, sticking to seasonal seafood would enable fisheries to diversify their target species and distribute fishing impact more evenly across the underlying marine ecosystem. Such a balanced harvest strategy, it has recently been suggested, would be useful in mitigating the adverse ecological effects of fishing, even going so far as to support sustainable fisheries [2].

In terms of economics, matching seafood demand to seasonal availability could moderate the potential for price collapses associated with oversupply during peak catch seasons. By creating a situation in which fisheries could capitalize on the pent-up demand that accrues during periods of little or no catch, the additional supply during seasons of plenty would be absorbed by additional demand. Here the example of BC spot prawns comes to mind.

Diversifying the "portfolio" of fish species targeted by fisheries would also help to mitigate the inherent risks involved with specialized fishing, allowing the fisheries to better cope with fluctuations of specific stocks. Moreover, the promotion of seasonal seafood may present new marketing opportunities for fishes that aren't "mainstream" and are currently treated as by-catch, thus further enhancing the economics of multi-species fisheries.

What about the benefits closer to home? A shift to consuming locally seasonal seafood would logically lead to consumption of local fish, which would have a positive impact on local fishing communities. The versatility required to shift target species and gears from season to season throughout the year is likely to favour small-scale fishing operations, which are generally perceived to be – though not necessarily – more energy-efficient and ecologically sustainable [3]. Rather than operating over a greater distance and following the migration patterns of targeted species, vessels could remain closer to their local fishing grounds, enhancing the socio-economic conditions of fishermen.

The issue is how do we promote such a major shift in our purchasing and eating habits?

"Seasonal" versions of consumer guides like OceanWise (http://www.oceanwisecanada.org/) and Seafood Watch (http://www.montereybayaquarium.org/) would be a start. And the feasibility of a seasonal seafood campaign and its effectiveness in promoting sustainable fisheries certainly needs to be investigated more closely.

But maybe the best science is no science. Yes, those left brainers, right brainers, or as we jokingly refer to them, "no brainers" may offer a key part of the solution. Eating what's in season is a concept that intrinsically appeals to people at an emotional level. And the message should not be "eat the fish that's in season for the ecological benefit,"

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but rather "eat the fish that's in season for the emotional benefit." In other words, because it will make you feel good.

For example, where was the chestnut industry, before a songwriter wrote, "chestnuts roasting by an open fire"? We need to find some brave, bold artist to write a song praising "pilchards pickled on a picnic table."

All jokes aside, it is time to re-introduce the seasonality of fish into the social conscience and into local diets. The consequences of standing by idly are too terrifying to contemplate. Going back to The Byrds, "I swear it's not too late."

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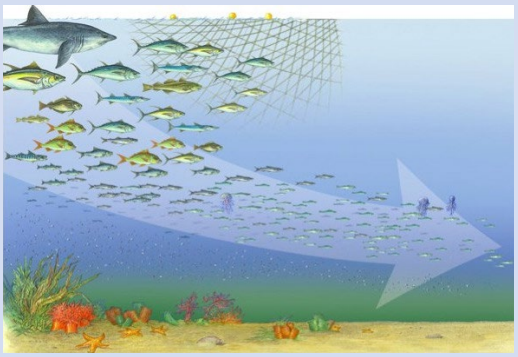
The feasibility of a seasonal seafood campaign and its effectiveness in promoting sustainable fisheries certainly needs to be investigated more closely

Website dedicated to "fishing down" launched



A new website (www.fishingdown.org), hosted by the *Sea Around Us* Project, has been launched. This website helps clear up misconceptions about the concept of "fishing down" in marine ecosystems – whereby fisheries have a tendency to deplete longer lived, high-trophic level species first, causing a decline in the mean trophic level of catches from an ecosystem.

Since it was first published, the fishing down concept has been documented and adopted by a broad community of marine and freshwater scientists around the world. Thus, the website also aggregates many case studies illustrating the phenomenon in marine ecosystems all over world, from Argentina to the North Sea, from Greece to the Caribbean. In 2010, the fishing down concept was challenged in a publication in the journal *Nature*. The objections that were raised are based mainly on imputations and misunderstandings, and the Fishing Down website is dedicated to clearing up the misunderstandings behind much of the controversy. One apparent problem is that fishing down can be masked by extraneous factors, such as the taxonomic over-aggregation of catch statistics. The website is intended as a response to the voiced concerns and provides scientific references about the fishing down phenomenon, including a link to the original article, led by biologist Daniel Pauly and published in the journal *Science* in 1998, titled "Fishing down marine food webs."

We welcome you to visit www.fishingdown.org.

Sharks, "Revolution" & the role of the arts in conservation

By Aylin Ulman and Laurenne Schiller

Despite covering potentially depressing, weighty topics, the movie delivered a sense of proactivity and hope for change from the general public

With the Vancouver International Film Festival in full swing during October, we decided to check out the new environmental documentary by fellow Canadian and ocean enthusiast Rob Stewart. *Revolution* (http://www.therevolutionmovie.com/) is a broader and more global follow-up to Stewart's first documentary, *Sharkwater* (http://www.sharkwater.com/), which he produced five years ago.

For those who have not heard of Stewart's first film, *Sharkwater* documents the illicit global shark trade, an incredibly lucrative exploit based primarily on the wasteful and barbaric practice of shark finning. Shark fin soup is considered both a delicacy and status symbol in China, and serving this dish at government functions, weddings and other cultural festivities shows wealth and power. Unfortunately, high demand for the soup's main ingredient has contributed to the decimation of many shark populations during the past decade. Although not the initial plan, Stewart's *Sharkwater* ultimately documents the path from boat to dinner table, demonstrating a high level of corruption and an absence of proper legislation in many shark-fishing countries.

Given that prior to this film little had been done to raise awareness about shark finning, *Sharkwater* garnered much global attention and action from both conservation groups and the general public. Subsequent efforts include the establishment of Shark Truth (http://www.sharktruth.com/), a local Vancouver-based shark conservation organization, and 9,000 km away in Guam, a class of sixth graders pushed their government to ban shark-finning. The success of their campaign resulted in a similar proposal from students in nearby Palau making these two island nations part of a very small group of countries that forbid this practice.

In *Revolution*, Stewart took a different and more ambitious approach. The film documents less water and more people. However, the ocean continues to play a pivotal role as Stewart uses it to develop the plot from an evolutionary and ecological standpoint. Filming largely on his own, in 15 countries and over four years, Stewart attempts to portray the necessary changes required by countries and their citizens in order to prevent further destruction of the Earth's ecosystems. This is an incredibly ambitious task and one that could have taken many paths, but Stewart chose to do a simultaneous documentation of how various creatures have adapted to changes in the Earth's climate over millions of years and the current conservation efforts of the world's youth – action he believes is necessary for the survival of humanity.

Revolution, *a new documentary film produced by Rob Stewart, succeeded in motivating and engaging the public on conservation issues, according to the authors. (Image: http://www.therevolutionmovie.com/)*

Revolution showcases some truly incredible underwater footage, scenes of remote island civilizations and an amazing clip of baby flamboyant

cuttlefish hatching from their eggs. Yet more notable than the beauty of these shots is the importance they played in understanding the film's key messages of adaptation and conservation.

Despite covering potentially depressing, weighty topics, the movie delivers a sense of proactivity and hope for change from the general public – particularly younger generations. *Revolution* shows that while many developed nations are based on democracy, somehow leaders ignore pressing environmental issues and the concerns of their citizens. Conversely, it also shows that even companies aimed at supporting conservation initiatives are afraid of being tied to anything related to civil disobedience. At one point in the film, Stewart joins a protest against climate change in Ottawa and is quite outspoken about urging people to act on these issues. The next day he discovers that the $5 million he'd been promised to fund *Revolution* had been pulled on account of his advocacy.

This film left us with three main take-home observations. First, it re-ignited our desire to do a bit of good in the world by standing up to protect the things we are so passionate about. "Be the change you want to see in the world" is such a common phrase these days, and here was another documentary aimed at stirring that change. Second, however, this film made us wonder how to accomplish such a goal. While everyone in the theatre likely had a similar mindset – including Stewart most of all – odds are, the majority of people in attendance had either seen *Sharkwater* or were interested in marine and environmental conservation issues already. So while this film did deliver in terms of entertainment and awareness, one has to wonder if *Revolution*, like many other documentaries, is merely another case of preaching to the converted. Stewart did touch on this issue indirectly during the Q&A session when he proclaimed that his goal is to have *Revolution* seen by a billion people around the world. As such, he is going to make it freely available in 2013. While his goal is ambitious, we believe that Stewart has the right idea and the determination to get his message out to the public. Lastly, this film made us think about the role of science in conservation.

We believe that one of the most difficult tasks for scientists is raising awareness about our research and the ideas we feel strongly about. Advocacy in science has always been a sensitive subject and – right or wrong – it is an entirely personal choice. Art, on the other hand – whether film, print, paint, music, dance or sculpture – is typically meant to target the average citizen and inspire thought. Stewart has the ability, and the luxury, to do something that many scientists dream of: spread knowledge and beliefs en masse to the public. Even if they put a personal spin on it, filmmakers are ultimately the voice for a lot of important research and conservation issues. We believe that those who are successful at communicating science, engaging the general public, and especially, motivating others, are an integral piece of the conservation puzzle. And we felt Stewart with his movie *Revolution* achieved all of the above.

We believe that one of the most difficult tasks for scientists is raising awareness about our research and the ideas we feel strongly about

Position available: Intermediate .NET Developer

The .NET Developer will have two main areas of responsibilities: a) take charge of *Sea Around Us* Web assets [applications and databases]; and b) design various Web or Windows based prototypes/applications which may be utilised in other core or support systems, as defined by the senior project management. The successful candidate will participate in design meetings with various team members and will work closely with our senior developer.

Our office is located on the UBC campus in Vancouver, Canada.
Education level: Bachelor's degree
Relevant work experience: preferably 3+ years
Term: 6-12 months (extension possible, depending on funding)

Please see the job openings section on the *Sea Around Us* Project website (http://www.seaaroundus.org/about/) for more details and information on how to apply.

ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

Google Earth: going beyond finding your own backyard

by Dalal Al-Abdulrazzak

Today, freely available global satellite imagery from Google Earth (http://www.google.com/earth) is revealing areas that were once too remote or too expensive – or even prohibited – to access, and making them ripe for scientific investigation. Google Earth's potential to answer scientific questions is quickly pushing the boundaries of science and in some cases, allowing scientists to venture into new disciplines.

Ground-truthing aquaculture [1], estimating forestry biomass [2] and assessing looting at archeological sites [3] are just a handful of the types of research made possible thanks to this tool. Health researchers are also using Google Earth to tackle epidemics. In Bluefields, Nicaragua, for example, researchers have compiled and overlaid contributing factors of dengue fever, such as the locations of tire dumps, cemeteries, large areas of standing water, etc., in order to prioritize specific neighborhoods for targeted control interventions.

As for marine science research, predator/prey interactions have been studied by using Google Earth to examine "grazing halos," rings of bare substrate around patches of reef created by herbivorous fish eating the surrounding algae. In a study published in 2011, Madin and colleagues used Google Earth to locate these halos in the Great Barrier Reef and subsequently ground-truthed the areas to determine the distances herbivorous fish and urchins were willing to venture away from their refugia while risking predation [4]. The authors suggested that sequential satellite images over time could potentially be used to

An example of what one can see using Google Maps – a tool similar to Google Earth that employs the same imagery – to view the coastline of the Persian Gulf. The author, a PhD candidate with the Sea Around Us *Project, is using such satellite imagery to quantify the catches from weirs in this region. (Image: ©2012 Cnes/Spot Image, DigitalGlobe, GeoEye, U.S. Geological Survey, Map data ©2012 Google)*

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monitor the effects of predator removals, recovery and reintroductions virtually anywhere on Earth.

At the *Sea Around Us* Project, we are also harnessing this technology. Under the supervision of Dr Daniel Pauly, I am using Google Earth to estimate catches from fishing weirs in the Persian Gulf, which are often not reported due to reasons related to their scale (small), ownership (often tribal) and local forms of governance. In our work, we describe the potential of Google Earth to circumvent voluntary reporting mechanisms and provide more accurate catch data, even revealing illegal fishing in certain countries.

Perhaps the software's most important merit, however, is its cost: nothing

Beyond scientific research, nongovernmental organizations (NGOs) are using Google's compelling visuals for public outreach. By mapping the results of spatial data analysis or by creating scenic narrated flyovers, NGOs as diverse as Greenpeace, the UNDP and the Jane Goodall Institute can quickly and effectively visualize their causes for stakeholders, legislators and the public. One of the most poignant examples is that of an NGO called Shelter Associates in Pune, India. They have used the technology to communicate health and sanitation issues of slum-dwellers in order to integrate low-income settlements into urban development planning and promote participatory mapping.

Although Google Earth cannot be used everywhere – imagery resolution varies between areas and across physical conditions (due to factors such as cloud cover and glare) – the potential to rapidly survey inaccessible or what would otherwise be costly areas is huge. One such application led to the discovery of new species. Using Google Earth, scientists in Britain were able to identify a large tract of previously undocumented forest in northern Mozambique. Although Mount Mabu was known to locals, scientists had yet to explore it. After scientists "discovered" the area in 2005, initial investigations led to a full-scale expedition, which yielded a number of previously unknown species [5].

Perhaps the software's most important merit, however, is its cost: nothing. Virtually anyone with a computer and an internet connection can gain free access, making it especially valuable in countries where resource allocation towards conservation is scarce. It remains to be seen what other exciting, new applications this technology could have in helping to expand our scientific knowledge when we take it beyond our own backyards.

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The *Sea Around Us* Project website can be accessed at www.seaaroundus.org and contains up-to-date information on the Project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and the Pew Environmental Group that began in July 1999. The Pew Environment Group works around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

A journey to South America

by Robin Ramdeen

The conference was a testament to the region's commitment to the stewardship of the Gulf of Mexico and the Caribbean Sea, and the marine resources therein

In the first week of November 2012, the 65th Annual Conference of the Gulf and Caribbean Fisheries Institute (GCFI) took place in Santa Marta, Colombia. GCFI facilitates the exchange of experiences and ideas in fisheries science, management, governance, conservation and education. The conference was a testament to the region's commitment to the stewardship of the Gulf of Mexico and the Caribbean Sea, and the marine resources therein. The Caribbean Sea is a special place for me, because I grew up in Trinidad and because I discovered my niche in Caribbean fisheries while doing my Master's thesis on the fishing of queen conch in Tobago. The theme of this year's conference was "Artisanal fisheries: importance, implications and challenges for management," a topic which is familiar to many of us. Artisanal fishing is defined by the Food and Agriculture Organisation (FAO) as fishing carried out by individuals or households requiring low investment in technology and gear. By this measure, the majority of Caribbean fisheries operations are artisanal or small-scale.

The conference's keynote speaker was Dr Ratana Chuenpagdee, who is no stranger to the *Sea Around Us* Project. Dr Chuenpagdee completed her PhD under Dr Daniel Pauly's supervision in 1998 and is now the Canada Research Chair in Natural Resource Sustainability and Community Development at the Memorial University of Newfoundland, St. John's. She urged the GCFI conference participants to consider ways to elevate the profile of small-scale fisheries, which – in terms of providing employment for fishers and catches for human consumption – are simply "too big to ignore" [1]. Dr Chuenpagdee is a powerhouse, and I was eager to chat with her at a socio-economic café where I got the opportunity to ask whether we erroneously mislabel our fisheries as small.

In terms of technological capacity, small-scale fisheries are certainly "small" compared to industrial ventures, but they are rather large in terms of the employment they provide for fishers as well as the quantity of catch they supply for human consumption [2]. Undoubtedly, the dearth of quantitative catch data associated with small-scale fishing sectors perpetuates this false notion of their size. As Dr Pauly plainly states in his foreword to the book "World small-scale fisheries: contemporary visions" (edited by Dr. Chuenpagdee), "countries cannot be bothered with the logistical and administrative nightmare that monitoring and reporting on small-scale fisheries often represents" [3]. As a native of the Caribbean and a research assistant with the *Sea Around Us* Project, I feel it to be my duty to reconstruct this historical fisheries information.

During my presentation at the conference, I explained how using information on catch, effort and seafood demand (i.e., consumption, as per household surveys) allowed me and my colleagues to reconstruct total marine fisheries catches for 10 Caribbean island countries from

Taganga, a fishing village in Colombia (LEFT). Robin Ramdeen presenting "Underreporting in Caribbean fisheries catches" at the GCFI conference (RIGHT). (Photos: Robin Ramdeen)

1950 to 2010. Unsurprisingly, these catch reconstructions illustrated a substantial level of under-reporting in the Caribbean. For example, the reconstructed catches of Haiti and Jamaica were 3 and 4.3 times higher, respectively, than catches reported by these countries to the FAO, where the data become part of the world "catch" database. Overall, approximately 5 million tonnes of unreported catches were estimated for these 10 Caribbean countries during the 60-year period that we examined, with an average of 54,000 tonnes of unreported catches each year. The main discrepancy was due to unreported and under-reported catches from the artisanal, subsistence and recreational sectors. However, reporting seems to be improving as unreported catches in the early time period accounted for 80% of reconstructed catches, as opposed to 50% in the present time period.

A fishing boat at Taganga, a village in Colombia. (Photo: Robin Ramdeen)

The presentation was well-received and I had a number of scientists and fishers as well as an anthropologist interested in learning more about the *Sea Around Us* Project. Despite the English-Spanish language barrier, the GCFI spirit demonstrated that we are just one planet, working together for our precious oceans – questioning, sharing and improving things.

We are just one planet, working together for our precious oceans

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Sea Around Us

EU Common Fisheries Policy reform, from the inside

by Frédéric Le Manach

Members of the European Parliament and scientists discuss the future (if any) of deep-sea fisheries in European waters. (Photo: Frédéric Le Manach)

In 2009, the European Commission initiated the third reform of its Common Fisheries Policy. Although the basic principles of this new framework – which will stay in place for the next 10 years – were adopted in early February by the Parliament, the Commission is still regularly hearing experts on various topics. This process aims to propose specific amendments to this basic framework, before the final decision around June, once the Parliament, the Commission and the Council of Ministers reach a consensus (yes, this is a rather complex system). One of these hearings was held in Brussels on 19 February, and it focused on deep-sea fishing. Claire Nouvian invited me to attend, and although I was expecting a vivid debate, I was not expecting such vividness.

Claire Nouvian – a Pew Fellow, journalist, director/producer, director of BLOOM (www.bloomassociation.org), but principally woman of action – was one of eight experts heard by European Union (EU) members of parliament (MPs) during a special session on deep-sea fisheries. Other names in this group of experts included Tom Blasdale, chair of the ICES Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP); Phil Weaver from the UK's

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National Oceanography Centre; Pascal Lorance from the French Research Institute for Exploitation of the Sea (Ifremer); and Matthew Gianni, co-founder of the Deep Sea Conservation Coalition. I will not go into much detail about these seven talks. To put it in a clamshell, everybody sort of agreed that deep-sea trawling is harmful to many long-lived species (such as fish, sponges and corals) and fragile ecosystems, and that we know very little about them (there are analytical assessments for only three species, and footage is very rarely available).

A couple of MPs started to shout, accusing each other of being blind or deaf

Claire introduced the French deep-sea fishery, and the bottom-line of her talk was that despite rather important subsidies, the three companies involved in French deep-sea fishing are all in deficit! The example of Scapêche, which takes between 60 and 86% of the total French deep-sea catch, is staggering: between 2002 and 2011 it received €9.34 million from the state, plus an additional €16.9 million cash-injection from Intermarché, the supermarket chain to which it belongs [1]. (If you are looking for a definition of vertically integrated systems, here you go.) Yet during this 2002-2011 exercise, it had €0.1 million of cumulated net losses after tax. A French MP, co-chair of the fisheries committee, then said something along these lines: "Are you saying that such companies are philanthropic? That they give away money to something that is not worth it? I don't buy it!"

That was it. At this point the extremely politically correct way of telling white lies or saying nothing too controversial was abandoned for a much spicier and polarized argument. A couple of MPs started to shout, accusing each other of being blind or deaf. Others tried to be more constructive, as one British MP and another French MP said that we should start inquiring upon the use of EU citizens' money, and further refuted the co-chair's argument that because some fishers were relying on this fishery, we should maintain it despite a high risk of collapse for most stocks.

Then, we ran out of time. Big surprise. My personal feeling is that this hearing was designed to restrict the debate. Controversial topics were kept for the end, whereas they should have been at the forefront. As a result, I am actually quite confused about the outcome of this meeting. Of course, its aim was not to make decisions, but rather to propose amendments to the Common Fisheries Policy proposal that is currently being reformed. However, I cannot guess what these amendments will be. Some MPs are definitely pro deep-sea fishing, others are firmly against it, but a number of them remain undecided and they will likely base their vote on who shouts the loudest. (Please remember that empty vessels make the most noise.)

Isabella Lövin, Swedish MP and author of the must-read book *Silent Seas*, managed to get the deadline for these amendments postponed to mid-March. I will follow-up with a report on the progress.

You can listen to the entire meeting at:
www.europarl.europa.eu/ep-live/en/committees/video?event=20130219-1500-COMMITTEE-PECH

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Coastal transects: a tool for marine biology & fisheries visualization

by Daniel Pauly

Transects are a conceptual tool for reducing maps, which present three dimensions of reality, to two dimensions

Coastal and other transects are a conceptual tool for reducing maps, which present three dimensions of reality (latitude, longitude and the dimension of interest, e.g., depth, primary production or fish size and abundance; Figure 1A) to two dimensions (e.g. distance from the coast vs abundance of different life stages; Figure 1B). However, this reduction of dimensionality does not necessarily imply loss of information content. In fact, transects, since their invention by Alexander von Humboldt in the early 19th century, allow the documentation of complex ecological patterns in a manner that is directly accessible.

This is the reason why, for example, the classical FAO *Atlas of the Living Resources of the Seas* [1] contains both maps and transects, both being of great assistance to the then expanding fishing industry in locating fish stocks to exploit. In 2013, however, we are past the stage where scientists produce atlases to show industry where fish concentrations are (fishers nowadays know this better than scientists, thanks to experience and electronics), but the superb atlas that FAO produced remains an inspiration for the clarity of the information it conveyed.

Indeed, this atlas was the reason why we explored transects for summarizing ecological data on marine fish species in FishBase (www.fishbase.org). One such approach (see Figure 1B) was presented by Zeller and Pauly in 2001 [2], but it was abandoned because it required too much work for each species.

I am thus delighted to present another intuitive approach for the representation of fisheries catches within profiles perpendicular to the coast of the Exclusive Economic Zones (EEZ) of countries, or of Large Marine Ecosystems (LME). The "catch transects" in our new paper ("Coastal catch transects as a tool for studying global fisheries" by Reg Watson and Daniel Pauly [3]), constructed through a new computer routine,

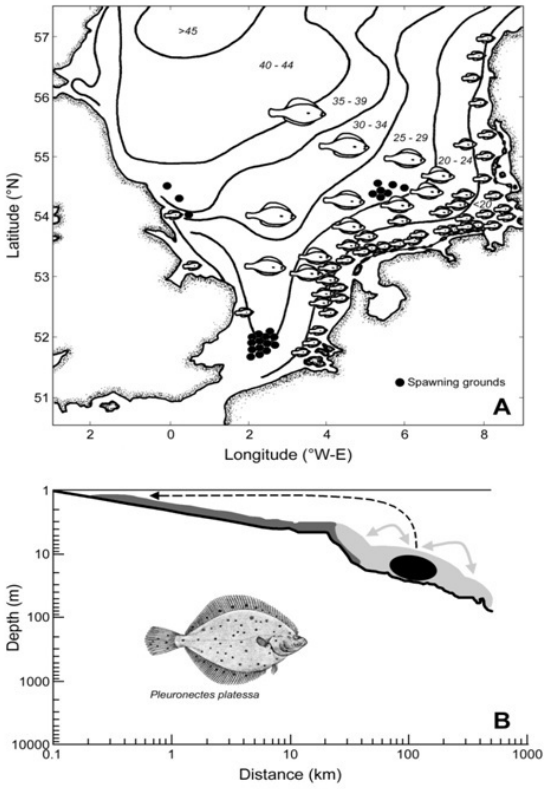

*Figure 1. Two modes of representation of the relationships between water depth and/or distance from the coast and the biology of fishes, illustrated with the plaice (*Pleuronectes platessa*) in the North Sea. A: Tri-dimensional map adapted from [6], with mean sizes (TL; cm) given for each isobaths. B: Typical transect (approximately 53° N, 8° E to 56° N, 3° E), dark grey represents juvenile distribution, light grey adult range and black indicates the spawning stocks (adapted from [2]).*

which uses the spatialized catch data file that the *Sea Around Us* Project created, show where catch is extracted in the water column as plots of log-bathymetry vs log-distance offshore, and thus allow for representation of the catch density of pelagic and benthic fisheries (Figure 2). Hence, they also allow direct visual comparison of the intensity of fishing through time and space.

The website of the *Sea Around Us* Project presently under reconstruction will, when completed, show

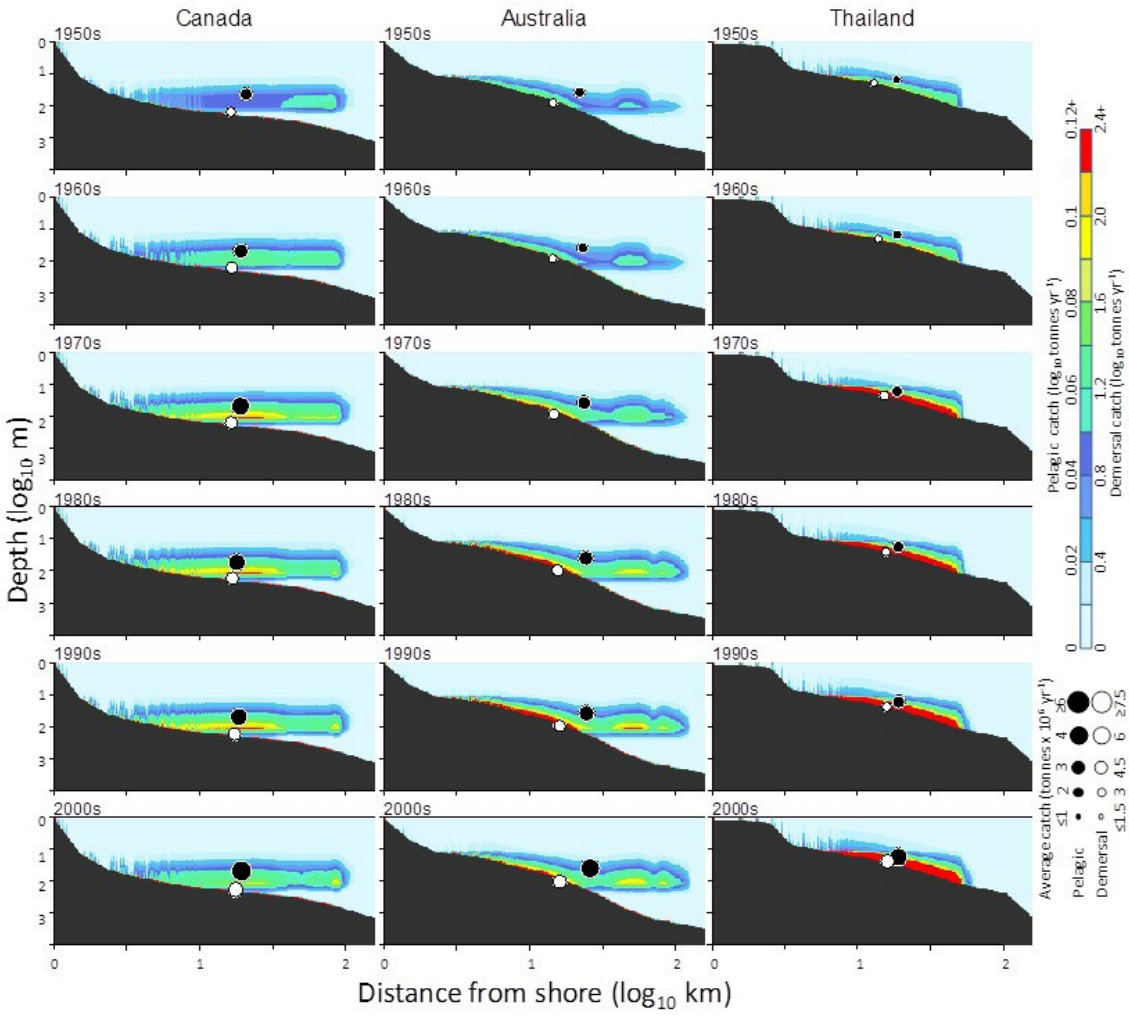

Figure 2. Catch transects for the Exclusive Economic Zones of Canada, Australia and Thailand. Catch densities (log_{10} tonnes·year^{-1}) are scaled by colour. Demersal catches are scaled differently from pelagic catches (adapted from [3]).

Transects also allow direct visual comparison of the intensity of fishing through time and space

catch transects for all EEZs and LMEs of the world based on "reconstructed catches" (see [4] and [5] for examples); hence they will differ from those presented here in Figure 2 by showing higher catches, notably inshore, as a result of larger small-scale fisheries catches.

They will, however, retain the intuitive nature of Figure 2, and hence collectively be seen, I hope, as worthy successors of the FAO *Atlas of the Living Resources of the Seas*.

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Marine how-protected areas?

by Lisa Boonzaier

Around the world, many marine protected areas (MPAs) – including some very big ones – are being proposed and instituted. Just last year, MPA coverage grew by more than 2.5 million km^2 with the creation of three of these very large MPAs (Cook Islands Marine Park, Coral Sea Marine National Park and New Caledonia), and more are proposed. As countries aim to reach global targets for MPA coverage and compete to stake their claim for having the biggest MPA in the world, the area encompassed by MPAs grows.

Do all these new MPAs equate to more and better protection for the ocean?

As we strive to see a larger part of the ocean protected than the current 1% (see sidebar), this growth sounds like a great thing for marine conservation – at least, on paper. But what does it mean for species and their habitats in-the-water? Do all these new MPAs equate to more and better protection for the ocean?

It's widely acknowledged that many protected areas – both terrestrial and marine – are not effectively managed. They are not adequately funded or enforced. They might not even have a management body or management plan. As an example, even though MPAs cover about 19% of the world's coral reefs, it's been estimated that less than 0.1% of coral reefs are within no-take MPAs with no poaching [1].

With these and related issues in mind, the wildlife conservation organisation WildAid (www.wildaid.org) organised a conference – the first of its kind – on the enforcement of MPAs. The Global Marine Protected Area Enforcement Conference, held during November 2012 in San Francisco, attracted a variety of people interested in MPAs: enforcement personnel, engineers, lawyers, researchers, managers, and students – like me – from more than 30 countries and representing a diversity of types of MPAs.

The overall aim of the conference was to discuss and share information on the MPA "enforcement chain," considered by WildAid to consist of five links all of which need to function for effective enforcement:

1) Surveillance and interdiction: monitoring MPAs, detecting violators and intercepting them.
2) Systematic training: not only of enforcement personnel, but also of prosecutors and judges.

The Global Marine Protected Area Enforcement Conference was held for the first time during November 2012 in San Francisco. (Photo: Lisa Boonzaier)

3) Prosecution and sanction: a judicial system that appropriately punishes violators, ultimately leading to deterrence and compliance.
4) Outreach and education: changing people's behaviour involves communication through outreach and education.
5) Sustainable finance: underpins successful implementation of the first four links.

The conference sent an overarching message that there's a need to think beyond the first step of establishing MPAs, and consider how to go about fostering sustainable, effective protection. The case studies revealed that many MPAs need help in a number of different but generally overlapping ways. During a session of case studies from around the world, we heard about the coupled problems of illegal fishing and drug trafficking in Latin America, that one large MPA in the Pacific has enough funds for a single patrol per year, and how enforcers struggle to control geoduck fishing in Puget Sound MPAs.

This message was balanced by the up-side that came from seeing the varied paths that different types of people have already identified for tackling the problems, and while every MPA's context is unique, there is a strong collaborative environment and opportunity for sharing knowledge and ideas.

The most exciting aspect of the conference was the showcase of several technologies for monitoring and surveillance, including more traditional tools, such as vessel monitoring systems (VMS)

Marine protected areas

What are they?

Marine protected areas (MPAs) in the broadest sense provide some level of protection to a defined area of the marine environment. There are more specific definitions and the one most commonly applied, which comes from the IUCN, specifies that conservation should be the protected area's primary objective.

(If you'd like to read more about the debate on how to define MPA, see the November/December 2012 issue of MPA news; www.mpanews.org)

How much is protected?

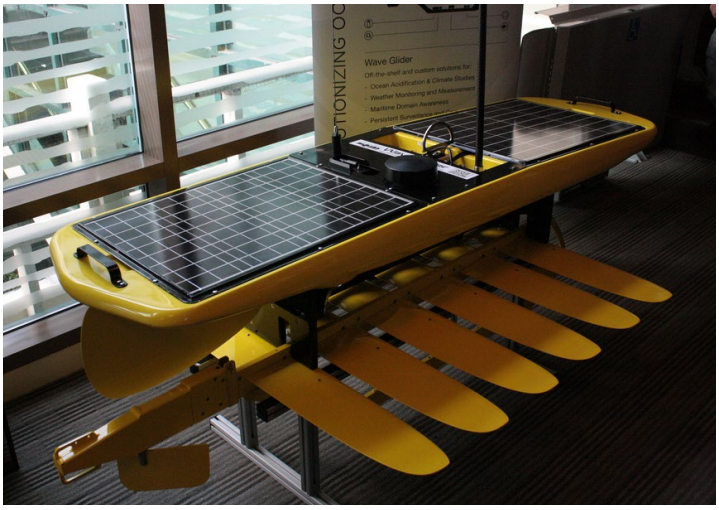
According to a 2008 study from the *Sea Around Us* Project [2], 2.35 million km^2 representing about 1% of the marine environment is protected. This value has increased since then, particularly given the recent rapid rate of expansion thanks to the very large MPAs that have been established in recent years. Even so, the figure is likely to be not much more than 1%. Of this 1%, about 13% is within no-take areas (according to the 2008 data), that is, areas where all extractive activities, including fishing, are prohibited.

and automatic identification systems (AIS), and new technologies, like unmanned vehicles. The most eye-catching device on display: a snazzy, yellow, unmanned robot called the Wave Glider (http://liquidr.com). Because the Wave Glider runs on wave and solar energy, and requires little maintenance and no on-board personnel, it's capable of year-long, continuous surveillance missions providing real-time data via satellite. Using an underwater microphone and on-board camera, it's able to sense vessel activity, but can also be tasked with environmental monitoring, like recording occurrences of marine mammals. And while it was eye-catching in the conference exhibition room, apparently it's tough to see on the ocean, so offenders will likely be unaware that their activities are being recorded. Other tools that could help with monitoring large, remote MPAs include unmanned aircraft, underwater autonomous vehicles and balloons.

The most eye-catching device on display: a snazzy, yellow, unmanned robot called the Wave Glider

There were more innovative ideas raised in other spheres of the conference. One such idea was presented from my home country, South Africa, where an initiative has been piloted to unify small-scale fishers through the creation of fishing cooperatives in coastal communities where people struggle to make ends meet and illegal activities, such as poaching for high-value and protected abalone, are often widespread. In one town, directed funding and training have resulted in the creation of 12 small businesses that employ 118 people – decreasing unemployment there from 85% to 68%. Additional outcomes include improved safety for fishers, and increased stewardship and compliance as users came to understand and defend their resources.

The Wave Glider, from Liquid Robotics, runs on wave and solar energy, and requires little maintenance and no on-board personnel. (Photo: WildAid.org)



The good news is that MPAs do work. There's a growing body of evidence showing that increases in biomass, diversity, spillover and larval export are all possible (for examples see [3-6]). And I'd like to emphasise, that although it's important to recognise the problems with our MPAs so that we can improve them, we must not to lose sight of the fact – highlighted by Graham Kelleher at the conference – that an imperfect MPA is better than no MPA at all.

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Daniel Pauly receives Honorary Doctorate

by José L. Sánchez Lizaso

On 28 January, Dr Daniel Pauly received an Honorary Doctorate at the University of Alicante, Spain. During the ceremony, the head of the Department of Marine Sciences and Applied Biology, Dr José L. Sánchez Lizaso, summarized the work of Dr Pauly first at the International Centre for Living Aquatic Resources Management (ICLARM; now known as WorldFish) in the Philippines, and after that at the Fisheries Centre at the University of British Columbia. Dr Lizaso explained that the models and tools Dr Pauly developed, and the new concepts that he introduced had a huge impact on fisheries management. The commitment of Dr Pauly and his efforts to preserve our oceans are the reason that the University of Alicante's Faculty of Sciences unanimously proposed him to receive the Honorary Doctorate.

Daniel Pauly receives his Honorary Doctorate at the University of Alicante, Spain. (Photo: Roberto Ruiz - University of Alicante)

The new concepts that Dr Pauly introduced had a huge impact on fisheries management

In his acceptance speech, Dr Pauly reviewed the importance of marine resources in the history of humans. However, he also stressed that the biodiversity we have exploited for millennia is now threatened, as are the very ecosystems in which these resources and species are embedded. He emphasized that overfishing is not due to a lack of biological knowledge about the fish stocks that are exploited, but rather a lack of proper incentives to do the right thing, and he explained the need for influencing policies to make exploitation sustainable. He also remembered the many colleagues who helped him reach this point and acknowledged being on the same list as Mario Varga Llosa, Ramon Margalef, Jane Goodall and others who have also been so honoured by the University of Alicante.

As result of his presence at the University of Alicante, Dr Pauly has been invited to participate in the next edition of the International Master in Sustainable Fisheries Management, a graduate degree that the University of Alicante organizes in collaboration with the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM).

Dr José L. Sánchez Lizaso is head of the Department of Marine Sciences and Applied Biology and a senior lecturer at the University of Alicante.

Sea Around Us

Ambassador to West Africa

by Dyhia Belhabib

"Our driftnets don't produce discards."
"We don't have illegal fishing – it's illegal."
"Your methods are correct, but your results don't make sense."
"Don't tell them we fish in their waters, they will deny us access."

These were some of the amazing comments I heard during my short visit to seven West African countries earlier this year as part of the "*Sea Around Us* Project and PRCM: Marine Conservation Research, Collaboration and Support in West Africa." (PRCM is the Regional Marine and Coastal Conservation Programme for West Africa). During my trip, I met with fisheries experts, researchers, decision-makers, NGOs and industry representatives to ground-truth the catch reconstruction results for the different countries.

I landed in Dakar on 4 April and met with the USAID Collaborative Management of Sustainable Fisheries in Senegal (COMFISH) team early the next day. Going through the presentation of Christopher Mathews (director of USAID/COMFISH in Senegal) for the upcoming meetings, made me realize how sensitive the subject of catch reconstructions was, and how diplomatic I would need to be. I would have to choose my words wisely.

The morning of April 6th, the Senegal workshop began. Around 85 people showed up, notably, the Department of Fisheries (DPM), the Fisheries Research Institute (CRODT), WWF, industrial and artisanal fisheries representatives, the Department of Fisheries Monitoring and Surveillance (DPSP), the US Navy, the local university and women from the fish processing industry, as

Conakry fishing port (Guinea). Fish trade and processing in West Africa is done mainly by women. (Photo: Dyhia Belhabib)

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well as the media. The main goal of the workshop was to validate catch reconstruction results and identify potential collaborators under the project in West Africa. I remembered that in 2012, Senegal denied the existence of any illegal activities in its waters and under-reporting as well, so we had to show some examples to demonstrate that Senegal was not an exception. With Duncan Copeland, our coordinator in West Africa, we prepared a "why bother?" presentation where we brainstormed with the audience on illegal fishing and under-reporting.

They had noticed shrinking fish sizes, shrinking catches and shrinking prices

The following day, I presented technical details and major results of the catch reconstruction, along with the first estimates of illegal, unreported and unregulated (IUU) fishing. Dougoutigui Koulibaly, the executive secretary of the Industrial Fisheries Association had a comment, and I was preparing myself to be really diplomatic and nice. He said: I couldn't eat lunch; if your estimations are remotely correct – and according to the audience, they seem to make sense – we are in trouble and we need to act now. I thought that we had come a long way from last year's sentiment of, "We don't have illegal fishing – it's illegal." One of the recommendations resulting from the workshop that had to be sent to the minister of fisheries was to create a working group to validate the results by 15 May. Senegal was ready to move ahead, and the people from the administration showed a strong will to participate.

Our next stop: Nouadhibou, Mauritania. We landed in Nouakchott, the capital city, and drove across the stunning, sandy desert to Nouadhibou to meet with staff of IMROP, the Mauritanian Institute of Fisheries Research. The meeting, although very casual, took around four hours and we discussed every single point of the methods. The organiser had us meet with the Association of Artisanal Cephalopod Fishermen with whom I used some mixed academic-Algerian Arabic to make myself understood. I implanted keywords such as "domestic," "industrial" and "China" in their minds, waiting for them to blow up. It didn't work that well, as the fishers told me they didn't believe the fishing access agreement with China would be of any benefit or harm to them. The fact that China is building infrastructure in the ports probably helped them forget the negative impacts of overfishing. But they said they had noticed shrinking fish sizes, shrinking catches and shrinking prices. We met with the subsistence fishing community and asked about their fishing traditions so that we could consider this community in our reconstruction of fisheries history. While the representative of the national federation told us that they don't have under-reporting anymore, and illegal fishing is rare, his colleague said they don't know what is happening in their waters, and there is probably discarding and illegal fishing. Two very different versions; the most realistic one was obvious.

On our way back to Nouakchott, we stopped for around 15 minutes at the beautiful National Park of the Banc D'arguin (PNBA). I couldn't possibly go to West Africa without stopping at its most famous national park, where overfishing in the adjacent waters has severely depleted fisheries resources.

I managed to get to Monrovia by traveling from Mauritania through Abidjan (Côte d'Ivoire), then Accra (Ghana) before heading back towards Liberia. It was a ridiculous, 48 hour-long trip. I arrived in Monrovia, hardly looking like a human being, and about one hour later, I had the pleasure of meeting with the Bureau of National Fisheries (BNF). One-on-

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The *Sea Around Us* Project website can be accessed at www.seaaroundus.org and contains up-to-date information on the Project.

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Fanti canoes of Ghana and Guinean pirogues landing fish in the port of Conakry in Guinea (TOP).
Duncan Copeland (centre left) and the author (centre right) at a meeting with a member of the artisanal fishing association of Conakry (far left) and Mr Kaba (far right), who is a representative of Guniean artisanal fisheries (MIDDLE).
River-crossing by "ferry" in Sierra Leone. The "ferry" is a wooden barge attached to a rope that allows it to be pulled forwards and backwards (BOTTOM). (Photos: Dyhia Belhabib)

Liberia was one of the most challenging countries to reconstruct catches for, as information was scarce

one meetings, it turned out, were the best choice for confirming or contradicting the information others could have given me. The SeaMen Workers Union, a group representing the benefits of workers in the fishing industry, talked about industrial discards and illegal Chinese pair trawling in Liberia. Coordinators and project managers talked about non-commercial fisheries, and the statistics division provided data on discards, transshipping and the real ownership of vessels. Liberia was one of the most challenging countries to reconstruct catches for, as information was scarce. Now it has been enriched by solid, if anecdotal, knowledge. Recently I also learned that after months of battling and collaboration with East African countries, Liberia has won a $2-million case against a Korean operator fishing illegally in its waters!

Crossing the border is always a pain in West Africa; however, the Liberia-Leonean border guards were surprisingly nice and welcoming. The beauty of the villages and the smiles of the children waving at us made the trip less painful and reduced the stress caused by our car breaking down in the middle of the bush. We finally made it to Freetown. The next day, we went to the Ministry of Fisheries, where I had the pleasure of meeting the deputy minister, and a while later, the minister himself. Thereafter we headed up to Guinea – the black hole of illegal fishing in Africa. Before even crossing the border, the friendly Sierra Leone immigration agents warned us: "They are hostiles."

Indeed, I would add that the country is not only the black hole of illegal fishing, but of corruption, as it was present even in the lowest levels of society. Alkaly Dooumbouya, our collaborator from the fisheries research institute of Conakry (*Centre National des Sciences halieutiques de Boussoura*; CNSHB) organized a workshop inviting the department of surveillance, university representatives, the ministry of fisheries and the CNSHB. However, it was more appropriate to meet Mr Kaba, the representative of artisanal fisheries, before the workshop, to grasp a realistic picture of fisheries in Guinea. From Mr Kaba, we learned about the politics of fisheries in Guinea, and that the minister of fisheries himself had a fishing company whose vessels were often spotted off Sierra Leone! To tackle this conflict of interest, a new department of surveillance was created under the supervision of the *Préfet maritime*, an important figure who made himself available for a meeting after the workshop. I also had the pleasure of meeting with some of the legends of fisheries in West Africa, like Ibrahima Diallo, a Guinean fisheries scientist who worked on establishing time series for Guinean fisheries despite many technical and financial challenges. We discussed our research, and in general, people agreed with the methods and partial results, were shocked by the cumulative graphs, but finally accepted the overall outcomes.

After seven nights in Conakry, I was more than relieved to leave Guinea, just because of the perpetual harassment by police officers and immigration agents, some of whom were former mercenaries for Kaddafi.

I was happy finally to see the Bissau-Guinean flag. The immigration checkpoint was in a little village with a friendly imam checking passports. (It occurred to me that this might be an easy way

in for drug dealers, as Guinea Bissau is coming to be known as the new Columbia of the world.) Once at the hotel, there was barely enough power for internet access, but we could contact our collaborators from the Bissau-Guinean ministry of fisheries and organise a meeting over Easter – a four-day holiday for 13% of the population that makes the entire nation happy. Meanwhile, we met with local experts from IUCN and discussed possible collaborations, especially on the topic of marine protected areas. We presented our results to Dr Victorino Nahada, the head of the fisheries department. He understood the basic concept and the rationale, as well as the data we used. He didn't have any negative nor positive comments, but said politely that Guinea-Bissau doesn't have an industrial fleet, they don't land here and transhipping is illegal. Then we showed him our satellite pictures of a reefer (refrigerated container ship) operating consistently in Guinea-Bissau waters...

After a stop in The Gambia, I was getting ready to return to Vancouver where a lot of follow-up work was waiting for me. My journey in West Africa could be summarized as productive, intense, emotional and sometimes frustrating, but with a happy ending. I grew up during this intense one-month trip of workshop organisation, presentations and interviews, questioning and interrogations in seven countries of West Africa – amongst them some of the poorest countries in the world. I also learned how difficult it is to be a woman in the manly world of fisheries. I learned to be patient and diplomatic – an aspect of my character that I hadn't known of myself before. I learned to interview people on very controversial topics and to gain their trust. I was particularly proud to get some of these countries out of their denial concerning illegal fisheries. By the end, I was deemed to be the Ambassador of the *Sea Around Us* Project in West Africa.

My journey in West Africa [was] productive, intense, emotional and sometimes frustrating, but with a happy ending

Lost in Translation

by Wilf Swartz

It was May 2008. I had just returned from England and was only beginning to reacquaint myself with the world of fisheries science when Daniel first approached me about helping to translate *Darwin's Fishes*, published in 2004 [1]. Daniel didn't suspect the rustiness of my Japanese, and explained that my job would be to assist with checking the work of Drs Mutsumi Nishida and Fumihito Muto, the Japan-based scientists who had volunteered to translate his book [2] in its entirety from English to Japanese. As such, my main responsibility was to read over their manuscript for errors. Daniel had just read an article by a professional translator who claimed that translations in Japanese commonly have several errors per page – including "howlers" – and he was worried. Having worked quite closely with Daniel for several years prior, I was well acquainted with his eclectic sense of humour. I therefore anticipated many howlers coming my way.

I accepted this task not only because I wanted to help my mentor, but also because I had some experience in translating; thus, I assumed a simple biology book would be a piece of cake. In my younger years, I had worked as a Coordinator of International Relations for Fukuoka City Hall in Japan, interpreting and translating city documents.

Daniel Pauly's book Darwin's Fishes Japanese Edition *is available from Tokai University Press.*

The Paulian sense of humour can also be blunt and obvious, and it never failed to amuse me during this project

The pinnacle of my early career was when I translated the Mayor's speech for a presentation to the United Nations. However, I quickly realized that the Mayor of Fukuoka had not prepared me for *Darwin's Fishes*, which presented challenges beyond the wildest nightmares of any professional translator, much less an amateur. Not only was the sheer diversity of the topics covered almost overwhelming (i.e., Daniel's musings wandered from discussions on evolution and natural selection, to politics, to the philosophy of science, to random tidbits on taxonomy and history, and even sports tactics), but also the tone in which these ideas were presented varied almost as extensively. At times, Daniel was passionate, and at times, he was lighthearted, humourous or ironic.

As any alumnus of his undergraduate biology course (BIOL 445) will tell you, Daniel is a cornucopia of thoughts and ideas, and it often takes a very open and creative mind to decipher their connections and relevance to the overarching lecture topic. The Paulian sense of humour can also be blunt and obvious, and it never failed to amuse me during this project. One of my favourite instances was when Daniel explains that the English version of *Darwin's Fishes*, which covers all the fishes that Darwin mentioned in his work, can be expressed graphically like this:

<oDARWIN>{

or "abbreviated (and as a shoal)" like this:

<oCD>{ <oCD>{ <oCD>{ <oCD>{ <oCD>{ <oCD>{

Daniel points out that the longer version somehow resembles a (European) mackerel (*Scomber scombrus*), while the fish in the shoal resemble Indo-Pacific mackerel (genus *Rastrelliger*). This one kept me up into the wee hours of the morning as I tried to figure out how best to explain it in Japanese.

Not only was I dealing with a heavy dose of scientific gags from Daniel, but puns that, by their nature, are impossible to translate faithfully.

Beyond the obvious grammatical and vocabulary differences between Japanese and English, translating cultural references was the most difficult part of this project. Certain phrases can trigger specific images or ideas that would makes sense to a reader in Europe or North America, but they may not have a similar connotation for those in Japan. For example, in the English version, Daniel makes reference to the French comic *Asterix*. Although undoubtedly a Western classic, I assumed that only a select few in Japan would understand this reference in the first place, and I highly doubted that any of them would be the type to also pick up a copy of *Darwin's Fishes*. After much deliberation, we felt that the inclusion of a side note was the only possible course of action. In other instances, we replaced a metaphor by another, while maintaining some sort of analogous structure. For example, in his book, Daniel "keeps score" (e.g., between feuding scientists) as in soccer matches. Even though this reference would work in Japanese, we chose instead to substitute sumo wrestling, where victors are indicated by the judge's fan. We felt this would be much more playful.

Although I now look back and laugh about many of these anecdotes, I know that, ultimately, I gained an incredible amount of insight and respect for scientific translating, and ultimately, for scientific communication. One of the most important jobs of a scientist is conveying information and ideas to the public. This, however, cannot be done through detailed elaborations or extensive equations, and being able to capture the essence of a story is key. A science joke can be hard enough to appreciate in one language, not to mention one with an entirely different writing system and culture. Without the skills required not only to translate words, but key messages as well, the science at the core of projects such as this would likely be overlooked. Or, at the very worst, lost.

Notes

[1] Pauly D (2004) Darwin's Fishes: an encyclopedia of ichthyology, ecology and evolution. Cambridge University Press. p. 340.

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Sea Around Us

During June, Deng Palomares and Daniel Pauly spent a week teaching a newly updated version of the ELEFAN software at the Institute for Fisheries and Aquaculture of the University Cheick Anta Diop of Dakar, Senegal. (Photo: Najih Lazar)

ELEFAN in (Daka)R

by M.L. 'Deng' Palomares and Daniel Pauly

The ELEFAN software and approach for the estimation of von Bertalanffy growth parameters from length-frequency data was developed at the International Center for Living Aquatic Resources Management (ICLARM), in Manila, Philippines, in the early 1980s by Daniel Pauly and two programmers (Noel David and Felimon Gayanilo). It was disseminated in various versions throughout the world, especially in tropical countries, through a series of training courses during the 1980s and 1990s. It also formed the core of a comprehensive software package called FAO-ICLARM Stock Assessment Tools (FiSAT; [1], [2]), still available from the FAO.

Overall, about 5,500 papers based on the ELEFAN approach, as incorporated in FiSAT and its predecessors have been published in the past 30+ years (as identified by Google Scholar records with "ELEFAN" in the title or the body of the text). However, since its release, FiSAT has been updated only once (FiSAT II; [3]), and it has become outdated in content and form. Thus, the offer was accepted to collaborate with USAID's COMFISH Project in Senegal to produce an updated version of ELEFAN and to test it in a training course in Dakar before releasing it for wider use as open-source software.

The bulk of the R coding was completed by Aaron Greenberg (with Mathieu Colléter also contributing a routine) just in time for a team consisting of Ted Hart (of UBC's Biodiversity Research Centre), Danielle Knip and Deng Palomares (of the *Sea Around Us* Project) to create a stand-alone package copied on 25 USB sticks at the end of May.

Daniel Pauly and Deng Palomares then spent a week in an ELEFAN training course, held at the Institute for Fisheries and Aquaculture of the University Cheick Anta Diop of Dakar, teaching the routines behind and the functioning of the ELEFAN package. The group of 25 Senegalese participants consisted of about one-half fisheries scientists and graduate students, and the other half fisheries inspectors.

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The students and scientists benefitted greatly from this training workshop

While the fisheries inspectors struggled somewhat with the relevance of growth and mortality estimations and clearly preferred Daniel's lectures on fisheries and climate change issues, the students and scientists benefitted greatly from this training workshop and generated – with Deng's help – results for sardinella (*Sardinella aurita*, *S. maderensi*), white grouper or *thiof* (*Epinephelus aeneus*), *bonga* (*Ethmalosa fimbriata*) and other species. The results – to our relief – were comparable to those obtained by a group of colleagues (also working for the COMFISH Project) through tedious reading of annual rings on bony structures. Indeed, in the case of octopus (where the cubic root of the weight was used instead of length), results were obtained which could not have been obtained though ageing of bony structures – octopi have no bones...

Thus, overall, the personnel who had arranged the workshop, notably COMFISH Project Leader Chris Mathews and Najih Lazar, Technical Advisor, both of The University of Rhode Island, were as pleased as we were about both the knowledge that was passed on during the workshop and the performance of the trial version of ELEFAN in R. Obviously, a number of items were noted which require improvement, as well as a swarm of bugs, both of which are due to be fixed in the next two to three months. The high hopes that we have for this new release of ELEFAN in R appear justified.

Photo: Najih Lazar

Daniel used the opportunity of being in Senegal to visit the *Département des Pêches Maritimes*, where he briefed its Director, Mr. J.-P. Manel, and members of his senior staff on the results of the reconstruction of Senegalese marine catches led by Dyhia Belhabib, with support from the MAVA Foundation and co-authors from the COMFISH project (Ms. Vivianne Koutob), the DPM (Mr. Lamine Mbaye) and WWF-Senegal (Mr. Nassirou Gueye). It was very gratifying that our Senegalese partners acknowledged that they have catch-reporting problems, both with regards to substantial illegal fishing in Senegalese waters and unregulated fishing by Senegalese fishers in the waters of neighbouring countries. This acceptance of reality signifies a level of political maturity that is lacking in many other countries where officialdom prefers to stick its head in the sand.

Daniel also used the opportunity, shortly before leaving Dakar, to hold a press conference with a dozen Senegalese journalists to inform them of a recent study authored by Drs William Cheung, Reg Watson and himself, on global warming and fisheries, which implies a dire future for tropical fisheries. One of the workshop participants suggested to Daniel that the public should be "alerted, but not alarmed" by the trend that this paper describes and the implication for Senegalese fisheries. This point to alert people and not alarm them is an excellent formulation of our job as scientists, and luckily, the Senegalese journalists

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followed up on it. For those who speak French, you can verify that the Senegalese journalists got the point by reading this article published in Le Soleil Online (www.lesoleil.sn), as an example.

Daniel can also attest that Deng was a big success with the national dress that she was given by the participants (see picture, right)!

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Correction: This is an updated version of the original article, correcting erroneous affiliations.

Deng Palomares in the Senegalese national dress given to her by participants of the ELEFAN training course held in Dakar. (Photo: Najih Lazar)

The public should be "alerted, but not alarmed" by the trend that this paper describes

On the migrating behaviour of joint-PhD students

By Frédéric Le Manach and Mathieu Colléter

Being a PhD student can be fun! While many of our colleagues picture their thesis research as a lousy job (and will probably strongly disagree with our bold, initial statement), we wish to maintain our position for one simple reason: we are "joint-PhD students." In a nutshell, this means that we get to carry out our research in two different institutions, spending roughly half of the year at each, thanks to an official agreement between our two universities. Twice the fun! (In case you are still having doubts, it also means that we more than double our chances to get access to proper cheese and wine on a regular basis. Think about it.)

Although this alternating behaviour can be socially awkward (e.g., "Hey, see you in six months!"), and can certainly be compared to the behaviour of the migratory species we deal with on a daily basis (such as tuna), we both see it as very beneficial with regards to our PhD theses. Why? Besides avoiding part of the Vancouver monsoon season, it is a great opportunity for us to be part of two very different teams. While the *Sea Around Us* Project has a global scope, our two other institutes have more technical and location-specific skills and a regional-based approach. So we may have twice the fun – and perhaps twice the workload – but we also get twice the impact in our respective fields (global and regional).

Mathieu Colléter:
"I work on marine ecosystem modeling using the Ecopath with Ecosim (EwE) and EcoTroph software. My research aims to better understand trophic functioning (i.e., food chain interactions) and its variability throughout various marine ecosystems, and to eventually address concerns about the potential impacts of

fisheries on this underlying trophic functioning at a global scale. I spent my initial stay at the Fisheries Centre's *Sea Around Us* Project (under the supervision of Dr Pauly) from February to September 2012, and came back in February 2013 after returning to my home institute, *Agrocampus Ouest* in Rennes, France (under Dr Gascuel's supervision). Originally, I was not convinced of the usefulness of this joint-PhD idea, seeing it as constraining rather than anything else. However, I quickly changed my mind, as the gains created by the *Sea Around Us* Project/*Agrocampus Ouest* collaboration clearly outweigh the disagreements caused by moving every six months.

Studying in two different countries, with two different approaches, is mind-opening

"In the end, personal comfort appeared less valuable in the long run, as this joint-PhD offers me a great deal of experiences that would not have been conceivable otherwise. The only drawback I see is that, naturally, I miss wine, cheese and beautiful French ladies half of the year!"

Frédéric Le Manach: "Compared to Mathieu, I organized my joint-PhD the other way round: my main lab is the Fisheries Centre's *Sea Around Us* Project (under Dr Pauly's supervision), and I recently returned from a six-month period at the *Centre de Recherche Halieutique* in Sète, France (supervised by Dr Cury). I focus on global fishing access agreements, and look at the economic, social and ecological implications of these complex deals generally held between developed and developing countries. Ultimately, I would like to be able to propose a framework for these agreements that would be as fair as possible to all stakeholders.

"I feel that being part of these two teams is highly beneficial to my thesis: Vancouver provides me with the global scope of my research, which includes a fair amount of discussion on international relations and economic/political games from the developed countries' perspective. While the team in Sète offers me a remarkable body of knowledge on regional fisheries, for example, in the Indian Ocean and in West Africa. By combining both aspects, I feel like I will be able to cover my research topic more thoroughly than if I had to work with only one of these research groups."

From a personal perspective, we also believe that studying in two different countries, with two different approaches, is mind-opening, in the sense that we get to work with different people, who use different tools, and who certainly have different perspectives on the world out there. We do hope this will be reflected in our future employment opportunities, as we might be able to work under a wider array of situations than other "regular" students.

On a more academic matter, an official joint-PhD agreement (in contrast with other widespread, less official, partnerships) also has other benefits, such as the fact that our degrees will be delivered by two partner universities, as we are registered at both. This means that our diplomas will be recognized in both countries, and that until we graduate, we can access the financial, technical and human resources available at both universities – something which other less formal partnerships may not allow. Finally, we also believe that this is a relatively easy and fairly efficient way to further collaborations between different institutions, which in turn allows us to label the fun we have as "useful."

The bottom line is that, apart from the tiny disagreements involved – such as becoming homeless every six months – we would sign up again if we had to do another PhD (i.e., never!).

ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

The author conducting research on recreational anglers on Galata Bridge, in the Golden Horn estuary of Istanbul (© A. Ulman)

Documenting history in Turkey

by Aylin Ulman

In 2011, I began working for the *Sea Around Us* Project to complete catch reconstructions for Eastern Mediterranean and Black Sea countries. I quickly realized, while studying Turkey's fisheries, that some marine ecosystems of Turkey recently underwent immense reductions of commercial species [1], leading to entire trophic shifts, but little data were available to explain these issues. At the beginning of my MSc with Daniel Pauly in 2012, it was decided that I'd go to Turkey to document the shifting baselines syndrome, i.e., gradual shifts in perception of the ecosystem, and collect details on these missing species/habitats.

My father was part of this study, as he is part of the first generation of scuba divers from Istanbul in the late 1950s and remembers a time long gone-by, when the Bosphorus was pristine and teeming with marine life. He has always been a typical eastern Mediterranean fisher, which does not normally go well with proud marine conservationists such as me. However, documenting shifting baselines in Turkey allowed me to turn his older generation's Turkish traditional ecological knowledge (TEK) into recording the missing pieces of biological history.

To assess the shifting baselines syndrome, I compared today's level of fishing effort,

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catch amounts, catch composition, and mean sizes to the time when these fisheries began; had them rate the quality of fishing now and when they first started; asked about any local extirpations or serious collapses in fish abundances; asked about the changes in catch of several other key taxa; and then queried the fishers about how they would improve fisheries.

The present plight of Turkish fisheries are likely a combination of the following: they have a tremendous fishing fleet (over 17,000 commercial vessels), very sophisticated technology (i.e., sonars and GPS), no catch restrictions, little enforcement of regulations, and also grapple with pollution issues.

The industrial fishers are the true traditional fishers of the country

I attended meetings for both the small-scale and industrial sectors and quickly realized that some sectors were more affected by the changes in biodiversity and catches than others. Consequently, I decided to interview fishers from all sectors (industrial, artisanal, and recreational) to understand their unique perspectives. Thanks to my prior work with the *Sea Around Us*, I knew over 100 Turkish names for fish, which was essential in conducting my surveys. I concentrated mostly on the Istanbul Bosphorus (where fishers depart to fish each of Turkey's four seas), the Dardanelles (home to the most productive migration route for the key pelagic species), and the southwestern peninsula (which separates the Aegean Sea from the Mediterranean).

I first began my survey training on my father's fishing friends in Datça, on the very southwestern peninsula, where he is the vice-president of the local fisheries co-operative. Everywhere, fishers were very open and helpful to me, which surprised me. Many were asking me: "Why does our government not try to learn how our seas have changed, yet a Canadian is out there with us trying to understand it?" I then realized just how privileged we are to be able to conduct this type of study. I was most surprised by how welcomed I was by the industrial fishers. I had gone there with a preconceived notion that these were the bad guys, wielding an immense fishing power. However, I quickly learned that these were the true 'traditional' fishers of the country, many whose families had been fishing for hundreds of years. They really care about the future of the fisheries and are desperately seeking some sort of output control to manage the stocks.

Some industrial-sized driftnets (averaging 6 km in width) in Poyrazköy on the north-eastern tip of the Bosphorus Strait, and me for size comparison. (© A. Ulman)

As I surveyed each fishing sector, and made many new friends, I gained new insights into a few common illegal

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fisheries of the Bosphorus, like the sea snail, Mediterranean mussel and bottom trawl fisheries, and now I have numbers to better estimate them.

I realized that the rate of ecological change is unbelievable for certain areas. For example, the Golden Horn estuary of the Bosphorus was teeming with swordfish, bluefin tuna, lobsters and Atlantic mackerel just 60 years ago, all of which seem to have vanished since the 1970s. Older fishers rarely bring up these species in conversation anymore, but are still haunted by their disappearances.

If I had to remember just a few quotes from this field trip, they would be:

- "Forget about making money [fishing], we do not even enjoy this anymore";
- "30 years ago, 3 months of fishing would leave your pockets full for the other 9 months, now we fish every day and can barely afford our bread";
- "Both small-scale and medium-scale fisheries are just not viable anymore, only the large-scale fisheries can survive, we need to find other work to complement our fishing salaries"; and
- "We have seen the best fishing years imaginable, but our children will only know those years through encyclopedias".

On a side note, I was staying in Taksim Square when I was in Istanbul, where east meets west, and ancient history is met with modernity. There, I got to witness the Turkish national revolution, and its daily progression first hand. Its early stages were a very elated street party, comparable in my lifetime only to the Toronto after the Blue Jay's World Series wins of 1992 and 1993. The educated half of the country united for the first time in history in Taksim Square to oppose actions of the Prime Minister. The protesters went from feeling utterly powerless to realizing that united they were strong, and that the world indeed was listening (for a little while anyways). I have never felt more proud to be Turkish, that is, until they began to use tear gas; I then realized that human rights and democracy have a different meaning than in Canada, and that it was better to be safe than arrested...

"Our children will only know our best fishing years through encyclopedias"

The shifted baselines of Turkey had not been previously studied. There is no other way to find out this information besides speaking to the fishers whom have witnessed these changes first hand. I hope to make my findings accessible to the fishing community in their local publications so that those without the prior ecological knowledge can at least try to imagine it, and even pass it down. Now that we know that Turkish citizens have a voice, it is now time for Turkish fishers to have a voice.

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[1] Ulman A, Bekişoğlu Ş, Zengin M, Knudsen S, Ünal V, Mathews C, Harper S, Zeller D and Pauly D (2013) From bonito to anchovy: a reconstruction of Turkey's marine fisheries catches (1950-2010). Mediterranean Marine Science 14(2): 309-342.

Experiences with the *Sea Around Us* Project

by Beau Doherty

It is hard to believe that it has been only 18 months since I first joined the *Sea Around Us* Project, effectively starting my career in fisheries sciences and marine conservation. Looking back, my former career seems a world away, yet only two years ago I was working as an environmental engineer in Ottawa. I have always loved the oceans, even in my undergrad where I dabbled in biology and oceanography courses, and I immersed myself in books about fisheries and learning about the impacts that humans were having on our marine ecosystems. These readings included, among many others, Charles Clover's *The End of the Line* and Sylvia Earle's *The World is Blue*. I was inspired to try and improve things in our oceans and with that in mind. I left my job and set off to work with a small non-profit group on small-scale fisheries and marine conservation issues in Madagascar.

I returned to Vancouver eager to enter the world of fisheries and make a difference. However, I never imagined that I would get a job working as a Research Assistant with the *Sea Around Us*, alongside some of the very people whose work had inspired me to change careers. I felt extremely lucky and enthusiastically jumped into the exciting world of catch data!

I was assigned to reconstruct catches for countries in the Western Indian Ocean (and the western United States, just for fun), a good area for me given my recent stint in that part of the world. This job basically boils down to answering the question: "How many fish have we *really* extracted from the ocean over the last 60+ years, and from where? If we are to understand how to manage fisheries and rebuild marine ecosystems, it is important to at least know what we have removed from these systems in the past.

This was hard work, painful at times, and it involved many long hours sitting in front of a computer reading through reports and working with electronic catch data. It involved many emails to local experts and digging through much of the grey literature, and due to the different languages in that part of the world… a fair amount of Google Translate.

I never thought I would be thrilled to receive emails with attachments of historical documents or unpublished data sets, but this information was often hard to come by and I was always excited when I finally got my hands on it. I guess this is when I got confirmation that I had officially become a "fish geek". The historical documents were a lens into the past and provided great insight into what fisheries were like in these places several decades ago. There is a wealth of historical data in libraries around the world, which unfortunately are not easily found on the Internet and thus likely to be missed in the literature review for much of the research today. The reconstruction work by the *Sea Around Us* has incorporated information from thousands of such references into usable catch data, much of which otherwise would have been lost. It is a huge accomplishment and I am proud to be part of it.

I quickly learned that working in fisheries was not all about living on the beach and diving on coral reefs. I guess my short 2 months in Madagascar was like a honeymoon, whereas working with catch data has been like a marriage: lots of hard work but very rewarding (or so I've been told by married folks...). I didn't have quite the same view from my cubicle as in Madagascar, but I loved it. I was excited to come into the office every day and learn about fish and I was energized by the people around me.

It was incredible to work in an environment surrounded by so many brilliant and dedicated people working on such a variety of interesting marine research, all of whom were dedicated to improving things in our oceans. It really was inspiring and I tried to be like a sponge, soaking up absolutely as much information as I could.

I didn't have quite the same view from my cubicle as in Madagascar, but I loved it.

I have just started my Master's in the Resource and Environmental Management program at Simon Fraser University, where I will be working with their fisheries group. I will very much miss coming into work everyday at the UBC Fisheries Centre but will continue on with the project part-time and look forward to our future accomplishments.

Captain Beau Doherty cruising around Vancouver Island (© B. Doherty)

ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

Tuna keychains are prizes in Tokyo's version of the claw crane game; fresh or flash-frozen varieties available (© Laurenne Schiller)

Eating Bluefin

By Laurenne Schiller

Typically, when I start writing about the situation regarding the decline of bluefin tuna[1] — which has been primarily driven by demand from the Japanese sashimi market since the late 1970s — my go-to introductory sentences include the words "luxury", "expensive", and "wealthy consumer". The use of this terminology stemmed from a personal belief that bluefin was part of the upper echelon of gastronomic extravagance: the marine equivalent to a Kobe steak or Périgord truffles. Thus, you can imagine my complete surprise when I was in Tokyo this past month and saw it on the menu of every seafood restaurant in which I ate, or passed on the street. Literally, every single one — from 49th floor fine dining establishments, to curbside take-out lunch stands. I honestly could not believe that this fish was still so ubiquitous and, in many cases, inexpensive, when there is so much international pressure to reduce catches and allow for populations to recover.

Bluefin intrinsically holds a special place in my heart; it was the fish that made me decide to go into the field of fisheries science. And so, for me, the thought of eating it would be akin to how some people would feel about eating dog, or horse, or koala. Still, in going to Japan, I promised my travel companion that I would try everything. This decision was also based on one of my fundamental beliefs that in order to have an opinion (good or bad) on anything, it is important to have experienced it first-

1 There are three species of bluefin tuna, each residing in a separate part of the world. However, all of these species have undergone dramatic stock depletions since commercial fishing began.

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hand, and not simply judge based on hearsay or emotion. Still, I know that some may say that a fisheries scientist eating one of the most overfished species in the world could be considered hypocritical, so I will address that thought in a minute.

Tuna is a key component of modern Japan's cultural identity

At any rate, we were less than two days into our travels in Japan when I had to live up to my word. Midway through a ten-course culinary extravaganza at a *ryokan*[2] in Hakone, I found myself staring at a small plate of beautifully arranged sashimi. I knew right away that two of the three pieces were bluefin. Although it might sound silly to some, it actually took me a while to get the nerve up to even poke at it with my chopsticks. All I could think about was when I had visited the world-class aquarium in Monterey Bay and seen these pelagic fish up close and personal for the first time. People sometimes wonder if fish can feel and perceive their surroundings; I guarantee that anyone who has ever looked a bluefin in the eye will know the answer to that question. However, I did my best to put sentimentality aside and kept true to my promise. And honestly, it was the most delicious fish I have ever eaten.

Tuna are everywhere in Japan. And I don't just mean fresh tuna, but tuna culture. There are tuna mascots, tuna murals, tuna t-shirts, and keychains, and stickers, the list goes on. They even have those rip-off mechanical claw vending machines with tuna toys for prizes. It quickly became obvious that tuna is so much more than just a fish — it is a key component of modern Japan's cultural identity. And bluefin is the most iconic of all. However, as mentioned above, populations of this species continue to be rapidly overexploited with no serious conservation or

Bluefin sashimi as part of the meal at the ryokan *(© Laurenne Schiller)*

fishing targets in place. So, in addition to attending a joint symposium on current ocean issues, the other purpose of my trip to Japan was to serve as a rapporteur among a small group of fisheries scientists. Although the agenda was quite unstructured, the overall aim of our gathering was to discuss current and potential management strategies for Pacific bluefin tuna.

Alas, my revolutionized view of Japanese tuna culture combined with a trip to the morning bluefin auction at Tsukiji Market, and four days of intense discussion on all matters scientific, economic, and political, has made me realize that this is a far more complicated issue than simply setting quotas or raising consumer awareness. Perhaps unlike any other wild biological field, fisheries science is unique in that the wellbeing of the studied organisms has a direct connection to the wellbeing of humanity at large. While my friends have asked me why I want to save the fish, this is not a complete representation of why I do what I do. I don't just want to "save the fish". Personally, yes, I do think that bluefin are much more beautiful in the wild than on a plate, but I understand that I am in the minority on this matter. So, ultimately, my goal as a fisheries scientist is to ensure they can survive sustainably into the future as both

Tuna are everywhere in Japan

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a vital component of their natural marine ecosystem and also as food for those who enjoy them in that manner.

Which brings me back to my aforementioned point on hypocrisy. In addition to the overarching goal of finding a sustainable fishing solution for bluefin, I study these fish with the hope of being able to provide accurate information to the public so that they may make informed decisions about what they choose to eat. I do not think it is about telling others what to do, but rather about making sure people are aware that there is an ecological cost to everything we do in life; I understand that in going to Japan to (hopefully) do some good for tuna and tuna fishers, I substantially increased my carbon footprint as a result of the flights it took to get there. Ultimately, however, it is important to decide how to act based on all available information. With regard to eating bluefin, I was completely aware of the ecological impact of my decision. And, for me, the cost to long-term sustainability outweighs however much I enjoyed its taste. So, while I can now understand why people love to eat it, I will refrain from doing so again

Stunning vew of the vieux port *from the Pharo Palace, where the conference was held (© Beau Doherty)*

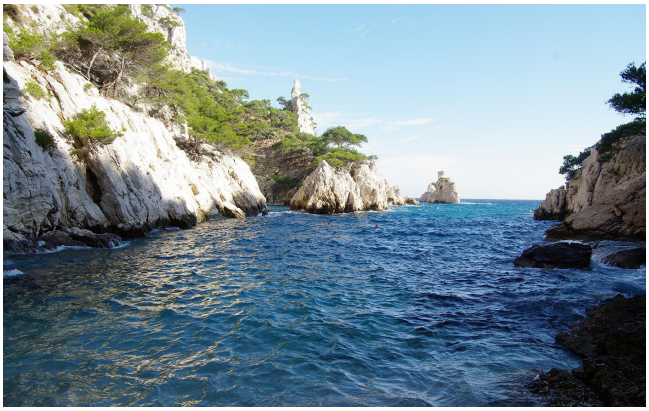
Off to Marseille!

By Beau Doherty

In October I headed to Marseille, France, for the 3rd International Marine Protected Areas Congress. It was my first major conference and I joined over 1,700 participants from around the world. The conference took place at the spectacular Pharo Palace, which sits on a cliff with incredible vistas of Marseille's *vieux port* (old harbour) and which was built in the 19th century for Napoleon the 3rd.

The conference was four days of jam-packed action, each of which had a theme ranging from the use of science and knowledge for better management and enforcement, to regional approaches and partnership with the industry. There were nearly 130 sessions throughout the week geared towards these themes (many can be viewed at www.oceanplus.tv). Since the congress was more about finding solutions for creating and managing MPAs, the sessions were less about individual presentations and more about fostering discussion and networking among the participants.

I co-chaired a session, along with Regen Jamieson of the New England Aquarium, titled "Historical time series



The Calanques of Marseille: a nice place to empty your head after one week of the conference (© Frédéric Le Manach)

and how they support MPAs". Regen presented research on historical whaling logbook data in Kiribati's Phoenix Islands Protected Area, and I — along with Frédéric Le Manach and Dr. Daniel Pauly — presented work from the *Sea Around Us* Project's catch reconstructions,[1] using Mayotte as a case study. Many of the participants were interested in the use of catch reconstructions and historical data to deal with large gaps (missing or incomplete data) in official catch statistics. There was a real understanding of the need for more complete time-series and the use of past information to avoid shifting baselines and achieve conservation goals, and this was emphasized during the following plenary session.

Throughout the week, I met many inspiring people from around the world working hard to protect our oceans. I also got a chance to visit the nearby Calanques, which are these stunning white limestone cliffs that dip into the blue Mediterranean, so I couldn't resist taking a dip myself.

One of the highlights for me was listening to two Pitcairn islanders — one of which was the mayor — speak passionately about their wish to create a marine reserve in their islands. Pitcairn is a British Overseas Territory composed of 4 remote islands in the South Pacific with a population of around 55 people. These two people — i.e., almost 4% of Pitcairn's total population — had spent several days travelling on boats, planes and trains halfway around the world to speak with us… and I thought I had come a long way. It would have been an amazing cap off to the week, had the British government announced there and then their support to create the largest marine reserve in the world in Pitcairn, but sadly this ribbon has yet to be cut. The residents of Pitcairn both delivered truly heartfelt messages about their vision and desire to protect the marine ecosystems in their home islands and preserve this natural treasure for the world.[2] Hopefully the British government will hear their message loud and clear.

There was a real understanding of the need for more complete time-series

Finally, an interesting outcome of this non-scientific congress was that each session had to summarize its findings and recommendations for MPA policies. These summaries were then presented to representatives of governments (including 19 Ministers) and international institutions and NGOs, over a two-day political conference in Corsica that immediately succeeded the conference in Marseille. There, the French Minister of Ecology Philippe Martin and HSH Albert II of Monaco announced the creation of a Trust fund[3] for the management of marine protected areas in the Mediterranean

1 This project aims to improve historic estimates of marine landings for every region of the world from 1950-2010. More information and results at www.seaaroundus.org.

2 More information on the proposed marine reserve in Pitcairn can be obtained at the "Protect Pitcairn: An Underwater Bounty" campaign at www.pewenvironment.org

3 More at: www.impac3.org/en/news/all/382-french-announcements-at-the-ajaccio-conference

Verbatim

From Douglas C. Harris, Faculty of Law at Allard Hall, The University of British Columbia.

«Hello Daniel.

I've never been to a concert and heard the lead singer cite a fisheries scientist, but it happened last night in Buffalo when Gord Downie of the Tragically Hip, in a solo concert, described your shifting baselines idea and cited you! It's not a citation that will show up in a citation count, but a 1,000 plus were introduced to a clear explanation of your idea and much of what it entails from Downie. To be fair, it was about half concert and half Downie holding forth on the state of Lake Ontario. Still it was nice to hear.»

ISSN 1713-5214 Sea Around Us (ONLINE)

Sea Around Us

The Prime Minister of Senegal opening the Forum of the Regional Marine and Coastal Conservation Programme for West Africa (©PRCM)

Discussing catch reconstructions in Senegal

By Dyhia Belhabib

If I had to summarize my previous journeys in Senegal in one word, I would certainly use 'denial' for the first trip, 'hope' for the second, but many words for my last visit to Dakar last November when Dr. Daniel Pauly and I represented the *Sea Around Us* Project at the Forum of the Regional Marine and Coastal Conservation Programme for West Africa (*Programme Régional de Conservation de la zone côtière et Marine*; PRCM). The description of the Forum that can be found on the PRCM website underlines the importance of this event (www.forumprcm.org).

The theme of the Forum was 'Investing in coastal and marine conservation for the wellbeing of populations', and as suggested, its goal was to put forward ideas about the use of nature with a view to improve the wellbeing of people relying on it. Many different stakeholders were present (e.g., NGOs, professional fishers, scientists, decision-makers) and were eager to discuss sustainability and conservation.

I was delighted to meet again our collaborators and colleagues from Cape Verde, The Gambia, Guinea, Guinea-Bissau, Liberia, Morocco, Senegal, and Sierra Leone, as well as from the Fishery Committee for the West Central Gulf of Guinea (FCWC) countries, notably Ghana and Côte d'Ivoire. On a lighter note, a young man from Tanzania presented his journey as he biked from Chile to Tanzania, raising awareness about the environment and funds for Tanzanian students along the way. He also reminded me that I am not the only person in this world who needs a visa to go to conferences and talk about issues and potential solutions for a sustainable use of the ocean. After all, if fish needed a visa, the issue of illegal fishing would

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The author presenting her results on Illegal, Unreported, and Unregulated (IUU) fisheries in West Africa (©PRCM)

not be that bad. Illegal fishing was actually one of the topics of the Forum, and our colleague Duncan Copeland talked about how to implement efficient, non-expensive solutions to tackle illegal fishing. While some Mauritanian representatives claimed that illegal fishing was no longer as significant as it was in the past, a representative from Guinea-Bissau stated that the coastal waters of "Bissau looked like Hong Kong at night", referring to the lights of the industrial fishing boats illegally venturing into artisanal fishing grounds at night. Afterwards, I was not able to make up my mind between 'content' — as 'admitting' is the first step towards 'healing' — or 'sadness' — as the issue of illegal fishing is now so important, that being politically correct is no longer an option.

The presence of journalists made for a great opportunity for the *Sea Around Us* Project to share our knowledge of West African fisheries with the public, and to emphasize the implications of our catch reconstruction work. For example, I had the opportunity to clarify some points such as "women's catches are not substantial, therefore, it is not an important activity". Indeed, one can argue that if this activity allows women to be financially independent and provide their households with food, then, it is of paramount importance, regardless of the volume of the catch (especially if vulnerable species are targeted).

"Bissau looked like Hong Kong at night"

At the end of the day, the Forum was a very productive experience for the *Sea Around Us* Project, as NGOs, research institutes, and regional organizations were eager to use and work with the catch reconstruction results. Indeed, they all agreed that looking at the impact of local small-scale fisheries, filling data gaps, and contributing to capacity building in the region is an important process. For example, we discussed catch reconstructions with representatives from Morocco (who were keen to work with us) and from the FCWC region (with whom we recently signed a Memorandum of Understanding), as well as with traditional community representatives such as the Imraguen, who constantly remind us of the reasons why we are fighting to save our oceans.

After the Forum, Daniel and I had the honour of having an informal lunch with his Excellency the Minister of Fisheries of Senegal, Haïdar El Ali, who informed us of his decision to invite the Sea Shepherd Conservation Society to act in Senegal. It was pleasant to have a conversation with him as he seemed to be a person who is deeply driven by conservation. As we came back from Dakar, we also learned that Senegal had just arrested illegal Russian fishers despite diplomatic pressure from Russia. This action was backed by numbers the *Sea Around Us* Project estimated with colleagues from USAID and many other Senegalese organizations

Dr. Daniel Pauly answering a question regarding the estimation of errors in the fisheries catch reconstructions (©PRCM)

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The authors (center and right) at the 6th ordinary session of the conference of Ministers of the Fishery Committee for the West Central Gulf of Guinea (courtesy V. Koutob)

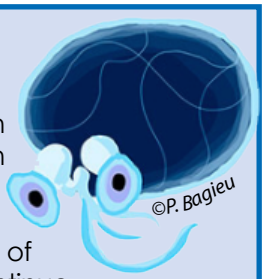
Fostering collaboration in the Gulf of Guinea

By Viviane Koutob and Duncan Copeland

As part of the 'Marine Conservation Research, Collaboration and Support in West Africa' project, the *Sea Around Us* Project was invited by the UN Food and Agriculture Organization's Fishery Committee for the West Central Gulf of Guinea (FCWC) to present some catch reconstruction materials, methods and results. One of the objectives of this project was to develop a strong collaborative relationship between the *Sea Around Us* Project and key regional stakeholders. This included a wide engagement with — and support for — governments, research institutes, and NGOs. Thus, on December 11-13, about forty people from the fisheries and aquaculture sectors and representing Member States, local partners, research institutes, and regional projects attended to the 6th ordinary session of the Conference of Ministers of the FCWC in Cotonou, Benin. We presented the methods and results of several catch reconstructions in the region.

Overall, the results of the catch reconstructions were welcomed by the participants. Civil society stakeholders and country representatives of Côte d'Ivoire, Togo and Benin showed great interest in having the *Sea Around Us* Project reconstruct their catches with a view to help them manage their marine resources. Although most reconstructions are already done for the UN Food and Agriculture Organization's Sub-Regional Fisheries Commission (SRFC) countries, a partnership is currently being signed between *Sea Around Us* Project and the Ministerial Conference on Fisheries Cooperation Among African States Bordering the Atlantic (ATLAFCO), to improve the available data and develop collaboration opportunities among its Member States

Note from your Editor!



In the March-April 2013 issue of the *Sea Around Us* Newsletter, you read an article on the then ongoing deep-sea negotiations in Europe. On December 10th, the European Parliament eventually rejected the proposition of the Commission to phase-out deep-sea bottom trawling and allowed this practice to continue for, at least, the next five years. But — because this story is not complicated-enough — a few Members of Parliament got confused with the meaning of 'yes' and 'no', and voted for it to continue although they publicly took position against it. They notified the European Union, but the vote cannot be undone, although it would have changed its outcome! Interestingly, it also seems that the majority of deep-sea fish retailers are exiting this market, fearing that the nearly one million people who signed a petition asking Members of Parliament to forbid this practice would go to other brands. The future will tell us whether such a market-based move without any binding regulations is viable... so stay tuned!

Sea Around Us

Here's what all the fuss is about — cannonball jellyfish Stomolophus meleagris *(© L. Brotz)*

Jellyfishing in Mexico: the burgers are ready

Andrés Cisneros-Montemayor and Lucas Brotz

On a warm winter day in the capital of Sonora, a state in northern Mexico bordering the Gulf of California, over 80 stakeholders gathered for a pre-opening fishery planning meeting. Such a meeting — which included fishers, processors, scientists, and managers — is not unusual, but the fishery in question is anything but traditional. These men and women had come to discuss what has recently become one of the most valuable fisheries in the region: jellyfish.

The fishery for *Stomolophus meleagris*, the cannonball jellyfish (locally called *medusa bola de cañon*, or the generic *aguamala*), first started in the region in the early 2000s, with one well-established company hiring about 70 small boats (*pangas*) to dip-net for jellyfish. In addition to the fishers, hundreds of workers were employed to help dry, salt, bleach, and package product for export to Asia. Fishers were paid about 6 cents US per kilo and the fishery lasted for up to four months, a boon during the dog months between the shrimp and crab seasons. Over the last decade, this new economic incentive in the absence of strong management and enforcement capacity has played out like a textbook case of the tragedy of the commons. Last year, over a thousand boats fished for jellyfish, at least two dozen processing plants sprang up (some of them literally beach-side tents paying cash), and the price paid to fishers more than tripled.

The fishery lasted for five days until there were no more jellyfish to catch.

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Processing plants may handle hundreds of tonnes of jellyfish in a single day (© Javier Álvarez-Tello).

Dr. Miguel Cisneros-Mata is the government researcher tasked with providing scientific advice for jellyfish management in the region. Over the course of the next few weeks, he and a team of young researchers from the National Fisheries Institute research station in Guaymas, Sonora, will survey the entire state coast for jellyfish. They will investigate the abundance and size structure of local jellyfish "veins" in order to recommend an opening date for the fishery, along with other advice for managers. We joined two such surveys, one in central Sonora (Las Guásimas) and one further south in Bahia Lobos, within native Yaqui territory. Between surface tows, GPS mapping, and biometric sampling, these surveys provide an excellent avenue for discussing new data, rumours and experiences from fishers, as well as providing a better idea of the fishery both in ecological and human terms.

[the fishery] has played out like a textbook case of the tragedy of the commons

A recurring theme in discussions with fishers, processors, and scientists, is the issue of truly enforcing science-based fisheries policy. Everyone agrees with and understands the need for size limits and spatial closures, but limited enforcement capability is a fact of life here, and there is little trust that handshake agreements will hold up beyond the first transgression. Dr. Cisneros-Mata thinks the keys to achieving a sustainable fishery include spatial zoning and processing plants. The entire coastline cannot be patrolled, but if processing plants can be held accountable for the jellyfish they receive, restrictions on size could trickle down to fishers. One processor at the jellyfish planning meeting, after openly (and rather refreshingly) admitting that their firm encourages illegal fishing in order to compete with others, stated that "you don't need much infrastructure to process jellyfish, we can do it as well as anyone; so why should only a few processors make the big money from this?"

Processed jellyfish nearly ready for export to Asia (© Javier Álvarez-Tello).

We have come to accept free markets as vital for economic growth, and restricting the number of jellyfish processors would likely bring the associated troubles of a planned economy. However, any processor should be required to comply with transparent safety, sanitation, and fisheries management guidelines in order to operate (so, no more

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Our mailing address is UBC Fisheries Centre, Aquatic Ecosystems Research Laboratory, 2202 Main Mall, The University of British Columbia, Vancouver, BC, Canada,V6T 1Z4. Our e-mail address is seanotes@fisheries.ubc.ca. All queries, subscription requests and address changes should be sent to Frédéric Le Manach, the *Sea Around Us* Project Newsletter editor.

The Sea Around Us Project website can be accessed at www.seaaroundus.org and contains up-to-date information on the Project.

The *Sea Around Us* Project is a scientific collaboration between the University of British Columbia and The Pew Charitable Trusts that began in July 1999. The Pew Charitable Trusts work around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

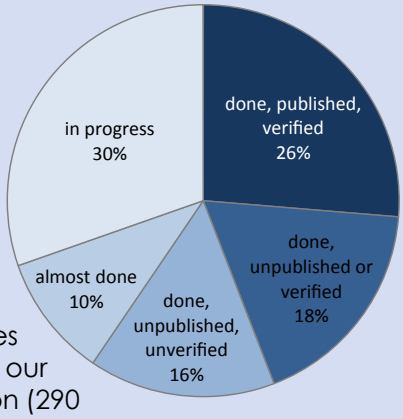
tents). Combined with a flexible and adaptive framework for allocating fishing permits, as well as implementing policies in accordance with regional abundances of jellyfish (which are highly variable), this would allow for a natural restructuring of the sector where policies would be dictated by regional ecology while the business of processing could regulate itself.

Fisheries for jellyfish also present a unique set of management challenges due to the peculiar life cycles of the organisms. Many jellyfish, including cannonballs, have a bipartite life cycle. We are all familiar with the 'medusa' phase, but after spawning, fertilized eggs form ciliated larvae that seek out hard substrate in coastal waters. These larvae then metamorphose into tiny polyps that resemble miniature sea anemones or coral polyps without skeletons (note that all of these organisms belong to the phylum Cnidaria). Little is known about the sessile polyp phase, especially in the field, but polyps can presumably survive for years, sometimes even transforming into cysts capable of resisting harsh environmental conditions. When conditions are favourable, polyps will undergo a dramatic metamorphosis where they begin to segment and asexually release 'ephyrae' (baby jellyfish), in a process known as 'strobilation'. Each polyp may release numerous ephyrae and will often strobilate more than once within the same season. Ephyrae join the plankton, grow rapidly, and develop into medusae, resulting in a jellyfish bloom. Abundances of jellyfish vary dramatically between years, and the environmental conditions that control their populations are not well understood. As such, determining the 'fishable stock' of jellyfish is difficult. While jellyfish polyps may provide a buffer against overfishing, they are not a guaranteed safeguard. Jellyfish fisheries have been depleted in other parts of the world, and although preliminary, recent catch data suggest that a similar trend could be unfolding in the Gulf of California.

The unique challenges presented by jellyfish fisheries, combined with the complicated situation of regulation and enforcement in Mexico, leaves us with more questions than answers. What should be the targets and goals of the cannonball fishery? Will maximizing economic profit restrict resources to only a few? Is the jellyfish fishery doomed to repeat the fate of so many other depleted stocks in the region and around the world, or can it be a sustainable resource? And perhaps most importantly, how bad have things become when thousands of people are fighting over jellyfish?

Note from your editor!

THE RECONSTRUCTIONS ARE ALMOST DONE!



Kyrstn Zylich and Vicky Lam — our database wizards — have compiled data on our worldwide project of marine fisheries catch reconstructions, and only 30% of them are yet to be completed (but all are in progress). The other 70% are completed, although not entirely validated or published yet.

Dr. Daniel Pauly has also compiled and/or written over 200 summaries of these reconstructions, which will represent the backbone of our forthcoming Atlas. However, since this is only halfway to completion (290 summaries expected), the June publishing date has been pushed back to August.

The *Sea Around Us* Project is as productive as ever, with — to date — over a dozen articles in peer-reviewed journals (including Conservation Biology, Cybium, Fish and Fisheries, Fisheries Research, Global Environmental Change, PLOS ONE, and Scientia Marina), as well as several books chapters, e.g., by D. Al-Abdulrazzak, D. Zeller and D. Pauly (University of California Press), and S. Villasante, U.R. Sumaila and M. Antelo (Oxford University Press). Many Fisheries Centre Working Papers have also been published online since the beginning of 2014 (available at: www.fisheries.ubc.ca/biblio/type/1001, and one report in the Fisheries Centre Research Reports series has been completed (with many others on their way; available at: www.fisheries.ubc.ca/biblio/type/1000).

With the reconstructions nearing completion, this list is expected to grow by the day... so you can now get back to your reconstructions!

Sea Around Us

The Fisheries Centre was well represented at the CREAM Conference in Barcelona, with, from left to right, Dr. Philippe Cury (International Advisory Council Member), Dr. Marta Coll (former visiting scientist), Chiara Piroddi (former student), Dr. Simone Libralato (former visiting scientist), Dr. Daniel Pauly (Principal Investigator of the Sea Around Us*), and Aylin Ulman (current student) (courtesy A. Ulman).*

CREAM Conference in Barcelona

By Aylin Ulman

On April 9 and 10th, 2014, Dr. Daniel Pauly and I joined the international CREAM (Coordinating Research in support to application of Ecosystem Approach to Fisheries and Management advice in the Mediterranean and Black Seas) conference in Barcelona. The conference itself was hosted at the lovely seaside Institut de Ciències del Mar, located in the Vila Olímpica district.

Dr. Pauly opened the conference as keynote speaker by giving an overview of the *Sea Around Us* global catch reconstruction project, and illustrated several individual results. Dr. Marta Coll and Chiara Piroddi (former visiting scientist and student of the Fisheries Centre, respectively), as well as myself then presented the results of four Mediterranean catch reconstruction case-studies: Spain, France, Italy and Turkey, respectively. From these presentations, it became apparent that Mediterranean fish stocks have been rapidly declining for the last couple of decades, likely earlier than the reported data suggest.

The conference had a healthy fusion of scientists both from the northern and southern Mediterranean, necessary in the context of Mediterranean fish stocks, since many stocks are shared. One fact which shocked many of us was that the Egyptian Mediterranean has over 1,000

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bottom trawlers in operation, atypical of the region. Talks which I found very interesting included Dr. Jordi Leonhart's example of a successful co-management regime in the sand-eel fishery of Catalonia, Dr. Marta Coll's Mediterranean-wide initiative to develop a new set of indicators to assess exploitation status, Dr. Francesc Maynou's results of his 'Shifting Baselines' assessment of elasmobranches in the Mediterranean, and Dr. Simone Libralato's multi-fleet EwE (Ecopath with Ecosim) model to manage multi-species fisheries.

Mediterranean fish stocks have been rapidly declining for the last couple of decades

On a networking level, this meeting was very important for my ongoing projects. Collaborations and the sharing of information are crucial in the success of marine conservation work, most of which is fairly new to me. I was delighted to meet some Turkish scientists I did not know previously and discuss the local problems and initiatives at depth (which is part of my thesis). In addition, I got some advice on statistical analysis techniques I could apply to some of my survey results on the 'Shifting Baselines of the Turkish and Cypriot fisheries'.

The end of the conference closed with a round-table discussion on how best to implement the Ecosystem Approach to Fisheries framework in the Mediterranean and Black Seas. Before ensuring that there are enough fish to sustain the fisheries and all the stakeholders, including even the seabirds as Dr. Philippe Cury suggested, the rapid decline of fisheries first must be dealt with, before it becomes irreversible because certain thresholds will have been bypassed.

Some of the key points emphasized were that:

- A new vision is urgently needed for the Mediterranean and Black Sea fisheries;
- Processes, not only problems, need to be monitored;
- Leading policymakers need to be convinced that fisheries matter; not only oil & gas, tourism and aquaculture;
- A compliance committee needs to be established to ensure that overcapacity is dealt with; this is an illness and should be treated with prescriptive medication;
- More science is not necessarily needed; rather, clear messages and fast solutions are needed;
- Research needs to continue to be a collaborative process utilizing social and economic indicators;
- Co-management needs to incorporate the Traditional Ecological Knowledge (TEK) of fishers, since fishers have lifetimes of important understanding, and excluding them from management undermines our collective knowledge;
- Successful case-studies of ecosystem-based management need to be shared and promoted;
- Research and the inclusion of small-scale fishers is almost totally lacking in this large marine ecosystem. However, they are the largest sector in terms of players, which should warrant more attention; and
- Marine Spatial Planning is multi-zone management as a mosaic, and the health of the ecosystem is not just for fisheries but for all stakeholders. Perhaps there are too many actors in too small an area

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The Sea Around Us Project website can be accessed at www.seaaroundus.org and contains up-to-date information on the Project.

A beautiful view of Rome from the United Nations Food and Agriculture Organization's (FAO) headquarters (© D. Belhabib).

The *Sea Around Us* at FAO's Headquarters

By Dyhia Belhabib

As part of the *Sea Around Us* reconstruction of worldwide marine fisheries catch, we always end up comparing our results to the data supplied to the United Nations Food and Agriculture Organization (FAO) by its Member Countries; statistics which eventually make their way to us through FAO's software FishStatJ. It is these official catches that we complement with what is missing, e.g., industrial discards, subsistence catches, illegal catches of various sectors. Although this approach does not assume by default that these official data are wrong (but rather lacking to account for non-commercial sectors), it often has to face a certain degree of controversy. This is particularly true while attending official meetings.

Just when I thought I had managed to go through the most challenging meetings I could ever have to attend with regards to catch reconstructions — i.e., facing government officials supplying the original data to FAO — I had the immense honour to go to FAO's headquarters in Rome, Italy, to present some key findings of West African catch reconstructions at the Second Symposium on Fishery-Dependent Information, on March 3-6 2014. This symposium was designed for "resource managers, scientists and the fishing sector [and focused] on the collection and interpretation of information in the context of the ecosystem approach". I was there, stepping upon the previously known great empire of Julius Cesar.[1]

Although the conference — I thought — was largely at the disfavour of the developing countries,[2] the very fact that a 'fisheries dependent data' conference was organized and included a fair number of colleagues from developed countries meant a great deal to me with regards to the global effort of the *Sea Around Us*: "You may be rich, but you still depend on fisheries catch data — just as any other developing country."

I was really surprised to see that our methods — although more global in scope — were reproduced at very local scales and were generally welcomed. This certainly

1 Or at least, what remains of it — lots of ruins and valuable rocks. This reminded me that too much power and expansion often leads to losing control and ultimately collapse, an interesting analogy to present day fisheries.

2 The United States, Europe and Norway were particularly well represented.

contributed to de-emphasizing the controversy and putting the emphasis on interpreting the results, where it always should have been.

I was privileged to be one of the very few people to talk about West Africa, or should I say Africa at all. Accompanied and supported by Angela Bednarek (from The Pew Charitable Trusts), the talk went smoothly, and questions about common issues, e.g., uncertainty and lack of data, were not raised. Apparently, these issues were common for everyone in the room; a room filled with senior FAO staff members, so I used this opportunity to introduce myself.

A brief encounter with one of these senior FAO staff member was most surprising. I was told things such as "we saw that official landings were increasing sharply in some islands, and we discovered that some countries were adding 6% every year, which is very dubious", or "some countries even question the very fact of supplying data to us", or "a lot is missing from their data". So it was clear to me that even FAO staff members are perfectly aware of — and understand — the issues that we are dealing with on a daily basis, and that a 'zero' is the worst possible estimate for a sector that may well not be marginal at all.

Yet — and ironically-enough — this uncertainty appeared to vanish when I mentioned that the catch reconstructions by the *Sea Around Us* are meant to address this very issue, i.e., reduce that uncertainty. These issues were particularly apparent with poor countries, notably those of Africa, and the situation of having developed countries over-represented did not help. I, for one, felt that it was unfair for Africa, along with other developing regions of the world, to be under-represented despite the immense efforts of the organizers and the hosts. We often think we know what to do when we have the money and capacity to monitor fisheries, but we have to start accepting alternative solutions for the other, less wealthy countries.

We have to start accepting alternative solutions for the other, less wealthy countries

The next meeting where there will be opportunities to continue these discussions will be on the occasion of the meeting of the Committee on Fisheries (COFI) in June, described in the FAO website as "the only global inter-governmental forum where major international fisheries and aquaculture problems and issues are examined and recommendations addressed to governments, regional fishery bodies, NGOs, fishworkers, FAO and international community, periodically on a world-wide basis". Hopefully, this will provide the opportunity for starting a more sustained collaboration

The Salish Sea in FishBase and SeaLifeBase

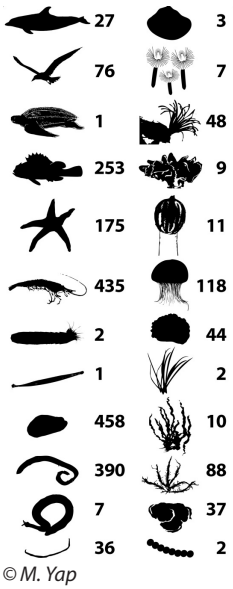
By ML Deng Palomares and Nicolas Bailly

We reviewed the biodiversity of the Salish Sea and its regional components (Puget Sound, Straits of Georgia, and Juan de Fuca) based on the incorporation into major databases — i.e., FishBase (www.fishbase.ca) for fish and SeaLifeBase (www.sealifebase.ca) for other marine organisms — of a massive body of literature data. The objective was to document the marine biodiversity of the Salish Sea, and if possible to complete this documentation for marine vertebrates.

This information is vetted for quality and can be compared with information from similar ecosystems. The review resulted in a complete list of about 250 fish species for the Salish Sea in FishBase (over 150 for Puget Sound, about 200 for the Strait of Georgia, and about 140 for the Strait of Juan de Fuca), and over 2,000 marine species in SeaLifeBase, extracted from about 100 published sources (see figure on the right side).

Though documentation is ongoing (notably for marine invertebrates), we can now say that overall, the Salish Sea is as biodiverse as can be expected of a temperate ecosystem of its size, i.e., 17,000 km^2.

This work was presented as the sole 'fish' contribution at the session on 'Marine Birds and Mammals of the Salish Sea: Identifying Patterns and Causes of Change' during the 2014 Salish Sea Ecosystem Conference (April 30-2 May 2014) held at the Washington State Convention and Trade Center in Seattle, Washington



© M. Yap

Sea Around Us

One last word...

Daniel Pauly

The *Sea Around Us* started in July 1999. At the time, we called it the '*Sea Around Us* Project', because we thought it would last only a few years, as most projects do. But the *Sea Around Us* lasted because it quickly found its niche and generated products — notably publications and global online databases — that a growing number of colleagues in the scientific and conservation community found useful. Among them was our principal funder, The Pew Charitable Trusts.

While I outlined the goal of the *Sea Around Us* in 2006,[1] our progress in the 15 years since July 1999 is documented in 5-year and 10-year cumulative reports, to which a third, 15-year report, will be added by the end of 2014.

One constant throughout these 15 years has been the *Sea Around Us* Newsletter, of which one issue was published in 1999, followed by 81 issues in the following years (i.e., 5–6 issues per year). The founding editor of the *Sea Around Us* Newsletter was Ms. Nancy Baron, a Canadian journalist[2] and naturalist[3] now with the National Center for Ecological Analysis and Synthesis in Santa Barbara, CA (USA). She was followed as Newsletter editor by a succession of PhD and MSc students: Melanie Power (until June 2002), Robin Forrest (until June 2008), Megan Bailey (until December 2011), Lisa Boonzaier (until June 2013), and finally Frédéric Le Manach. This 83rd issue is the last one, and I thank them all very much.

The *Sea Around Us* now has a new main funder, the Paul G. Allen Family Foundation (see page 2). We will work with its implementation arm, the Seattle-based Vulcan Inc. (www.vulcan.com) to develop a new web-based approach to delivering our products, including material so far published through our Newsletter.

These new approaches will include social media and will be implemented in the course of 2015. In the meantime, we will be announcing new products (especially publications), mainly through our website (www.seaaroundus.org). There, the interested reader will also find a single searchable file that will include all 83 issues of the *Sea Around Us* Newsletter.

All is left is to thank you, dear Reader, for your interest in the *Sea Around Us*. We hope it will last beyond this transition

1 Pauly D (2007) The *Sea Around Us* Project: documenting and communicating global fisheries impacts on marine ecosystems. AMBIO: a Journal of the Human Environment 34(4): 290–295.

2 Baron N (2010) Escape from the ivory tower: a guide to making your science matter. Island Press, Washington, DC (USA).

3 Baron N and Acorn J (1997) Birds of coastal British Columbia. Lone Pine Publishing, Vancouver, BC (Canada).

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The Paul G. Allen Family Foundation grants $2.6 million to improve data on world fisheries

UBC Media Release

The University of British Columbia's *Sea Around Us* has received $2.6 million (U.S.) from The Paul G. Allen Family Foundation to provide African, Asian, and other countries with more accurate and comprehensive fisheries data to help them better analyze and support their ocean resources and local economies.

"This generous support will help UBC fisheries researchers work with countries to better understand the industry's impact on marine ecosystems and its social and economic benefits", UBC President Arvind Gupta said. "The Paul G. Allen Family Foundation is giving our researchers an exceptional opportunity to work with global communities". The project, led by UBC Fisheries Centre Professor Daniel Pauly and Dr. Dirk Zeller, will provide comprehensive catch data and data collection methods to policy-makers and nongovernmental organizations working with countries in West Africa, East Africa, the Arab world and South Asia.

Researchers will help countries use these data to address national policies related to four main problem areas:

- Increasing public transparency of access agreements for foreign vessels to fish in a country's waters;
- Improving inadequate methods for recording or estimating fish catches;
- Improving poor policy and management environments for local small-scale fisheries; and
- Deterring Illegal fishing by foreign fleets.

"This project is significant for the global fisheries community", Pauly said. "The data collected will help governments make informed national policy decisions by balancing economic growth with resource preservation".

Sea Around Us started this project June 1, 2014, and it will run to June 1, 2016. The Paul G. Allen Family Foundation's funding will also support FishBase, the Philippines-based research partner of *Sea Around Us*, which aims to create the largest and most extensively accessed online database about fishes on the web

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The original press release (published by UBC on August 20, 2014) is available at: http://news.ubc.ca/2014/08/20/the-paul-g-allen-family-foundation-grants-2-6-million-to-improve-data-on-world-fisheries/

About The Paul G. Allen Family Foundation

Launched by Microsoft co-founder and philanthropist Paul G. Allen and Jody Allen in 1988, the Allen family's philanthropy is dedicated to transforming lives and strengthening communities by fostering innovation, creating knowledge and promoting social progress. Since inception, the Foundation has awarded over $500 million to more than 1,500 non-profit groups to support and advance their critical charitable endeavours in the Pacific Northwest and beyond. The Foundation's funding programs nurture the arts, engage children in learning, address the needs of vulnerable populations, advance scientific and technological discoveries, and provide economic relief amid the downturn. For more information, go to www.pgafamilyfoundation.org.

About UBC's *start an evolution* campaign

This gift forms a part of UBC's *start an evolution* campaign, the most ambitious fundraising and alumni engagement campaign in Canadian history with the twin goal of raising $1.5 billion and involving 50,000 alumni annually in the life of the university by 2015.

The *Sea Around Us* is a scientific collaboration between the University of British Columbia and The Pew Charitable Trusts that began in July 1999. The Pew Charitable Trusts work around the world to establish pragmatic, science-based policies that protect our oceans, wild lands and climate. Pew also sponsors scientific research that sheds new light on the dimensions of and solutions to the problems facing the global marine environment.

List of 2014 *Sea Around Us* publications (as of October 31st)

Peer-Reviewed Journals

Al-Abdulrazzak D and Pauly D (2014) Ground-truthing the ground-truth: reply to Garibaldi *et al.*'s comment on "Managing fisheries from space: Google Earth improves estimates of distant fish catches". ICES Journal of Marine Science 71(7): 1927–1931.

Belhabib D, Koutob V, Sall A, Lam VWY and Pauly D (2014) Fisheries catch misreporting and its implications: the case of Senegal. Fisheries Research 151: 1–11.

Belhabib D, Koutob V, Sall A, Lam VWY, Zeller D and Pauly D (in press) Counting pirogues and missing the boat: reply to Chaboud *et al.*'s comment "Fisheries catch misreporting and its implications: the case of Senegal". Fisheries Research.

Cheung WWL, Brodeur RD, Okey TA and Pauly D (2014) Projecting future changes in distributions of pelagic fish species of Northeast Pacific shelf seas. Progress in Oceanography , DOI: 10.1016/j.pocean.2014.09.003.

Christensen V, Piroddi C, Coll M, Steenbeek J, Buszowski J and Pauly P (2014) A century of fish biomass decline in the ocean. Marine Ecology Progress Series, 512: 155–166.

Coll M, Carreras M, Cornax MJ, Massutí E, Morote E, Pastor X, Quetglas A, Sáez R, Silva L, Sobrino I, Torres MA, Tudela S, Harper S, Zeller D and Pauly D (2014) Closer to reality: reconstructing total removals in mixed fisheries from Southern Europe. Fisheries Research 154: 179–194.

Davidson DJ, Andrews J and Pauly D (2014) The effort factor: evaluating the increasing marginal impact of resource extraction over time. Global Environmental Change 25: 63–68.

Greer K, Harper S, Zeller D and Pauly D (2014) Evidence for overfishing on pristine coral reefs: reconstructing coastal catches in the Australian Indian Ocean Territories. Journal of the Indian Ocean Region 10(1): 67–80.

Harper S, Guzmán HM, Zylich K and Zeller D (2014) Reconstructing Panama's total fisheries catches from 1950 to 2010: highlighting data deficiencies and management needs. Marine Fisheries Review 76(1–2): 51–65.

Kleisner K, Mansour H and Pauly D (2014) Region-based MTI: resolving geographic expansion in the Marine Trophic Index. Marine Ecology Progress Series, 512: 185–199.

Leitão F, Baptista V, Zeller D and Erzini K (2014) Reconstructed catches and trends for mainland Portugal fisheries between 1938 and 2009: implications for sustainability, domestic fish supply and imports. Fisheries Research 155: 33–50.

McClenachan L, Neal BP, Al-Abdulrazzak D, Witin T, Fisher K and J. Kittenger (2014) Do community support fisheries (CSFs) improve fisheries sustainability? Fisheries Research 157: 62–69.

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