

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

The *Sea Around Us* database contains information about the name, location, area in km², 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



Figure 1. Map showing the location of the 1201 estuaries in the *Sea Around Us* project

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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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.

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 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),

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

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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.

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 studenthood. 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.

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

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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.

“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

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

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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,

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.

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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.



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

Social scientists go to GLOBEC

By Ussif Rashid Sumaila

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.

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.

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



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

Photos by J. Alder



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).

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