

Sea Around Us

Four years of the *Sea Around Us* Project

by Daniel Pauly
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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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Issue 18 – July/August 2003

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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.

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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

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



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.

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.

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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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 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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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 Okhotsk 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.

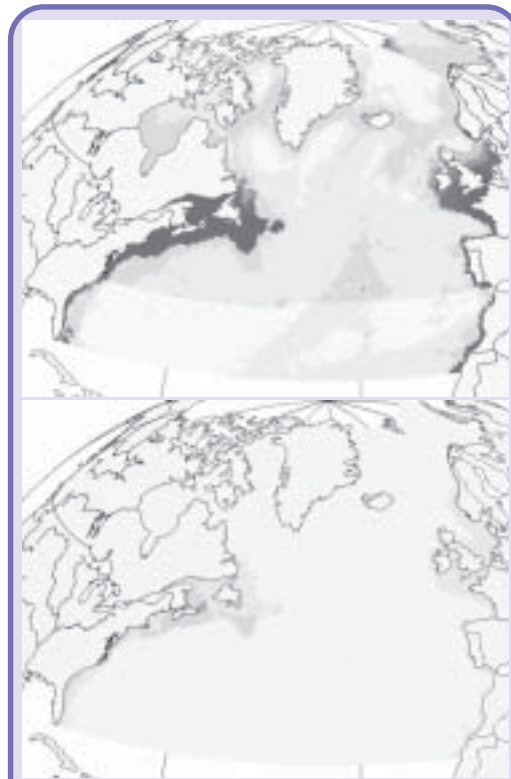
The SAUP project is now entering its 5th year. Herein, emphasis will be given to small-scale fisheries and their catches,

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

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.

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,

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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 in 1900. Bottom: estimated biomass distributions for the same in 1999, 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 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

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.

