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).

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.
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.

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

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

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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
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.

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).
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).

**Figure 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).

### 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).

### 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.

*Continued on page 5*
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.

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

\[ \text{Fig. 5. Graph of commercial catches taken by countries fishing in Mauritanian EEZ waters since 1950.} \]

\[ \text{Fig. 6 Primary production for the EEZ of the US contiguous states made possible through collaboration with the European Union’s Joint Research Center in Ispra, Italy.} \]

**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.
5) Observations documented in reports, news services etc.
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

**Continued on page 7**

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

Fig. 8. The predicted global distribution of the hooded seal (see Box 4).
Box 4. We may know more than we think... 
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.
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!

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