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FishBase

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The *Sea Around Us* project as a FishBase partner

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Introduction. Since its inception in 1999, the *Sea Around Us* project of the Fisheries Centre, University of British Columbia, and as a founding member of the FishBase Consortium, has been involved with the various FishBase activities. The project, funded by the Pew Charitable Trusts in Philadelphia, is devoted to the study and documentation of the impact of fisheries on marine ecosystems, and to the identification and implementation of policies that will reduce this impact.

Fishes are the major component of the catch of most fisheries. Thus, the project relies heavily on information available in FishBase in order to characterize commercially important groups of species, i.e., using: (1) taxonomic; (2) geographical (e.g., distribution); and (3) biological (e.g., maximum lengths, growth, trophic levels, food and diet) information on fishes, as well as the (4) treaties and conventions applying to fisheries targeting these species.

The *Sea Around Us* project, in the course of its 'heavy' use of FishBase, in turn contributes data, notably on common names used in the national fisheries statistics, e.g., of Brazil and India; and routines that, e.g., calculates the vulnerability of marine fishes to be exploited by the various fisheries operating in a country. This contribution discusses in detail the user/contributor role of the *Sea Around Us* project as a FishBase partner and outlines future activities that will further enhance the existing links between these two databases.

The *Sea Around Us* project as a FishBase user - Implicit uses. The *Sea Around Us* project database uses FishBase as a standard for scientific and common names to correct misidentifications in reported catch statistics in a given country. This permits the disaggregation of catch statistics in the *Sea Around Us* project database, notably for items such as 'miscellaneous fishes', into family,

genus and, when possible, species. In addition, information on the distribution of fishes by country, depth distributions and latitude ranges (i.e., north-south limits) provided in FishBase is used by the *Sea Around Us* project database to verify reported occurrences of species in the catch of a particular country or area, e.g., as illustrated by Watson & Pauly (2001) to document the over-reporting of China's catches.

Spatial allocation of catches in *The Sea Around Us* project database is enhanced by routines extrapolating catches using biological information provided by FishBase. Cheung *et al.* (ms) developed a routine that aims to enhance predictions of taxon distributions by associating habitat preferences (or the 'versatility' of a species to inhabit different habitat types) with the species' maximum length. Heuristic rules are applied to define the maximum effective distance that a species would 'stray' from its preferred habitat while relative abundance of a species in a given habitat is defined using heuristic descriptions. This component of the *Sea Around Us* project database thus allows, given that the heuristic rules and assumptions apply, a general tool to predict, at large spatial scales, the distribution of commercial marine species by habitat.

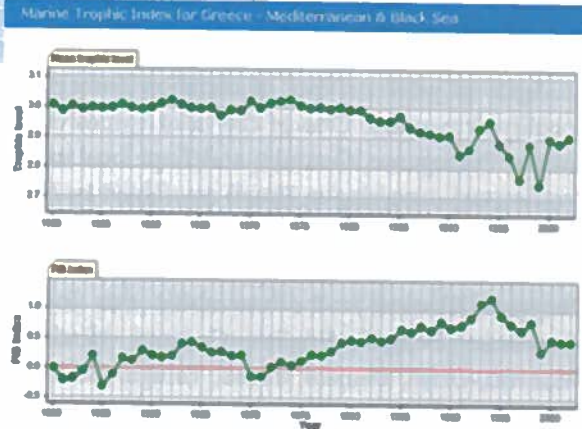
A more extensive use of FishBase biological parameters by the *Sea Around Us* project database resulted in a fuzzy expert system routine, which calculates the intrinsic vulnerability of marine fishes to extraction, developed by Cheung *et al.* (2004). This routine uses, as input variables, maximum length, age at first maturity, longevity, the von Bertalanffy growth parameter K, natural mortality rate, fecundity, geographic range and strength of spatial behavior. All except the last parameter are obtained from FishBase. This routine was applied to seamount-associated fishes by Morato *et al.* (2004, in press) who found that, in general, seamount-aggregated species are highly vulnerable to fishing, and thus puts in question the plans of some countries to expand their fisheries to distant water seamounts.

The *Sea Around Us* project as a FishBase user - Explicit uses. The online interface of the *Sea Around Us* project (www.seaaroundus.org) extensively uses deep-links to the various lists provided by FishBase. The most visible of these links are those provided under the *Biodiversity* button (see Fig. 1A), i.e., categorical lists of fishes by country. Another link is used under the *Governance* button for *Treaties and Conventions* which lists agreements ratified and/or pending ratification by the country in question. In addition, under the *Ecosystems* button, i.e., the fish parameters link which displays the list of FishBase life-history parameters useful for *Ecopath with Ecosim* models; and the trophic pyramid link which displays FishBase's *Lindeman pyramid* (see Lindeman 1942) for that country's Exclusive Economic Zone (EEZ) (Εικόνα 1A,B).



Figure 1A Information on the EEZ of a country, in this example, Greece (for which the EEZ represents the territorial waters to 6 nm and international waters). Note the list of choices under the biodiversity button. All fish-related choices display FishBase lists created on demand

Figure 1B The Marine Trophic Index (MTI) page accessed through the Ecosystem button of the countries' EEZ routine available at the Sea Around Us project website (www.seaaroundus.org). The MTI is computed, here for the Greek EEZ (see comment in Fig. 1A), with the exclusion of all fishes with trophic levels less than 3.25 to exclude small pelagics



Finally, the *Sea Around Us* project catch database plots the Marine Trophic Index and the Fishing-In-Balance Index (FIB) by country (see Fig. 1B). The Marine Trophic Index (MTI) was identified by the Conference of the Parties to the Convention on Biological Diversity (CBD), in February 2004, as one of the eight indicators for 'immediate testing' of their ability to monitor progress toward reaching the target to "achieve by 2010 a significant reduction in the current rate of biodiversity loss" (CBD 2004). The original routine to calculate trophic levels was used in FishBase to create *Lindeman pyramids* (see above). This was used by Pauly *et al.* (1998) and more recently by Pauly & Palomares (2005) to calculate the trophic levels of the fisheries catch statistics supplied by FAO and modified by the *Sea Around Us* project database to illustrate the 'fishing down marine food webs' phenomenon. It was also incorporated in the CD version of FishBase 2000 (Froese & Pauly 2000).

All of these links to FishBase direct *Sea Around Us* products users to the

FishBase website, thus increasing the number of hits received by FishBase by an average of 130,000 per month. Note that, for example, in December 2004, the *Sea Around Us* website received a total of 200,000 hits; this is a significant increase in user trends since its launching in November 2003.

The *Sea Around Us* project as a FishBase contributor. As heavy FishBase users, the *Sea Around Us* project team members, and many of the students of the Fisheries Centre, are bound to encounter information gaps in FishBase. These encounters turn out to be useful in filling in these gaps in FishBase as *Sea Around Us* project team members and Fisheries Centre students gather the information from other sources and provide them to FishBase.

A first kind of information gap is encountered at the nomenclatural level, notably on common names. This prompted the second author to suggest to his students to work on lists of common names by language used in a specific locality or country. One of the most extensive of these contributions are the lists of Portuguese, Guarani, and Tupi local names of fishes (both marine and freshwater) occurring in Brazil assembled by Ms Katia Freire and resulting in several contributions on analyses of common names (Freire & Pauly 2003; Freire & Pauly in press). Another extensive contribution of this sort by Ms Brajgeet Bhathal is the assembled lists for India covering Andamanese, Assamese, Bengali, English, Gujarati, Hindi, Kannada, Mahl, Malayalam, Marathi, Oriya, Punjabi, Tamil, Telugu and transcribed common names from Roman characters into eight different scripts, e.g., Hindi, Punjabi, Tamil, Telugu, Malayalam, Kannada, Marathi, and Nepali (Bhathal 2003; Bhathal & Pauly 2004). Ms Freire and Ms Bhathal continue the collection of fish common names used in their countries and both are maintaining their own databases in order to analyze these common names following the methodology set by Palomares *et al.* (1999). Other contributions include English and Amerindian common names for fishes occurring in British Columbia, Canada; common names of fishes in Indonesian, Japanese, Maltese, some languages used in Malawi, and Russian. Overall, Fisheries Centre students and staff members have contributed more than 15,000 common names to FishBase.

A second kind of information is encountered at the 'biological' and 'distribution' levels, which is more difficult to quantify in terms of absolute numbers of contributions made. However, frequent exchanges occur between *Sea Around Us* project staff members and the FishBase team in the Philippines identifying additions, corrections and verifications of biological parameters, i.e., notably trophic levels and maximum sizes, and questions on geographical and vertical distributions of species. Results of studies conducted by the *Sea Around Us* project are sent to FishBase to add to or to correct existing records.

In addition, copies of sources used by these studies are sent to the FishBase team for extraction and encoding of other pertinent information. This ensures that gaps are continually being filled for the next round of data extraction and subsequent analyses.

The *Sea Around Us* project assures that the data being contributed by its members are incorporated in FishBase by maintaining a small contribution to fund one FishBase encoder in the Philippines (Ms Arlene Sampang) and one FishBase coordinator within the project at the Fisheries Centre in Vancouver (Dr M.L. Deng Palomares).

Future collaborations. In addition to the ongoing uses and contributions between these two databases, we have identified some desirable links which will enhance the use of these databases on both ends. These are enumerated below:

(1) As the *Sea Around Us* project database improves its coverage of historic expeditions and scientific surveys (see www.seaaroundus.org for links), a routine that lists all expeditions and surveys conducted in a country can be added under its *Biodiversity* section. FishBase, on the other hand, has its own *Expeditions* table that lists fish specimens sampled by an expedition, through records of fish occurrence. It will thus be possible in the future to provide links from the historical accounts of an expedition in the *Sea Around Us* project database to the list of specimens by station sampled by that expedition in FishBase. In return, FishBase will be able to provide links to the historic and qualitative component of these expeditions in the *Sea Around Us* project database. These 'synergetic links' will thus make an expedition story whole.

(2) Recent discussions with FishBase team members illustrated the need for a re-evaluation of the choices used in categorizing the global commercial importance of a species. These discussions led to the conclusion that the *Sea Around Us* project price database maybe able to help in this re-categorization as it will provide the necessary information on the global value of a species. Once this re-categorization has been implemented, links to the *Sea Around Us* Project price database can be provided by FishBase to enhance the background information needed in justifying the re-categorization.

(3) The *Sea Around Us* project database user's manual is currently in preparation. Once finished and launched online, links to FishBase where FishBase data and/or routines are used will be provided.

(4) Funding for a database of marine organisms was obtained from the Oak Foundation, Geneva and we will have to consult with the FishBase Consortium concerning the allocation of these funds.

Conclusions. Overall, the relationship between the *Sea Around Us* project and FishBase has matured, and can be expected to continue flourishing.

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