FISHBASE: An Information System to Support Fisheries and Aquaculture Research*

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Abstract

The International Center for Living Aquatic Resources Management (ICLARM) in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and with the support of the Commission of the European Communities is developing a database (called FISHBASE) to summarize global information on living aquatic resources (fish, crustaceans and molluscs) in a standardized form to be made available on CD-ROM to institutions in developing countries. For all species, stocks and strains relevant to fisheries or aquaculture, FISHBASE summarizes information comparable in scope to that normally provided in species synopses such as those published by FAO. FISHBASE provides not only fast access to information on a given species but also allows for comparative studies between species groups or geographical areas. In more than 1,200 fields, the database contains information on nomenclature, distribution, ecology, morphometrics, population dynamics, reproduction, eggs and larvae, diseases, genetics, and aquaculture. The first version of FISHBASE will be distributed by the end of 1992.

Introduction

Fisheries have enormous importance for rural and coastal dwellers in developing countries. To sustain and improve the contribution of fisheries to their nutritional well-being and livelihood, effective management is essential. This in turn depends on the availability of accurate information for researchers, planners and managers. Knowledge on fisheries and aquaculture is distributed in numerous textbooks and thousands of papers with hardly any standards in terms and units. Bibliographic databases, such as Aquatic Sciences and Fisheries Abstracts (ASFA) provide access to key terms, titles and abstracts, but lack structured data; hence, their users must access the original literature to extract the information of interest. As institutions in developing countries often cannot afford to maintain extensive libraries, scientists thus often lack such access, and even if possible, such data retrieval is very costly and time-consuming.

To help solve this problem, the International Center for Living Aquatic Resources Management (ICLARM) in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and with the support of the Commission of the European Communities is developing a database (called FISHBASE). FISHBASE summarizes global information on living aquatic resources (fish, crustaceans and molluscs) in a standardized form to be made available to institutions in developing countries. It also contains high quality color pictures (see Fig. 1).

FISHBASE will be used by scientists (biologists, economists, environmentalists and sociologists) and by educators, planners and policymakers. It will

Fig. 1. "Painting" of a coral reef fish (*Balistoides conspicillum*) as incorporated in FISHBASE. Such figures are usually found only in expensive taxonomic books, often not available to developing-country libraries.

compensate, in part at least, for a fisheries science and development reference library in laboratories and other institutions in developing countries.

Inside FISHBASE

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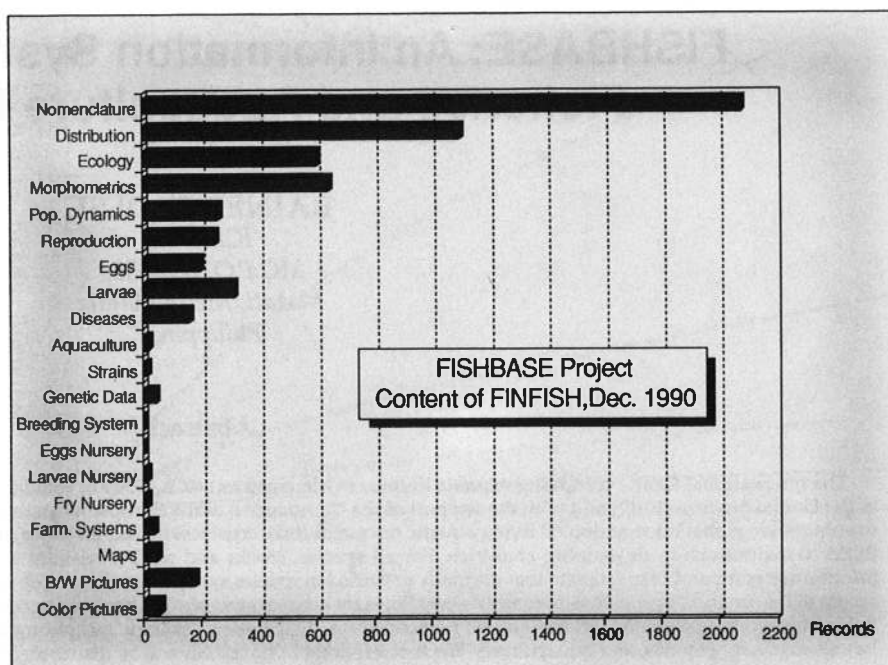

Fig. 2. Content of FINFISH, the part of FISHBASE dealing with fishes, as of December 1990. Efforts are underway to increase the information contained in the various areas presently not well covered, notably the aquaculture section.

Taxonomy, Distribution and Importance

FISHBASE contains valid scientific names and synonyms, valid FAO names, common names by country and species distribution by FAO areas and countries. Several fields describe the economic importance of a species. This information is derived from the FAO Species Identification and Data Programme. As of December 1990, this information has been entered for about 2,000 fishes (Fig. 2) and about 500 crustaceans.

Morphology, Identification and Museum Collections

For eggs, larvae and adults, FISHBASE contains morphometric measurements, meristics and detailed descriptions including pictures, which allow quick, easy and accurate identification. Complete morphometric descriptions of all fish larvae occuring in the North Sea and Mediterranean have already been entered. The data on museum collections inform scientists where to find type specimens for taxonomic purposes. This part of FISHBASE also draws upon and assists the conservation of archival material, including drawings and descriptions from publications dating back to the last century.

Ecology

FISHBASE contains structured information on abundance, habitats, behavior, reproduction, food items, food consumption, predators, competitors, status of

threat and ecological parameters, which help environmental and related studies in the context of global change.

Population Dynamics

The need for structured population dynamics data was a primary reason for establishing FISHBASE. Important parameters related to growth, mortality and lenght-weigth relationships are included by species and stock. In addition, time series data on catches are entered when available.

Aquaculture

FISHBASE is the first database to provide an organized and easily searchable structure to the highly heterogeneous data produced by the rapidly evolving world of aquaculture. In addition to general data on the performance and tolerance of farmed species or strains, FISHBASE contains genetic data, time series data on production by country, information on breeding, hatchery and nursery systems, and on the farming systems used for growout.

Germplasm and Biodiversity

For technical reasons as well as high cost, it is not practical to maintain large-scale collection and conservation of fish germplasm. In order to assist researchers in selecting the most suitable species for

aquaculture, culture-based fisheries or genetic studies, FISHBASE combines information on characters, performance and genetics of a species with a detailed description of where the species can be obtained or collected in case it is needed. These data will also help to identify threatened species and habitats in order to preserve biodiversity.

Diseases

Diseases are of increasing concern in aquaculture and fisheries, FISHBASE records the diseases reported for a species, stock, or strain, including their prevalence, symptoms, effects, treatment and prophylaxis. Symptoms are classified to allow diagnosis through FISHBASE. Complete descriptions of about 140 important fish diseases have already been entered.

Graphics

FISHBASE has a strong graphical component. It contains images of eggs, larvae and adults as well as distribution maps for all species. Many images are colored (Fig. 1, 3 and 5). In addition, numerical data can

Fig. 3. Distribution of the shark mackerel, *Grammatorcynus bicarinatus*, as an example of a distribution map contained in FISHBASE.

be plotted on screen in many different ways through built-in graphic routines.

Mode of Operation

FISHBASE is designed to run on low-cost IBM compatible microcomputers such as those already existing in many institutions in developing countries. Special emphasis is given to user-friendliness.

FISHBASE is built around a relational database. It consists of more than 1,200 fields distributed in 33 linked tables (Fig. 4). Users access information though windows that combine information from several tables. The ECOLOGY window, for example, displays information from the tables FAMILIES, SPECIES, STOCKS, FAOAREAS, ECOLOGY, FOODS, COMPETS and PREDATS. A search is performed by entering the desired characters in an empty form. The Boolean operators AND, OR, NOT, >, < can be used to deal with uncertain characters (Froese et al. 1990).

Inputing is done mainly at ICLARM headquarters in Manila, under the supervision of ICLARM
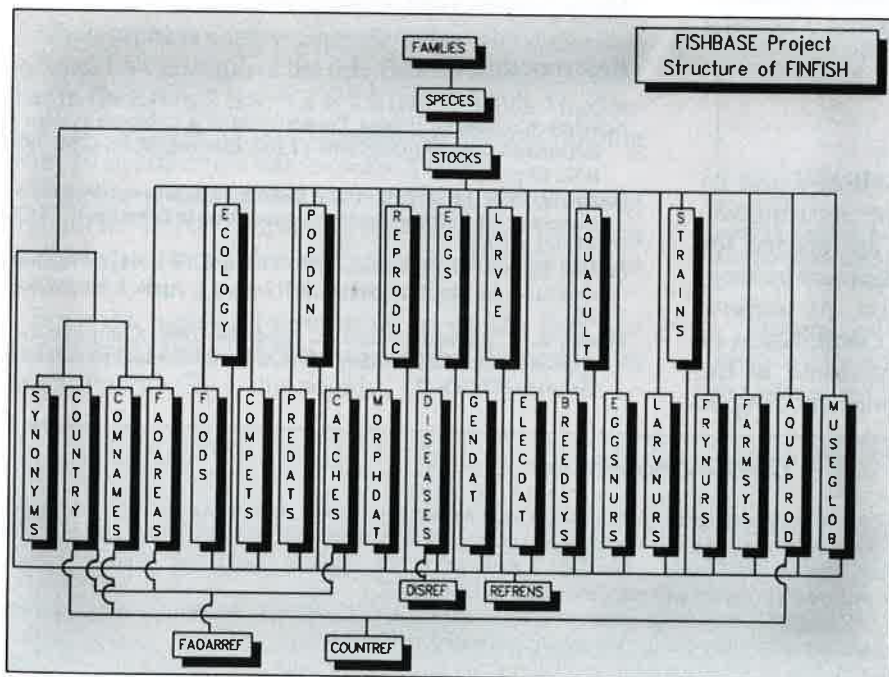

Fig. 4. Outline of the internal structure of FISHBASE. Information is stored in more than 1,200 fields organized in 33 linked tables.

scientists. The FAO Species Identification and Data Programme is responsible for the nomenclature part. Several regional outposts, e.g., at the Malawi Department of Fisheries and at the University of the Philippines, provide national or regional information. Cooperation agreements are in preparation with the Expert Center for Taxonomic Identification, Amsterdam; the Museé de l'Afrique Centrale, Tervuren; and the Zoologisches Museum Hamburg. Inputs are also sought from the members of the Network of Tropical Fisheries Scientists (NTFS) and the Network of Tropical Aquaculture Scientists (NTAS).

The entries for every species in FISHBASE will be checked by appropriate experts before the first release of the software.

Fig. 5. "Painting" of a shrimp (*Penaeus japonicus*) as incorporated in FISHBASE.

FISHBASE Products

The main FISHBASE product will be a complete database stored on a CD-ROM laser disk for use with IBM-compatible microcomputers. Release of the first version is planned for the end of 1992. Updates will be available on an annual basis. Regional or national output will be distributed on standard diskettes and where appropriate as hard copy. Training courses on the use of FISHBASE will be held in developing countries and at ICLARM headquarters in Manila.

FISHBASE is a research tool whose main strength lies in comparative studies. Such studies have already commenced using the data already entered (Achenbach and Froese 1990; Froese 1990; Froese and Papassisi 1990).

Financial Requirements

The successful development of FISHBASE and its availability to end-users depend upon securing the necessary financial resources. Funds are needed for hiring inputters, advisory services, management training, product development and distribution. At present, FISHBASE is mainly funded by the Commission of European Communities, which is interested in the coverage of African fishes. Additional funding is provided by FAO for inputting of shrimps and cephalopods. ICLARM is seeking additional support for coverage of specific regions and of aquaculture topics according to needs and donor interests.

Further Information

For more information on the ICLARM Database on Living Aquatic Resources (FISHBASE), contact the Director General, International Center for Living Aquatic Resources Management, MC P.O. Box 1501, Makati, Metro Manila 1299, Philippines.

References

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Call for Cooperation

Scientists who are interested in contributing data or cooperating on specific topics such as morphometrics, diseases or ecology, may contact directly Dr. R. Froese, FISHBASE Project Leader. Most needed are scientists willing to validate the content of FISHBASE for those species/groups with which they are familiar. Every contribution will be cited using a standard format or, in the case of unpublished data, as "personal communication", with full address of the author. Also, collaborators will get a free copy of FISHBASE.

ICLARM has developed a set of printed DATA COLLECTION FORMS which provide an easy way to accumulate the information on a species that can go into FISHBASE. ICLARM is looking forward to sending out these forms to interested colleagues.

The International Council for the Exploration of the Sea (ICES) has recently created a study group to identify possibilities for including North Atlantic species into FISHBASE. This offers additional opportunities for cooperation agreements with scientists or institutions in the ICES member countries (contact: Chairman R. Froese, ICLARM).