Fisheries Resource Information System and Tools (FiRST):

USER MANUAL

F.C. Gayanilo, Jr. G. Silvestre F. Valdez D. Pauly

2001

ICLARM
THE WORLD FISH CENTER

ASIAN DEVELOPMENT BANK

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ICLARM – The World Fish Center's Organizational Statement

"For those who use and depend on fish and aquatic life in the developing world"

Our Commitment

The World Fish Center is committed to assist in the affordability of food for poor people in developing countries now and in the future. We aim for:

- less poverty
- a healthier, better nourished human family
- reduced pressure on fragile natural resources
- people-centered policies for sustainable development

A way to achieve this

Through research, partnership, capacity building and policy support, we aim to improve the production, management and conservation of aquatic resources such as fish. The research priorities are:

- improving productivity
- protecting the environment
- saving aquatic biodiversity
- improving policies
- strengthening the capacity of national programs to support sustainable development

We believe this work will be most successful when undertaken in partnership with national government and nongovernment institutions and with the participation of the users of the research results.

FUTURE HARVEST CGIAR

ICLARM – The World Fish Center is one of the 16 international research centers of the Consultative Group on International Agricultural Research (CGIAR) that has initiated the public awareness campaign, Future Harvest.

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2001

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Foreword

Foreword

Meryl J. Williams

Director General
ICLARM –
The World Fish Center

In July 1996 a Workshop on "Sustainable Exploitation of Coastal Fish Stocks in Asia" was organized by ICLARM – The World Fish Center with participation of seven countries in Asia. A consensus was achieved on the usefulness of compiling and analyzing past trawl survey to establish benchmarks for stock rehabilitation, supplement existing statistical baseline and improve management directions and strategies. A prototype database and analytic tool for this purpose was presented and evaluated during the Workshop using data from available surveys in South and Southeast Asia.

Under the Regional Technical Assistance (RETA 5766) on "Sustainable Management of Coastal Fish Stocks in Asia" the prototype database and analytic tool was further improved and developed. This manual on the Fisheries Resource Information System and Tools (FiRST) version 2000 documents the database system that was developed under RETA 5766. As envisioned, the database system includes "data containers" for extant trawl surveys and socioeconomic information, as well as catch and effort statistics. Basic analytical routines such as models to approximate fish biomasses have also been developed and made an integral part of FiRST. Analytical modules from other software needed for data analyses have been made accessible via the database system. To facilitate the use of these external software tools, modules have been developed to allow the saving of data in required formats.

The database system currently contains about 21,000 hauls/stations from eight participating countries and published data from Singapore, Myanmar and Pakistan. Access to these data is governed by access protocols. Substantive use of data contained in FiRST was conducted under the Resource and Socioeconomic Analyses Components of RETA 5766. This has allowed retrospective analyses of the extant trawl survey data and provided better understanding on the biology and exploitation status of the coastal fishery resources of Asia. With the development of this database system, ICLARM anticipates that the fisheries resource databases will be able to provide solid foundations for appropriate strategies and action plans at the national and regional levels.

This publication was made possible by a grant from the Asian Development Bank (ADB) under RETA 5766 and core funds of ICLARM – The World Fish Center and its partners (fisheries institutions in Bangladesh, India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam).

Foreword

Foreword

Muhammad A. Mannan

Manager
Forestry and Natural Resources Division
Asian Development Bank

The coastal fish stocks of several Asian countries have been severely depleted due mainly to overfishing, with obvious consequences for the commercial fisheries, the income of small-scale fishers and fish supply to consumers. Recognizing the problems of degradation of coastal fisheries resources and the resultant adverse impact on fishing communities in coastal areas, many governments have made efforts to improve coastal fisheries resources management and to initiate various programs to improve the social and economic conditions of coastal communities. However, effective fisheries resources management strategies are not in place in many countries due to lack of reliable fisheries resource information and the databases that are essential for developing such strategies.

In 1996, the Asian Development Bank (ADB) provided a small scale Regional technical assistance (RETA) to ICLARM – The World Fish Center for a "Review of Sustainable Exploitation of Coastal Fish Stocks in Asia" (RETA No. 5651). RETA assisted seven developing member countries (DMCs) of the ADB to establish a systematic fisheries resource database as a first step in meeting the fisheries resource management needs and preparing appropriate strategies, action plans and options to rehabilitate degraded coastal fish stocks. ICLARM – The World Fish Center in collaboration with participating national fisheries agencies (NFAs), namely, Bangladesh, Indonesia, Malaysia, the Philippines, Thailand and Vietnam, identified several key issues and opportunities impacting coastal fisheries resources and outlined the scope for regional collaborative efforts to catalyze DMCs to improve resource baseline data and aid them to use coastal fish stocks in a sustainable manner. The participating DMCs also requested ICLARM and ADB to initiate further regional collaborative efforts by building on the findings and recommendations of the RETA. The result was RETA 5766 Sustainable Management of Coastal Fish Stocks in Asia, approved in 1997, to assist eight DMCs of ADB, viz. Bangladesh, India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam, in improving the management and sustainable utilization of their coastal fisheries resources and related ecological systems. The eight countries and ICLARM – The World Fish Center provided additional funds to complement the ADB component.

This Fisheries Resources Information System and Tools (FiRST): User Manual provides documentation of the database system which was developed under RETA 5766, based largely on extant trawl surveys and related environmental and socioeconomic information relevant to the management needs of the eight DMCs. The database system has been extensively used by participating fisheries institutions in the eight DMCs, and it is envisioned that the system will be continually used to support policy decisions in the management of coastal fisheries in these countries. ADB is pleased to be associated with the initiative and commends ICLARM – The World Fish Center and the collaborating DMCs for their efforts.

CHAPTER 1

Introduction

Introduction

The exponential growth in information technology undoubtedly benefits fisheries science. However, fisheries research is still faced with practical problems which have hampered its development and, in many cases, have prevented a better understanding of the dynamics of the stocks being investigated (Gayanilo and Pauly 1997). The development and wide distribution of FishBase (Froese and Pauly 1998; Froese and Pauly 1999; see also http://www.fishbase.org/) has partly resolved problems associated with the systematics and biology of fish species. The once tedious task of using complicated mathematical equations is fading out with the development of software packages such as the FAO-ICLARM Stock Assessment Tools (or FiSAT; Gayanilo et al. 1995, Gayanilo and Pauly 1997) and Ecopath with Ecosim (Christensen and Pauly 1992; Walters et al. 1997; see also http:www.ecopath.org/). However, other problems remain.

For example, fisheries research (which ideally should provide a basis for sound management) is very often conducted without reference to data documenting earlier states of the resources which provide reference points for evaluation. In the early 1980s, the challenge was how to develop database systems to resolve this problem. Several research institutions and organizations developed databases in an attempt to resolve the problem. This work was not coordinated, however. Thus, in the Southeast and South Asian region, there are now several database management systems (DBMS) in existence, with largely overlapping functions, but at the same time incapable of directly sharing data. Fishes migrate and very often traverse political boundaries. Hence, fisheries research often requires data from neighboring countries.

Following on Pauly (1996), who reiterated the importance of trawl surveys as a fisheries-independent method for assessing and monitoring demersal stocks, a workshop was held in Manila in July 1996 to examine the usefulness of compiling and analyzing extant trawl surveys in Asia. Methods to analyze trawl survey data are fairly standard and can help establish benchmarks for stock rehabilitation and hence improve management directions and strategies (Silvestre and Pauly 1997). To address the issue of data standardization, a prototype of a trawl survey database management system (TrawlBase) was presented to the participating country representatives to demonstrate the feasibility of standardizing trawl survey data in South and Southeast Asia (Gayanilo et al. 1997).

In 1998, the Asian Development Bank (ADB) provided funding (under its regional technical assistance program) to ICLARM – The World Fish Center for a project entitled Sustainable Management of Coastal Fish Stocks in Asia (ADB-RETA 5766). The project intended to conduct retrospective analyses of extant trawl survey data from the South and Southeast Asian region. By combining these analyses with related biological and socioeconomic information, the project planned to assess the prevailing fisheries situation and develop strategies and action plans to improve the management of coastal fish stocks in the region.

Encoding and Editing Effort Data

The procedure in encoding and editing effort data is similar as with that for catches.

1. Same as step 1 above.
2. Start entering data on the effort table.
   a. Same as step 2(a) above.
   b. The second column, fleet name, is a dropdown list box wherein inputs can be selected. An unlisted fleet name may be added. Click the list of values command button on the tool bar menu.
   c. The third column, No. of vessels is a numeric value.
   d. The fourth column, capacity HP, is the horsepower of the vessel's main engine.
3. To add another record, click the Add Record–Effort command button on the tool bar menu.
4. To insert / add another worksheet, click Insert Worksheet command button on the tool bar menu. To enter data and add records, repeat steps 2 and 3.

Note: Skip step 1 if the catch table has been created.

Catch and Effort Table Worksheet

There are four tables on the catch and effort worksheet, namely,

1. yield and effort;
2. yield and number of vessels;
3. yield and horsepower; and
4. yield and gross tonnage.

These tables automate the computation of the yield curve using both the Schaefer and Fox surplus production models. The Schaefer model is expressed as:

$$C_i/f_i = a + b \cdot f_i$$

where C_i – time series of catches
f_i – efforts associated to the catches, C_i

The Fox model is an alternative to the Schaefer model. However, unlike the Schaefer model, the Fox model C_i / f_i is always greater than zero for all values of f_i greater than zero. The Fox model is expressed as:

$$\ln(C_i/f_i) = a + b \cdot f_i$$

which can also be written as $C_i/f_i = \exp(a + b \cdot f_i)$.

Surplus Production Model Graph Worksheet

The surplus production model graph worksheet has three objects (Fig. 9.4):

1. Surplus production graph (line-scatter on two axes);
2. Option buttons (two option groups)
   - Effort to use
   - Surplus production model
3. Summary table
   - Description of regression results
   - Value of the two models (Schaefer and Fox)

Surplus Production Model Graph (Line-Scatter on Two Axes)

The model is a line-scatter type (on 2 axes) of chart. The chart:

1. displays trends on Schaefer and / or Fox model(s);
2. plots the line of maximum sustainable yield (MSY) and f_{MSY} intersect; and
3. compares values of yield (C) against effort (f).

The first series is a line type of chart that displays the trends of yield and effort where yield / effort (C / f) is plotted on the Y-axis and effort (f) is plotted on the X-axis. The second series is a line type of chart that plots MSY for the Y-axis and f_{MSY} for the X-axis. This line intersects with the maximum value of either Schaefer or Fox model. The third series is the XY (scatter) type of chart that compares the values of yield against effort where yield (C) is plotted on the Y-axis and effort (f) is plotted on the X-axis.

Option Button

There are two groups of options used for this task, namely,

1. effort to use, and
2. surplus – production model.

The first option group is a selection of the kind of effort to use in the model and the second is a type of model(s) to plot on the graph. Users can select an option for each group (Fig. 9.4).

Summary Table

The results of the regression computation are displayed in the summary table. The first column provides the description of the values, and the second and third columns are the regression values for both the Schaefer and Fox models (Fig. 9.4).

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Adding Program Modules to FiRST

Adding a module in FiRST no longer requires a recompilation of the program. Note that the, Report, Biomass, PopDyn, CommAna, EcoDir and BioEcon sectors have the same structure. To add an executable, do the following:

Step 1 Copy the program to the FiRST directory, i.e., the same folder where the FiRST.EXE was installed.

Step 2 Open the FiRST.INI file using any text editor.

Step 3 Edit the sector where the program is to be classified. The same program can be placed in more than one sector. For example, if the program performs ecosystem analysis, locate it in the EcoDir sector. Sectors are enclosed in square brackets.

Step 4 Increment the "Number" keyname. For example, if a module is to be added in EcoDir sector and this happens to be the first program in the list, change the value for the "Number" to "1".

Step 5 Locate the keyname in the same sector with a suffix similar to the number incremented in Step 4. For example (as in Step 4), edit the EcoDir1 and put the value following the format: CAPTION.EXECUTABLE. The caption (or descriptive title of the program) is what the user views from a menu which the program displays to the user. The executable is the name of the program itself with the .EXE suffix.

Step 6 Save the FiRST.INI and the program can now be restarted and the new module tested.

Not all executables can run simultaneously with other programs. It is advisable to test the module before distributing it. Visit the ICLARM website for publication of new modules.

List of Acronyms

ADB	Asian Development Bank
CD-ROM	Compact disk-read only memory
CPUE	Catch per unit effort
DBMS	Database management system
FiRST	Fisheries Resource Information System and Tools
FiSAT	FAO-ICLARM Stock Assessment Tools
FTP	File transfer protocol
GIS	Geographic information system
GUI	Graphic user interface
HTML	Hypertext mark-up language
HTTP	Hypertext transfer protocol
ICLARM	International Center for Living Aquatic Resources Management – The World Fish Center
ISCAAP	International Standard Statistical Classification of Aquatic Animals and Plants
MSY	Maximum sustainable yield
RETA	Regional Technical Assistance
RTF	Rich text format
URL	Uniform resource locator

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