FAO Developments in Software for Tropical Fish Stock Assessment

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The Marine Resources Service of FAO is developing microcomputer software for assessment of tropical fisheries. These packages are intended for users in developing countries who may not have easy access to technical expertise. Thus, great emphasis has been placed on user friendliness. Often the users will be a group of one to three scientists in an isolated area who have limited contacts with colleagues in other institutes and little or no hardware/software expertise available.

New Programs

The Marine Resources Service has started a series of technical papers on software for fish stock assessment, of which one has been published and a second one is being printed. These are:

- Sparre, P. 1987. Length-based fish stock assessment for Apple II computers. FAO Fish. Tech. Pap. 101, Suppl. 2. 217 p. + 3 diskettes.
- Vakily, J.M., M.L. Palomares and D. Pauly. 1986. Computer programs for fish stock assessment: HP 41 CV calculator. FAO Fish. Tech. Pap. 101, Suppl. 1. 255 p. Details are given on p. 20.

Four more packages are under development:

- "Analysis" of catch at age and effort data by Carl Walters, University of British Columbia, Canada.
- Length-based fish stock assessment (extension of the package of Sparre 1987) by Mesnil, IFREMER, Nantes, France.
- Cohort analysis package by A. Laurec, IFREMER, Nantes, France.
- Production modelling with environmental variables by P. Freon, ORSTOM, France.

Software Guidelines

In order to standardize contributions to the FAO series of software, a meeting of 10 specialists was held in FAO Headquarters in December 1986. At this meeting a set of guidelines for user-friendly fish stock assessment software and documentation was developed. Bearing in mind the conditions of customers in developing countries, it was decided that the user's manual should contain a textbook-like description of the methodology with at least two examples. The examples should preferably be based on real data from a tropical fishery. One example should be a "nice" one which demonstrates that the method works in practice; the other one should be a "nasty" one which illustrates difficulties that may be encountered. The latter could be one where the assumptions behind the method are not met but where the data have the desired format. A special section in the manual should be devoted to the assumptions behind the method so as to avoid misuse of the program.

Bearing in mind the current status of the microcomputer market the software specialists decided to recommend software based on MS-DOS for a minimum configuration of IBM XT (or its compatibles). No preferred language was decided upon.

The packages should preferably be "turn-key" systems, which do not require additional software (except what is usually available, such as a BASIC interpreter).

In general, the highest possible level of user friendliness would be welcomed. The user may not be very familiar with the basic theory behind the method, and may know little about computers and operating systems. Of course, this will be more and more rarely the case, but this assumption is a fruitful one when aiming at a user-friendly program and at a large user base. If possible, the program should be written in such a way that it can be run by someone who has no detailed knowledge on the operating system and the source language used. It should not be assumed, for instance, that the user knows how to program in BASIC and can be required to modify the code source.

Pitfalls

We have experienced that the risk of misuses of "black-box" type programs is considerable. Therefore, we have suggested that the user should monitor all steps in the analysis (as far as possible) in order to detect violations of the assumptions. Further, the package should contain programs by which the results can be evaluated. This may be in the form of sensitivity analysis, cross validation and prediction validation. Cross validation means estimating the same parameters from two independent data sets, perhaps by different methods. Prediction validation means using, say, half the data to estimate parameters and then use these to predict the remaining part of the data to test the predictive ability of the method.

As tropical fish stock assessment is a relatively new discipline there are few really well established and well recognized methodologies available and those available contain many pitfalls and shortcomings. We consider "black-box" programs extremely dangerous when it comes to the population/fisheries dynamics part of the analyses. The other part of the analyses consists of well established techniques such as nonlinear regression analysis which do not need to be explained in detail to the user.

For further development of the series we are interested in hearing about any general purpose routines (such as nonlinear fitting) which we would be free to include in our program packages. Additional details on the guidelines are available from Mr. Sparre.

A different FAO-sponsored activity in this field was the Expert Consultation on the Use of Microcomputers for Processing Statistical and Biological Fisheries Data, held in Trinidad and Tobago, 17-21 November 1986. This meeting recommended that FAO be requested to assist countries in the Caribbean region with technical advice and training, with emphasis on low-cost, globally compatible microcomputer equipment. ●