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A Note on the Development of A New Software Package, The FAO-ICLARM Stock Assessment Tools (FiSAT)*

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Abstract

A brief narrative is given of the background of a new FAO-ICLARM software for (mainly length-based) fish stock assessment, the FAO-ICLARM Stock Assessment Tools or "FiSAT" package, integrating the ICLARM's Compleat ELEFAN, FAO's LFSA and various other routines, and which is to be released in mid-1992.

Introduction

In their review of experiences gained during the FAO/DANIDA training course, to which both authors contributed as lecturers, Venema et al. (1989) noted that "the diversity of [assessment packages] was the cause of significant loss of time during [courses]; the need to re-enter files into different computers proved particularly frustrating. It was therefore decided that the subsequent course[s] would use only one type of program and that files created for one type of analysis should be transferable between programs".

As it turned out, easy transfers of files between ICLARM Compleat ELEFAN (Gayanilo et al. 1988) and FAO's LFSA (Sparre 1987) - the two packages whose early versions here actually meant in the above paragraph - were not enough to ensure efficient training. The time devoted to teaching two different, largely overlapping packages during the courses, the need to explain their often minor differences, etc., used too much of the time available for discussions. Thus, the pros and cons of the various key routines they contain, (e.g., the Bhattacharya technique for separating normal distribution, the ELEFAN I routine for estimating L_∞ and K, or length-converted catch curves for estimating total mortality and related statistics) often remained unappreciated by the course participants.

It was thus agreed between our two institutions that ICLARM's *programmeur extraordinaire,* Felimon "Nonong" Gayanilo, Jr., who created the particularly user-friendly "feel" of the Compleat ELEFAN should develop a new package that would integrate all routines of LFSA with all routines of the Compleat ELEFAN, along with a number of new routines, as suggested by the partner institutions. The new package, it was agreed, would also provide an opportunity for overcoming various problems of the two previous software and to join forces to prepare a new, comprehensive manual and user's guide.

This note is to inform the Network membership of the status of FiSAT, particularly to ask for patience, since we do not expect this package to be released before mid-1992.

One neat aspect of FiSAT is that we have a name for it. However, no NTFS member will win the price offered in the Editorial of the August 1989 issue of *Fishbyte,* as this name, which stands for "FAO-ICLARM Stock Assessment Tools", was created by us. However, we did receive a large number of suggestions, of which almost several made it (see box).

Moreover, there is more to FiSAT than just a name. Its structure is established (Fig. 1) and about 80% of the routines in that structure are programmed. Key features are:

- a spreadsheet-like "feel", with the file that is being processed at most with one click of a button away;
- four major groups of routines ("FILE", "ASSESS", "SUPPORT" and "UTILITIES"), with only one ("ASSESS") containing true stock assessment routines, the other either preparatory ("FILE"), or supporting routines ("SUPPORT", "UTILITIES");
- pop-up windows, with detailed help messages and description of equations used and key assumptions made;

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FAO-ICLARM STOCK ASSESSMENT TOOLS (FiSAT)
SYSTEMS IDENTIFICATION

- Calculator
- HELP Messages

FILE

- About...
- Create...
  - Length-frequency file
  - Weight-frequency file
  - Shrimp-tail counts
  - Size-at-age file
  - Growth increment file
  - Mean and S.D. file
  - Probability file
  - Catch data file
  - Values by size
  - XY file
- Load...
  - Length-frequency file
  - Weight-frequency file
  - Shrimp-tail counts
  - Size-at-age file
  - Growth increment file
  - Mean and S.D. file
  - Probability file
  - Catch data file
  - Values by size
  - XY file
- Save file...
- Print file...
  - LPT1:
  - LPT2:
  - COM1:
  - COM2:
  - COM3:
  - File
- Merge file...
- Delete file...
- Correct using probabilities
  - Use of L50 and L75
  - Using probability file
- Adjust class interval
- Smooth data...
  - Over 3 classes
  - Over 5 classes
  - Deconvolution
- Pool sample
- Sample subsets
- Convert...
  - L(new) = a + b*L(old)
  - L(new) = a L(old)^b
  - Commercial size to L/F
  - Age = t_0 - (1/K)* ln(1-(L/L_∞))
  - Age = t_0 - (1/K)* ln(1-((a * W^b)/L_∞)
  - L to age given seasonality
  - % of sample total
- Raise samples
  - Using CPUE
  - Using catch/sample weight
  - Using a constant
- DOS Shell
- Exit

ASSESS

- Parameter estimation
  - Analysis of size-at-age...
    - With seasonality
    - Without seasonality
  - Modal progression analysis...
    - Bhattacharya's method
    - NORMSEP
    - Linking of means/C.V. of L_∞
  - Analysis of growth increment data...
    - Gulland and Holt plot
    - Munro's method
    - Fabens' method
    - Modified Appeldoorn method
  - Direct fit of L/F data
    - ELEFAN 1...
      - Curve-fitting-by-eye
      - Response surface
      - Scan of K values
      - Automatic search
    - Shepherd's method
      - Response surface
      - Scan of values
    - Powell-Wetherall method
  - Z from steady-state sample...
    - Catch curve
      - With seasonality
      - Without seasonality
    - Jones' cumulative-plot.
      From mean length...
      - Beverton and Holt model
      - Ault and Ehrhardt method
  - Z from Hoenig's models
  - Natural mortalities
    - Rickhter and Efanov's method
    - Pauly's M equation
    - M from selection data
  - Recruitment pattern
  - Virtual population analysis...
    - Age-structured VPA
    - Length-structured VPA
    - Length/age VPA
- Prediction...
  - Y/R and B/R analysis...
    - Single species...
      - Without seasonality
      - With seasonality
    - Multi-species
  - Thompson and Bell yield and stock prediction...
    - Single species
    - Multi-species...
      - Single fleet
      - Multi-fleet

SUPPORT

- Simulation of L/F samples
  - Random samples
  - Biased samples
- Sample weight estimation
- Sample bar graph
- Maximum length
- Regression analysis...
  - Y = a + b * X
  - Y = a' + b' * X
  - log(Y) = a + b * log (X)
  - ln(Y) = a + b * X
  - Y = a + b * ln (X)
  - Y/X = a + b * X
  - ln((1-Y)/C) = a + b * X
  - Y^C = a + b * X
  - Y = a + b * X^C

UTILITIES

- Copy data files
- Show file status...
- Configure output
- Import file
  - ELEFAN files
  - LFSA files
  - LOTUS 1-2-3 WK1's
  - ASCIII files
  - R/V NANSEN FILES
- Export file
  - LOTUS 1-2-3- WK1's
  - ASCII files
  - ANALEN

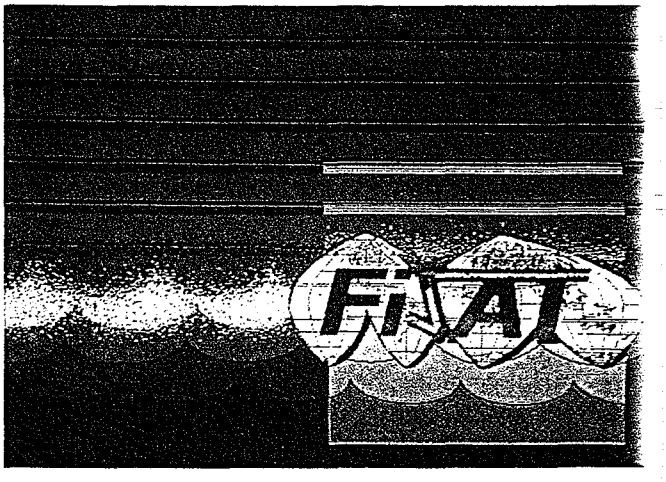

Fig. 1. Logo and structure of FiSAT, presently being developed synthesis of FAO's LFSA and ICLARM's Compleat ELEFAN softwar

Here are some names submitted (some in jest, we hope!) for the joint FAO-ICLARM software for which the name FiSAT has been retained (some authors and/or remarks are added in brackets where available).

AFIS	Analysis of Fish Stocks (similar to ASFIS?)
ALGOLEN	Algorithm for Length (J.F. Caddy)
ANAL	Analysis for Length (oops!)
ELF	Electronic Length Frequency analysis (Elves are mythological, semiheroic beings, representative of the highest and most creative aspects of the intellect) (C.P. Mathews)
FATS	Fisheries Assessment for Tropical Stocks
FIAT (or FAT)	Fisheries Assessment Tools
FINAL	Fisheries Investigation Algorithms
FISSA	FAO/ICLARM Software for Stock Assessment (means "quick" in Arabic)
FISTAT	FAO/ICLARM Stock Assessment Tools (this almost made it, but it turned out too close to the name of an FAO database).
JP	Joint Package (short!)
SAT	Stock Assessment Toolbox
SIS	Stock Investigations System
SOFI(E)	Software for Fisheries (Evaluation) (P. Sparre)
SOFIA	Software for Fisheries Assessments
STOP	Stock Assessment Programmes
TROFIN	Tropical Fisheries Investigations
ULDA	Ultimate Length-Data Analysis (U. Enin)

Some colleagues were quite prolific. Here are their suggestions:

S. GARCIA	
ASSESS	short and easy to remember
ELEFSA	Electronic Length Frequency Stock Assessment
FUSION	self-explanatory
GENESIS	at the origin, there was ELEFAN and LFSA; their combination led to GENESIS - may stand for GENEral Stock Assessment Integration System
LFAN	Length-Frequency Analysis (recalls both LFSA and ELEFAN)

J. McMANUS	
FAST	Fishery Applications Statistical Techniques
FEAST	Fishery Ecological Assessment Statistical Techniques
FEST	Fishery Ecology Statistical Techniques
FIGS	Fishery Interactive Graphical Statistics
FINS	Fishery Interactive Numerical Analysis System
FLAT	Fishery Length-based Analysis Techniques
FLIP	Fishery Length-based Interactive Package
PUFS	Package of User-friendly Fisheries Statistics
FAFE	Fishery Applications for Fishery Ecology

V. RESTREPO	
ALFRED	Analysis of Length FREquency Distributions
SQUEEZE	(as in squeezing juice from an orange or mortality and growth rates from length-frequencies)

S. VENEMA	
ANALFI	Analysis of Fish
LEAN	Length Analysis

Altogether, these suggestions document quite a bit of creativity; we are pleased we could fish in such a large pond. Thanks!

- support of mouse, and of CGA, EGA, VGA and Hercules graphic cards; and
- new assessment routines, not previously incorporated in the Compleat ELEFAN or LFSA, such as, e.g., the SRLCA method (Shepherd 1987).

The process by which this package will be made available to users consists of the following steps:

- September-December 1991 - completion of residual programming tasks;
- July 1991-March 1992 - testing by a group of colleagues at the Danish Institute of Fisheries and Marine Research (DIFMAR), Charlottenburg (J. Beyer, Poul Degnbol and E. Kirkegaard), with feedback to ICLARM to implement corrections and other modifications;
- September 1991-March 1992 - preparation of a comprehensive manual by these authors, by Mr. Gayanilo and by the three DIFMAR staff. This manual is to be *edited* by D. Pauly, P. Sparre and F.C. Gayanilo, Jr.; as far as possible, it will be the authors of the original routines who will describe these, not the editors or the DIFMAR staff;
- Then: release of version 1.0 of FiSAT as soon as manual is printed (as an FAO Fish. Tech. Pap.); and
- When the "English" version of FiSAT and its manual are completed, the preliminary identification of colleagues willing to translate these into French and Spanish will be confirmed; their output may become available in early 1993.

Overall, we hope that this new software, through the support of FAO, ICLARM (and DIFMAR) will serve as a key element of training courses in fish population dynamics throughout the mid-1990s and also serve as one building block for integrated systems involving other software to be prepared by our and other institutions.

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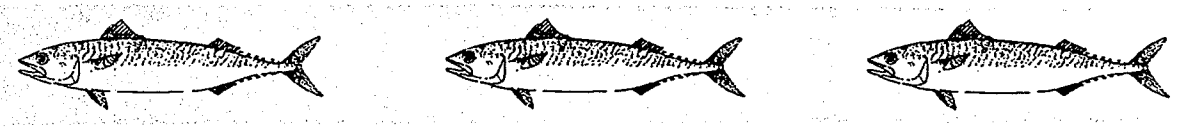
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