

# Who's Working on Fisheries Computer Applications?

For this issue of *Naga*, I intended to look at the uses of microcomputers in fisheries and aquaculture, using the Aquatic Science and Fisheries Abstracts online database. However, there were only 22 entries over the period 1977-1986. Instead the analysis deals with computers in general because it was found that most abstracts (88% in fact) did not mention the type of computer used in the article. For the whole ASFA database, computers were mentioned in about 3,500 articles while microcomputers were specified only 175 times.

ASFA listed 269 articles in which computers or computer programs were mentioned in article titles or abstracts or as key words from 1977 to 1986. The numbers per year (Fig. 1) show an inexplicable decline but 1986 must be inadequately covered and I strongly suspect that many authors now do not bother to mention in their abstract that a computer was used.

This list may thus be only the tip of the computing iceberg. On the other hand, the 269 articles located may represent the more significant uses of computers in fisheries and aquaculture.

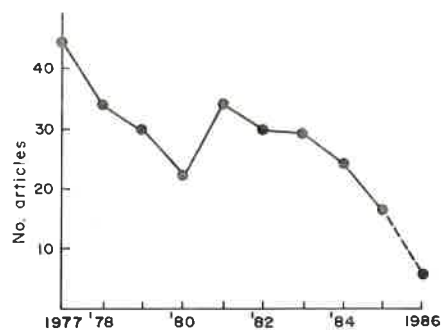


Fig. 1. No. of articles on computer use in fisheries 1977-1986 in the ASFA database.

**Subject matter.** Table 1 shows the distribution of topics. Biological studies not directly related to fisheries totalled 31% of all the articles found. The largest component was a heterogeneous group of articles; biological surveys were the largest identifiable group, followed by

J.L. MACLEAN

ICLARM

behavior, trace element and growth studies. Ecosystem studies were separated from the biological, forming a small but discrete grouping (4%). Stock assessment, including acoustics, was the major topic amongst fisheries applications (22% of all articles). Other major fisheries computer uses were on fishing gear, statistics and navigation. Articles on aquaculture in general made up 9% of the total; separately listed are related topics: fish health, genetics and nutrition.

Cutting across these various themes, the term modelling was used in 49 articles (19%); modelling is clearly one of the more important uses of computers in fisheries and aquaculture.

Table 1. Subject matter of computer use in fisheries (n = 259).

Subject	No. articles	%
Aquaculture		
general	20	9
nutrition	8	3
fish health	5	2
genetics	4	2
Bibliographies	4	2
Biology		
general	30	11
surveys	16	6
behavior	9	3
trace elements	9	3
growth	8	3
migration	4	2
taxonomy	4	2
Ecosystem studies	11	4
Fisheries		
stock assessment	34	13
acoustics	20	9
gear	16	6
statistics	13	5
navigation	11	4
management	9	3
oceanography	8	3
processing	7	3
education	1	—
Pollution/water quality	8	3

**Dominant countries.** Table 2 shows the country listings. Predictably, the USA leads the field in computer use in fisheries and aquaculture; in distant second place is a group consisting of Japan, the United Kingdom and Canada; Russia is next, followed by Australia, France and Norway. The table shows that at least an-

other 19 countries are active in this field. There was no discernible trend from year to year. Numbers of articles per year from the dominant countries followed the general trend of Fig. 1. The minor contributing countries mostly began publishing in this field later than the first year searchable (1977), with Malaysia and Yugoslavia (1985) and Brazil (1986) being the latest countries to appear in the database.

Perhaps the most significant number in this analysis is that of papers about computer programs *per se*, 41 articles (16%). Most of the older articles, probably about mainframes, are no longer useful while the newer ones are so scattered subjectwise that no particular articles can be recommended. The other papers, which deal with applications

Table 2. Computer use in fisheries by country (n = 269).

Country	No. articles	%
USA	110	41
Japan	28	10
UK	24	9
Canada	23	9
USSR	16	6
Australia	10	4
France	10	4
Norway	9	3
Argentina, Denmark, GDR, Iceland, Italy, N.Z.	3	
China, FRG, Netherlands, S. Africa	2	
Brazil, Hungary, India, Kuwait, Malaysia, Philippines, Poland, Switzerland, Yugoslavia	1	
(unspecified country)	4	

rather than programs, are probably based on commercial software, virtually no authors or organizations had more than one article in the ASFA listing, it is also impossible to recommend any contacts for researchers wanting general advice.

**Conclusions.** Hindsight reveals that the question posed in the title was not a useful one to cover the field in depth. Rather, researchers should ask about their own subject areas and browse amongst that literature for computer applications and programs. There are bound to be some because, as Table 1 shows, computers have infiltrated almost every aspect of fisheries science. ●

## Software Options: A List of Some General and Specific Microcomputer Programs

This list is made up from contributions by the authors of the articles in this Naga issue. In no way do they or the publisher (ICLARM) intend to endorse the programs. All the programs are based on microcomputers with IBM compatibility. The suppliers should be contacted for particular machine requirements. The vast array of (more limited) Apple software is omitted for brevity.

### STATISTICS

Software	Features/capabilities	Price	Vendor
SIGSTAT	uni-, multivariate analysis for up to 80 variables, time series, multidim scaling, crosstabs, plots, 8087 supported	\$595	Significant Software, 3334 N. Caynon Road, Provo, UT 84604 (801) 377-4860
NCSS	multiple and stepwise regression, T-test, ANOVA (up to 10 factors, covariance), forecasting factor, cluster, and discriminant analysis, nonparametrics, chi-square, crosstabs, plots (histogram, box, scatter, stemleaf), sort, subset, transformation, can read ASCII files from Lotus, dBASE, etc. menu-driven	\$79	NCSS-PC, 865 East 400 N., Kaysville, UT 84037 (801) 546-0445
STATI	algebraic transforms, import and export data, descriptive, table, n-way ANOVA, ANCOVA, MANOVA regression with residuals, smallest space and factor analysis, full screen data and text editor, menu-driven	\$129	Sugar Mill Software, 1180 Kika Place, Kailua, HI 96734
BMDP	over 40 programs for data analysis, plots, T-test, ANOVA, ANCOVA, stepwise regression, time series, frequency tables, survival analysis	Starts @ \$450 for 6	BMDP Stat. Software, Inc., 1440 Sepulveda, Los Angeles, CA 90025 (213) 479-7799
STAT PLAN III	complete range of statistics-curve fitting, crosstab, correlation, multiple regression, T-test, plots, able to handle 60,000 data points, interface with Lotus 1-2-3 files	\$179	The Futures Group, 76 Eastern Blvd., Gastonbury, CT 06033-1264 (203) 633-3501
STAT-2	easy access to data from spreadsheet file such as Lotus 1-2-3, Symphony, etc., data analysis and forecasting tool, T-test, correlation, crosstab, comparison of distributions, significance tests, multiple regression (up to 50 predictors, Durbin-Watson statistics, autocorrelation of residuals, forecasting subprograms), ANOVA and ANCOVA (up to 5 factors, repeated measures, unequal n, contrasts, etc.), 10 nonparametric statistics, bar graphs, scatterplots, 8087 supported, menu-driven	\$149	Statsoft, 2832 E. 10th St., Suite #4, Tulsa, OK 74104 (918) 583-4149
Statistician's MACE 2.0	full-featured program calculates 11 prob. functions, multiple regression, correlation, ANOVA, nonparametrics, rank, transformation, can either read data from keyboard and ASCII files such as spreadsheet data base, word processor files	\$255	The Matrix Calculating Engine, 2313 Center Ave., Madison, WI 53704 (608) 244-3331
SPSS/PC +	sophisticated package for statistical analysis, reads ASCII files, own command language, 8087 supported, variable configuration from 1.2 to 6 megabytes, program size (20 diskettes, hard disk required)	Starts \$1,500	SPSS Inc., 444 North Michigan Ave., Chicago, Illinois 60611, USA (312) 329-2400
SAS/PC	sophisticated package for statistical analysis, reads ASCII files, own command language, 8087 supported, 19 diskettes program size (hard disk required)		SAS Institute, Inc., Box 8000 Cary, NC 27511, USA

● NOTE: There is a place from which you can get more information about statistical software for the IBM PC and its compatibles. For information and free catalog, write to: HSD, 9010 Resada Blvd., Suite #222 Northridge, CA 91324, 1-8000-451-3030 (inside USA).

### AQUACULTURE

Software catalog	nearly 100 agriculture-related program summaries	Extension Computer Technology Group, Texas A&M Univ., College Station, TX 77843, USA
Aquaculture pondmaster/wizard	aquaculture production, pond management	Island Science, P.O. Box 564, Novato, CA 94948, USA
Computer programs for fish farmers	aquaculture production, pond management	Dr. P. Landless, 45 Acheroftr Rd., Cirencester, Glos., UK

Software	Features/capabilities	Price	Vendor
Aquaculture MIS	aquaculture management		University of Hawaii, Sea Grant Extension, 1000 Pope Rd., Honolulu, HI 96822, USA
CRSP database	aquaculture pond dynamics		Aquaculture CRSP, Program Management Office, Office of International Agriculture, Oregon State University, Corvallis, OR 97331, USA
Descriptions in "Automation and data processing in aquaculture"	proceedings of the first international conference, August 1986 (to be published by Pergamon Press)		Prof. J.G. Balchen, Norwegian Institute of Technology, O.S. Bragstads plass 8, N 7034 Trondheim, Norway

### FISH STOCK ASSESSMENT

Length-based fish stock assessment for Apple II	an integrated package mainly for analysis of length-frequency data. Due to difficulties in reading ages from hard parts (otoliths or scales) of tropical fishes, this package which works mainly with length measurements of fish is considered suitable for tropical fish stock assessment. Written in BASIC for Apple II, but an MS-DOS version for IBM XT (or compatibles) is being developed. Selection of methodologies is based on experience of author, P. Sparre, as lecturer in a series of FAO/DANIDA training courses in tropical fish stock assessment		FAO, via delle terme di Caracalla, 00100 Rome, Italy ●(FAO Fish. Tech. Pap. 100, Suppl. 2. 217 p. + 3 diskettes)
Computer programs for fish stock assessment: HP 41 CV calculator	an HP 41 CV version of D. Pauly. 1984. Fish population dynamics in tropical waters: a manual for use with programmable calculators (ICLARM Stud. Rev. 8. 325 p.), which was written for HP 67/97 calculators		ICLARM, MC P.O. Box 1501, Makati, Metro Manila, Philippines. ●(FAO Fish. Tech. Pap. 101, Suppl. 1. 255 p. By Vakily, J.M., M.L. Palomares and D. Pauly 1986)

### DATABASE

dBASE III PLUS	very powerful database management software with user programming capability; easy-to-use pull down menus for creating, using and modifying databases; creates custom screens without programming; accesses related information in several databases at one time without programming; with Advanced Query System, user is allowed to build complex queries by selecting from the pull-down menu; an Application Generator is available for rapid creation of programs; the ASSISTANT can be used for teaching user to learn programming in dBASE III PLUS; IBM PC/XT/AT and compatibles with 256K RAM, 2 floppy drives and DOS 2.0 or later	\$695 (retail price; it's cheaper now)	Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502-8000 (213) 329-8000
DataEase	entirely menu-driven database program; very easy-to-use but with limited programming capabilities; can still allow you to build your own menu by selecting different given options (this is what we call 'custom menu'); user is allowed to develop very complex queries simply by responding to the menu choices on the screen; best feature is the interactive query editor which makes it easy to create complex queries and difficult to make mistakes; very fast in creating a report and can find a specified record with or without the need of indexing; IBM PC/XT/AT or compatibles, 256K RAM, 2 drives, DOS 2.0 or later	\$600	Software Solution Inc., 12 Cambridge Dr., Trumbull, CT 06611 (203) 374-8000
R:Base System V	a very impressive menu-driven facility database program; an upgraded version from R:Base 5000; user programming is available; automated process for creating tables, reports and entry screens; fast file utility for importing data into a database; menu-driven facility makes it easy for less experienced users to gain access to its features; menu generator makes it a standout; however, its performance is somewhat slower than that of the above 2 packages; IBM PC/XT/AT or compatibles, 512K RAM, hard disk, DOS 2.0 or later	\$700	Microrim, 3925 159th Ave. NE, P.O. Box 97022, Redmond, WA 98073-9722 (206) 885-2000

Software	Features/capabilities	Price	Vendor
dBXL	the dBASE III PLUS "Superclone"; all files and syntax are compatible with dBASE III PLUS; can interchange databases, indexes and other files between the two products; more features are included such as the DOS services, up to 99 windows without any other software, automatic memory variable management; IBM PC/XT/AT or compatibles, 256K RAM, 2 drives, DOS 2.0 or later	\$169	WORDTECH SYSTEMS, P.O. Box 1747, Orinda, CA 94563 (415) 254-0900
REFLEX— The Analyst	totally menu-driven relational database management software; form, reports generation crosstab, graphs; user defined or programmed menu for the database is not supported; good for beginners for learning database but might need more sophisticated database software later as needs increase; IBM PC/XT or compatibles, 384K RAM, 2 drives, DOS 2.0 or later	\$149	Borland International, 4585 Scotts Valley Drive, Scotts Valley, CA 95066

### OTHER FILE MANAGEMENT/INTEGRATED SOFTWARE

PFS:Professional File	an easy-to-use file manager that stands out its ability to crosstab reports; IBM PC/XT/AT or compatibles, 256K RAM, 2 drives, DOS 2.0 or later, if DOS 3.2 needs additional 64K RAM; a combination of the PFS:File and PFS:Report	\$249	Software Publishing Corp. 1901 Landings Dr., Mountain View, CA 94034 (415) 962-8910
Q&A 2.0	a full-featured, easy-to-use file manager with a natural language interface and built-in word processor; overall speaking, this is a very powerful and very fast file manager package; IBM PC/XT/AT or compatibles, 512K RAM, 2 drives, DOS 2.0 or later	\$349	Symantec, 10201 Torre Ave., Cupertino, CA 95014 (408) 253-9600
PowerBase 2.3	full-featured relational database manager that is not very difficult to use; IBM PC/XT/AT or compatible, 320K RAM, 2 drives, DOS 2.0 or later	\$349	PowerBase Systems Inc., 32100 Telegraph Rd., Birmingham, MI 48010 (800) 292-7432
PFS:First Choice	easy-to-use, integrated software program designed for beginners; combines four applications—word processing, file management, spreadsheet analysis and electronic communications; for the Electronic Communication, it allows the sending/receiving of the ASCII, and binary files, automatic dialing, user defined macro capabilities; IBM PC/XT/AT and compatibles, 256K RAM, 2 drives, 8087 supported, DOS 2.0 or later, most of the modems on the market supported	\$149	Corporate Headquarters, P.O. Box 7210, 1901 Landings Drive, Mountain View CA 94039-7210
Symphony	integrated business package including worksheet, word processing, database, graphics, communications; worksheet allows up to 8912 (rows) x 256 (columns) cells (the size of the worksheet actually depends on the size of the RAM of the computer), mathematical, statistical, logical, and financial functions, hidden cells and password for the worksheet available for extra security and protection of your data; IBM PC/XT/AT or compatibles, IBM 3270-PC, 3270-G, PCjr, 512K RAM, 2 drives, DOS 2.0 or later	\$699	Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA 02142
Lotus 1-2-3	mainly a spreadsheet program which provides 4096 (rows) x 256 (columns) cells; built-in mathematical, logical, financial and some statistical functions; IBM PC/XT/AT or compatibles, 256K RAM, 2 drives, DOS 2.0 or later	\$299	Lotus Development Corporation, 55 Cambridge Parkway, Cambridge, MA 02142

### WORD PROCESSOR

WordStar	general word processing programs which provides different basic print style options, mail merge capability, binary or ASCII file creation	\$199	MicroPro International Corp. 33 San Pablo Ave., San Rafael, CA 94903 (415) 499-1200
Microsoft WORD	word processing program with more flexible and special features than WordStar; it is the WYSIWYG (What You See Is What You Get) type word processor	\$250	Microsoft Corp., 16011 North East 36th Way, P.O. Box 97017, Redmond, WA 98073-9717