

# Microcomputer Use in Aquaculture Genetics

L. JAMES LESTER

SHARON PERKINS

BASSANIO TENG-CHEONG  
WONG

University of Houston—Clear Lake  
2700 Bay Area Blvd.  
Houston, Texas 77058, USA

Although this is hailed as the Information Age and computers are being integrated into many activities, there are advantages as well as disadvantages to computerization. This is even true for the microcomputer which is easy to use and is becoming more and more powerful. For example, the information on approximately 120 single-spaced pages can be stored on one double-sided/double-density diskette. A microcomputer can hold and manipulate very large data sets, performing repetitious processes very rapidly. So if you have 1) large data sets, 2) repetitious calculations, 3) simulations or problems with iterative solutions, 4) matrix calculations, or 5) problems requiring graphics capability, a microcomputer can make your work a lot less cumbersome.

Should your work on genetics have none of the listed characteristics, you will want to carefully consider the following disadvantages. In countries that do not produce microcomputer hardware, microcomputers can be expensive and difficult to maintain and to furnish with appropriate software. Even obtaining a steady electrical supply can be difficult. If no one on the staff is trained in the use of the hardware and/or software, it will be necessary to arrange for such training. Reading computer and software manuals will not be enough because these are written by experts who often neglect critical facts that they assume are common knowledge.

## Operations in Aquaculture Genetics for a Microcomputer

**Broodstock management.** Record keeping related to the management of a broodstock would be better performed on a microcomputer than by hand. The use of database software (such as "dBase III plus", "DataEase", "R:Base System V") would permit the geneticist or manager to incorporate new records easily into a continuous database and would encourage the collection of the same data and entry in the same format. This would facilitate analysis of the data.

Many genetics questions can be answered when there is a good record of performance by broodstock and their offspring.

In the case of shrimp aquaculture, each spawn could have a record containing the information listed in Table 1.

Of course, multiple families are stocked in each of the production units mentioned in the table, but problems associated with a particular female or geographic stock or species could be detected with sufficient data. When such information is collected over years, it will become possible to detect domestication selection and possible sources of

Sample attributes of a typical record for a spawn.

- female parent identification
- parent species or strain
- date of spawn
- fecundity
- female parent weight or size
- ID of hatchery tank stocked
- feeding pattern for hatchery tank
- water quality data for hatchery tank
- date of transfer from hatchery to nursery
- stage or size at hatchery harvest
- survival in hatchery tank
- ID of nursery unit stocked
- date nursery stocked
- feeding pattern for nursery unit
- environmental data for nursery unit
- date of transfer from nursery to grow-out
- survival in nursery unit
- size at nursery harvest
- ID of grow-out unit stocked
- feeding pattern for grow-out unit
- environmental data for grow-out unit
- date grow-out harvested
- survival in grow-out unit
- size at grow-out harvest
- number of broodstock selected from grow-out unit
- maturation unit stocked with broodstock

inbreeding from patterns of broodstock selection and dispersal.

**Statistical analysis of experimental or operational data.** Whether genetics information is being extracted from data collected in the normal operation of an aquaculture facility or from results of controlled experiments, statistical software will prove valuable. Software can be made available for the analysis of variance (the nested model is especially important), regression, correlation, and multiple comparisons of means (e.g., t-test, Duncan's, Fisher's, etc.). Also, the math library in a good software package should permit a range of transformations, such as natural logarithms and exponentials. Although most advanced database programs will have plotting and charting capabilities, this function can also be obtained in statistical packages. One can even get packages designed to assist in planning and decisionmaking which allow one to build a model and simulate the results of changing a variable, such as growth rate.

**Advanced research capability.** It is now possible to obtain in a microcomputer system such capabilities as multivariate statistical analysis which were recently limited to minicomputers costing over \$100,000. Some questions in genetics and other fields are best approached by dealing with multiple variables simultaneously, rather than one variable at a time. Problems related to body shape or interactions of several environmental parameters would fall into this realm, as well as attempts to classify the animal's performance in relation to several different categories. In these cases it will be necessary to have access to programs performing principal components analysis, discriminant function analysis, clustering, multivariate analysis of variance, or canonical correlation. These packages are very expensive in comparison to other software for microcomputers, but are considerably cheaper than investing in a minicomputer.

The normal hardware of a microcomputer system would include the key-

board, monitor, drives (either floppy or hard disk), a printer and boards with different capabilities such as graphics, modem, etc. In the absence of a larger computer, a hard disk with 20 megabytes or more of RAM (random access memory) is advisable. Some applications require other hardware additions. For example, we are currently working on a system for analysis of the shape of penaeid shrimp. The computer can calculate and enter the many dimensions that are being used for variables with the aid

of digitizing tablets. These tablets can be attached to microcomputers equipped with software for biological applications such as analysis of shapes and areas.

### Conclusion

A microcomputer is a valuable tool for routine genetic analyses and is essential for research applications. Any aquaculture facility charged with genetics research or management and dispersal of important genetic stocks should be equipped with a microcomputer. One or

more personnel at the facility should be trained in the operation of the machine and the use of the software. Operational activities should be managed with the aid of database software. Experimental activities should be supported by software for statistical analysis. Standard genetics experiments can be analyzed with univariate software, but advanced research applications will require a multivariate statistical package and possibly additional hardware. ●

## The American Fisheries Society Computer Users' Group

**RICHARD K. KEISER**

American Fisheries Society  
Computer Users' Section  
32 Stillway Court  
Cockeysville, Maryland 21030  
USA

The Computer Users' Group is a section of the American Fisheries Society. The section was established two years ago and in that brief period has grown from 150 members to over 500. This is a strong indication of the high interest among fisheries biologists in computers, microcomputers in particular.

The section has as its objectives:

- to serve as a service section to the society and the fisheries profession;
- to work with other disciplines to develop workshops and symposia;
- to act as a clearinghouse for computer information and software;
- to develop a "refereed" software library for fisheries biologists;
- to work to obtain volume discounts and benefits through section membership in national organizations;
- to provide a contact service to bring fisheries users with similar interests and needs together with other users and/or industry products.

In its relatively short period of existence, the section has:

- worked with the home office of the parent society to develop an initial office automation plan including hardware and software acquisition;
- cosponsored a symposium at the annual meeting on microcomputers in fisheries;
- assembled a microcomputer fisheries software library containing over

18 diskettes of fishery programs—including many of the analytical programs presented in the microcomputer symposium;

- begun planning a series of focused continuing education workshops on fisheries and microcomputers.

At the Annual Meeting, the Computer Users' Group cosponsored two symposia, one with the Marine Fisheries Section and the second with the Fish Culture, Fish Management, and Bioengineering Sections. We are presently spearheading a drive to finance a publication of the two symposia briefly outlined below.

- **Micro-Fish I: Stock Dynamics.** Fishery analysis and quantitative ecology; current concepts on integrated approaches. This included reviews, demonstrations and applications of modern methods for analyzing dynamics of exploited populations. The emphasis was non-age/size-structured approaches, including basic models for stock assessment and reconstruction, bioenergetics approaches, and innovative techniques for incorporating environmental and stochastic effects.
- **Micro-Fish II: Hatchery Applications.** Microcomputers in bioengineering and fish culture. This session included lectures, demonstrations and applications with an

emphasis on hardware and control systems. The intent was to present a broad survey of both realized and potential applications of microcomputer technology.

The Computer Users' section publishes two to three newspapers per year. Our members include biologists in Europe, Latin America, Australia, Africa and the Far East. Members of the Section need first be members of the parent society. For further information, please contact: Mr. Bernard Magrey, Secretary/Treasurer, NMFS/NWAF, 7600 Sand Point Way, N.E., BIN C 15700, Bldg 4, Seattle, WA 98115-0070. ●

Republic of the Philippines  
Ministry of Transportation and Communications  
BUREAU OF POSTS  
NATIONAL CAPITAL REGION  
March 2001

**SWORN STATEMENT**

The undersigned, J. L. Magrey, Editor/Managing Editor/Publisher/owner/publisher of Micro-Fish Quarterly, (title of publication) published quarterly (frequency of issue) in English (language in which printed) at 108 E. Washington Blvd., Belmont St., Taguig Village, Manila (office of publication) after having been duly sworn to in accordance with law, hereby submits the following statement of ownership, management, circulation, etc. which is required by Act 2580, as amended by Commonwealth Act No. 791.

NAME	ADDRESS
Editor: <u>J. L. Magrey</u>	<u>108 E. Washington Blvd., Belmont St., Manila</u>
Managing Editor: <u>J. L. Magrey</u>	<u>108 E. Washington Blvd., Belmont St., Manila</u>
Business Manager: <u>J. L. Magrey</u>	<u>108 E. Washington Blvd., Belmont St., Manila</u>
Owner: <u>International Center for Living Aquatic Resources Management</u>	<u>108 E. Washington Blvd., Belmont St., Manila</u>
Publisher: <u>ICLARM</u>	<u>108 E. Washington Blvd., Belmont St., Manila</u>
Printer: <u>ICLARM Printing Unit</u>	<u>108 E. Washington Blvd., Belmont St., Manila</u>

If publication is owned by a corporation, stockholders owning one percent or more of the total amount of stock:

Stockholders, mortgagors, or other security holders owning one percent or more of the total amount of security:

In case of daily publication, average number of copies printed and circulated of each issue during the preceding month of \_\_\_\_\_ 19\_\_\_\_

- Sent to paid subscribers \_\_\_\_\_
- Sent to other than paid subscribers \_\_\_\_\_
- Total \_\_\_\_\_

In case of publication other than daily total number of copies printed and circulated of the last issue dated January \_\_\_\_\_ 19\_\_\_\_

- Sent to paid subscribers \_\_\_\_\_
- Sent to other than paid subscribers \_\_\_\_\_
- Total \_\_\_\_\_

J. L. Magrey  
(Signature)  
Director, Information Program  
(Title of designation)

SUBSCRIBED AND SWORN TO before me on this \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_ at \_\_\_\_\_ the aforesaid subject to see his Residence Certificate No. \_\_\_\_\_ issued at Manila on \_\_\_\_\_ 19\_\_\_\_

NOTARY PUBLIC  
UNITED STATES OF AMERICA  
RICHARD K. KEISER  
32 STILLWAY COURT  
COCKEYSVILLE, MD 21030