A Fisheries Scientist's View of Microcomputer Use and Training

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The first computer exhibition in Thailand was held under make-shift tents on a rain-soaked field. The most recent one in 1986 featured the glittering wares of the world's major hardware manufacturers spread over two floors of a large exhibition center. The two events were separated by a mere four years.

This example reflects a development that is taking place in many Southeast Asian countries. The mass production of relatively cheap IBM-compatible machines has considerably helped the introduction of computer technology to all walks of life.

This rapid development has led to a sort of "computer generation gap". Young scientists who have started their careers at universities and other scientific institutions just a few years ago are suddenly exposed to a new tool they had never been trained to use. Some manage to catch up by teaching themselves, but the majority usually prefer some sort of guided training.

Who Needs a Microcomputer?

If one's research work hardly requires the use of a calculator, there is a good chance that the "computer generation gap" will not be much of a burden. If at all, a computer might just serve as a sophisticated typewriter.

The more common case in research is the existence of a more or less extensive data set that is typically handled in four stages:

- Storage of primary data (data lists)
- Reduction of primary data (summaries)
- Data analysis (e.g., statistics)
- Presentation of results (tables, graphics, reports)

Microcomputers are very useful for these processes.

What Kind of Training is Needed?

Basically, there are two possibilities offered to a researcher when it comes to computer-based data handling.

One is the tailor-made program, that can handle all steps involved from the storage of the primary data to the presentation of the results. There are literally thousands of quite useful programs scattered all over the world, written by or for scientists who had similar requirements in data analysis. The major disadvantage with this "grey" software is that its existence is usually known to only a small number of people, thus making the programs not readily available to other potential users.

This usually leaves a scientist with no other choice than writing his or her own programs, perpetuating the "grey" software.

However, one thing many potential computer users do not want to do is to spend a lot of time just to learn how to get their data into their computer's memory. To them, training courses are not attractive if they only deal with programming languages like BASIC or FORTRAN.

The second option available to a researcher is to use general-purpose software that is best suited for a specific task. The advantage of this approach is the enormous flexibility; the disadvantage is the fact that the manuals accompanying the various software packages might together cover a whole meter of a book shelf and still not tell us how to turn our precious data set into an all-explaining graph!

This is, first of all, the result of the "computerese" in which even the best manuals are written, and which clearly prevents them from becoming best-sellers. Secondly, it is obvious that most of the general-purpose software have been developed for the business world and as a consequence examples in the manuals rely heavily on typical business tasks.

Probably the best examples of general-purpose software that have become very popular with scientists are the so-called spreadsheet programs such as MULTIPLAN, VISICALC and LOTUS 1-2-3.

Even though originally designed for business application, these programs have proven extremely useful in routine data analysis in scientific research. Data are entered (and edited) in a way very similar to the way one would do it with pencil and paper. Data analysis is facilitated by a large set of built-in mathematical and statistical functions. LOTUS 1-2-3 even features built-in multiple linear regression.

Any computer training course for people involved in large-scale analysis of numeric information ("number crunching") should, therefore, emphasize the use of these programs. It should then be demonstrated that data files created by these spreadsheet programs can either be analyzed to some extent by the same software package, or transfered to other application programs without the need to reenter the data. This is known as "software integration", which is becoming a standard feature of application programs.

Design of a Training Course

The author just completed an 18-month study of bivalve growth based at the Marine Science Department of Chulalongkorn University, Bangkok, Thailand. Previously, he had attended a microcomputer training course in northern Germany and was later asked to help other scientists in the Department to familiarize them with microcomputer use.

A training program for scientists should be split into the following two components:

Introductory Course. This is to create awareness of the many possibilities in data analysis through use of appropriate software. The topics should include: introduction to the hardware; general "house keeping"; making participants familar with the major software in the fields of spreadsheet application, database management, statistics, graphics and wordprocessing; and giving practical examples closely related to the research work of the participants.

An introduction should also mention the limitations in the application of computer software. This means making it very clear that a computer always will come up with a result, as long as the input procedure of the respective software program has been followed correctly and no mathematically impossible calculation is involved. Whether a result is "correct" or "meaningful" depends on the parameters entered by the user and his or her own capability of judging the quality of the output obtained. This understanding reduces the computer to what it really is: a willing work horse, ready to do what it is being told to do, nothing less, nothing more, and at an awesome speed!

A five-day introductory course could consist of: a half-day introducing computer systems; half-day for system software; 3.5 days for application software; and final half-day for software integration.

Care should be taken to have a sufficient number of microcomputers available, with not more than two participants sharing one machine.

Practical Training. The practical training aims at teaching participants the most rational use of selected software packages and their adaptation to specific requirements in scientific research. Such a course could last for two to three weeks, depending on the number of software packages included in the training program. Participants should be encouraged to bring their own data sets. This allows them to test the usefulness (and the limitations!) of the software packages presented, and gives them a feeling of what is possible and what is not.

If the person in charge of computer training happens to be working at the same institution, the course could become "on-the-job" training. The trainer provides assistance in all computer-related matters to the participants while they are involved in their normal working routine.

Another option worthwhile considering is to send participants to institutions that have specialized in this kind of training. Examples are ICID at Kiel (FRG) which organizes the "Kiel-Stanford Workshops on Micro Computer and Development", or the more specialized ICMRD Workshop on "Micro Computer Applications in Fisheries" at Rhode Island University, USA. Both centers are closely cooperating with national development agencies, which makes it possible to apply for sponsorship or scholarship funds. (Addresses below)

In such a case, an introductory course would not only give a general overview of the use of microcomputers in scientific research, but also help identify potential candidates for further training.

The revolution in microcomputer technology has significantly increased the number of researchers with access to computer hardware and software. Given appropriate training, scientists can make use of microcomputers for the manipulation of large amounts of data into useful information, that otherwise would not have been done because of the sheer calculation time involved. ●

Some Short Courses on Microcomputer Applications

Course and place	Contact
Workshops on microcomputers and development (2-4 wk); Kiel, Germany	Prof. G. Schiefer, University of Kiel, D-2300 Kiel 1, F.R. Germany
Microcomputers in agricultural research/development (3-4 wk); Minnesota, USA	Dr. F. Hoefer, Office of Special Programs, 405 Cottey Hall, Univ. of Minnesota, St. Paul, MN 55108, USA
Microcomputer applications in fisheries (2 wk); Rhode Island, USA	Director, ICMRD, University of Rhode Island, Kingston RI 02881, USA
Fisheries data management using microcomputers (2-3 wk); Oregon, USA	Dr. Alfred M. Beeton, CIFAD, 443 Snell Hall, Oregon State Univ., Corvallis, OR 97331, USA
A short course on fisheries management (2 mo) (Includes an introduction to the use of computers for management application. Software for sampling applications and for fisheries management computations will be available.); Washington, USA	Vincent F. Gallucci, Center for Quantitative Science (HR-20), Univ. of Washington, Seattle, WA 98195, USA

Dr. Dan Janzen asked us to include the appeal below. His request could not be ignored not only because Dr. Janzen is very serious in this effort (he is a winner of the Crafoord Award—the equivalent in bio- and other sciences of the Nobel Prize), but also because such restoration is badly needed in other tropical coastal areas, especially (ex) mangrove zones; Dr. Janzen's approach of listing the many resources provides a convincing rationale for conserving such areas.

A Tropical Easter Catalogue

Western Mesoamerica had a France-worth of tropical dry forest but today less than 2% remains. Only 0.09% has conservation status. The dry forest in Guanacaste National Park (GNP) in northwestern Costa Rica wants to buy itself, replant itself and regrow itself. This restoration of 700 km^2 of dry forest and rainforest refugia will double the amount of Mesoamerican conserved dry forest.

How restore it? Give it back the land it once occupied, and protect it from ranching, fires, and hunting. The organisms come from the 255 km^2 of National Park restoration already within GNP, and from population fragments in the damaged habitats. Invasion by native organisms will be natural or assisted, depending on the zone. But it is also cultural restoration. Its user-friendly performance as a living classroom and research laboratory will be conducted and attended largely by Costa Ricans, with an international audience as well. GNP has raised $1 million, and requires $5 million more by May 1987 to purchase GNP's 160 km^2 core. This purchase will secure the entire project.

The Easter shopping menu—$300 buys you all of (forever):

- 1 hectare or 2.47 acres
- 0.001 jaguar
- 0.1 adult guanacaste tree
- 0.01 muscovy duck
- 0.0029 herp species
- 0.1 agouti
- 0.05 curassow
- 0.000029 volcano
- 0.0071 bird species
- 0.04 anteater
- 200 sphinx moth caterpillars (offer good in July only)
- 25 spiny pocket mice
- 0.429 insect species
- 0.000016 of the join between 330 km^2 dry forest and 210 km^2 rain forest
- 1,000,000 ants
- 10,000 mushrooms (early rainy season bargain)
- 0.25 tinamou
- 0.4 adult guapinol tree
- 0.5 parrot
- 5 m riverbank
- 0.005 tapir
- 1 rattlesnake
- 200 orchids
- 3 million unlisted organisms
- 0.01 white-lipped peccary
- 400 dung beetles
- 20 toads
- 125,000 acorns
- 0.023 mammal species
- 100 vines
- 5,000 bruchid beetles (rainy season purchase not guaranteed)
- 100 scorpions
- 0.000028571 peripatus species
- 0.03 spider monkey

Your tax-deductible Easter purchase order of any amount should be mailed to Nature Conservancy-Guanacaste Fund, 1785 Massachusetts Ave., NW, Washington, D.C. 20036: All purchases will be held for your on-site inspection by the Costa Rican National Park Service. Detailed information available from D.H. Janzen, Department of Biology, University of Pennsylvania, Philadelphia, PA 19104 (215-898-5636).