

## Report on 'Numerical Methods in Ecology and Systematics'

*A short course held at the Università di Roma, June 19–29, 1983*

The short course 'Numerical Methods in Ecology and Systematics' was recently offered by the International School of Vegetation Science under the sponsorship of the International Society of Vegetation Science. The course was well attended, with over forty faculty and students from fourteen countries participating. The host institute was represented by F. Bruno and S. Pignatti (Istituto di Botanica), and M. Schaerf (Centro di Calcolo Interfacolta). L. Orlóci (University of Western Ontario) was course director and E. Feoli (Università di Trieste) served as program coordinator. Their collective effort is credited with getting the course off the ground, and for making it an unqualified success.

The purpose of the ten-day course was to introduce interested students to numerical methods of data analysis. The application of available methodologies was felt to be of primary importance. With this in mind, the course was designed to emphasize not only the methods and their underlying theory, but also the hands-on computer experience inevitably required in applying such methods. Apple II personal computers and a UNIVAC mainframe computer served as laboratory equipment.

The course was structured to provide for eight full days of instruction and an overnight field trip. It began with a welcoming address by F. Bruno, who stressed the immense importance of quantitative methods in vegetation work. Following this was a series of lectures by L. Orlóci covering the topics of population description, methods of sampling, comparison, the exploration of multidimensional data (multivariate analysis, including ordination and classification), and identification. These

lectures were supplemented by a manual of course notes and computer programs. Running consecutively with the lectures were a series of tutorials presented by M. Lagonegro (Università di Trieste). These outlined BASIC programming, matrix operations, and the use of the equipment. Again, a manual was provided to supplement the presentation.

Complementing the lectures and tutorials were scheduled laboratories held under the direction of J. Bowles and N. Kenkel (University of Western Ontario). These labs afforded participants the opportunity to use computers in applying the methods discussed in the lectures. This facilitated an understanding of the methods, and allowed users to assess the relevance of the algorithms to their own data. An extensive program library written for the Apple II was made available for student use. In addition, workshops were organized to familiarize users with some of the programs available on the mainframe computer at the university. G. Cavedon (Università di Roma) presented an introduction to the mainframe system and discussed some of the available statistical program packages. E. Feoli outlined the programs available in the package 'Information Analysis in Vegetation Research'. Finally, a workshop by O. Wildi (Swiss Federal Forestry Service) offered an introduction to the package 'Management and Multivariate Analysis of Vegetation Data'.

The course culminated with a series of special guest lectures. D. W. Goodall (C.S.I.R.O.) began the proceedings with a seminar on the philosophy of applications of ordination and classification in ecology. This was followed by a lecture by E. van

der Maarel (University of Uppsala) on species response curves and ordinations. Next, P. Juhász-Nagy (Eötvös Loránt Tudomány Egyetem) presented an introduction to dynamic modelling, followed by a lecture on a maximum likelihood method of ordination by D. W. Goodall. The lecture series concluded with a discussion of the nature of individuals – descriptions, equivalence, similarity, and pattern, by M. B. Dale (C.S.I.R.O.).

Also included was a field trip to Circeo National Park on the Mediterranean coast of central Italy, organized by C. Blasi and F. Spada (Università di Roma). On the first day of the trip participants had the opportunity to view a relatively undisturbed coastal Mediterranean evergreen sclerophyllous forest dominated by *Quercus ilex*. The night was spent at the forestry station in the park. Early next morning, a bus took the group to the base of the promontorium of Monte Circeo, a 514 m high limestone outcrop on the coast. The day's trip involved a long and sometimes arduous ascent of the promontorium under a blazing hot sun. The path to the top traversed a number of interesting and varied vegetation types. The view from the top was most spectacular. For many the field trip afforded a unique opportunity to view undisturbed maquis vegetation firsthand.

Participating faculty staff and students agreed that the course was both timely and very useful.

Many of the students expressed frustration at the lack of a comprehensive course in multivariate analysis for vegetation ecologists at their institutions. For them the course offered a unique opportunity to acquire knowledge of the computer techniques being increasingly used in their field. For others the access offered by the course to computers and computer program packages was important. The need and increasing demand for a course of this type was thus clearly demonstrated. This has prompted the organizers to consider offering, on a regular basis, a course along similar lines. Tentative plans call for holding the course at a different host institute each time, thus affording persons in different parts of the world the opportunity to participate. In keeping the course fresh, new topics and materials will be presented and course contents updated to meet future requirements. Special guest lectures will remain on the agenda, and emphasis will continue to be placed on instruction in methods and their application.

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