

Christopher Margules

Effects of Human Action on the Persistence or Extinction of Species



Born on October 25, 1951 in Canberra, Australia. I attended secondary school in Davis, California and Canberra. I obtained a B.app.Sc. from the Canberra College of Advanced Education in 1974 and a Graduate Diploma in Recreation Planning (part time) from the same institution in 1978. I worked as technical assistant, then as experimental officer in CSIRO until 1978. From October 1978 to October 1981, I was a D.Phil. candidate at the University of York (UK). The degree was awarded in 1982. Since then I have conducted ecological research in the CSIRO Division of Water and Land Resources, moving in 1986 to the Division of Wildlife and Ecology, where I am now a Principal Research Scientist. I am author or co-author of 22 papers in refereed journals, 18 refereed book chapters or conference papers, and editor of three volumes. I was married in 1974 and divorced in 1987. There are three children, Nick, Elisabeth and Tom. I married Janice in 1990 and she died in her sleep, too young, on September 25, 1994. — Address: CSIRO, Division of Wildlife and Ecology, P.O.Box 184, Lyneham, ACT 2602 — Australia.

My five-month stay at the Wissenschaftskolleg was spent primarily on my commitment to the biodiversity group (*Schwerpunkt "Methoden zur Erfassung der Artenvielfalt bei der Auswahl von Reservaten"*) project. This was a book manuscript entitled *Priority Areas Analysis: Systematic Methods for Conserving Biodiversity*. The mechanism used most commonly for the protection of biodiversity at the present time is to alienate areas of land or water from utilisation or exploitation by providing legal protection as reserves or similar classes of land tenure, usually called protected areas. We chose to use the generic term, biodiversity priority areas, recognising that it may not be possible to protect all areas which intrinsically deserve to be protected, and that of those that do become protected, not all will be protected to the same degree. In the past, the identification of such areas has largely been *ad hoc* and opportunistic, leading to a biased

representation of biodiversity within them. Our aim was to devise more systematic methods for locating priority areas so that a less biased representation can be achieved in the future. This is an immensely practical problem, but one which required scientific progress before it could be solved. Governments and natural resource management agencies throughout the world would like an answer to it, especially now that the biodiversity convention requires the many governments which have signed it to actively pursue biodiversity protection. However, before proceeding to develop those methods, it was necessary to pin down the specific role priority areas should play in the overall goal of protecting biodiversity. The biological world is fundamentally different from the physical world. The material physicists deal with displays regularity within homogeneous infinite classes, the members of which cannot be distinguished from one another (e. g., electrons, hydrogen atoms). In contrast, biological systems are organised hierarchically from the molecular, to the ecosystem level. They are characterised by complexity and variability at every level above the molecular and processes operating at one level cannot necessarily be assumed to operate at any other. Logical classes such as genotypes, species communities and ecosystems are heterogeneous. Each member of each class is an individual, which can be distinguished from every other individual. The variety of biological configurations at all hierarchical levels is unknown but clearly extremely large and probably unmeasurable. Yet protecting this complexity is the goal of biodiversity protection. It means protecting hierarchical systems that consist of finite classes of heterogeneous entities that are self-organising (maintain themselves at the expense of the environment) and display emergent properties (different processes at different levels). Priority areas alone cannot achieve this goal. Sympathetic management outside of priority areas will also be needed. The role of priority areas is that, collectively, they should encompass examples of all, or as much as possible, of the biodiversity of the region, country or biome they are situated in. Thus, priority areas make a necessary contribution, but not a sufficient one, to the overall protection of biodiversity.

With this role in mind it was possible for the group to devise explicit efficient procedures for identifying networks of priority areas that more comprehensively represent biological diversity^{*}. Recognising that legitimate alternative land uses severely constrain practical options, the methods provide the greatest possible flexibility in the location of priority areas to facilitate negotiation and expedite the planning process. However, the

^{*} See the relevant seminar reports in this volume, pages 193 ff., 198 ff.

question of the adequacy of representation — how much is enough — is still open. Perhaps another project at the Wissenschaftskolleg might help solve this problem as well and provide an even more powerful tool for policy-makers and planners?

There was some time for other work-related activities. I helped run a five-day workshop in Pori, Finland, along with other Australian colleagues, on the design and sampling strategies of biological surveys, the analysis of survey data and the use of those data in the identification of biodiversity priority areas. This workshop was attended mainly by officers of natural resource management agencies from Norway, Sweden, Finland, Estonia, Latvia, and Russia. The aim was to show how methods developed in Australia for collecting and analysing data on the distribution patterns of species and communities could be applied to the Taiga, the northern boreal forests. The Taiga in Scandinavia has been logged systematically for many years, but large areas of the Russian Taiga are only now being opened up for timber production. The opportunity may exist for biodiversity priority areas to be identified before exploitation gets into full swing and therefore to be taken into account at the start of the planning and development process.

I also visited the University of Halle and the *Umweltforschungszentrum* in Leipzig to give seminars on the identification of biodiversity priority areas and my other main research interest, the effects of habitat fragmentation on the persistence or extinction of species. Some collaborative research projects were discussed and are planned to get underway once my commitment to the Wissenschaftskolleg project is complete. Semi-natural habitat in the Leipzig-Halle region is extremely fragmented. The present patterns of distribution and abundance of species in this fragmented landscape will help me interpret the results of a field experiment underway in Australia, where I have deliberately fragmented forest habitat with bulldozers to track the persistence or extinction of species. The results of this experiment could, in turn, inform the management of landscapes that have been fragmented for centuries, such as that of the Leipzig-Halle region, by identifying the kinds of species that have disappeared, and the ecological requirements for their reinstatement. Back at the Wissenschaftskolleg, I completed "Deutsch eins für Ausländer" thanks to the excellent, patient tuition of Eva Hund.

There is one more thing. Two of my children, Nick and Elisabeth, had the best and most educational experience of their lives and my wife, Janice, the most peaceful time she could remember.

The working environment of the Kolleg stands in stark contrast to the one I, along with most other scientists, find myself in these days, in which time and effort is mostly taken up with grant applications, external con-

sultancies to earn funds for staff salaries and the juggling of ever scarcer resources to support demands for higher levels of productivity. I very much appreciated the opportunity provided by my fellowship at the Wissenschaftskolleg to think carefully about, discuss with colleagues and write down a solution to one of the many practical problems of protecting biodiversity, which I feel sure will influence planners and policy-makers in many parts of the world, should they read it.