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Preface

Extinction Thresholds: Insights from ecology, genetics, epidemiology and behaviour

One of the fundamental tasks in population biology is to clarify the conditions that allow long-term persistence of populations and species. A wide range of behavioural, genetic, ecological and evolutionary processes may lead to threshold values in population size, landscape structure or some biological characteristics of populations that critically influence the likelihood of extinction versus persistence. Examples of such processes include Allee effects, dynamics of populations in fragmented landscapes, and genetic meltdown processes faced by small populations. Knowledge of the occurrence and determinants of extinction thresholds is critical not only for our fundamental understanding on how populations function, but also for practical conservation and management planning. Metapopulation ecology provides the most clearcut example: What is the critical amount of habitat that would allow long-term persistence of an organism, and how does the degree of habitat fragmentation influence the threshold value? Answers to these questions are provided by Ovaskainen and Hanski (this volume).

The extinction threshold represents a qualitative change of one sort or another, and is hence the focus of theoretical studies. One of the intriguing questions concerns the nature of transition from one state (say non-zero population size) to another (extinction). This transition may involve alternative locally stable equilibria, which would lead to particularly abrupt changes. One controversial idea is that evolutionary dynamics might tend to move populations and species towards the threshold value. A sharp threshold value characterizes deterministic models, whereas in stochastic models the boundary becomes blurred — and makes the empirical study of extinction thresholds in real populations even more difficult. Arguably, the best empirical evidence for extinction thresholds presently comes from epidemiological studies, which benefit from the vast amounts of high-quality data available for some diseases such as measles.

This volume, consisting of 13 invited contributions under the general theme of *Extinction Thresholds*, aims to bring together current theoretical and empirical knowledge of extinction thresholds and their determinants in the wild. Rather than being an exhaustive treatment of the topic, the volume should be viewed as a snapshot of the problems and research in this complex and multidimensional area of investigation. The volume was born out of the *Extinction Thresholds* conference held in Helsinki, 2–5 September 2002, hosted by the Spatial Ecology Programme of the Department of Ecology Systematics, University of Helsinki. The purpose of the meeting was to bring together theoretically and empirically oriented population biologists and conservationists, and to promote research interest on extinction thresholds and their applications in conservation. The scientific contents of the meeting are summarised in Tim Benton's congress report opening this volume.

As the editors of this volume, we express our thanks to all of the authors who contributed to and made this special issue possible. Our task in coordinating and editing the contributions has been an easy one given the high quality of manuscripts as well as the generous help from many external referees. On behalf of the Spatial Ecology Programme (www.helsinki.fi/ml/ekol/spatial_ecology.html), we would like to take the opportunity to thank all of those who participated and helped in making the *Extinction Thresholds* meeting possible. In particular, we would like to thank the Academy of Finland for its continued support to the programme since 1998.

Juha Merilä & Johan D. Kotze
Department of Ecology and Systematics
P.O. Box 65, FIN-00014 University of Helsinki, Finland