On the theory and practice of Conservation Biology:

a comment on Marone’s paper

Sobre la teoría y la práctica de la biología de la conservación:

un comentario sobre el artículo de Marone

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ABSTRACT

The presumed reliance of modern conservation biology on equilibrium and deterministic models is criticized. Ecology has contributed with both equilibrium and nonequilibrium theories and approaches to conservation biology. Conservation biology does not pursue the restoration or maintenance of ecological equilibria. The use of equilibrium models is related to the nature of the decision-making process in disciplines that deal with human issues, not to the uncritical acceptance of deterministic dictums.

Key words: Conservation, equilibrium, decision-making.

RESUMEN

Este trabajo critica la supuesta dependencia de la biología de la conservación moderna, de modelos deterministas y de equilibrio. La ecología ha contribuido con teorías y enfoques basados tanto en sistemas en equilibrio como sin equilibrio. La conservación biológica, de hecho no persigue restaurar ni mantener equilibrios ecológicos. El uso de modelos deterministas se interpreta como resultado de la naturaleza del proceso de toma de decisiones en disciplinas donde el bienestar de las poblaciones humanas está involucrado, y no como aceptación ciega de dichos modelos.

Palabras clave: Conservación, equilibrio, toma de decisiones.

INTRODUCTION

Recently, Marone (1988) has characterized conservation biology as applied biology, relying blindly on ecological concepts of equilibrium, and focusing on the restoration and preservation of such equilibrium. In my opinion, that view is narrow when compared to the actual status of conservation biology as a discipline and as an endeavor.

Conservation biology is an emerging, synthetic and crisis-oriented discipline, aimed toward the development of “principles and tools for preserving biological diversity” (Soulé 1985: 727). The conservation of living resources has, by itself, three goals, namely “to maintain essential ecological processes and life-support systems, to preserve genetic diversity [and], to ensure the sustainable utilization of species and ecosystems” (IUCN et al. 1980: vi). Therefore, the discipline of conservation biology does not focus on the maintenance or restoration of ecological equilibria. Further, the conservation of living resources is related to social issues to a higher degree than Marone (1988) has recently pointed out. Conservation is regarded as a tool for development, by ensuring sustainable benefits for human populations through the use of wild species (IUCN et al. 1980).

The review of conservation biology by Marone (1988) includes at least two misconceptions regarding the nature and status of the discipline. The first one refers to the assumed reliance on equilibrium models. The second misconception refers to the origin of the discrepancies between the theory and practice of conservation biology. According to Marone (1988), while theoretical ecology accepts a nonequilibrium view

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of ecological systems, practitioners of conservation biology are still attached to old views regarding a perfectly ordered, equilibrium world. Here, I put forth that modern conservation biology is on better grounds than Marone (1988) suggests.

**Dogmas in the theory of conservation**

Conservation biology, according to Marone (1988), is tied to deterministic models borrowed from ecology, irresponsible to the debate regarding the equilibrium-nonequilibrium nature of ecological systems. Marone (1988) neglects the point that the equilibrium versus nonequilibrium debate is not the right issue in contemporary ecology (Berryman 1987). Such a dichotomy is false in ecology and, by extension, in conservation biology. Single, multiple and non-equilibrium points should be viewed as a property emerging under a given set of conditions, not as a unique and intrinsic property of ecological systems (e.g., May 1977, Wiens 1984, De Angelis & Waterhouse 1987). Similarly, rather than debating the role of a given biotic interaction in shaping ecological communities, the “one or the other” approach has been superseded by the analysis of the conditions under which a given interaction or set of interactions has relatively higher importance (e.g., Lubchenco 1986). Therefore, the theoretical scenario is not as chaotic as Marone (1988) depicts.

Undoubtedly, some approaches in conservation biology have relied on equilibrium models, such as the pioneering attempts to apply the theory of island biogeography to the design of nature reserves (e.g., Terborgh 1975, Wilson & Willis 1975, Diamond & May 1976). Single large reserves were recommended as optimal over several small ones, in order to maximize species diversity within reserves. The immediate debate that sprung around this suggestion contradicts Marone’s (1988) claim regarding the uncritical acceptance of deterministic dictums in conservation biology. Criticisms indicated that the equilibrium theory of island biogeography was neutral regarding the diversity accomplished with reserves of different sizes (see Simberloff & Abele 1982, Soulé & Simberloff 1986, for a summary of the debate).

Further, even the presumed perfect analogy between nature reserves and islands has been questioned. The nature of “island” depends on the organisms involved (Janzen 1983, 1986a).

Further, and more importantly, several issues related to nonequilibrium communities, such as their spatial and temporal dynamics, have been addressed by ecologists and have direct bearing on conservation biology (e.g., Pickett & Thompson 1978, White & Bratton 1980, Niering 1987). Special attention has been devoted to the role of disturbance in creating and maintaining habitat heterogeneity, and its impact upon population demography and species diversity (e.g., Foster 1980). In fact, the need to conserve changing ecosystems has been recognized as paradoxical (White & Bratton 1980). Practical recommendations have been advanced on these grounds: Reserves should be large enough to encompass a “minimum dynamic area”, the smallest area with a natural disturbance regime which maintains internal recolonization sources and hence minimizes extinction” (Pickett & Thompson 1978: 27).

The role of stochastic events upon the demography and probability of extinction of endangered species has recently received attention, from both theoretical and practical grounds (Leigh 1981, Soulé 1986a, Verner et al. 1986 among others). These analyses have aided in the determination of the size of the “minimum viable population”, which in turns translates into the amount of area that needs to be preserved in order to ensure the long term survival of a given population (Frankel & Soulé 1981, Soulé & Simberloff 1986, Soulé 1986a for a review). Stochasticity is regarded as a key factor when assessing minimum population size for conservation purposes (e.g., Samson et al. 1985, Shaffer & Samson 1985).

Clearly, the two examples cited above demonstrate that modern conservation biology is not relying exclusively on equilibrium models. The use of such models does not owe to the uncritical acceptance of equilibrium theories. It only reflects the framework in which conservation biology is operating. Societal demands for effective managerial plans are pressing. Little time is available for refinement prior to theory application. Action then must be taken based on available theory and data (Diamond & May 1985, Soulé 1986b). Testing and reformulation must be accomplished in parallel to implementation. For example, the equilibrium theory of island biogeography has offered a starting
point for challenging views on practical issues such as the conservation of biotic diversity in exploited forests (e.g., Harris 1984, Verner et al. 1986; see also Janzen 1988a).

**Dogmas in the practice of conservation**

The second of Marone’s (1988) misconceptions is related to the social nature of conservation biology. According to Marone (1988), the discrepancies between theory and actual practice of conservation biology lie in the dogmatism demonstrated by the administrative personnel, that remain attached to obsolete ideas regarding the prevalence of an equilibrium world. Although the ideas of ecological equilibrium are indeed deeply rooted in western thought (Worster 1977), the eventual discrepancies between theory and practice, in my opinion, may have an additional source: conservation is a social issue.

For Marone (1988), the conservation of living resources, although dependent of social and economical issues, is largely applied biology. By definition it is not. To the conservation of living resources, disciplines other than biology concur, such as philosophy, economy, law, and sociology. In this multidisciplinary approach to conservation biology lies its synthetic nature (Soulé 1985). Further, the final goal of the conservation of living resources is human welfare via the long term survival of species and functioning of ecological systems (Leopold 1949, Ehrenfeld 1970, McNeely & Miller 1984). Conservation of living resources is regarded as a prerequisite for development, hence as a condition to satisfy human needs and improve human welfare (IUCN et al. 1980).

In social sciences, or in any discipline where human issues are at stake, the decision-making process differs profoundly from that in the natural sciences. Decisions are based on the best guess that is backed by available information. Due to the provisional validity of the scientific and technical knowledge available, the consequences are not always predictable. However, no action at all may be worse than an action based on questionable theories (Hayek 1979, Weber 1980). This is certainly the case of conservation biology, where decisions must be made regardless of how confident scientists are about their current theories (Soulé 1986b). As such, the adoption of the theory of island biogeography in the World Conservation Strategy (UICN et al. 1980) does not imply the acceptance of the theory and underlying assumptions, but simply the need to use the available theoretical framework in order to prevent the dismal extinction of species that hampers the survival of the human species itself.

Further, in the practice of conservation, decisions are not only based on scientific knowledge. Ecological theory and experience is necessary but not sufficient to determine the rationale for species conservation (e.g., Middleton & Merriam 1985). In fact, trade-offs are to be expected between scientifically sound (read provisionally valid) and socially acceptable practices. The joint contributions of natural and social sciences are required to launch and carry on conservation programs if both species are to be saved from extinction, and human needs satisfied. In fact, cultural and social perceptions are key factors in conservation, and should be considered in any managerial attempt (e.g., Ehrenfeld 1981, McNeely & Miller 1984, Kellert 1985, Janzen 1986b, 1988b).

**A final remark**

Conservation of living resources, as an idea and an endeavor largely antedates the writings of Robert T. Malthus in 1789. The conservation of Nature has been for millenia an overt or tacit activity with different objectives in mind (Glacken 1967, Passmore 1978). It is the formalization of this activity as a scientific discipline that is a recent event (Soulé & Wilcox 1980). As any human endeavor, it can be improved. Let’s work on it.

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**LITERATURE CITED**


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