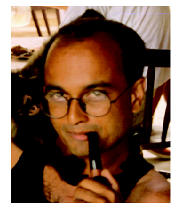
Norms and the Conservation of Biodiversity

Sahotra Sarkar

The aim of this article is to discuss the various ways in which norms enter into discussions of biodiversity and its conservation. It will treat both conservation policy and the science behind biodiversity.



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Introduction

Twenty years ago, the neologism *biodiversity* was introduced as a contraction for *biological diversity* to describe the intended target of preservation efforts by conservation biologists in the United States [1]. The new term was intended to include more than the game species, other resource species (those of agricultural value, used as building material, *etc*.), and the charismatic species that had traditionally been the targets of conservation efforts. All aspects of biological heterogeneity, whether structural, functional, or taxonomic, were to be included in the scope of the new term. Around the same time conservation biology emerged as an organized discipline with the formation of new professional societies with their dedicated journals.

There was an immediate and powerful synergistic interaction between the growing use of the new term, *biodiversity*, and the spread of conservation biology in the early 1990s [2]. The first journal with the term in its title, *Canadian Biodiversity*, began publishing in 1991 and changed its name to *Global Biodiversity* in 1993; a second, *Tropical Biodiversity*, began appearing in 1992; *Biodiversity Letters* and *Global Biodiversity* followed in 1993. The Society for Conservation Biology was founded in 1985, and its journal *Conservation Biology* started appearing in 1986. The goal of conservation biology is the preservation of biodiversity.

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Biodiversity, conservation biology, habitat, environmental ethics, endangered species.

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prise that embraces a social goal, namely, the protection of habitats and species, the concept of biodiversity has a normative component besides a purely scientific or descriptive one. A useful analog is health, the goal of medicine, and Soulé [3] and other founders of conservation biology endorsed the analogy between the two disciplines right from the beginning. Also like medicine, conservation biology is a hybrid discipline drawing insights from a variety of fields, including both the biological and social sciences, but it is the normative aspect of biodiversity is what made the new discipline distinctively different from traditional ecology and other descriptive sciences on which it drew for its foundations.

Norms and Conservation Policy

That norms should enter discussions of conservation policy is not surprising since the political arena is necessarily about norms. There are at least five distinct ways in which norms enter policy formulation.

Justification for Conserving Biodiversity

In the first place, there must be normative justification for conserving biodiversity. How this is best done remains a contentious issue that is central to the philosophical discipline of environmental ethics. At one extreme are proposals that attribute intrinsic value to biodiversity, to all taxa, and sometimes even to physical features of the environment [4]. Something has intrinsic value if it is to be regarded as valuable independent of its utility or value to some other thing. Because of this, entities that are supposed to have intrinsic value are supposed to merit protection.

It is probably uncontroversial that human beings should be regarded as having intrinsic value: this is one of the foundations of ordinary ethics. However, it is not equally obvious that non-human entities should also be regarded as having intrinsic value –some argument is necessary for making such attributions.

Restricting attention to living entities, typically, these arguments use analogies between humans and other entities: they all have a will to live, they all have identifiable interests, and so on. However, such arguments for intrinsic value are most convincing when they refer to individual organisms rather than abstract entities such as species or, especially, higher taxa. Consequently, intrinsic value attributions may at best lead to concern for the welfare of individual organisms (for instance, as argued by proponents of animal rights). They are problematic in conservation biology because they would prevent necessary practices such as the culling of overgrown populations or invasive species.

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At the other extreme is the position that biodiversity deserves protection because of its instrumental value to humans in providing resources and other services. Between those positions are more nuanced forms of anthropocentrism that sometimes are coupled to a pragmatic multifaceted approach that admits a plurality of values [2]. Environmental ethicists continue to debate these issues. The critical point is that, if there is no adequate normative basis for biodiversity conservation, conservation biology becomes a dubious enterprise because its explicit purpose is the conservation of biodiversity.

Definition of Conservation

The way the normative basis for biodiversity conservation is established influences what counts as conservation. If all individual organisms have intrinsic value, the target of conservation should be each one of them. Even controlling an invasive species to protect the habitat of an endangered endemic species becomes an ethically suspect policy. Conservation becomes a question of protecting lives rather than preventing the extinction of species. If the justification for conservation is purely instrumental, conservation consists of natural resource management and *biodiversity* is little more than a fancy new name for living natural resources. All other proposals admit a much broader approach to conservation and thus a more general concept of biodiversity that goes beyond individual organisms or living natural resources.

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Conceptualization of Conservation Policy

The way the normative basis for biodiversity conservation is established influences the way conservation policy is conceptualized and formulated. In particular, conservation planning, which is a central part of the practice of contemporary conservation biology, is increasingly being approached within the formal framework of decision theory and often involves the use of extensive software-based decision support tools [5]. The use of such a framework presumes that there is an anthropocentric basis for conservation decisions that are ultimately supposed to be evaluated through the use of expected utility functions constructed from (human) preferences as elicited through a variety of methods. If biodiversity conservation must be based normatively on intrinsic values, this approach to conservation is not valid.

Characterization and Operationalization

The normative component of the concept of biodiversity constrains the way it should be quantitatively characterized and operationalized in the field (which is a necessary prerequisite for policy formulation and implementation). Suppose that some (very eccentric) definition of biodiversity gives high conservation value to *Mus muscuslus* (the house mouse) and *Corvus splendens* (the common crow) in India. Now, independent of this putative definition of biodiversity, there is little rational basis to expend limited resources on the welfare of either of those species. Rather, both are widespread species whose spread should be controlled. Because the purpose of conservation biology is the protection of biodiversity, which is a normative goal, something must have gone wrong with the way in which biodiversity was defined. Thus, carefully considered normative decisions that specify what deserves protection must enter into the definition of biodiversity. Typically, these decisions embody cultural values. As is discussed in detail below, those cultural values influence the selection of "true surrogates" for the measurement of biodiversity in the field.

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Vermeulen and Koziell [6] recently emphasized the importance of local cultural values in the definition of biodiversity over global values that are not culturally shared. However, such a choice would come at a cost: it would not allow the use of many scientific criteria such as endagerment or endemicity to define biodiversity. While such criteria are supposed to reflect universal values, they may not be locally appreciated and would thus become illegitimate.

However, when global values alone have dictated what counts as biodiversity and how different components of biodiversity are prioritized, the typical result has been political conflict, sometimes leading to serious deprivation of those with the fewest resources. For instance, conservation refuges have been created throughout the developing world (the South) to protect endangered species in nature reserves because those species are highly valued by Northern environmentalists [7]. The extent and severity of this problem are contested, but there is little doubt that it is a serious issue [2]. Such situations create troubling ethical problems besides violating every canon of distributive justice, assuming that at least some equity is acknowledged as a desired end. Many critics from the South have assailed what they perceive as the arrogance of Northern biodiversity conservationists [8].

Negotiations on Conservation Policy

Because biodiversity is a concept of recent vintage, its role, especially in the context of policy formulation, continues to be negotiated with the roles of other values, in particular the more traditional natural values that may be related to it. These other natural values include wilderness ('pristine habitats'), natural resources, ecosystem services, and ecological integrity. There has been a long and unfortunate tradition in some Northern countries, especially Australia and the United States, of conflating various natural values, in particular wilderness and biodiversity [9]. The pursuit of these other values is often consistent with biodiversity conservation but sometimes it is not.

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For instance, consider Keoladeo Ghana National Park in Rajasthan [2]. This 450 hectare artificial wetland was created by local rulers during the nineteenth century. It attracts tens of thousands of wintering waterfowl and also supports a large number of bird species that breed during the monsoon. Before Indian independence in 1947, the area was a hunting preserve (which is why it was created). But it also served and a grazing ground for cattle, mainly buffaloes, from the surrounding villages and also as a source of agricultural water during the post-monsoon period. After independence it was set aside as a bird reserve and, from 1981 onwards, as a national park along the wilderness model of land use. On the advice of Indian and U S experts, grazing was banned in the early 1980s ostensibly to promote bird diversity. When villagers protested the loss of fodder, the police responded with violence, at one point killing nine villagers. The ban on grazing, despite its intent, devastated Keoladeo as a bird habitat, especially for wintering geese, duck, and teal. Paspalum grass and other opportunistic weeds, which had been kept in check by grazing, established a stranglehold on the wetland, choking the shallow bodies of water. Fish populations declined, leading to corresponding declines in bird populations. These results were presented in 1987 in a report prepared by the Bombay Natural History Society (BNHS). This study was originally designed to document the harm done by grazing but came to the opposite conclusion. Officially the no-grazing policy has never been reversed but it is no longer systematically enforced. As a result, some (technically illegal) grazing began again, and anecdotal reports suggested that bird habitat improved in the 1990s. (Lately, Keoladeo has been suffering from a drought unrelated to these earlier problems.) In this case, wilderness preservation (the creation of national parks) was in conflict with biodiversity conservation.

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Besides biodiversity, ecological integrity has also been urged as a goal of nature protection, and is a central goal of ecological restoration [10]. Because the concept of biodiversity comes with an obligation to protect biodiversity, care must be taken that its definition does not lead to normatively unacceptable conflicts with other values and, preferably, as few practical conflicts as possible.

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Norms and the Science of Biodiversity

With respect to the scientific aspect of the concept of biodiversity, the characterization that it includes all taxonomic, functional, and structural biological differences is unexceptionable in principle. However, it is useless in practice because it cannot be assessed in the field. Conservation also is an impractical proposal: every biological pattern and process becomes a target of conservation. As was stated above, biodiversity must be defined so that it will be an appropriate target of conservation and be amenable to the practical needs of conservation planning. This means that it must be operationalized in such a way that: (i) what it includes is deemed appropriate as a conservation target; (ii) it must be estimable from field studies; and (iii) preferably, it must be quantifiable.

If biodiversity is defined as all taxonomic, functional, and structural diversity, it falls afoul of the estimability and quantifiability criteria. A standard move at this stage is to suggest that three entities capture what is important about biodiversity: genes (alleles), species, and ecosystems [5]. As a simplifying proposal in the face of intractable complexity, this suggestion has merit. Conserving all allelic heterogeneity takes care of much of the diversity below the level of species. Conserving all species conserves all higher taxa, though it may not conserve interspecific hybrids. Conserving all ecosystems protects most communities, and so on. However, even this proposal is too broad: in practice it is impossible to estimate allelic and species diversity in almost any habitat. The definition also excludes biological processes.

It thus is necessary to choose surrogates for biodiversity ("true surrogates" [11]). The estimability problem is solved by making sure that these are tractable sets of taxa, ecosystems, processes, and so on. The normative decision of what should be conserved now decides which set is appropriate. In the United States, for instance, typical true surrogates are endangered and vulnerable species. Some conservation agencies, such as Conservation International, use critically endangered species as defined by the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List along with endemic species. Others, such as The Nature Conservancy in many regions, use carefully delineated habitat types.

From a scientific perspective there is thus a conventional element in such a definition of biodiversity based on true surrogates in the sense that the definition is not entirely specified by scientific facts. However, from the normative perspective these are not conventional choices. Instead, they reflect deep cultural judgments of what is worth preserving in nature and thus these choices must be carefully made. For instance, all the choices of true surrogates mentioned above mark a fairly recent shift in cultural values away from charismatic species to a more inclusive set of taxa.

There is also a further level of complication. In many situations even the true surrogate set (for example, if it is something broad, such as all vertebrate species or all vascular plant species) is too difficult to measure in the field. (Measuring all species, including microbial species, is nearly impossible in any habitat unit large enough to be of potential conservation interest.) In this situation 'estimator-surrogates' must be used to represent true surrogates for biodiversity, especially in biodiversity conservation planning. For instance, a set of environmental parameters (which are much easier to measure and model) may be adequate to represent many taxonomic groups (the true surrogates) in many regions [5]. Techniques of surrogacy analysis have been developed to quantify the extent to which there is a match between planning outcomes using true and estimator surrogates. However, even after the components of biodiversity (that is, the true surrogate set) has been normatively selected, there remains the question of how it is to be quantitatively measured. The next section discusses that question.

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Complementarity

Since the 1960s, ecologists have distinguished between α-diversity, or the diversity within a study unit; β-diversity, or the diversity between study units; and γ-diversity, or the total diversity of a region [12]. Over the years, a wide variety of mathematical measures have been proposed to quantify each of these three concepts. In the 1980s several groups of conservation biologists independently began to use a measure of diversity that came to be called complementarity [13]: if areas are being selected iteratively for conservation, the complementarity value of an area is the extent to which it includes new entities not already present in the areas previously selected. If areas are selected to maximize complementarity, they add the most diversity to the total set of selected areas. There have been many variants of this idea, in particular, the suggestion to include broader measures of taxonomic and phylogenetic diversity than species diversity.

It can be shown that the use of complementarity typically leads to nearly optimal spatial economy in the selection of conservation area networks, that is, to the representation of a full complement of the biodiversity of a region (represented by true surrogates) in as small an area as possible [5]. Sarkar [11] argued that procedures using complementarity provide an implicit quantitative measure of biodiversity that is sufficiently precise for the purposes of conservation, in which all this measure must permit is a comparative assessment of how important different areas are when some but not all of them are to be selected for conservation. Magurran [14] pointed out that complementarity is essentially a measure of β-diversity because it quantifies the extent to which a new area is different from those already selected.

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The recognition that complementarity is a measure of β-diversity establishes an important conceptual link between the measurement of biodiversity in conservation planning and the older work of quantifying ecological diversity, which was not initiated with policy development as an explicit goal [15]. Because the practical selection and implementation of conservation area networks is the central goal of systematic conservation planning, when a (descriptive) diversity measure is used for this purpose, it is incorporated explicitly into (normative) policy formulation.

Concluding Remarks

Even when complementarity is used to quantify biodiversity, the choice of the true surrogate set for which this diversity measure is being quantitatively assessed must ulitmately be based on normative judgments about what it is important to conserve. Thus, descriptive and normative judgments are being simultaneously integrated in planning protocols rather than a descriptive judgment being adopted within the policy framework. As noted earlier, that normative elements should enter into policy formulation is neither controversial nor unexpected. Similarly, that there should be non-normative scientific issues connected to the quantification of biodiversity is also expected. What is worth noting is that, because the choice of true surrogates for biodiversity involves cultural values, even the quantification of biodiversity involves norms. Both the descriptive and the normative aspects of the concept of biodiversity remain central to its use within conservation biology just as they were when the concept was introduced.

Acknowledgments

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