BIOTROPICA 42(5): 563–565 2010 10.1111/j.1744-7429.2010.00690.x

COMMENTARY

Is There Enough Science for Conservation Action?

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ABSTRACT

We argue that there is not enough science to appropriately support many of the conservation measures currently being proposed, and hence, we cannot be sure of the objectivity of the conservation actions being implemented. The objectivity claimed to be underlying conservation actions is more assumed than real. We also suggest that the approach to conservation is driven more by moral commitments than by tested concepts, and it is further biased by our anthropocentric evaluation of ecological processes and their outcomes. Conservation science is a young subject, which needs to be nourished while it continues to feed on its roots-ecology and evolutionary biology.

Key words: conservation action; endangered species; extinction rates; invasive species; Red Lists; science; sustainable use.

CONSERVATION BIOLOGY, BY IMPLICATION, IS ORIENTED TOWARD ACTION and is looked upon to address burning problems of biodiversity, forest, natural vegetation, etc. It is seized with the expediency of finding immediate solutions to reverse the problems most often created by human actions. Therefore, it is essential to ensure that the conservation actions we initiate today do not trigger another set of problems for our posterity. We should ensure that actions taken today are not viewed in retrospect as mere emotional knee-jerk reactions based on poor foundations. This is possible if, and only if, we are confident that there is enough science and knowledge to back such actions. But are our conservation actions prompted by, and derived from, strong scientific data and reasoning? Do our models of conservation stand the test of objectivity?

Perhaps not! Conservation action has often been driven more by moral commitments and is based on shaky scientific foundations that forego detailed and critical analysis on account of urgency. Although such efforts are well intended, instances have shown that conservation practices formulated without a strong scientific basis could indeed boomerang. A few decades ago, the Keoladeo National Park, formerly known as the Bharatpur Ghana Bird Sanctuary, one of India's famous bird sanctuaries, was facing the problem of buffaloes intruding from neighboring villages to graze on its marshy grasslands. Fearing that this might affect the famed bird visitors, and based on measures suggested by conservation experts, the sanctuary was fenced off to prevent the entry of buffaloes. A few years later, surprisingly, birds visiting the sanctuary were declining! When bird visitation dropped to alarmingly low levels, an investigation was launched. Careful analysis revealed that the immediate cause of the problem was the clogging of water bodies within the sanctuary owing to the ungrazed, overgrown grass! Conservation experts had gone wrong because their suggestions, although well intended, were not based on strong science (Lewis 2003, Middleton 2003). This event perhaps reflects the state of science backing much of our conservation action.

In this commentary, we attempt to argue that 'conservation' in general is suffering from the *poverty of right information* that *has relevant content* for formulating appropriate actions. We illustrate this with a few examples from current global conservation practices and show that there has been a general lack of objectivity in decision making in science-based conservation. We hope that such a debate will stimulate better science for robust and informed decision making in conservation contexts because 'conservation action without good science to underpin it is like alchemy, or faith healing' (Lawton 1997).

ASSUMED OBJECTIVITY OF CONSERVATION EFFORTS

On several occasions, conservation scientists and practitioners attempt to dress up their approaches with the guile of objectivity demanded in science. Merely scratching the surface of these approaches often exposes their scientific weakness, revealing that the claimed objectivity is only assumed and not real. What is more disturbing is that this assumed objectivity is often capitalized to steer (and even impose) conservation actions and agenda at the global level.

Consider the malady in identifying rare, endangered, and threatened (RET) species for conservation. For more than two decades, enormous effort and money has been spent in pigeonholing species into RET categories (Red List) and then in addressing the conservation of thus labeled species across the world (IUCN Species

Received 17 May 2010; revision accepted 25 May 2010.

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Survival Commission 2001). There are global and local lists, developed by both international and local organizations, each claiming to have undertaken this effort in an objective and transparent way (Gardenfors 2001). But, there is little consensus on the criteria used or on the lists of species—a feature not expected if the lists were indeed based on objective approaches. This lack of agreement has led to unending debates and conflicts over whether or not our conservation efforts should be guided by these lists (Possingham *et al*. 2002).

The criteria used for categorizing the species are often criticized as being too generic and based on sweeping assumptions. Consequently, they cannot be applied uniformly to all the organisms. Further, most criteria, as they are currently formulated, cannot be applied in practice because the data they require hardly exist. Despite this, conservationists develop and circulate lists the world over, and indeed these attract huge conservation resources. Yet, a careful perusal would indicate that little effort has been invested in testing the objectivity of the criteria on which such lists are based, and much less in generating data to assess the reliability of the lists (Aravind *et al*. 2005).

For instance, in a recent study, we asked how rare are the so-called 'rare' species compared with the 'common' species along the Western Ghats, India (Aravind *et al*. 2005). Because data on rates of population decline are hardly available for any species, the qualitative perception of the abundance *per se* has been used repeatedly as a surrogate to notify rare, endangered or threatened species. Our study based on quantitative analysis showed that species termed rare were not significantly different in terms of abundance from those classified as common. In fact, some of the common species were rarer than some rare species and vice versa. The classification of species as being rare, endangered, or common was more *ad-hoc*, raising questions on their worth in guiding conservation decisions. Clearly, there seems to be a great deal of hand-waving in assigning species to Red List categories, a process that nevertheless guides most of our species recovery and conservation efforts.

Such assumed objectivity (and the virtual lack of it) is evident from estimates offered by conservation biologists on species extinction rates. Although there is no denying that extinction rates have increased in the recent past, mostly due to human activities, the values floated around appear to be based not as much on hard data than on good intentions. While it is important to have values to convince policy makers on the need for immediate actions, it is equally important to ensure that estimates are backed by strong data. Precisely owing to the lack of such data, there have been frequent disagreements on the extinction rates and their implications (Guruswamy & McNeely 1998, Lomborg 2001, Sax & Gaines 2007).

ANTHROPOCENTRIC MYOPIA IN CONSERVATION

We look at most of conservation issues through an anthropocentric lens; this is particularly true in conservation actions and has often led to the derailment of the scientific method. Our obsession with invasive species serves a good example to illustrate this myopia.

First, both the definition and the conceptualization of 'invasive species' are highly anthropocentrically rooted. Blinded by this heavy anthropocentric view, biological invasions are, by default, inferred to be 'bad'. Note that any species that adversely affects the habitat or the environment immediately following its introduction (accidental or otherwise) is labeled 'invasive' without any consideration of its long-term impact. Even before the invasive species in question is examined by the jury of time, it is judged guilty of being bad and the species is condemned. Such a treatment conveniently pretends amnesia on two accounts: (1) 'migration' of the species has been an important component of evolution contributing to the native biota and hence 'invasion' could actually add to the diversity of the invaded habitat; and (2) in the 'evolutionary long run', the initial perturbations created by the invasive species are dissipated with or without the invasive species. In other words, our treatment of invasive species is influenced by the hysteria derived from our tendency to observe processes through a narrow temporal window and the impact that the invasive species has on the human economy; without any concern for the instinctive ability of the species to survive on its own ability in the Darwinian world. In the process, we are missing the larger picture of invasion on a wider temporal scale.

Second, our anthropocentric view of invasive species has considerably biased the models we have adopted for their management. Until recently, the only mantra for management of invasive plant species has been to control and eradicate them—mostly implemented by forest officials as an 'uproot and burn' strategy. Alternate management strategy suggested, involving their utilization was vehemently opposed and regarded sacrilegious. It is surprising that even when impossible to control, invasive species are not viewed as an opportunity but only as threats. Yet, it has been amply illustrated that even for notable invasive species such as *Lantana camara*, a management strategy that involves the utilization of the invasive can indeed minimize its net costs (Uma Shaanker *et al*. 2010). Viewed from a strictly ecological–economic perspective, this suggestion offers a solution to the present deadlock on invasive species and opens up the door to view some invasive species more as opportunities than as threats.

Third, the lack of objectivity in conservation efforts is also visible in the way 'invasion' is defined geographically and thence in the way quarantine measures are drawn to prevent the spread of invasive species. In a Darwinian sense, a species can not survive outside its preferred habitat. Thus by definition, if an introduced species swamps an alien habitat, it only means that it has 'discovered' and is occupying its hitherto unoccupied niche. But the definition of invasive does not accommodate this view; rather political geography is considered while defining the 'invasion'. In other words, geography of invasion is not conceptualized in ecologically objective terms rather defined by the political boundaries and economic consequences. It is the latter that have driven the quarantine laws across the world and not the habitat and ecosystem boundaries of species (Uma Shaanker & Ganeshaiah 1992).

RIDING ON MYTHS THAN CONCEPTS

It is said that when facts are few, speculations abound. Being an emerging science, conservation biology in general and conservation action in particular is impoverished of concepts and facts because its

foundations are built on opportunistically borrowed concepts from ecology and evolution. The science of conservation has not yet established deep roots of its own, and hence suffers from the absence of a strong, structured and scientifically based program. Consequently, conservation actions are often shaped by myths rather than by hard concepts. One such myth is that of a sustainable use of resources. Hundreds of papers and theses have been written and scores of management prescriptions offered, but can there be anything that is regarded as the sustainable use of resources?

Sustainable use of resources is more of a philosophical argument than an objective possibility. History has shown that regimes that exploit others' resources have grown stronger and dominated those who do not resort to such exploitation (Ganeshaiah *et al.* 2007). This aggravates differences among human societies, enhancing opportunities for those who exploit and reducing power for those who limit resource use for the purpose of sustainability. In such a hierarchical world, survival and growth of a regime is contingent not so much on the sustainable use of resources but rather on how efficiently the resources are used. Obviously, as long as humanity is divided along political borders, such a differential exploitation of resources is unavoidable: the rich will continue to preach, and even force, the poor to follow a sustainable use paradigm. In other words, sustainable use of resources is more a myth than a conceptual possibility unless the entire world uniformly adopts it. This is possible only in a world without borders, or, if we are able to ensure commitment to strong international agreements that are economically, politically, and environmentally equitable—which, on current trajectories, appear very unlikely possibilities. Conservation biology, nevertheless, continues to cling to the idea of sustainability as if it is a solution to the present problems.

CONSERVATION SCIENCE

The purpose of science is to produce useful models of reality. Classically, the scientific process starts by building a theory, then a falsifiable hypothesis, which is tested by collecting data. Based on the results, the hypothesis is either rejected or accepted. Rarely, if ever, are conservation actions preceded by such a methodological framework. Rarely, if ever, have alternate hypotheses been erected. Rarely, if ever, are verifiable hypotheses even proposed. Even when these actions are taken, they are often specific to a local situation and therefore not amenable to generalization. In the absence of these fundamental requirements of sieving truth from falsehood, it is not surprising that conservation research and actions have frequently been contentious. Right and wrong are often blurred, thanks to the lack of critical decision criteria.

Perhaps one way of addressing this problem is to promote conservation science more vigorously, both as an inter-disciplinary science and also as an independent branch of science akin to physics and biology. While conservation science needs to borrow abundantly from ecology, evolution, sociology, anthropology, forestry, wildlife biology, etc., it is important to chart an entirely fresh path for the problems it has to address (Salafsky *et al.* 2002). It should adopt the highest rigor of scientific methodology while testing the consequences of alternate models of conservation action, lest we be blamed in posterity for poor actions that aggravated the very problems we sought to address. Although applying the exacting standards of physical sciences might not be possible, or even appropriate, we must ensure that conservation research and action does not pass off as mere good old moral science.

ACKNOWLEDGMENTS

This paper and work there in was supported by grants from the Department of Biotechnology, Government of India, New Delhi, India. We thank Jaboury Ghazoul for his invitation to contribute to this volume and for his suggestions on this paper.

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