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TARGET ARTICLE

Biodiversity at Twenty-Five Years: Revolution Or Red Herring?

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Introduction

A quarter of a century ago, a group of scientists and conservationists introduced 'biodiversity' as a media buzzword with the explicit intent of galvanizing public and political support for environmental causes. As David Takacs summarizes this on the basis of his interviews with many of those involved, 'Scientists who love the natural world forged the term *biodiversity* as a weapon to be wielded' in battles over biological resources (Takacs, 1996, p. 3; cf. p. 37). The resulting conception of biodiversity, and the image of nature that it suggests, has subsequently dominated public perceptions, political discourse, and empirical research in the fields of ecology and resource management. For instance, David Tilman refers to the last several decades of ecological research as the 'biodiversity revolution' (Tilman, 2012, p. 109), and the goal of Conservation Biology as an interdisciplinary research program has been understood since its inception in terms of biodiversity conservation and restoration.[1] Within the policy arena, the concept's influence is international, from the United Nations Convention on Biological Diversity, signed as a legally binding treaty in 1992, which specifies the 'conservation of biological diversity' as one of its main goals, to the UN's declaration of 2011–2020 as the Decade on Biodiversity, with a strategic plan that aims to integrate the values of biodiversity into government decision-making at all levels and to 'mainstream' biodiversity across government, society, and the economy.[2]

In short, since gaining broad attention quickly in the late 1980s and early 1990s, biodiversity has remained a focal point for scientific research and environmental policy, with consequences for how significant research and management resources have been distributed and invested over this period. Notably, environmental ethicists have also eagerly embraced biodiversity as a natural value, and whereas they have debated whether this value is intrinsic or merely instrumental, they have rarely questioned either its descriptive basis or its prescriptive import.[3]

Critical scrutiny of the concept of biodiversity is nevertheless long overdue, and we argue that there are good reasons to doubt whether it provides any guidance for environmental decision-makers or has any clearly established relationship with those

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aspects of nature about which we care the most. First, there are difficulties with the descriptive content and management application of the concept that, while little appreciated by philosophers or the general public, are well documented in the scientific literature. The abstractness and breadth of biodiversity as currently conceived rules out any possibility for its operationalization or its adequate representation by proposed surrogates. Furthermore, the evidence for a relation between biodiversity and ecosystem function is inconclusive at best, which undermines many popular interpretations of its instrumental value. Secondly, despite the well-known fact that biodiversity was first introduced to the media and general public in order to influence political decisions about conservation practices, no clear account has been offered of the relationship between biodiversity's descriptive and normative aspects. Thanks to the concept's abstractness, it readily lends itself to a wide range of value interpretations in the public imaginary, and its normative appeal may be bolstered by resonances with social diversity. Yet efforts, such as those proposed by Sahotra Sarkar and Bryan Norton, to make the normative dimensions of biodiversity an explicit part of its definition tend to subject it to the independently determined values of conservation biologists, without regard for how this may unduly influence the policy process.

Lastly, we suggest that biodiversity is only the most recent in a long line of scientific 'proxies' promoted to the public as a basis for conservation values. Such proxies gain widespread popularity due to their veneer of empirical objectivity, which encourages the public and policy makers to believe that decisions made on their basis are value-neutral and free from any ideological commitments. Yet, as the example of biodiversity makes salient, this veneer of objectivity masks the normative decisions that frame the definition and application of the concept and obscures the relationship between the concept and experienced values. Furthermore, proxies encourage the myth that empirical facts can substitute for ethical judgments, thereby shifting responsibility for environmental policy away from policy makers and the public themselves and onto scientific and technical experts. This practice compromises the goals of conservation in concrete ways. As an alternative, we propose that scientific study of life's complexity avoid assuming a normative role in policy discourse, that we pay renewed attention to our experiences of what we value in nature, and that we promote an inclusively democratic approach to the value judgments that underlie conservation policy.

Biodiversity as a Descriptive Concept

In the descriptive, empirical sense generally assumed within the scientific context, biodiversity names the diversity or variability among the units of life, the differences between them. The starting point for defining biodiversity is therefore to identify the relevant units and the manners in which they differ from themselves and from each other (Maclaurin & Sterelny, 2008, p. 9). Since scientists have not come to a consensus about which units and which differences should be included within the broad scope of biodiversity *per se*, the concept lacks a generally accepted definition, and some have expressed skepticism about the possibility for any definition that would be 'simple, comprehensive, and fully operational' (Noss, 1990). Nevertheless, the tendency has been toward definitions that are increasingly inclusive and abstract (Koricheva & Siipi, 2004, p. 29–30), such as 'the variety and variability among living organisms and the ecological complexes in which they occur' (U.S. Congress, Office of Technology Assessment, 1987)

or simply 'the diversity of life' (Jensen, Torn, & Harte, 1993). Recent definitions tend to recognize three nested hierarchical levels—genetic, taxonomic, and ecosystemic—and to characterize the differences within each level in terms of three primary aspects: composition, structure, and function (i.e., the units, their organizational patterns, and functional processes) (Koricheva & Siipi, 2004, p. 31–32).[4] There have occasionally been initiatives to restrict the definition in ways that would make it more empirically tractable, for instance by limiting it to species richness in a particular place and time. But critics have responded that doing so confuses definition with application, arguing that 'the need to measure biodiversity should not drive the fundamental meaning of the term, and temptations to narrow the scope of the concept for particular management or monitoring purposes should be resisted' (Koricheva & Siipi, 2004, p. 30; citing DeLong, 1996). Perhaps the widest consensus about biodiversity understood in this broad and all-inclusive sense is that it cannot, as a matter of principle, be quantified, due to its multidimensionality and the lack of commensurability and covariance among its components (Cervigni, 2001; Gaston & Spicer, 1998; Gaston, 2009; Koricheva & Siipi, 2004; Maclaurin & Sterelny, 2008; Margules & Pressey, 2000; Norton, 2008; Sarkar, 2005; Wood, 2000). As Bryan Norton puts it, 'Strong arguments show that an *index* that captures all that is legitimately included as biodiversity is not possible. Biodiversity cannot be made a measurable quantity' (Norton, 2008, p. 373). Even if debates were resolved about what biodiversity should include, then, it would still be impossible to measure biodiversity *per se*, and not only because we are unable to collect the vast empirical data that would be required, but also for *de jure* reasons about the aggregation of this data into a single measure. And as we cannot measure biodiversity *per se*, we lack any empirical foundation for testing hypotheses about it or using it in any management or conservation decisions.

This problem has been met in practice through the identification of surrogates of various sorts, most often species richness, that are empirically tractable and capture some valuable elements of diversity at some relevant scales. The most likely surrogates, including species counts, are also difficult to measure directly in many cases, so that indirect surrogates of these may also be needed in practice (Koricheva and Siipi, 2004, p. 37). Elaborate efforts have also been made, by Sahotra Sarkar among others, to develop good enough surrogates for general biodiversity that would at least allow for comparison between sites in meeting conservation goals (e.g., Sarkar & Margules, 2002). Apart from the well-known difficulties that have been raised for each candidate for surrogacy, the surrogacy approach in general confronts two problems of principle. First, it is not clear what sense can be made of identifying a surrogate for biodiversity in general, given the latter's breadth and multidimensionality. One component of biodiversity, such as species richness, may parallel some other components, but it will be incommensurable with innumerable others, and no empirical evidence is possible for how well a surrogate tracks what is essentially immeasurable. Species richness is a valuable measure of diversity at one level and may reveal important regularities in nature, but it cannot stand in for biodiversity writ large and should not be termed a 'surrogate' for it in any empirical sense. The best effort to meet this challenge is arguably found in the work of Sarkar and Margules (2002), who argue that biodiversity conservation with respect to places need only provide a basis for prioritization rather than an absolute measure of diversity. While we grant this point, their work does not escape the problem that no empirically justifiable surrogates for biodiversity are plausible, even when the target is biodiversity of a particular place rather than biodiversity *per se*. They conceded this when they admit that 'because we do not know what general

biodiversity is, we will never be able to assert beyond controversy that we have found the true surrogate' (Sarkar & Margules, 2002, p. 304). Thus, 'there is no non-conventional solution to the true surrogacy problem' (Sarkar & Margules, 2002, p. 305). As a further complication, the decision process that they recommend must ultimately be based on 'estimator surrogates' that stand in for true surrogates, despite the fact that 'there has been very little empirical work establishing the adequacy of any … estimator-surrogates as predictors of true surrogates' (Sarkar & Margules, 2002, p. 306). In short, we conclude that if biodiversity *per se* cannot be measured, it can have no empirically justified surrogates.

The second problem of principle with describing an alternative measure as a surrogate for biodiversity is that this masks the essentially normative basis for the surrogate's selection. As Koricheva and Siipi note, 'Since each biodiversity measure captures only some elements or attributes of biodiversity, by choosing a biodiversity index one is also assigning a value to the particular aspect of biodiversity expressed by this index' (Koricheva & Siipi, 2004, p. 37). Or, as Gaston and Spicer put it more forcefully, 'both what you are measuring and how you are measuring it reveals something about what you most value' (Gaston & Spicer, 1998; cited in Koricheva & Siipi, 2004, p. 37). Koricheva and Siipi present this mediation by values as one of the strengths of the concept of biodiversity, insofar as it is flexible enough to respond over time to changing values and conservation priorities. But this raises serious difficulties about the presumed value-neutrality of biodiversity as a descriptive concept and about its role in public and political discourse, to which we will return in the sections that follow.

These problems with defining and operationalizing the concept of biodiversity are surprising to many who have heard the strong claims concerning its relationship with ecosystem functions, such as the well-known diversity–stability hypothesis, and biodiversity advocates continue to make a strong public case for such claims (e.g., Tilman, 2012). Nevertheless, such claims must be met with careful scrutiny. The evidence for a clear, consistent and general relationship between biodiversity and any aspect of ecosystem functioning is very thin. Although to date at least 400 studies have attempted to link biodiversity and ecosystem function, these studies are very limited in scope. Nearly all focus on just one component of biodiversity (species richness), they tend to work with species assemblages that are easy to manipulate experimentally (e.g., terrestrial annual plants), and most have been conducted at very small scales of space and time (relative to the scale of ecosystems). Furthermore, many of these studies have been fraught with experimental design problems, including 'hidden treatments' (Huston, 1997; Huston et al., 2000). A recent meta-analysis of 394 of these studies (Cardinale et al., 2011) concluded that there was strong evidence only for an effect of species richness on plant biomass and nutrient assimilation, and that this relationship was due at least in part to 'species specific' effects (i.e., the disproportionate effects of particular species, rather than species diversity *per se*). Even if one assumes that this limited evidence can be generalized to other aspects of diversity, other organisms, and larger scales, there is no evidence that biodiversity loss generally has a larger effect on ecosystem function than other forms of environmental change (Srivastava & Vellend, 2005; Cardinale et al., 2011). For these (and other) reasons, the biological ecologists Srivastava and Vellend concluded that studies of the relationship between biodiversity and ecosystem function have 'little to offer in the way of practical advice for conservation managers' (Srivastava & Vellend, 2005, p. 285). Similarly deflationary responses can be made to arguments that attribute option value or

evolutionary value to biodiversity in general, insofar as these rely on hypotheses and assumptions about consistent relationships between biodiversity and ecosystem function.

The Normative Dimension of Biodiversity

To this point, we have considered the limitations of biodiversity as a descriptive, ecological term, following its common usage in the scientific context. Because of the abstractness and breadth of the concept, it can neither be quantified nor justifiably represented by any genuine surrogate. Furthermore, we lack clear and consistent evidence of a relation between biodiversity and ecosystem functions. Nevertheless, biodiversity has been championed to the public as perhaps the most significant natural value deserving our protection. This raises questions about the normative dimension of biodiversity, its public understanding, and the role that it plays in the policy context. As a start, what explains the rapid and broad success of biodiversity as a popular conservation concept? David Takacs begins his account of this transformation with the following thought experiment:

> I write *nature*; neurons network; you conjure up images of a personalized nature, yours uniquely. When I write *biodiversity*, perhaps other images appear to your mind's eye. Take notice: How do these differ from the images evoked by the word *nature*? (Takacs, 1996, p. 1)

Takacs's point is that the term biodiversity was 'generated and disseminated' with the explicit intent of 'chang[ing] the terrain of [our] mental map' (Takacs, 1996, p. 1). So, what does this term change about our intuitions of what is under threat and our investments in it? For the non-scientific public, biodiversity conjures a vision of nature as a richly varied, aesthetically pleasing, and interconnected network. It thereby replaces, even as it echoes and evokes, earlier concepts that had proven so stimulating for conservation purposes—e.g., the balance of nature, ecological harmony, the web of life, or wilderness—that have since fallen out of fashion from a scientific or political perspective. In other words, biodiversity provides the conservationist with something of a blank check, insofar as the image of the world that it offers can be populated with any species but requires none in particular, and insofar as it may be expanded or contracted to suit any scale or level of the hierarchy of life. The popular image of biodiversity is therefore essentially indefinite and fuzzy, and as Koricheva and Siipi note, 'this imprecision appears to be one of the main reasons for the popularity of the word biodiversity in nonscientific circles' (Koricheva & Siipi, 2004, p. 42). It is also a major reason for the word's success in its political function. Takacs asks 'What is it you most prize in the natural world? Yes, biodiversity is that, too. In biodiversity, each of us finds a mirror for our most treasured natural images, our most fervent environmental concerns' (Takacs, 1996, p. 81).

Furthermore, in addition to the malleability of biodiversity as an image, it is worth noting that its introduction into public discourse parallels and is supported by commitments to cultural diversity and multiculturalism. For David Heyd, biodiversity and cultural diversity are two manifestations of the 'culture of diversity,' and, in his view, 'It is by no means a coincidence that despite the different origins of the two movements, their evolution took place more or less simultaneously' (Heyd, 2010, p. 160). In developing this point, Heyd notes that the rhetoric of each movement has invoked the value of diversity in

the other movement to bolster its case. For example, the UN's 2001 Universal Declaration on Cultural Diversity, as Heyd points out, 'explicitly introduces the analogy between the two kinds of diversity, trying to reinforce the claim for cultural diversity on the more scientifically based grounds of biological diversity: "As a source of exchange, innovation and creativity, cultural diversity is as necessary for humankind as biodiversity is for nature"' (Heyd, 2010, p. 162). Whereas this socio-historical fact does not, on its own, weaken the case for the value of biodiversity, it does suggest that the public reception of this concept, and the image that it plants in our minds, may be shaped by its association with social concerns that are encouraged by the terminology of 'diversity.'

The analogy of these two kinds of diversity sheds light on the difficulties of attributing value to biodiversity *per se*. In the case of multicultural diversity, we tacitly recognize that our aims are not to maximize diversity as such, but instead only particular axes of diversity within specific ranges. If we consider college admissions as an example, there are good reasons to value diversity of gender, ethnicity, and class, whereas diversity of innumerable other sorts is simply irrelevant—say, of the location of names in the alphabet or of favorite foods. We even actively suppress some kinds of diversity, insofar as we do not aim to admit students with the most diverse possible scores on standardized tests, for instance (see also Maier, 2012, pp. 68–70). Similarly, we may prefer a variety of items on a restaurant menu, but only along tacitly assumed dimensions: not greater diversity in, say, digestibility or carbon footprint. From an esthetic point of view, while we may value the variety of a rainforest, we may also appreciate the uniform beauty of redwood forests or amber waves of grain. Yet there is no room within the concept of biodiversity *per se* to differentiate good from bad diversity, as we undoubtedly do tacitly when we call to mind an image of such diversity that mirrors what we already find valuable in nature.

As Donald Maier puts this point,

> Some kinds of diversity are good, but others are bad; and some are very, very bad. So it is for biodiversity. Therefore one must take care to identify 'just the right kind' of biodiversity—the kind that does, indeed, have great value. But what is 'the right kind?' (Maier, 2012, p. 344)

Insofar as decisions about 'the right kind' fall to scientists and other experts, we can expect that the decisions affecting biodiversity's measurement and application, which, as we have already noted, require substantive judgments of value, will be guided by the environmental values, implicit or explicit, of these experts. This is perhaps already obvious from the fact that conservation-minded scientists did not first discover biodiversity, as a fact about nature measured in a value-neutral way, and then recognize its value and seek its protection. Whereas humans have long appreciated the variety of life, the promotion of biodiversity in its contemporary sense is quite recent and was introduced in advance of refining the concept's definition and application, and in advance of any empirical evidence linking it to ecosystem functions. In short, the conservation values at stake preceded biodiversity as a popular term intended to promote these values.

From the perspective of democratic decision-making and procedural justice, the relegation of all value decisions involved in defining and applying biodiversity to scientists and politicians is problematic. For instance, noting the fuzziness of the popular understanding of biodiversity, Koricheva and Siipi propose that the 'differences in the

meaning of popular and scientific concepts of biodiversity need not be cause for concern, as long as scientists and policy makers are aware of them' (Koricheva & Siipi, 2004, p. 43). This is consistent with their view that the role of the concept in public discourse is primarily to communicate the significance of the environmental crisis. Even so, they recognize that if scientists and the general public rely on different understandings of the value of biodiversity, this runs the risk of introducing a 'double standard' that is not only disingenuous but introduces diverging criteria for decision-making (Koricheva & Siipi, 2004, pp. 46–47). Furthermore, when they refer to the public's understanding of biodiversity as a 'populist' conception, they unwittingly align the scientific view with populism's opponent, namely elitism (Koricheva & Siipi, 2004, p. 44).

This problem of the divergence between popular and scientific understandings of biodiversity in relation to biodiversity's political role also troubles the efforts by Bryan Norton and Sahotra Sarkar to redefine biodiversity in explicitly normative and pragmatic terms. Norton and Sarkar are both well aware of the difficulties with operationalizing biodiversity as a strictly descriptive concept, and both accept that no single index of biodiversity *per se* is possible. Furthermore, both recognize that biodiversity's usefulness for conservation purposes requires an explicitly normative dimension. For Sarkar, biodiversity should be redefined as what conservation biology seeks to preserve, which entails that it be appropriate as a conservation target, estimable from field studies, and preferably quantifiable (Sarkar, 2002, p. 132; Sarkar, 2009, p. 106). Any conception of biodiversity that runs afoul of what we know in advance to be worth preserving is to be rejected, as is any account of biodiversity that leaves it too abstract and inclusive for practical conservation decisions. Ultimately, then, our definition and application of biodiversity is to be evaluated by whether it allows us to achieve our conservation goals (Sarkar & Margules, 2002, p. 307). In this case, we do not discover biodiversity as a value in its own right, nor can we refine our evaluations of nature in light of empirical knowledge of biodiversity, as how biodiversity is defined is to be corrected to match conservation values and goals that precede and guide it. To Sarkar's credit, he recognizes that the normative decisions guiding and defining biodiversity 'embody cultural values' and that local cultural values in the global South may conflict with those promoted by northern environmentalists (Sarkar, 2009, p. 106).

Norton also emphasizes that biodiversity is a 'normatively charged concept' and recommends that its 'biological definition … be shaped to capture whatever is at stake in the diversity of life' (Norton, 2008, p. 369). The decisions about what is at stake should be made by the 'large, international activist community that is united by the purpose of protecting biodiversity,' which can

> … test the usefulness of various definitions by discussing and setting goals to protect the perceived social values associated with biodiversity. Proposed definitions will be judged by their usefulness in choosing effective policies … Environmentalists in general and conservation biologists in particular form the nucleus of such a goal-directed and action-oriented community. These individuals and groups largely agree about what objectives should be pursued. (Norton, 2008, p. 370)

The main purpose of biodiversity as a concept, in Norton's view, is communication of this group's agenda to policy makers and the public. On this understanding, once again,

biodiversity is not something that we have discovered to be valuable, nor can empirical study of biodiversity lead us to revise or refine our value judgments, as the definition and measurement of biodiversity will be evaluated by its success at meeting objectives that are agreed upon in advance. And whereas Norton emphasizes the need to avoid the colonialist ideology and top-down approach associated with an earlier generation of wilderness protection, he offers no suggestions for how those, domestically or internationally, whose values that are not in agreement with the mainstream conservation community will have any voice in the concept's deployment or the objectives it is shaped to pursue. In other words, if 'biodiversity' is defined in terms of what the international environmental community, and conservation biologists in particular, already 'largely agree' on as environmental objectives, then it is not clear how the concept can be subject to the 'ongoing, open, public process of deliberation, experimentation, and further deliberation' (Norton, 2005, p. 427) that Norton elsewhere describes as essential to the environmental decision process, especially insofar as the public will not be a part of the initial problem formulation. Furthermore, by presenting their agenda under the moniker of 'biodiversity,' this environmentalist community trades on the public perception of the term as empirically grounded. This is a textbook example of what Bruno Latour terms 'Science' with a capital 'S,' which reserves for itself the right to mediate between a reality to which it claims privileged access and the dark cave of political confusion (Latour, 2004).

Sarkar's and Norton's efforts to integrate biodiversity's normative function with its empirical content ultimately make salient the unbridgeable gap between the two. To the extent that we take seriously the scientific understanding of biodiversity as such, it provides no value-neutral guidance for conservation policy. On the other hand, by privileging the political and communicative role of the term, we run the risk of reducing it to a propaganda tool for the promotion of values that we have arrived at independently. According to Donald Maier's analysis, the difficulties here follow in principle from the concept of biodiversity itself. Biodiversity serves so easily as a cipher for our own image of what is valuable in nature because we readily confuse it with individual plants and animals, or with assemblages of them in a particular place, or with their qualities. In other words, we confuse biodiversity with a 'particular instantiation of one or more of its abstract part' (Maier, 2012, p. 113). Yet these particular instances are not the *diversity*, the *differences*, between kinds of living things, even at a limited scale. Biodiversity should not be confused with the 'particular species that constitute the current state of species diversity' (Maier, 2012, p. 113), for instance, as the same diversity could be present with an entirely distinct set of species at some other point in time. More generally, the concept of biodiversity tends to call to our minds the image of something experienced, whereas biodiversity as such cannot be a direct object of experience. As Maier puts it, 'There is no sensible entity or even simple collection of entities that any person encounters in the world that *is* biodiversity or that in any straightforward way stands in for it' (Maier, 2012, p. 346). The reason why we are so tempted to associate biodiversity with something that we value, and the difficulty that we have in justifying the attribution of value to biodiversity as such, both stem from its abstract remove from our experience and our confusion of it with its component elements. This makes biodiversity as a concept ripe for ideological appropriation, as it is so easily loosed from any experiential moorings.

Reevaluating the Role of Scientific Value Proxies in Conservation Rhetoric

The public promotion of biodiversity as a rallying point for conservationists since the 1980s has been well-intentioned, both in its aim to build public awareness and support for environmental causes on a solid scientific foundation, and in its desire to reduce anthropogenic species loss and stave off the prospect of a mass extinction event. These conservation goals, which are even more pressing in the light of climate destabilization, certainly deserve our full attention. Furthermore, empirical research into the diversity of life at every scale, which will undoubtedly shed new light on what we value in nature and prove useful for conservation purposes, should continue unabated. Nevertheless, we have argued that biodiversity as an empirical concept fails to provide a firm foundation for conservation values and practice and that its political deployment trades on confusions about its meaning and value-neutrality. Additionally, the normative decisions that shape its definition and application are not held to democratic standards of transparency and inclusiveness. For these reasons, we conclude that biodiversity *per se* is a problematic concept and undermines genuine conservation efforts.

More specifically, the privileging of biodiversity as a conservation goal hinders our progress in at least five ways. First, whereas it may be true that we value diversity of certain kinds and at particular scales, this does not exhaust what we value in the natural world and is arguably of relatively minor importance in comparison with the actual species, processes, habitats, and so on, that command our respect. Insofar as biodiversity emphasizes the differences between kinds, in distinction from the concrete individuals and places that instantiate these kinds, it risks occluding what we value most: not life's *variety* but rather life *itself* in its concrete richness.[5]

Second, the slippages between the various senses given to the term biodiversity, especially as these differ between the scientific community, environmental managers, policy makers, and the general public, inevitably cause confusion about what is being valued and why. This weakens any shared empirical foundation for decision-making about where to invest limited energy and resources, and may lead to the problems that we have noted concerning double standards of value and decision criteria. The more important current decisions are for developing long-term solutions to environmental problems, the more serious it is that such decisions be founded on a common understanding of what is at stake and why it matters.

Third, as with previous concepts drawn from scientific ecology and promoted to the public as empirical foundations for nature's value, biodiversity operates with a veneer of objectivity that appeals to those who wish to avoid seeming subjective or ideological. The dominant ethos in our culture informs us that, whereas values tend to be treated as a matter of personal preferences, facts are not; to paraphrase Daniel Moynihan, we are entitled to our own values, but we are not entitled to our own facts. Consequently, there is often a tendency or a temptation to present a value under the guise of a fact, such as when a scientific concept is used in an apparently empirical fashion but with normative intent. In the conservation arena, this has happened repeatedly with concepts drawn from the science of ecology, including the 'balance' and 'harmony' of nature, ecosystem health and integrity, ecological interdependence, keystone species—and even 'ecology' itself, the popular understanding of which has long contrasted with the term's scientific meaning (Cittadino, 2006; Mitman, 1992). A consequence, whether intended or not, of privileging such scientific concepts as proxies for values within policy debates is that they lend a

veneer of objectivity and value-neutrality to decisions that are, nevertheless, inescapably normative. While this practice may have strategic value for influencing public opinion, it is disingenuous; policy decisions necessarily involve value judgments, and the role of these judgments is obscured when decisions are presented as following automatically from empirical evidence. It can be difficult in such contexts to identify precisely where facts end and value judgments begin, with potentially problematic consequences for the transparency and democratic inclusiveness of the decision-making process. Whereas biodiversity is only the most recent in a long line of such scientific value proxies, it lends itself remarkably well to this role because of the abstractness and breadth of its empirical definition and the indefiniteness of its associations in the public imaginary.

Fourth, reliance on scientific concepts as proxies for values shifts the burden for policy decisions away from policy makers and democratic process and onto those, the scientists, whose work most needs to remain as free as possible from ideological bias. In a context where empirical research concerning biodiversity can be translated very quickly into political action or inaction, scientists may find it difficult to prevent their own convictions from influencing their choice of research programs, biasing their interpretation of data, shifting their standards of evidence, and so on. Whereas some scientists may be influenced by confirmation biases unintentionally, others may explicitly conclude that they do not have the luxury of approaching their research impartially, given the political stakes. In either case, as informed conservation decisions require empirical knowledge that is as free from bias as possible, we should avoid shifting the burden for value judgments directly onto empirical evidence (and therefore onto the scientists who produce it) in ways that ultimately undermine the impartiality of that evidence.[6]

Fifth and lastly, the adoption of scientific concepts as value proxies, insofar as this shifts the responsibility for value judgments onto empirical evidence or masks the need for value judgment altogether, delays the serious work of developing our public capacity for ethical dialog and judgment about environmental issues on its own terms. In the end, conservation policies require normative judgments. Al Gore has famously described our response to climate change as a 'moral issue,' but the same must be said for every environmental issue that confronts us, inasmuch as our decisions reflect our commitments to what kind of people we wish to be, how we choose to live, and our responsibilities toward the human and non-human world now and in the future. We can only make such decisions well by addressing them openly in an ethical register rather than obliquely as if they were matters of fact, whether ecological or economic. Doing so will undoubtedly require developing a new vocabulary and a new capacity for public reflection and dialog, which will admittedly not be an easy task.

In the end, our critique of biodiversity makes salient the ineluctable role that value judgments play in mediating between empirical knowledge and policy application. If we take seriously the need for transparency and democratic process in the formulation of these value judgments, then we must reconsider the long tradition of promoting scientific concepts as value proxies. We conclude with three preliminary proposals. First, it is necessary to differentiate empirical research clearly from pursuit of a value agenda, so as to minimize any ideological influence over what is studied and how. It will be very difficult to do so under the banner of the term biodiversity, given its baggage and cultural resonances.

Another possibility would be to investigate the same empirical concerns under the umbrella of a concept that is less tainted by proxy associations. For example,

'biocomplexity' (which has been described as incorporating, without being limited to, biodiversity) (Callicott et al., 2007; Colwell, 2004) lacks the immediate value-laden connotations of 'diversity' (or balance, harmony, integrity, health, and so on); complexity is good, bad, or neutral depending on its context. If the normative extension of biocomplexity beyond its empirical scope could be avoided, this may allow for a clearer distinction in the minds of scientists, policy makers, and the public about where empirical inquiry ends and value judgments begin. A normatively neutral term for the empirical description of life's variety would guard against skewing empirical research through implicit or explicit biases and restore the possibility that we may revise our value judgments in the light of better empirical understanding—rather than evaluating our empirical 'facts' according to whether they fit preexisting values. Even so, it is unlikely that biocomplexity would be a panacea in this case, not only because any scientific term may eventually take on normative baggage, but also because the more inclusive definition of this concept further exacerbates the problems of operationalizability that we have noted above with respect the biodiversity.

Second, granting greater visibility to the ineliminable role of value judgment in setting environmental policy calls for a renewal of explicit reflection on *what* we value in nature and *why*. As the lens of biodiversity conceptualizes nature 'primarily as a catalog of biota and biota-related entities,' as Maier notes, it constrains us to express our valuing of nature in terms of 'the catalog's size, its contents, and the variety of goods it offers' (Maier, 2012, pp. 423–24). To most of us, this will seem a rather narrow hook on which to hang all that we value in the natural world. The development of alternatives must start from a patient examination of *our experiences* of nature's value, which is where the methods of phenomenology can lend a hand (James, 2009). This is certainly not to say that values cannot extend to the abstract and the theoretical, but only that the grounding for any such values must ultimately be traced to what we experience, directly or indirectly. If biodiversity *per se* turns out to be a poor locus for what we value in nature, it is worthwhile asking after the values that have mistakenly pointed us in its direction: what is it about the image of biodiversity that has made it such a potent cipher for our value investments, and can we articulate those value investments in a way that allows us to bring their content more clearly into focus? The images and descriptions that we find repeatedly associated with biodiversity include esthetic appreciation of the beauty of life's variety, amazed wonder at its sheer fecundity and creativity, and nostalgic grief over its loss and irreplaceability. Whereas we have argued that none of these associations genuinely track the empirical concept of biodiversity *per se*, this does nothing to undermine the value of such experiences on their own terms. It requires instead that we describe and articulate such experiences, critically and hermeneutically, to sort out when they appropriately track qualities and aspects of the natural world that deserve our respect and protection.

Lastly, we caution against the temptation to short-circuit democratic process in making the value judgments that ground environmental policy, which must be done as inclusively and transparently as possible. The apocalyptic tone of current environmental rhetoric may encourage us to privilege expediency over inclusive process—by consolidating decision-making authority in the hands of select experts and casting conservation advocates in a paternalistic role. Such paternalism can undermine well-intentioned goals and destroy the basis for collaborative conservation efforts, as the exportation of the wilderness preservation model around the globe has made clear (Colchester, 2003; Cronon, 1996; Neumann, 1998). The alternative is an explicitly democratic approach to environmental

decision-making.[7] For example, stakeholder partnerships, such as watershed councils, have demonstrated considerable success at encouraging transparent, inclusive, and procedurally just conservation decisions, albeit at local scales.[8] Meanwhile, at the national and global scales, the rise over the last several decades of grassroots environmental protest movements in response to climate change, fracking, tar sands extraction, mountain-top coal removal, logging, and many other environmental issues points to the transformative potential of democratic dissensus.[9] Our point is that democracy, in the anarchic sense that Rancière grants to this term, need not be an enemy of dramatic and positive environmental change (Rancière, 2007, 2010). When it concedes to paternalistic means, environmentalism joins the ranks of police power and contributes to the hatred of democracy apparent in recent political trends. A more radical embrace of democracy's subversive potential may instead be the most effective means of honoring the values we hold dear about the natural world.

Notes

[1] The Society for Conservation Biology, founded in 1985, is 'dedicated to promoting the scientific study of the phenomena that affect the maintenance, loss, and restoration of biological diversity' (http://www.conbio.org/). As Sarkar notes, 'A sociologically synergistic interaction between the use of "biodiversity" and the growth of conservation biology as a discipline occurred and it led to the re-configuration of environmental studies that we see today: biodiversity conservation has emerged as the central focus of environmental concern' (Sarkar, 2002, p. 131; see also Sarkar, 2009, p. 104).

[2] Details on both initiatives are available on the website for the United Nations' Convention on Biological Diversity, http://www.cbd.int/.

[3] For a review of positions concerning the basis for the value of biodiversity, see Koricheva and Siipi (2004), who note a 'rather general consensus that biodiversity is a good thing and that its loss is bad' (p. 38), and Oksanen (1997). For a recent and notable exception to the uncritical embrace of biodiversity among philosophers, see Maier (2012).

[4] The extent to which biodiversity should include ecological processes and exclude human-generated diversity has also been a matter of debate (arguments for: Noss, 1990, Western, 1992, Mosquin, 1996; arguments against: Angermeier and Karr, 1994 and Gaston, 2009; to situate the debate, see Koricheva & Siipi, 2004, pp. 32–34).

[5] A similar point is made by Rawles (2004) and Maier (2012), especially chapters 4 and 8.

[6] Of course, we have no illusions about the many roles that values necessarily play in scientific research, not all of which are pernicious; a purely value-free science is neither possible nor desirable. Furthermore, every theory, scientific or philosophical, harbors assumptions and biases that remain invisible within its own cultural and historical milieu, and implicit personal biases of various sorts may be unavoidable. Lastly, drawing a pure distinction between facts and values may not be tenable for epistemological and even ontological reasons (Kincaid, Dupré, & Wylie, 2007; Longino, 1990; Douglas, 2009). Even so, such admissions do not weaken the need for vigilance against avoidable bias or mitigate the ideal of impartiality for empirical (and normative) judgment where ideological influence is concerned.

[7] Bryan Norton's proposals for refining the community-based model of decision-making are certainly a step in the right direction. See Norton (2005), especially chapter 10.

[8] For some examples of success with the stakeholder model, see Leach, Pelkey, & Sabatier, 2002. Nevertheless, as Wood (2000) notes, care must be taken in stakeholder decision-making to avoid privileging present public interests over future interests. See Wood (2000), especially 123–130.

[9] We are grateful to Janet Fiskio for suggesting this point. On the notion of dissensus, see Rancière (2010).

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