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Biodiversity as a General, Scientific Concept*

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Abstract *Morar et al. argue that justifications for conservation based on assessments of biodiversity are vacuous, because 'biodiversity' is a flawed concept. However, their analysis of the concept mistakes how scientific concepts function. The concept 'biodiversity' stands up to their criticisms.*

The subtitle of 'Biodiversity at Twenty-Five Years: Revolution or Red Herring?' recommends we be alert to whether 'biodiversity' is fishy. It recommends we watch for biodiversity to be revealed as something slipperier than the aboveboard component of contemporary conservation biology and conservation practice it is presented as being by biologists and conservationists. We should be watchful in particular for whether, when it appears, it participates in fallacy, as a distracting or misleading red herring.

However, the article's central argument focuses on a different fallacy. As I read it, its main concern is not so much that biologists and the public are distracted by biodiversity, but that biodiversity is rotten as a concept. Because it is rotten, it cannot play the roles it is made to play. Increasingly, it is treated by conservation biologists as one of the most important properties for ecological assessment and by conservationists as a central target for preservation. As it is rotten, but still made to play those roles, it renders justifications of conservation hollowly question-begging.

That is, biodiversity, the article suggests, falls down as a concept. It undermines rationales for conservation by failing to offer independent support when called on. It fails for two reasons: like something rotten, biodiversity does not contain in its insides what it looks from the outside like it should contain, and what it does contain is problematic.

From the outside, biodiversity is supposed to be a scientifically measurable property of ecological systems or natural areas. But, Morar et al. posit, it is not that at all. It cannot be measured. Accordingly, it is not a scientific property. It is not a property for which objective assessment is possible. When biologists attempt to measure it, they do not measure biodiversity itself, but rather one of its proxies—one or another measurable property like numbers of species or genes, which are made to stand in for biodiversity but are each something less than biodiversity itself.

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*The few quotations are from the target article. The few references are all to sources also cited by the target article except Helen Longino, (1990) *Science as Social Knowledge*. Princeton, NJ: Princeton University Press.

However, although biodiversity falls down as a descriptive, scientific concept, it is not hollow, because it has a normative dimension. Indeed, it *is* a value. It 'has been championed to the public as perhaps the most significant natural value deserving our protection.' Yet, its value contents develop inside it insidiously; values are injected into the concept by conservation biologists themselves. The primary vector is the choices conservation biologists make about what to measure. If they value there being a large number of species of a certain type, like birds or mammals, they treat their measurement of those as a measure of biodiversity. But such a measurement, the argument runs, disingenuously harbors these values under a shiny skin of objectivity.

Consequently, if evidence about biodiversity is used to support policy decisions, those policy decisions beg the question: which decision is asserted to be best looks best because the offered rationale already favors that decision. Meanwhile, it is not necessarily actually best, because there can be no independent standard for determining that. To argue that some one area should be preserved ahead of another because of its higher biodiversity would therefore be to argue disingenuously, concluding something that follows trivially from one's assumptions. And this situation arises, we are led to believe, because conservation biologists choose how to measure diversity as a function of their antecedent interest in preserving certain favored living things.

As I've reconstructed it, this argument that justifications from biodiversity are trivial arises from two assertions about biodiversity: it is unmeasurable and it is intrinsically value-laden. I will consider them in turn.

Morar et al.'s argument for biodiversity being unmeasurable is based on the term's generality. Indeed, groups of organisms can be diverse in many ways. In practice, many biologists quantify biodiversity by counting species. But groups also have phylogenetic diversity, genetic diversity, and phenotypic diversity, and all of these are aspects of biodiversity. Even the simplest of these to quantify—species counting—faces the problems that different species concepts will yield different numbers of species, some species concepts work well for only some taxa (as the scientifically popular 'biological species concept' does not handle non-sexual organisms well), and (even given agreement on a species concept) whether a certain population counts as a species or subspecies is often far from clear. Quantifying the others—and especially anatomic and behavioral diversity—involves addressing immense problems, both practical and conceptual. Maclaurin and Sterelny (2008) offers a book-length consideration of these problems by philosophers of science.

So, it is certainly right that there is not a single quantity scientists measure and call 'biodiversity.' But Morar et al. capitalize on the gap between the particular measures and general concept of biodiversity to insist that the various dimensions cannot be aggregated to yield a single quantity. Does it follow that biodiversity per se is 'impossible to measure'?

This is not how general descriptive concepts work. Consider the similarly general concept of athleticism. Athleticism, like biodiversity, is multidimensional. Among athleticism's dimensions are speed, endurance, agility, dexterity, muscular power, lung capacity, V02 max, and others. Each of these can be measured in myriad ways. There is no agreement about—nor is it likely that there could be any principled agreement about—how to aggregate these dimensions into a single athleticism score. It does not follow that athleticism is impossible to measure. It is meaningful, measurable, and true to assert that my own athleticism is radically lower than tennis-player Serena Williams's and swimmer

Michael Phelps's. How much? I can offer specific, quantitative evidence that that gap is comparatively much larger than the degree to which my athleticism has declined since my teens, for instance. For a harder ranking problem, can we compare Williams and Phelps? I suspect Williams is the more agile and Phelps has the higher V02 max. If we assemble the various dimensions of each's athleticism, we may not find one athlete clearly ahead across a range of scores. But even if we cannot identify a clear winner, we will know in what ways and to what degrees they differ *in athleticism*. We can know that because the various metrics are indeed dimensions of athleticism. They are determined as such non-arbitrarily by the general concept of athleticism. More generally, concepts are not empty or impossible to measure just by virtue of being general, multidimensional, and challenging to collapse into a single dimension. They are meaningfully measured by assessing their various dimensions. In the case of biodiversity, it is comparably meaningful to observe that a grassland's biological diversity diminishes measurably after paving, along multiple dimensions.

The other aspect of 'biodiversity' that might make its use in justifying conservation question-begging lies in that Morar et al. consider the term itself intrinsically loaded with values. 'It can be difficult in such contexts,' they remark about policy-formation contexts, 'to identify precisely where facts end and value judgments begin.' The danger here is vacuity, comparable with that in arguing 'It was a murder, so it was wrong!' Though it is debatable whether killing is always wrong, it is not debatable whether murder is, because moral wrongness is built into the concept of murder.

It is easy to assume the goodness of what one approves of without offering an argument, and even without having any argument in hand. I do not doubt that conservationists and conservation-valuing biologists sometimes do so. The concern raised by Morar et al. is not about the assumed values, but about their opacity, about the way they can be embedded in what is presented as empirical. But here, the same multidimensionality just discussed rescues the capacity of biodiversity research to achieve degrees of objectivity. Because biodiversity is not directly measurable, and only measurable along various dimensions, scientists are compelled to be explicit about what dimensions they measure, and generally to offer justification for those choices. Following Longino (1990), it is exactly this sort of explicitness and public availability of scientific assumptions, including choices and values, that opens the grounds to objectivity. It makes possible the transformative criticism of assumptions that can neutralize distortions produced by idiosyncratic assumptions. As a corollary, the positivist ideal of value-free science is not only not pertinent to value-driven scientific fields like medicine, economics, and conservation biology, but also more generally unnecessary for their objectivity. When Tilman (2012) argues for the value of biodiversity, for instance, he does so by citing exactly what was measured in particular studies of biodiversity's causal influences. His arguments—whether or not finally correct—point to empirical foundations similar to those of every scientific discipline.

The risk of vacuous justification is a serious one, and especially in value-driven fields, sniffing for it is valuable. In the case of biodiversity, however, the crucial critical scrutiny of assumptions has been ongoing as part of the scientific activity of ecologists and conservation biologists, and indeed is essential to its status as science. Biodiversity is complex, multifarious, and enmeshed in human value-discussions. But for exactly those reasons, it's not rotten; it's rich.