Values, Advocacy and Conservation Biology

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ABSTRACT

In this essay, I examine the controversy concerning the advocacy of ethical values in conservation biology. First, I argue, as others have, that conservation biology is a science laden with values both ethical and non-ethical. Second, after clarifying the notion of advocacy at work, I contend that conservation biologists should advocate the preservation of biological diversity. Third, I explore what ethical grounds should be used for advocating the preservation of ecological systems by conservation biologists. I argue that conservation biologists should defend their preservationist positions on instrumentalist grounds alone if the context of discussion and debate is a scientific one.

KEY WORDS

Advocacy, conservation biology, values, preservation.

I. INTRODUCTION.

Conservation biologists study phenomena such as inbreeding depression, habitat fragmentation, demographic stochasticity, and metapopulation structure in order to better understand the nature and rate of anthropogenically caused mass extinctions (see Caughley and Gunn 1996, Meffe, Carroll et al. 1997). According to received opinion, these theoretical studies arise out of the inextricably value-laden nature of conservation biology. As philosopher Arne Naess writes,

> Insofar as conservation biology is a scientific discipline, it is a crisis science like AIDS and cancer research. That is, it uses certain goals and values as axioms. The intrinsic value of diversity of life forms and the meaningfulness of a struggle to save life forms from extinction are taken for granted. Conservation biology is

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> therefore not purely descriptive; it is 'a prescriptive science' (Naess 1990 [1991], 169).

Conservation biologists examine the effects of the above mechanisms amongst many others in order to *preserve* biodiversity. Likewise, Barry and Oeschlaeger argue, 'Conservation biology is inescapably normative. Advocacy for the preservation of biodiversity is part of the scientific practice of conservation biology' (1996: 905).

In this essay, I will explore several issues concerning the value-ladenness of conservation biology and the role of advocacy by biologists. First, I argue, as others have, that conservation biology is value-laden and attempt to clarify what this exactly means. Second, I argue that when the notion of *advocacy* is suitably construed, conservation biologists should advocate the preservation of biodiversity. Third, I explore what the ethical basis of advocating the preservation of flora and fauna should be in conservation biology. I argue that it is prudent for conservation biologists to defend the preservation of biodiversity on instrumentalist grounds *alone* if the context of discussion and debate is in scientific journals, conferences, or public policy forums. If biologists argue for the intrinsic value of species and ecosystems, then the arena in which this occurs should be one of an informal nature.

In this essay, I attempt to clarify the controversial normative nature of conservation biology. It will emerge that conservation biologists should be advocates for biodiversity; however, the reasons for and the strictures on such an advocacy are interestingly complex.

II. IS CONSERVATION BIOLOGY VALUE-LADEN?

For those philosophers and biologists that insist that biologists ought to be advocates for the preservation of biodiversity, the thesis that conservation biology is value-laden is a major premise in their argument. There are however several different ways in which conservation biology, or any science for that matter, can be value-laden. In this section, I separate these ways and examine their relevance to questions of advocacy.

Most biologists and philosophers would grant that conservation biology is value-laden. Biodiversity watcher David Takacs is a good representative of this point of view when he writes,

> Science is commonly thought of by the public and portrayed by its practitioners as an objective, cold, nonpartisan, value-neutral enterprise. Scientists discover facts, mediate truths about nature: on this image their continued prosperity is thought to ride. Yet a group of biologists have been as partisan as can be in their

> attempts to preserve biodiversity. Biologists speak for it in Congress and on *The Tonight Show*. They whisper into the ears of foreign leaders. They extol its virtues to the Harvard Divinity School. They transport 10 percent of the U. S. Senate to spend nights in the heart of the Amazon so that biodiversity will work its persuasive charms firsthand (Takacs 1996: 3–4).[1]

I will use Helen Longino's (1990) analysis of the values in science since some philosophers (for example, Barry and Oeschlaeger 1996) use her work and because it offers a perspicuous entry point. According to Longino, at least two types of value are found in science, *constitutive* and *contextual* (1990: 4). Constitutive values are those values that *constitute* the enterprise of science. These are the aims and goals that make science the sort of institution that it is. It is these values that '…are the source of the rules determining what constitutes acceptable scientific practice or scientific method' (1990: 4). These sorts of values range from simplicity, empirical accuracy, fecundity, scope (generality) and, more generally, knowledge of the empirical world. Some of these values are intrinsic aims and some are instrumental. For example, if the fundamental aim of science is the attainment of significant empirical knowledge, then empirical accuracy would be an instrumental goal relative to the former aim. Likewise, for those for whom knowledge of the deep structure of the empirical world is considered practically unattainable, empirical accuracy is an intrinsic aim of science (Van Fraassen 1980). The goals of science are coupled with implicit imperatives like, 'Prefer simpler theories to more complex ones,' 'Prefer theories which are more empirically accurate to ones that are less so,' and are sometimes made explicit. Of course, it is certainly true that much more must be said about what makes one theory more simple, general, accurate, etc. than another. Nonetheless, some philosophers of science consider theory choice nothing short of impossible without these values (Kuhn 1977).[2]

In some cases, these constitutive goals may include ethical aims. For example, medicine, insofar as it is a science, contains such ethical aims as the betterment of those who are afflicted by illness or disease. However, even when ethical goals are part of a science they are not sufficient to make that institution a science. Other non-scientific institutions or groups can have the same goals. In the environmental case, public interest groups as diverse as Earth First! and the Sierra Club have the goal of preserving species and yet they of course are not sciences or scientific groups, unlike conservation biology. So some methodological aims are necessary for something to be a science.

These persuasive constitutive values are not the only values in science. There are what Longino calls *contextual values* as well which arise from '…the social and cultural environment in which science is done' (1990: 4). These values find themselves in scientific investigation through several different entry points. They may enter from the values *individual* scientists have, or they may enter

through the social structure of science as a collective (for example, through the activity of the National Academy of the Sciences or the NSF). Lastly, they may also enter from the society at large as the needs and amenities of the public inform science.

These contextual values are often relevant to questions concerning advocacy in conservation biology. We can easily find examples of them in the discipline. For example, conservation biologist Reed Noss states that his

> [S]trongest feelings about nature are still just that direct joy. I mean, I guess it's an aesthetic appreciation where I'm literally just brought sometimes to tears just by looking at a piece of moss or some other thing in nature…and [that] is what has motivated me to become a conservationist (Takacs 1996: 276).

This is clearly an example of an individual's values forming the context for his work (see Noss and Cooperrider 1994). Thomas Kuhn recognised these factors as well, '[T]hese motives and others besides also help determine the particular problems that will later engage [a scientist]' (1970: 37).

There are also examples of norms that are found in science as a collective and which are pervasive in conservation biology. Soule writes,

> These normative postulates are value statements that make up the basis of an ethic of appropriate attitudes toward other forms of life – an ecosophy (Naess 1979)…. They are shared, I believe, by most conservationists and many biologists, although ideological purity is not my reason for proposing them (1985: 42).

Examples of these supposed collective norms are *diversity of organisms is good*, *ecological complexity is good*, *evolution is good*, and *biotic diversity has intrinsic value* (Soule 1985: 42–5).

Conservation biology also provides good examples of how the values of society at large influence biological theorising in powerful ways. One of the important theoretical tasks that conservation biologists have laboured over is population viability analysis (*PVA*s) (Soule 1987, Burgman, Ferson, and Akcakaya 1993). Biologists devise mathematical models of population growth, which are utilised analytically or more often simulated by computers, to better understand how and why populations and species go extinct. On the basis of these models, they attempt to estimate the effects of genetic and catastrophic uncertainty, demographic and environmental stochasticity on population and species longevity. They then try to project the mean time to extinction for these taxa. These techniques have been used for grizzly bears and northern spotted owls with success.

Population viability analysis has a normative or evaluative component. In order to determine what a minimum viable population is for a given taxa, one must determine the appropriate fraction of the population or species we want to keep around and the desired time of persistence. For example, do we want at least

90% or 95% of the population to persist for 100 years or 1000 years? There will be different risks and costs attendant to these different population sizes and time frames and these are ultimately determined by the public's values and preferences. Thus, society's values enter directly into conservation biology (Grumbine 1992). The values of society at large can often be necessary to consider in a conservation biologist's field and mathematical work.

Thus, there are several different sorts of values that are found in the sciences. First, there are constitutive values. These values concern the fundamental aims of science and how to attain those aims. Philosophers of science typically do not find the existence of these values as controversial.[3] One way of understanding these aims is that an aim is constitutive of science if it is *necessary* for something to count as science that it must have that aim either intrinsically or instrumentally. There are also contextual values that arise from the context in which science is practised. Some of these values are what we might term *endogenous*; i.e., they arise from individual scientists or science as a collective. Likewise, there are what we might call *exogenous* values which arise from outside of science. The distinction between endogenous and exogenous contextual values is difficult to make precise but it serves to locate what sorts of mechanisms can generate values in science.[4]

Is conservation biology value-laden? Absolutely. It is value-laden in the same sense that other sciences are – after all, it is a science. More importantly for us, it is laden with ethical values (the commitment to the preservation of biodiversity) which arises from a multitude of sources. However, it is important to notice that from the fact that there are values in conservation biology it does not follow that biologists *should* be advocates of these values. First, there must be ethical values present for them to advocate; non-ethical constitutive values will not do it. Second, even though there are such values concerning the preservation of biodiversity, it still does not follow that they should advocate them. Those values might be morally suspect, as some political conservatives believe. Likewise, those values might be morally sound but the consequences of such an advocacy might be disastrous to the public image of the biological sciences and in the balance unacceptable. Thus, from the fact that conservation biology is value-laden it does not follow that biologists should be advocates for the preservation of biodiversity – more is needed.

III. WHAT IS AN ADVOCATE?

There has been quite a controversy over the normative nature of conservation biology and whether conservation biologists ought to advocate the preservation of biodiversity.[5] Important as the debate has been, there has been little effort to define one of the central and crucial terms – namely, what is an advocate? In order

to fix a point of reference, I will first explore what an advocate might be in applied ecology and will suggest a working definition.

There are several different ways in which a conservation biologist might be an advocate.[6] First, a biologist might attempt to provide the public with the relevant ecological information concerning the rates and nature of mass extinctions, the effects of pollutants, global warming, and so on. They supply scientific data and recommend a course of action for the public in light of the *public's* values. This minimalist use of the term 'advocacy' is apparent in the following, '…[scientists] have the responsibility to explain what they are learning to the public', and '…we have an ethical obligation to provide decision-makers with explanatory knowledge and prescriptive recommendations' (Barry and Oeschlaeger 1996: 906, 910). Medical doctors provide this sort of minimal advocacy any time they recommend a treatment for a patient given the needs of the patient. In an environmental context, this sort of advocate is a biologist who provides relevant information on pressing environmental problems and provides relevant advice for the public and government, given what they want. In fact, biologists must understand the values of their constituencies often to recommend appropriate prescriptions and carry out their analyses (as we have seen with *PVA*s). As Lynn Maguire writes,

> The role of science is to give guidance in *how to achieve* goals that have been set with reference to underlying values. Science can help evaluate alternative strategies for achieving goals, and it can help predict the consequences of pursuing a particular set of goals (1994: 270).

This sense of the term 'advocacy' is relatively uncontroversial. Whenever scientific and technological impacts are felt in society scientists have responsibilities to explain their research, to have their research regulated, and to offer advice. As biologist E. D. McCoy writes,

> Who could argue that explaining research, using our scientific understanding to educate others, and even making practical recommendations based on our findings are inappropriate scientific undertakings? Scientists do these things regularly, for contractual work, give talks to civic groups, and engage in many other activities (1996: 920).

A second sense of the term 'advocacy' can be found in the following by Arne Naess,

> Is it my privilege as a philosopher to announce what *is* of intrinsic value, whereas scientists, as such, must stick to theories and observations? No, it is not – because you are not scientists as such; you are autonomous, unique persons, with obligations to *announce* what has intrinsic value without any cowardly subclass saying that it is just your subjective opinion or feeling (1986: 504).

In this case, to be an advocate is to be a biologist who argues for and recommends the protection of biodiversity. More generally, advocates are scientists who recommend a course of action on the basis of scientific evidence and the values *they hold*. These values may first arise from science as a collective, society, or even their own emotional and intellectual history; however, these values must be theirs. Thus, conservation biology is not *applied* biology as if the science is only applied to the values of others. Rather, conservation biologists also should recommend their own ethical views (Barry and Oeschlaeger 1996: 909).

There are at least two distinct notions as to what constitutes an advocate *qua* conservation biologist. An advocate is either (i) a biologist who recommends a course of action to the public in light of his/her work and *the public's values alone*, or (ii) a biologist who recommends a course of action to the public in light of his/her work and *their own values* (possibly with other's values as well). I will stipulate that an advocate in this essay will be only of the second sort. My reasons for this are that the first notion is relatively uncontroversial and is certainly not unique to conservation biology. Insofar as a science has consequences for the well-being of a societies' members, it is uncontroversial that scientists recommend policies that accord with the well-being of those individuals. This is just as true of physicists, chemists, and economists as it is of biologists – no one disagrees on this point. It is with respect to the latter notion of *advocacy* where we find disagreement.

There are several interesting questions that arise with respect to the second notion of advocacy discussed above. For example, if biologists should be advocates, then what should they advocate? Most of those in the debate have argued that conservation biologists should argue for the preservation of biodiversity. However, on what basis should they recommend the preservation of species and ecosystems? Some would argue that the basis for the preservation of biodiversity rests on the fact that it provides food, fibre, and pharmaceuticals for us and is the crucial matrix for the ecosystem services on which we depend (Myers 1979, Ehrlich and Ehrlich 1981, Daily 1997). Others would suggest that it is the aesthetic experiences that such objects provide, or even the intrinsic value that species and ecosystems possess. As is obvious, some of these bases are far more contentious than others. Every one of the reasons for preserving biodiversity with the exception of the intrinsic value of biological diversity will be disagreed with on an empirical basis by anti-environmentalists.[7] However, the intrinsic value of biodiversity is something that appears to have an explicitly controversial *ethical* basis. Conservation biologists are not experts on these matters and are not the traditional spokespersons for such views.[8] Should biologists be advocates for the preservation of biodiversity if it is based on an area outside of their expertise? Should one only advocate some ethical position for which one has the appropriate credentials?

IV. WHAT SHOULD CONSERVATION BIOLOGISTS ADVOCATE?

Clearly conservation biologists, if they are to be advocates, must have a position to advocate. We have seen this to be the preservation of biodiversity. They must also offer their reasons for preservation. There are several different options for why society ought to preserve biodiversity. Traditionally, there are instrumental reasons and there are non-instrumental reasons for preventing species extinctions. In the debate about the normative nature of conservation biology, many commentators have suggested that the reasons must concern the intrinsic value of biodiversity.

The reasons why we should preserve biodiversity need not concern the intrinsic value or worth of biodiversity though. Consider the fact that biodiversity provides society with much valued ecosystem services. That is, ecosystems provide purification of air and water, detoxification and decomposition of wastes, generation and renewal of soil, pollination of crops and plants, control of agricultural pests, and partial stabilisation of climate (Daily 1997). These services all affect the good of the human species. If these services are not provided, and they most certainly could not be without many of our extant species and their interactions amongst one another and their abiotic environment, then our species would be direly affected. Hence, if our welfare is morally significant, then we ought to preserve biodiversity.

There are important issues that must be attended to in determining the soundness of this ecosystem services argument. For example, philosopher Mark Sagoff (Meffe, Carroll et al. 1997: 522–3) has argued that ecosystems contain immense functional redundancies. If one species goes extinct, there is a functionally equivalent surrogate that can take its place. Does the fact that there is some functional redundancy in ecosystems which can buffer the effects of some extinctions demonstrate that the extinction of species will not affect these services? Likewise, Sagoff claims that in some ecosystems the important interactions that shape ecosystem functions are between just a few keystone species. Many of the species in the ecosystem do not determine the relevant functions of an ecosystem in any direct way. Hence, most of the species in an ecosystem do not appreciably affect the ecosystem services performed. So the extinction of these species would not affect the good of humans.

Whatever one thinks of Sagoff's arguments we can see that what he and others consider controversial are *empirical* issues and not the moral claim that we ought to promote human well-being.[9] This ecosystem services argument, though controversial, is unlike some of the arguments offered by some prominent conservation biologists. Some argue that we ought to preserve biodiversity because it has intrinsic value and here the argument is more controversial. Surely, we ought to preserve those objects that have intrinsic value but it becomes difficult to provide a reasonable and persuasive account of why and how populations, species, and ecosystems have such a value.

Environmental philosophers are divided over these issues. For example, Bryan Norton (1992) and Anthony Weston (1988) are two notable critics of the claim that species and ecosystems have intrinsic value. Moreover, even those philosophers who agree that biodiversity is intrinsically valuable such as J. B. Callicott (1986) and Holmes Rolston III (1988) do not agree as to why it has such a value.[10] Unlike the ecosystem services argument, the controversy concerns moral philosophy and it is unlikely that biology can resolve that.

Now consider the position of a conservation biologist who believes that biodiversity is intrinsically valuable and argues that species and ecosystems should be preserved on that basis. Clearly, an anti-environmental critic can and ought to ask why this is so – on what basis do you believe this and on what basis should *they* believe this? If philosophers themselves are in radical disagreement on the subject what should we expect of biologists? Consider some of Takac's interviews of various biologists and their responses to questions concerning biodiversity's intrinsic value.

> David Ehrenfeld: 'For biological diversity, value is. Nothing more and nothing less…. Well, I couldn't prove it, I guess. I just believe it.'
>
> Paul Ehrlich: '…I just can't have the feeling that the only value they [species] might have is what they might mean to us. But you can't possibly defend that scientifically.'
>
> Jerry Franklin: 'Oh, I basically think so, yes. But I haven't given a whole lot of thought to it.'
>
> Daniel Janzen: 'The word *value* is anthropocentric…. That's a contradiction in terms.'
>
> S. J. MacNaughton: 'I don't see how anything can have value outside of a value that human beings place on it, because value is really something uniquely human, isn't it?'
>
> David Pimmentel: '[I]n trying to protect or conserve nature, to use the argument of intrinsic value gets you – well, I don't think it sells very well' (1996: 249–52).

Takacs concludes that a majority of the conservation biologists he interviewed believe that species have intrinsic value though many are reluctant to publicly offer arguments to this effect. We can see why from the above comments. To some of these scientists the notion of intrinsic value does not make sense, is not capable of being 'proven', is not persuasive, or they have not given it much thought. As Takacs, writes, 'Intrinsic value appeals to those with whom you don't need to argue that biodiversity has intrinsic value: they just agree with you' (1996: 253).

Most commentators on values and the role of advocacy in conservation biology have insisted that biologists promote the preservation of biodiversity *because* of its intrinsic value. We can see now that this is a problematic position.

First, not all conservation biologists agree with the claim. Second, it is clear from the comments above that for many they consider it an 'intuition' of sorts and it is not something that they (self-admittedly) could or would want to defend. Third, insofar as environmental philosophers themselves are in radical disagreement over the nature and importance of the intrinsic value of nature, we should not expect conservation biologists to provide philosophical justifications of such attributions.

Scientists attempting to justify claims of intrinsic value can be especially problematic. Traditionally, science is portrayed as an enterprise where personal values are absent. Insofar as biologists offer such values as a basis for environmental decision-making and have no means of defending those values, they can lose scientific credibility amongst the public. They are likely to be perceived as biased and as serving the interests of liberal lobbying groups. In controversial environmental matters, credibility is of extreme importance in persuading the public to alter their consumptive lifestyles. Thus, if we want the public to respect the credibility of conservation biologists and their scientific work, then it is prudent that conservation biologists do not advocate the preservation of species and ecosystems on the basis of their intrinsic value.

Nonetheless, conservation biologists should be advocates in the robust sense offered above. If biodiversity affects the well-being of our species, and given that this is an uncontroversial good which is held by conservation biologists and the public at large, then scientists should advocate the preservation of ecological systems on the basis of those values. Recall that I characterised an advocate qua conservation biologist as a biologist who recommends a course of action in light of his/her values. Since conservation biologists consider the welfare of their fellow humans an important good, then they ought to advocate the preservation of biodiversity as it affects that good. Thus, there are contextual values which conservation biologists should advocate.[11]

I have used the terms 'ought' and 'should' in much of what has been discussed and have phrased the question under consideration as 'Should conservation biologists be advocates of the preservation of biodiversity?' From this, one might conclude that I have argued that conservation biologists insofar as they have certain values and beliefs are morally obligated to advocate the preservation of biodiversity; i.e., it is morally impermissible for them not to do so. I do think that it is the responsibility of environmental scientists to offer their best advice about how we should live our lives in the natural world. Likewise, it would be inappropriate for the public to consider their advocacy as a sign of bias simply because they advocate an ethical position.[12]

The 'should' I am mostly concerned with here is one of prudence. I have argued that promoting the preservation of biodiversity on the basis of claims of intrinsic value is a delicate enterprise. Here the problem lies in the fact that such attributions are difficult to defend by anyone including biologists. This is not to say that there is no place for this sort of advocacy. However, it becomes

increasingly problematic when it casts doubt on the credibility of conservation biologists. There is a moral obligation of biologists to voice their considered moral judgements on policies which affect our well-being. It is prudentially inappropriate for conservation biologists to recommend policies to the public when those policies are to be justified by reference to the intrinsic value of non-human species.[13]

Finally, I want to consider where conservation biologists should advocate their ethical positions. Should such arguments be limited to informal arenas such as the lab or classroom or the non-technical literature such as *Bioscience* or *Natural History*? Should ethical arguments be offered in technical literature such as *Conservation Biology*, *Biological Conservation*, and *Nature* or in professional meetings? I have argued that it is most appropriate for conservation biologists to advocate the preservation of biodiversity when it is grounded in instrumentalist reasons pertaining to human goods. There are however a variety of forums for biologists to offer diverse opinions and arguments. Does it matter where their advocacy takes place?

As I argued above, advocacy becomes problematic when it affects the credibility of conservation biologists as biologists. However, the sorts of instrumentalist arguments that I discussed are just the sort that biologists are often well equipped to discuss (as we saw with the ecosystem services argument). Moreover, it does not matter whether that forum is a technical one or not. In the case of advocacy of intrinsic values, the situation changes. The prudence of such advocacy is often dependent on the forum in which it takes place. It is clearly a very different circumstance when a conservation biologist offers ethical views as an individual versus one in which he/she is speaking for conservation biology as a discipline.

As the forum changes from one in which a scientist can share personal values and the audience expects this to one in which they do not, the appropriateness of the advocacy of intrinsic value changes as well. It is important that an audience does not confuse the personal values of a scientist with his/her empirical work. If the occasion is such that this is clear, then the advocacy of such values can be important and inspiring. If it is not clear, then it can be confusing and problematic. Anti-environmentalist sceptics often confuse scientific claims with ethical ones. This provides ammunition for individuals to confuse important controversial claims with scientifically credible ones.[14]

V. CONCLUSION.

In this essay, I have attempted to clarify the normative nature of conservation biology. I have argued that conservation biology is value-laden. There are both constitutive and contextual values that arise in the science from individual scientists, the scientific collective, and from the public at large. I have offered an

account of what an advocate is in conservation biology and have claimed that they should be advocates in the requisite sense. However, there are important qualifications that arise insofar as the reason for such preservation changes from instrumentalist arguments to non-instrumentalist arguments especially of interest to environmental philosophers. However, even such arguments should be offered when the public expects scientists to speak on matters beyond the narrowly scientific.

NOTES

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[1] Conservation biologist Michael Soule writes, 'I don't think there's anything terribly unusual about a field having an ethical foundation. They all do. There's always either implicit or explicit norms for whatever humans do. We tend to think there's a dichotomy, though, in science between the normative and non-normative disciplines. This is also a myth' (1994: 103). Soule is surely correct that every science is grounded in norms; however, not all of these norms are ethical and it is not obvious at all that *all* sciences have ethical *foundations*.

[2] It should be noted that it is possible for these aims to conflict, both at a time and over time, and scientists may weight their importance relative to other aims.

[3] Of course the content of these various aims *is* extremely controversial. For example, the debate over scientific realism is in part a debate about what the aims of science are, what they should be, and whether they can be attained (Van Fraassen 1980, Churchland and Hooker 1988).

[4] One way in which to demarcate endogenous and exogenous contextual values is to identify their proximate mechanisms. For example, a conservation biologist's formative experiences surely are affected by society at large. However, in some cases, her scientific work is directly, and hence most proximately, affected by her own values whatever their origin. Likewise, in some instances, particular values most directly enter science from society. A contextual value is endogenous or exogenous depending on what is the most proximate mechanism for that value's introduction into scientific practice.

[5] For a sample of the controversy, see the June 1996 issue of *Conservation Biology* and David Takacs *The Idea of Biodiversity*.

[6] E. D. McCoy (1996: 920) argues that the term 'advocacy' has been used in very different ways in this debate.

[7] It is true that anti-environmentalists might disagree with arguments for the preservation of ecological systems on the basis of aesthetic values. However, the disagreements are of two sorts. First, some brownlashers will argue that aesthetic values are trumped by economic values. If the choice is between the jobs of loggers and hence their well-being and the cute Northern spotted owls, then the well-being of the loggers takes priority since they are of greater moral worth. However, the critics still grant that the owls have some value from an aesthetic point of view. The second sort of criticism concerns what objects have the aesthetic value under consideration. Some species will be considered to be of

marginal aesthetic value at best. Nonetheless, these critics surely consider *some* species to be aestheticall valuable. These worries are of a different sort than those generated by claims of intrinsic value.

[8] Of course, there may not be *any* experts or appropriate spokespersons on such matters.

[9] Nonetheless, both of Sagoff's arguments are questionable. First, Sagoff is right that biologists have found that there is functional redundancy in some ecosystems (Lawton and Brown 1993). However, he assumes that it is practically unlimited and this is not the case (Kinzig et al. 2001). For example, ecologists Tilman and Downing (1994) determined, in the systems they studied, that there is a curvilinear relation between drought resistance and the number of plant species in an ecosystem. Thus, as the number of plant species increases the drought resistance of an ecosystem increases. However, once a certain level of species richness is attained, drought resistance does not change appreciably as new species are added. Tilman's work thus serves as an example of an ecosystem in which there is some redundancy. Unfortunately, as we eliminate those redundant species we are quickly on the road to eliminating the *entire functional group* and hence the life-supporting service. Sagoff's second argument assumes that a species is important to ecosystem services only if it is a 'driver' of the dynamics of an ecosystem. However, this is false. Many species do not drive the dynamics of a community but are necessary for the viability of the keystone species in the ecosystem.

[10] Consider the following claim: a species or ecosystem has intrinsic value only if someone values or would value that species or ecosystem. Rolston disagrees with the claim since if no one values species or ecosystems either actually or even possibly, then on his view they still would possess intrinsic value. Callicott agrees with the claim since on his account it is necessary that someone values a species or ecosystem intrinsically if it is to have intrinsic value. Hence, there is a fundamental metaethical disagreement between them.

[11] An anonymous referee offered the following argument: something is contextual value only if it is a value that 'drives or motivates an individual to engage in a certain kind of scientific activity'. However, not all conservation biologists are driven or motivated to preserve biodiversity on the basis of human well-being. Hence, at least for those biologists it is not a contextual value. Here I would suggest that something is a contextual value only if it informs or is causally related to their scientific work – it need not 'drive' their work. Human well-being can be a contextual value of biologists in this sense.

[12] If the public did consider conservation biology to be biased because it has ethical foundations, then they must also view medicine as biased on pain of inconsistency.

[13] Incidentally, I do think that ecological systems can possess intrinsic value when suitably characterised (though my account of intrinsic value would differ from Rolston and Callicott). In a few words, my suggested account would be the following: *x* is *intrinsically valuable* just in case *x* would be intrinsically valued by a moral agent where that agent is fully informed and fully rational (see Brower, B. (1993), P. Railton (1986a, 1986b) for similar axiological approaches). There is no obvious reason why ecological systems cannot have intrinsic value on this account. Nonetheless, my worries concerning what such attributions can accomplish in the context of public policy and the damage they can bring to the extremely important work of biologists applies to this account as well. This account is as controversial as the ones that have been mentioned previously. But of course, particular normative and metaethical views can be philosophically sound and yet politically unpersuasive as justifications for various policies. Thanks for helpful comments on this point from an anonymous referee.

[14] As an example of such confusions, see Chase 1995. Sometimes Chase does not clearly distinguish the 'biocentric' philosophical views of some ecologists with their ontological claims made about the existence of ecosystems. Thus, his critique of ecosystem management suffers as a result.

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