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From Biodiversity-based Conservation to an Ethic of Bio-proportionality

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Abstract

Nature conservation has in recent decades become largely synonymous with biodiversity conservation. Biodiversity is a term with scientific meaning but in policy contexts it also carries a normative loading. Under this normative aspect, the notion of biodiversity has received little scrutiny. Upon examination it may be shown to set the bar of conservation too low. The goal of biodiversity conservation, as framed in the terms of the Convention on Biological Diversity, is to assure viability rather than abundance for species populations. This results in a tendency towards an "ecology of the minimal" which is compatible with large-scale human exploitation of natural environments. To equate conservation with biodiversity conservation is thus to tailor conservation to the requirements of "development". In its implicit concession to human hegemony, biodiversity-based conservation reveals its underlying anthropocentrism. In this paper it is argued that, as an anthropocentric project, biodiversity-based conservation cannot assure the future of earth-life and that a bio-inclusive value base, which exceeds the requirement of biodiversity conservation, is therefore needed: over-reliance on the concept of biodiversity has skewed conservation policy towards a possibly self-defeating minimalism. As an alternative basis for conservation policy, an ethic of *bio-proportionality* is proposed. The goal of such an ethic would be not mere viability but optimization: it would seek not merely viable but optimal populations of all species. This has specific policy implications for human population and strengthens the case for increasing the extent of protected areas.

1. Introduction

Few vast areas of land relatively undisturbed by human activity and home to abundant populations of wild, indigenous animal species remain on earth, but wherever they do – as in parts of the Arctic, Antarctica, Australia and South America – they are currently threatened with large-scale resource extraction and development. Conservationists fight for reserves and devise strategies within these areas in order to protect species and ecological communities that development is likely to place at risk, but conservation discourse generally seems to have lost terms of reference that would enable it to question whether these regions need to be developed at all. It seems to have lost the capacity to advocate not merely on behalf of threatened nature but on behalf of abundant nature. How has this state of affairs come about? How has it transpired that conservationists no longer have the discursive means to advocate on behalf of vast terrains of abundant life rather than mere remnants and last things?

As this is a normative and philosophical question, though one with important implications for policy, a philosophical method will be required to address it. In order to give focus and concreteness to the inquiry, I shall initially consider the case of the Kimberley in Australia's far northwest. I shall then consider how the notion of biodiversity, as defined and enshrined in the United Nations Convention on Biological Diversity (CBD) and its Australian subsidiary, the Environmental Protection and Biodiversity Conservation Act (EPBC), predetermines the optimal scope of conservation in the Kimberley and elsewhere, and in doing so drastically limits what conservationists may aspire to achieve. Logical objections to this notion of biodiversity as a normative basis for conservation will then be canvassed. For the purpose of understanding how the

concept of biodiversity has become the very pivot of wildlife conservation throughout the world, a resume of its emergence in scientific literature will be offered. Its rapid uptake in the sphere of policy will be attributed at least in part to the fact that, as a criterion of what should be conserved, this notion was eminently compatible with the anthropocentric project of economic development that was also enshrined in the CBD. As a normative criterion, biodiversity will be contrasted with the earlier, more generous, less anthropocentric – though also flawed - notion of wilderness. In order to offer a proper evaluation of the relative merits of biodiversity versus wilderness in this connection, the anthropocentrism/biocentrism debate, recently revived (though without hindsight) by ecomodernists, will be revisited. After several less oft-noted objections to the anthropocentric position are outlined, a new concept, that of *bioproportionality*, will be advanced in lieu of biodiversity as a normative foundation for conservation.

2. Arguments against Biodiversity as the Exclusive Basis for Conservation

The Kimberley is an area of over 424,000 square kilometres. This is larger than many European countries, such as Italy or Germany, and almost twice the size of the United Kingdom. Yet according to government census figures for 2011, it has a permanent human population of 34,794 (Australian Bureau of Statistics 2011). Nor is the Kimberley merely a desert region, an arid zone of little biological significance. Rather, it is one of Australia's fifteen National Diversity Hotspots, characterized by a wide variety of unusual and endemic animal species, such as the snubfin dolphin, found only in northern Australian waters, the bilby, golden bandicoot, masked owl, golden-backed tree rat, painted snipe and Gouldian finch (McKenzie et al 1991; Cawardine et al 2011). It is a centre of world significance for migratory birds. The Kimberley coastline is also a humpback whale migration route, and the largest humpback nursery on earth lies between Broome and Camden Sound. The pristine coral reefs that line the coast rival, in terms of species richness, the Great Barrier Reef (Jones et al 2014).

As an environmental cause then, the Kimberley is in a very special class. At issue here is the protection, not of exhausted remnants, but of a veritable empire of nature, admittedly infiltrated by ferals and exotics, but not yet severely ecologically compromised (Cawardine et al 2011). Although the Kimberley does support industries, such as pastoralism, tourism, limited agriculture, pearling and fishing, it nevertheless remains largely a scene of ecological and evolutionary unfolding relatively free of human interference.

Recent battles over a proposed gas hub on the Dampier Peninsula and, subsequently, mushrooming mining projects all over the region have however brought the question of the future of the Kimberley to public attention. The fight to "save the Kimberley" [see < http://www.savethekimberley.com> for one hub of this campaign] has enumerated the known threatened and endangered species and vegetation communities, as well as certain archaeological, heritage and scenic values, but has overall been hard pressed to articulate a case for preserving the Kimberly in its present relatively undeveloped state at the cost of vast mining and other industrial revenues foregone. There seems to be a missing

argument at the heart of such campaigns, an argument simply for the entitlement of existing terrains of life to their continued existence. Campaigners instead resort almost exclusively to arguments framed in terms of extinctions, endangerment and the necessity to maintain viable populations of species and samples of vegetation communities.

2.1. The pivotal role of the concept of biodiversity in setting minimal targets for conservation

The emphasis on these terms of reference in campaigns and in policy settings derives from the centrality of *biodiversity* as the framing category of contemporary conservation, as canonized in the United Nations CBD. The CBD declares in its Preamble that

"....the fundamental requirement for the conservation of *biological diversity* is the in-situ conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings". (italics added)

The stated goal of this pre-eminent environmental charter – namely, the in-situ conservation of ecosystems and natural habitats – is given specificity by the qualifier that it is *viable* populations of *species* that are to be preserved. Elsewhere in the CBD, biodiversity is defined as

"the variability among living organisms from all sources…….this includes diversity within species, between species and of ecosystems". (CBD 1992, Article 2)

Although interpretations of the term, *biodiversity*, vary widely amongst biologists, the agreed core of the idea is, as stated in the CBD, diversity at genetic, species and ecosystem levels (Quammen 1997; Takacs 1996). However, since genetic variation is, in practice, on a landscape scale, hard to measure and since criteria for defining - identifying and demarcating - ecological communities are under-developed in biology, the "diversity" in biodiversity tends to be read, for policy and campaign purposes, in terms of species. Biodiversity conservation tends to be understood, at its core, as the preservation of viable populations of species in their natural surroundings.

But *viable* here implies a *minimum*. Populations of a given species ought to be protected to the extent that that species is in danger of ceasing to be viable. At its baldest, this implies that prior to the point of endangerment there is no obligation to protect species. The reason for this limitation on protection soon becomes clear. For the CBD is as much an edict to exploit nature as to protect it. It conjoins the requirement of biodiversity conservation with a requirement of economic development. In the body of the document the emphasis tends to fall heavily on the latter (Guruswamy 1998). Under the rubric of biodiversity conservation, in other words, permission for large-scale exploitation of all species and ecologies is granted: humans are morally entitled to monopolize the resources of the biosphere subject only to the condition of "sustainability", namely that other species and types of ecosystem are not entirely obliterated (Vucetich & Nelson 2010).

In the Australian context, the same back-handed commitment to conservation is evident in the EPBC, the federal Act that legislates Australia's responsibilities

under the CBD (Australian Government 1999). This Act nominates "matters of national environmental significance" which must be protected by law. They include endangered species, threatened ecosystems and migratory species as well as a list of nature and marine reserves already listed for their biodiversity values. The notion of biodiversity is used ambiguously throughout the text of the Act, as it is throughout the Convention, to signify, simply, natural environments, on the one hand, and an actual diversity of species or types of ecological community, on the other. The latter sense is used to select those natural environments that will qualify for protection, though the limited scope of this criterion is disguised by the more general sense. Both the Convention and the Act speak of the need to conserve biodiversity, which implies a commitment to conserving nature at large, but the commitment is implicitly only triggered by the threat of disappearance or non-viability of species or types of ecological community.

It is this hidden but extremely significant bias in contemporary biodiversity-based notions of conservation that makes a vast and ecologically abundant terrain such as the Kimberley difficult to defend. For although at-risk species and types of ecological community do of course occur in the Kimberley – such as the Monjon rock-wallaby, scaly-tailed possum and monsoon vine thicket (Australian Government Department of Environment) – saving a handful of rare entities from extinction is not the main point of popular campaigns to "save the Kimberley". The Kimberley is unique precisely in being a stage for ecological processes on a grand scale, for supporting vast flocks and herds, sheer numbers of wild things, such as used to occur on all continents. The gist of current biodiversity-based notions of conservation however is that such abundance is surplus to environmental requirements: viability might be assured with dramatically reduced populations of many species and types of ecological community. Official Minimum Viable Population figures of course vary from species to species, but are generally in the order of only hundreds or a few thousand (Quammen 1997). One recent meta-study of different estimates in the literature put the average figure at 4169 individuals (Traill et al, 2007).

The message implied in contemporary conservation discourse then is that "undeveloped" regions such as the Kimberley should indeed be open for business, provided that business allows for residual populations of species or representative samples of ecosystem-types unique to these regions. These populations/samples must be large enough to assure viability but small enough to minimize competition with human enterprises for natural resources. They might prove capable of subsisting in the interstices of industrial landscapes – wedged between mining installations or on the peripheries of irrigated croplands or tourism hubs. This is the prospective face of "sustainable use" of Kimberley resources from the point of view of the CBD and the EPBC. But such ecological minimalism is far from the goal of those running campaigns to "save the Kimberley".

2.2. Three reasons why over-reliance on viability fails conservation

The question whether biodiversity-based conservation, with its prescription to preserve only the bare biotic minimum required for viability, is *ethically*

defensible will be considered below. Three further objections to biodiversity as an exclusive basis for conservation however are also important.

2.2.1. Ecologies of the minimal are not enough

Firstly, the prescription merely to preserve biodiversity rather than abundance is unlikely, taken to its logical conclusion, to achieve even its own ecologically minimalist goals. As studies in island biogeography consistently show, remnant populations often decline in spite of satisfying estimates of viability (Quammen 1997; Whittaker & Fernandez-Palacios 2007). In the case of many species, viability in the long term is premised on abundance: undeterminably large populations are required as buffers against unforeseeable and hence statistically unquantifiable environmental set-backs and contingencies. Species that are already rare, either naturally or as a result of humanly induced attrition, are at greatest risk in fragmented and disturbed environments (Quammen 1997). As a general rule, nature operates with large numbers, or at any rate with a large margin of redundancy. Any prospective ecology of the minimal will arguably turn out to be oxymoronic.

In his book, *The Idea of Biodiversity*, David Takacs recognises that this is a weakness of any conservation movement organised exclusively around the preservation of threatened species, as he thinks the American conservation movement was prior to the emergence of the category of biodiversity. (Takacs 1996) Takacs argues that the emergence of this new category in the 1980's broadened the scope of conservation. But this is what I am suggesting seems questionable. Even were it to prove practicable, under the rubric of biodiversity conservation, to protect not merely species diversity but genetic and ecosystem diversity as well, the problem of minimalism would still apply. For 'diversity' in the sense intended pertains to *types*: genotypes, species, ecosystem-types; none of these types should disappear. But once a viable set of instances of any type is secured, that type is saved. Further instances are superfluous.

2.2.2. Viability is unknown for most species

Secondly, a conservation protocol triggered only by endangerment is, even at a common sense level, inadequate inasmuch as scientists have so far identified only a small percentage of the species that actually inhabit the earth. (Takacs 1996) A recent study estimates the present number of species to be 8.7 million (give or take 1.3 million). Of those, only 1.2 million have already been catalogued, leaving 86% of terrestrial species and 91% of marine species still to be identified (Mora et al 2011). If we are so little apprised of the species that do exist, how can we rely on evidence of endangerment as a trigger for intervention? It is obviously not possible to arrive at viability estimates for populations of species as yet unidentified.

2.2.3. Viability as a criterion leads to over-valuing the rare

Thirdly, an over-emphasis on threatened and endangered species leads to a one-sided valorization of rarity at the expense of commonness: common species are likely to be treated with environmental indifference, as of little value. This can lead to popular attitudes of contempt towards certain species, and consequently careless and brutal treatment. Popular attitudes to the kangaroo in Australia are

a case in point (Garlick et al 2011). Such attitudes not only subvert the very basis of conservation, which, as will be argued below, needs to rest on a generalized respect for living things. They can also lead to environmental practices as a result of which species once common quickly become uncommon. Historical examples are almost too numerous to mention – they range from passenger pigeons in the USA to bettongs in Australia (Fleming et al 2013).

2.3. In setting the bar of conservation too low, an ethic of biodiversity capitulates to anthropocentrism

An exclusively biodiversity-based approach to conservation may then be unlikely to succeed even in its own goal of sustaining viabilities. The main aim of the present paper however is to evaluate biodiversity-based conservation in specifically ethical terms. Are conservation biologists really concerned merely to head off extinctions rather than defend the entitlement of existing terrains of life to their continued existence? Are they really content to concede only residual spaces to earth-life rather than declaring its equal right to existence? To acknowledge the equal right of non-human life to existence would be to ask how, as environmental managers, we should divvy up the biological resources of the biosphere so as to ensure that all species receive their just apportionment. It would be to ask by what right humans are systematically displacing all other species (or at any rate, species which are not directly instrumentally important to us) to the point of mere "viability", their last few hundreds or thousands of members lingering in ghettoes, fenced out of their erstwhile territories or assailed in those territories by unremitting hazards. It would be to ask the most obvious yet till recently rarely asked question of the conservation project: how many humans can, in fairness to other species, inhabit the planet? (Cincotta & Engelman 2000) To how great a proportion of the biological resources of the biosphere is the human species entitled? How much "development" is consistent with the needs of the rest of life?

Instead of pressing these questions, the biases inherent in the biodiversity concept lead conservationists to acquiesce in the extravagant double standard that sets population goals for non-human species in the low thousands while condoning for humans a population in the billions. This willingness implicitly to defer to human hegemony implies that, whatever the private moral aspirations of conservationists, their deferral to an ethic of biodiversity results in an anthropocentric orientation in conservation. For if conservationists are not prepared to uphold, in principle, the entitlement of living things to their own existence, whether they are endangered or not, then from whence does the commitment to preserving species diversity arise? Diversity per se cannot be deemed intrinsically valuable. (Morar et al 2015) One does not value diversity where evils or matters of indifference are concerned. (A diversity of diseases, for instance, is hardly to be preferred over a single disease.) Diversity is intrinsically valuable only in relation to goods. If life is considered a good in its own right, then the greater the richness of life the better, where diversity in the forms of life is one measure of such richness. But if life is not considered a good in its own right, then any value accorded to diversity, in the case of species, must be purely instrumental: species diversity must be figuring merely as a condition for ecological functionality, where ecological functionality must in turn be figuring

merely as a condition for human amenity and survival. In other words, unless conservationists insist on the value of life in itself and hence the entitlement of living things, whether endangered or not, to their own existence, their commitment to biodiversity must ultimately be merely instrumental.[1]

2.3.1 Is anthropocentrism enough?

If anthropocentrism is already implicated in this way in conservation predicated exclusively on biodiversity then the ethical adequacy of anthropocentrism as a basis for conservation requires evaluation. How well can the conservation project be prosecuted from an anthropocentric value-base?

As this question has received considerable attention in recent conservation literature (Kareiva et al 2011; Kareiva & Marvier 2012; Doak et al 2014; Vucetich et al 2015; Vucetich & Nelson 2007, Soule 2013) it will be only briefly reviewed here, with emphasis on arguments that have not figured prominently in the debate so far. The adequacy of anthropocentrism will be considered under three headings:

(1) Is the anthropocentric assumption that only humans are entitled to moral consideration valid?
(2) Are the material outcomes of an anthropocentric ethic equivalent to those of a biocentric one?
(3) Ought an anthropocentric approach be preferred on pragmatic/political grounds to one based on biocentrism?

2.3.1.1. Do only humans possess moral entitlements?

(i) Intrinsic value. A first approach to this question is via the notion of intrinsic value. This was the approach that launched the field of environmental ethics in the 1970's: anthropocentrism was defined as the position that attributes intrinsic value exclusively to human beings. To possess intrinsic value is to be valuable in one's own right and hence inherently worthy of moral consideration. From an anthropocentric perspective, any value attaching to non-human entities is purely instrumental – it derives from the utility of such entities for human purposes. Biocentrism, by contrast, was defined as the position that attributes intrinsic value, and hence moral considerability, to non-human entities in their own right. (As the term 'biocentrism' can be misconstrued as privileging the interests of the non-human over the human, the term, 'bio-inclusive', signaling inclusiveness of both human and non-human interests, will here be used interchangeably with 'biocentrism'.)

Whilst historically some environmental philosophers concurred with the Western tradition of denying intrinsic value to non-human entities while also insisting that anthropocentrism provided an adequate basis for environmental protection, the weight of argument in environmental ethics over five decades has supported the view that at least some other-than-human living things are entitled to moral consideration in their own right and hence that a bio-inclusive ethic is required in addition to the traditional ethics of the human. Insufficient space is available here for a review of the literature on intrinsic value, but recent such reviews include Brennan 2008 and Vucetich et al 2015. (See also the section

on the history of environmental ethics below.) Such a vast weight of argument can hardly simply be set aside in determining the value-base of conservation.

(ii) Who owns the earth? A second approach to the issue of whether non-human life can claim moral entitlements in its own right revolves around notions of ownership and sovereignty. (Staples & Cafaro 2012; Van Dooren 2014). By what right does humanity claim exclusive ownership of terrestrial and marine environments? Legal regimes of ownership are based on conventions that vary widely across cultures and are eminently open to contestation. Often they serve to legitimate historical processes of dispossession, such as the modern regimes of private property that arose out of the Enclosures that took place in England from the early 16th century. (Linklater 2014) To the limited extent that such regimes can be morally justified, they arguably rest on notions of sovereignty or self-rule: a sovereign people is morally entitled to its own territory. But the notion of sovereignty applies to non-human life as well, particularly to wild animals. Wild animals do not owe their existence to us. We did not invent them, design them, create them. They are guided by ends that are completely independent of ours. They have their own unique patterns and rhythms of existence. They are, in the terms of Kant's moral philosophy (Taylor 1986), ends in themselves, not mere means to ends of ours. They are accordingly, in their relations with us, sovereign beings: they do not belong to us; they are not our property. They belong to themselves.

To acknowledge the moral sovereignty of wildlife is to concede that wild animals are, like sovereign peoples, entitled to their territories, their ecological estates. It is to acknowledge that the biosphere was shaped for wildlife and by wildlife as much as it was shaped for us and by us. They have been "mixing their labour with it", to adapt another criterion of ownership, that of the philosopher John Locke, as long as and longer than we have been mixing ours with it. In this sense the biosphere belongs to wildlife as much as it belongs to us. It follows that we have no right to dispossess wild things of their ranges or degrade their environment to the point that it can no longer sustain them

In light of the argument from sovereignty, we might detect, in the processes of displacement and dispossession that characterize the current regime of development, a familiar logic: that of colonization (Plumwood 1993). Invaders arrive in a land, repulse the indigenes with superior force and arrogate to themselves the natural resources of the region. After the event, when the spoils have been thoroughly appropriated and new property regimes consolidating and legitimating appropriation have been established, there is concern for the plight of surviving members of the dispossessed populations. Reserves are established, tribes and languages catalogued, pockets of accommodation arranged. As a sideline to the main business of appropriation, efforts are made to preserve cultural diversity. Everyone is morally pleased when threatened indigenous cultures and communities are dragged back, for the moment, from the brink.

The parallel between the logic of colonization and that of the ecological dispossession involved in the processes of modern development betrays an underlying moral symmetry that attests to the violated sovereignty of wildlife

even while the discourse of development, with its implication of progress, denies it.

2.3.1.2. Are the material outcomes of anthropocentrism equivalent to those of biocentric?

Some environmental philosophers have always argued that in protecting the biosphere for ourselves we incidentally protect it for all life and hence that there is no need, practically speaking, for recourse to a bio-inclusive ethic (Norton 1991, Light & Katz 1996).

This equivalence argument however is untenable inasmuch as it is clear, in the face of the current wave of extinctions, that many species are ecologically dispensable in the sense that their disappearance does not trigger the collapse of biospheric systems and thus endanger human survival or well being (Doak et al 2014 ; Vucetich et al 2015). From the perspective of a purely anthropocentric ethic seeking to conserve the biosphere strictly as life support for humanity then, such species may well prove superfluous.

Advocates of an anthropocentric approach might however reply that the definition of "human interests" must be drawn more widely: it might be in our interest to conserve species not merely to secure the conditions for human survival but for psychological, spiritual or even epistemic reasons - as objects of wonder or of scientific inquiry, for instance. A version of this weaker form of anthropocentrism frequently heard in environmental campaigns is the "for our grandchildren" argument. We must preserve existing species not merely on account of their material or ecological utility for us but as objects of wonder and joy for future generations.

Such an argument again however has little force. There is no more reason to expect future generations to feel significantly diminished by the loss of species they have never known than most people do today by the loss of species such as the auk and the dodo (Pauly 1995). Moreover, scientific interest of itself cannot be used as grounds for preserving or allowing any particular state of affairs. All manner of ethically unconscionable actual or possible states of affairs might possess scientific interest, as the fact of Nazi science attested. An evil universe might prove more interesting to science than a benign one. Other normative considerations must accordingly come into play where decisions regarding what should or should not be preserved are concerned.

The related argument that "biophilia" is an inherent aspect of human psychology, entailing a vital human need for access to nature (Kellert & Wilson 1993), is no more compelling as a case for conservation. People may indeed feel refreshed by greenery in their environment but the evident psychological and social functionality of countless millions of people currently enclosed in high-rise conurbations in developing nations, with little or no access to wild spaces, demonstrates that human flourishing by no means requires access to such spaces. Any innate need for greenery may evidently be satisfied by urban parklands, gardens or indoor plants.

Many other such "weaker" versions of anthropocentrism could be cited, but generally speaking, wherever living things are valued purely as means to ends of ours, they become inter-substitutable with other things that could satisfy those ends (Nelson & Vucetich 2013). As means only, living things are always at risk of becoming superfluous. In this sense, purely instrumental arguments can never assure equivalent outcomes to arguments based on the intrinsic value of living things.

2.3.1.3 Ought an anthropocentric approach be preferred on pragmatic/political grounds to one based on biocentrism?

Even if it is conceded that anthropocentrism cannot deliver conservation outcomes equivalent to those of biocentrism or bio-inclusiveness however, the question whether an anthropocentric approach should be preferred can still be raised on pragmatic grounds: are not anthropocentric arguments more likely to be accepted than bio-inclusive ones, especially in poorer countries? Such a pragmatic preference for anthropocentric approaches has gained prominence in recent years with the declaration of "eco-modernism" in conservation, where eco-modernists tailor conservation goals exclusively to the interests of human communities (Kareiva et al 2011; Kareiva & Marvier 2012; Marvier 2014; Asafu-Adjaye et al 2015). From this perspective, conservationists are urged to lower their ecological expectations and pitch their interventions in ways calculated primarily to benefit disadvantaged humans. A new, ecologically simplified nature integrated with human systems must replace wild nature as the telos of conservation. In the Anthropocene, it is argued, conservationists must concede the hegemony of the human and score whatever points they can for biodiversity incidentally to serving human interests (Lewis 2014).

To pull the rug of biocentrism out from under the project of conservation in this way however would not only drastically diminish the reach of conservation efforts (Soule 2013; Cafaro & Primack 2015) but would, in our present historical circumstances, risk rendering the conservation project altogether superfluous. For it may today no longer be valid to argue, as environmentalists have perennially done, that humanity needs to protect the ecological fabric of the planet in order to safeguard its own existence. While biosphere dysfunction – including climate instability - will indeed undoubtedly derange our urban-industrial systems in the short term, those systems, recalibrated to new climatic and biospherical conditions, may well prove adaptable and basically viable. Though the biosphere does currently provide essential life support for human civilization, it is no longer inconceivable that humans might eventually devise artificial systems that mimic the functionality of ecological systems, making natural ecologies superfluous.

For example, certain recent sustainability-design scenarios start with biomimetic products designed "after nature" and end with a radical architecture that applies the principles of genetics and cybernetics to design. Built environments created in accordance with these principles might be made, wholly or partially, of living tissue, capable of growing of its own accord. Alternatively, inert materials might be organized, following DNA blueprints, into "living", intelligent, adaptive, self-maintaining, self-replicating structures (Chu 2004; Estevez 2009). Not to be

confused with the clunky proposals of contemporary geo-engineering, such "genetic architecture" is prefigured today in solar cities that photosynthesize or industrial aggregates that cycle water and carbon and turn waste into resources. Genetic architecture would ultimately build the human environment from the inside out in accordance with the morphogenetic principles of life itself. In that sense it would be as "sustainable" as the natural systems on which it was modelled. However, there is no reason why an entire global urban-industrial formation so designed should not ultimately usurp the biosphere altogether, replacing it, as architect Karl Chu advocates, with a "new nature", a functional simulacrum of the biosphere designed *by* humans exclusively *for* humans (Chu 2004).

In light of such visions of sustainability without nature – of photosynthesis without plants, of carbon sequestration without forests, of water filtration without wetlands, of pollination without bees, etc – the idea of a *post*-ecological civilization starts to acquire plausibility. Humanity might indeed conceivably "out-grow" ecology, if not entirely then at least to a significant degree. Civilization might need to retain a retinue of possibly genetically modified "service species", whose only purpose would be to satisfy human needs and wants, but all other species might prove dispensable in favour of artificial systems that would mimic the life support functionality currently supplied by the biosphere.

If even a relatively post-ecological civilization is indeed a possibility then the question of the fate of earth-life has to be disentangled from the fate of humanity and addressed in its own right. Merely seeking human advantage might not enhance the prospects for non-human life at all. Human advantage might indeed best be served by a post-ecological civilization. To discount the intrinsic moral entitlements of living things is to risk steering humanity toward precisely such a post-ecological future, thereby abandoning the rest of earth-life to eventual superfluousness. There is nothing pragmatic about setting conservation on such a course.

For all these reasons then, anthropocentrism seems inadequate as an ethical base for conservation. Since a biodiversity ethic is, I have argued, reducible to anthropocentrism, it must likewise be ethically inadequate. A bio-inclusive base is required.

2.4. How did conservation come to be biodiversity-based?

But if a bio-inclusive base – an ethic that exceeds the requirement of biodiversity preservation - is indispensable for conservation, what form should it take? To answer this let us first review, briefly, how conservation came to be biodiversity-based in the first place.

When the modern environment movement emerged in the 1970's, it was very different from the resource-conservation movement of the early 20th century (Pinchot 1910). Indeed it was largely preoccupied with rescuing environments from the clutches of extractive industries, such as forestry. In settler societies, such as USA and Australia, forests were understood by the new

environmentalists not merely as standing reserves of resources but as *wilderness* areas (Rodman 1983; Devall & Sessions 1985; Callicott 1998 (b)).

2.4.1. The idea of wilderness

Wilderness preservation as an ethos dated back to the Romantic era of the 18th-19th centuries. The value of wilderness, from the perspective of figures such as Thoreau and Muir, was basically aesthetic. Romantics argued for the preservation of landscapes deemed spectacular, beautiful or sublime (Devall & Sessions 1985). While such aesthetic ideas, often spilling over into the spiritual, did indeed still linger in the emergent environmentalism of the 1970's, they quickly came under philosophical and ideological attack from many quarters. These attacks included arguments from the cultural relativity of aesthetic standards and the lack of equivalence between aesthetic and ecological criteria of significance (Rodman 1983); post-colonial arguments that wilderness preservation prioritizes recreational interests of Westerners over economic interests of people in developing countries (Guha 1998); and arguments that notions of "unspoilt nature" ignore the agency of indigenous peoples in creating landscapes considered wild (Callicott 1998 (b)).

2.4.2. From wilderness to ecological values

However, the idea of wilderness current in the environmentalism of the 1970's - 1980's was not in fact predominantly aesthetic and romantic in orientation, but ecological: wild areas were valued as evolutionary and ecological terrains of life. It was such terrains of life, unfolding freely and autonomously, that environmentalists sought to protect. The philosophical basis for this orientation was articulated as a new discourse, "environmental ethics", the premise of which was the contrast between anthropocentric and biocentric positions, generally defined in terms of intrinsic value, as noted above. (Brennan 2008.) Though most theorists favoured a biocentric approach, the locus of intrinsic value (or moral considerability) varied from one theory to another, ranging from sentient beings to all organisms, ecosystems or the biosphere as a whole, including inanimate things such rivers and rocks (Brennan 2008). Since all formulations of the intrinsic value thesis were unavoidably philosophical in nature however, no single formulation could achieve definitive status, and all were contested within the discipline of environmental ethics itself. This is not to say that the notion of intrinsic value was vague, arbitrary or subjective. Arguments on its behalf were generally rigorous and hard to refute (Vucetich et al 2015). Being inherently philosophical however, the exact locus of intrinsic value could not, even in principle, be conclusively established.

It was perhaps because of this that the language of intrinsic value did not gain the currency it deserved in political and policy discourse. Where references to "intrinsic values" or "existence values" did appear in policy documents and environmental impact statements, they were often factored indiscriminately, with category blindness, into lists of utility values. Even where the notion of intrinsic value was deployed correctly, it offered an uncertain basis for advocacy in situations of environmental conflict. Since theorists varied in their attribution of intrinsic value, the notion provided little guidance for arriving at negotiated settlements between competing human and non-human interests. Perhaps for

this reason the language of intrinsic value and the version of environmental ethics based on it gradually slipped from view.

2.4.3. The idea of biodiversity emerges in tandem with the idea of sustainable development

Meanwhile, in the mid 1980's, the notion of biodiversity was emerging in science: the expression, *biological diversity*, was first introduced by conservation biologist, Thomas Lovejoy, in 1980 and the contracted form, *biodiversity*, had gained currency by 1988 (Hawksworth 1995; 6-8). Rapidly this scientific concept, which was properly purely descriptive in meaning, assumed an implicit normative loading: biodiversity was a variable that could be measured but it was also tacitly considered a good to be protected in the interests of life on earth. (Takacs 1996; Morar et al 2015) By 1992, it was enshrined, as both a descriptive and normative principle, in the United Nations Convention on Biological Diversity.

As a notion that originated within science, biodiversity seemed to offer a stable, objective and hence defensible category that could provide a premise for conservation. The veneer of scientific objectivity enjoyed by the term meant that its unavowed normative loading escaped contestation in a way that the older environmental ethic based on the notion of intrinsic value had not. (Takacs 1996) Recognizing its strategic value, conservationists were quick to adopt the rhetoric of biodiversity: the notion of conservation rapidly became synonymous with biodiversity conservation. Biodiversity conservation proved relatively acceptable to the wider world as well - presumably on account of both its minimalism, explained above, and the aura it projected of scientific objectivity.

As the ethic of biodiversity was taking shape, the notion of sustainable development was also coming to the fore. In policy contexts the idea of conservation became conjoined with the idea of development, as if development were the appropriate tool for conservation. That this would have been unthinkable from the point of view of an earlier, biocentric ethic was barely remarked, because conservation had now become more or less synonymous merely with the preservation of *types* - species and types of ecological community - rather than their instances – living things in their own right. The crucial role of biodiversity conservation in the emerging notion of sustainable development is already evident in the Brundtland Report of the World Commission on Environment and Development (WCED) of 1987.

"Development patterns must be altered to make them more compatible with the preservation of the extremely valuable biological diversity of the planet" (WCED 1987: V, 9).

The final lines of Chapter 6, ominously entitled "Species and Ecosystems: Resources for Development", read as follows:

"There is still time to save species and their ecosystems. It is an indispensable prerequisite for sustainable development." (WCED 1987: VIII, 73)

It was arguably the minimalism of biodiversity as a criterion for conservation then that made the notion of conservation consistent with the ethos of development involved in the notion of sustainable development. It was furthermore the great scope for development permitted by such a criterion that

gave the norm of sustainable development such wide appeal. In the guise of sustainable development, conservation was converted into a veritable inducement to development – an inversion that was explicit by the time the CBD appeared in 1992 (Guruswamy 1998).

Conservation biologists enthusiastically embraced this rhetoric of biodiversity that was proving so acceptable to society without perhaps recognizing the minimalism of its ethical entailments. That such minimalism has proved a weak basis for conservation may be evidenced by the trajectory of conservation since biodiversity became the criterion of protection: the more conservation has become incorporated into mainstream policy and politics, under its biodiversity aspect, the more ground the movement has lost. Of course such loss cannot be blamed entirely on the watering down of conservation under its biodiversity-based definition. But the extremity of the extinctions crisis now facing the biosphere does suggest that by lowering the conservation bar and accepting the blatant double standard of species sustainability – populations numbering in the billions for us and in the low thousands for most other species – biodiversity-based conservation has left the way open, under the description of sustainable development, for humanity to colonize most of the life-space previously occupied and sustained by innumerable species. In other words biodiversity-based conservation has legitimated this process more than it has challenged it.

2.5. Bio-proportionality: a bio-inclusive ethic of abundance

If conservation is serious in its intention to advocate on behalf of earth-life, then it surely has to expose and challenge this double standard, contest human hegemony and explicitly adopt a bio-inclusive stance as the ethical basis of its efforts. It needs to commit not merely to the preservation of bio*diversity* – which is to say, preservation merely of the *forms* of life - but to the prima facie entitlement of all living things to their own existence.

How would such a bio-inclusive ethic, adopted today, avoid the short-comings that led to the lack of uptake in policy discourse of earlier versions of biocentrism? Any new biocentric or bio-inclusive ethic must surely incorporate a decision procedure that enables managers to negotiate conflicts of interest, whether between humans and other species or amongst other species themselves, as for instance amongst ferals and indigenous species.

Starting with an acknowledgement of the prima facie entitlement of all living things to their own existence, a commitment to avoid harming living things would follow. Since living things are interdependent however and inevitably require of one another a degree of mutual sacrifice as well as of mutual aid, a bio-inclusive ethic could not demand a wholly hands-off attitude to nature. A supplementary principle that could guide our use of living things and our interventions, as environmental managers, into natural systems, would be that of *bio-proportionality*. In accordance with this principle, our goal would be to optimize the populations of all species, relative only to the internal constraints imposed by the checks and balances inherent in ecosystems. The population of each species should be as abundant as would be consistent with the like relative abundance of all other species. That is to say, systems of trophic and other

ecological checks and balances would determine "abundance" in relative terms: an "abundant" population of top predators would tend to be lower, in absolute terms, than an "abundant" population of herbivores, and abundance would compute differently for species that were uncommon in their undisturbed condition as compared with those that were, in the same condition, highly populous.

Estimating proportionalities would be an empirical matter possibly best set against historical baselines. In referring estimates to baselines one would not be appealing to outmoded and discredited notions of wilderness (Marris 2011) nor necessarily seeking to exclude human agency from ecosystems. One would rather simply be seeking to discover in-situ mixes of species that broadly meet the criterion of bio-proportionality. Many such mixes might be possible in the abstract, but the easiest and safest way to discover instances would be by reference to those that existed prior to major anthropogenic disturbance in the past. The ecological proportionalities that obtained at such a nominated moment could then provide a yardstick. Such a yardstick need not be considered as rigidly fixed. Changing conditions allow for natural fluctuations in the relative abundance of different species. But the notion of proportionality, understood against the background of ecological optimization, would represent the normative heart of conservation from the perspective of bio-proportionality. The goal would be to seek relative abundance for all species, within ecological parameters. Preservation of biodiversity would of course remain an integral component of this goal, but as a goal bio-proportionality would subsume and greatly exceed biodiversity.

While the estimation of proportionalities in accordance with this normative goal need not presuppose a teleological or Clementsian "balance of nature" model of ecology, nor would it allow a purely "flux of nature", anything-goes model. Proportionalities would be estimated against a yardstick of *health* for ecosystems (Callicott 2002). In conservation contexts, according to Callicott, the health of ecosystems must be rated in terms of biodiversity, though expectations of biodiversity must be relativized to background enabling conditions. Measures of biodiversity must furthermore be qualified according to viability and stability factors across appropriate space and time scales. (Callicott 2002) (A zoo does not count as a healthy ecosystem just because it has a high species count.) Optimal population sizes for all species would be calculated against a background model of ecological stability and health. This model would establish the proportionalities; optimization would increase population sizes in accordance with these.

Just as proposing bio-proportionality as the ultimate goal of conservation is not to seek rigidly to restore the ecological past, nor is it to imply a program of planetary engineering aimed at optimizing species populations beyond what might have been achieved prior to industrial-scale human disturbances. It is rather to try to address, in an ecologically open and adaptive fashion, the extreme disproportionalities that have occurred in historical times as a result of the human co-optation of biological resources.

2.5.1. Bio-proportionality applied to the human population

Applying a principle of proportionality to biological populations would also entail applying it to the human population, subject to the same system of ecological checks and balances and relative to a selected historical baseline (or other indicator of ecological health). To achieve such ecological proportionality with respect to human population would entail a dramatic (though of course consensual) reduction, since our present population has been achieved at massive cost to other populations. More of us (humans) generally, other things being equal, means less of them (other species). (Cafaro & Crist 2012) However, the scale of reduction required could not be computed with reference only to numbers, but would also involve offsetting the ecological costs of human activity against any positive inputs that an ecologically reformed civilization might make to global ecology. The combined biomass of a particular species is not by itself a measure of its ecological impact. The global biomass of ants, for example, is estimated to be greater than the global biomass of humanity, but ant populations may be ecologically optimal because ants, unlike humans, contribute positively to overall ecological functionality (Hoyt 1996). In other words, calculation of an ecologically optimal human population would have to take into account the differential capacities of varying forms of civilization to contribute to ecological productivity. Forms of civilization that were genuinely ecologically productive, in the sense of contributing positively to the flourishing of ecosystems, might, were they to exist, justify larger human populations than those that obtained at the time of the nominated historical baseline.

An ethic of bio-proportionality then would squarely address the issue of human hegemony. It would effectively reverse the question posed by conservationists in recent years, namely, how much earth-life can be preserved alongside our totally disproportionate human population. Instead, from a bioproportionality perspective, conservationists would ask how large a human population would be feasible while proportionate non-human populations were maintained. The greater the target human population allowed, the greater would target non-human populations have to be.

The contrast between an ethic of bioproportionality and an ethic of biodiversity in this connection is clear: existing biodiversity could in principle (with good environmental management) be preserved – in the sense that further extinctions could be avoided - alongside a human population in the billions. But bioproportionality, with its requirement of greater proportionality between human and non-human populations, could not be achieved under this condition.

Any argument for bio-proportionality will be unavoidably philosophical because this principle is avowedly normative, where normative questions cannot be settled by science. The difficulty of mandating policy on philosophical rather than strictly empirical grounds must be acknowledged (Sorlin 2013; Vucetich & Nelson 2010), but this is a bullet that must be bitten, since otherwise values – such as those encoded in biodiversity-based conservation - that permit outright annexation of Earth by humanity will be mistakenly approved as the determinations of science.

2.5.2. Is bio-proportionality utopian?

Against those who style themselves ecological pragmatists (Lewis 2014), and for whom the capacity of bio-inclusive values to motivate change seems self-defeatingly utopian (Marvier 2013), it might be argued that lowering the ethical bar has never been the way to inspire social movements (Doak et al 2014; Vucetich & Nelson 2015). The civil rights movement in the USA was not pitched at the self-interest of whites nor feminism at the self-interest of men. If conservation is to galvanize the kind of public commitment needed in order to address the current plight of earth-life, it must surely not be content with an apologetic rear-guard stance, but must lead with moral force and vision. It must demand that the biological resources of the planet be distributed far more equitably than they currently are amongst the world's species.

2.5.3. Instrumentalities required for us to meet our moral obligations as a species to other species

The most difficult dilemmas for conservationists arise in developing regions where the interests of wildlife, such as elephants or tigers, conflict with those of under-privileged human populations. Many conservationists, including eco-pragmatists and eco-modernists, feel, understandably, that privileged humans have no right to legislate in favour of non-humans in these situations. Anticipating that an ethic of bio-proportionality would do so, they might reject it on these grounds. But the locus of responsibility, in relation to an ethic as encompassing as that of bio-proportionality, is neither the individual nor the nation but humanity as a whole: it is as a *species* that we humans are morally obliged to respect the entitlement of other species to their own existence and their own terrains of life. Effective international instruments that would enable us to meet these obligations from the combined resources of humanity as a whole, rather than merely from the often inadequate resources of local communities, are urgently needed (as the United Nations, under the banner of its Harmony with Nature program, now recognizes (UN 2010)). Conservation cannot accomplish its task without such instruments.

3. Conclusion

To insist that biological resources be distributed more equitably than they currently are amongst the world's species does indeed mean re-designing human civilization so that it becomes a system of affordances for the rest of life, thereby re-integrating the interests of other species with our own, as eco-modernists advocate. But it also means conceding that as the biosphere was shaped for earth-life and by earth-life just as surely as it was shaped for ourselves and by ourselves, it belongs to the rest of earth-life as much as it belongs to us. Since we have already annexed most of the terrestrial surface of the planet and are in the process of ecocidally depleting and degrading the oceans, we have not only to create new spaces for earth-life within the interstices of all the environments currently co-opted to human use; we also need to cede any remaining ecological estates to the species to which they belong, together with Indigenous peoples who have culturally co-evolved with them. The most direct way of doing this is of course through inter-linked systems of large-scale protected areas. (Wilson 2016; Wuerthner et al 2015) Perhaps one day, in the context of a truly evolved ecological civilization, human presence may become fully converted into a

system of ecological affordances for other species. In that event there might be no need to guard extensive areas against human encroachment: human activity might reliably contribute to an order of bio-proportionality. In the meantime however, while industrial development entails species displacement and the ecological depreciation of species' estates, such areas need to be protected against development. The great missing argument for "saving" areas such as the Kimberley is simply that *we owe the earth*, we are morally in biological and hence territorial deficit to the earth and other species. We have exceeded, by orders of magnitude, the proportionalities that ought to have been observed.

It is time then not to lower the ethical bar but to raise it to its true height and set about restoring these proportionalities. By allowing the moral force of its message to be diluted, conservation may have colluded in its own disempowerment. In this sense, pragmatism itself may be calling for a return to bio-inclusiveness in ethics.

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[1] It should be noted that, in its Preamble, the CBD affirms the intrinsic value of biodiversity. According to my argument, this only makes sense if living things themselves are also accorded intrinsic value: diversity is never intrinsically valuable in itself. But the body of the text of the CBD, with its injunction to develop as well as conserve, makes it clear that this is very far from its intention.