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Review

Effective Biodiversity Conservation Requires Dynamic, Pluralistic, Partnership-Based Approaches

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Abstract: Biodiversity loss undermines the long-term maintenance of ecosystem functions and the well-being of human populations. Global-scale policy initiatives, including the Convention on Biological Diversity, have failed to curb the loss of biodiversity. This failure has led to contentious debates over alternative solutions that represent opposing visions of value-orientations and policy tools at the heart of conservation action. We review these debates and argue that they impede conservation progress by wasting time and resources, overlooking common goals, failing to recognize the need for diverse solutions, and ignoring the central question of who should be involved in the conservation process. Breaking with the polarizing debates, we argue that biocultural approaches to conservation can guide progress toward just and sustainable conservation solutions. We provide examples of the central principles of biocultural conservation, which emphasize the need for pluralistic, partnership-based, and dynamic approaches to conservation.

Keywords: adaptive management and governance; biocultural approaches to conservation; different worldviews and knowledge systems; Gwaii Haanas; nested institutional frameworks; multiple stakeholders and objectives; New Conservation Science; partnerships and relationship building; rights and responsibilities; social-ecological context

1. Introduction

The current status and projected trajectories for all levels of biodiversity, from genetic diversity to ecosystems, are dire. Some 11,000–36,000 species may go extinct each year [1], and across much of the globe, local species richness has been reduced to below the threshold needed to ensure the long-term maintenance of ecosystem functions and services [2]. Many conservation efforts have attempted to stem the loss of biodiversity, and without such actions, the situation for biodiversity would undoubtedly be worse. “Bright spots” do exist [3], and much can be learned from these success stories. However, global-scale initiatives, such as the Convention on Biological Diversity (CBD), have not been able to reverse or even slow the overall trend. Despite widespread approval and significant funding, including the \$16 billion Global Environment Facility, the CBD has consistently failed to meet its

targets; recent assessments indicate that only 9% of 55 targets will be met [4]. The international conservation community, through the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), has also been exploring new ways to integrate the potential roles and the rights of local and Indigenous Peoples into conservation initiatives [5].














	New Conservation Science Approach	Half Earth Approach	Biocultural Approaches
What?	 <p>Biodiversity conservation, especially ecosystem services</p>	 <p>Biodiversity conservation, especially species and ecosystem integrity</p>	 <p>Multiple objectives of relevant stakeholders</p>
Why?	 <p>Emphasis on instrumental value of biodiversity</p>	 <p>Emphasis on intrinsic value of biodiversity</p>	 <p>Pluralistic worldviews (including relational (7), intrinsic, instrumental values)</p>
Where?	 <p>More emphasis on human-dominated landscapes</p>	 <p>More emphasis on remote locations and wilderness</p>	 <p>Tailor interventions to social-ecological context</p>
How?	 <p>Emphasis on economic incentives and payment for ecosystem services</p>	 <p>Emphasis on strict protected areas</p>	 <p>Diverse and nested institutions with adaptive governance and management</p>
Who?	Not specified	Not specified	 <p>Partnerships and social learning among multiple stakeholders</p>

Figure 1. Fundamental questions for different visions for conservation.

The slow rate of progress on global-scale solutions to biodiversity loss has led to a search for alternatives. Of a range of options, two different approaches have been receiving much attention: “New Conservation Science” [6,7] and “Half Earth” [8], both described below (Figure 1). The debate

between these two views of conservation is far from a mere academic squabble. The arguments seemingly pit against each other opposing visions of the underlying value-orientations, focal locations, and policy tools at the heart of conservation action. Here, we review the historical foundations of this debate, and the limitations it has placed on conservation progress. We then introduce biocultural approaches to conservation, which can guide just, pluralistic, and partnership-based conservation actions that can transcend these debates and provide more effective pathways to conservation.

2. Competing Visions of Conservation

Champions of New Conservation Science (NCS) emphasize the ubiquitous impact humans have had on natural systems. NCS challenges both the idea of a pristine and fragile nature, and the conservation paradigm that focuses on strict protected areas as the primary conservation tool [6]. NCS presents an alternative framing of conservation, which sees people and nature as inextricably linked, and emphasizes ecosystem functions and actions that “enhance those natural systems that benefit the widest number of people” [6]. Although NCS has also emphasized the intrinsic value of nature, this perspective is often associated with utilitarian valuation of ecosystem services [7]. NCS proponents argue that initiatives which demonstrate value to more people garner broader support for conservation [9]. Based on this assumption, NCS calls for a focus on human-dominated landscapes, and an expansion of the conservation toolbox to include market-based mechanisms and collaborations with corporations and industry [6]. These approaches now shape the conservation agenda of some of the world’s largest conservation NGOs (e.g., The Nature Conservancy), and have also influenced the environmental planning of government agencies.

Critics have argued that NCS overestimates the resilience of natural systems while ignoring rapid extinction rates and the dire state of biodiversity [8,10,11]. Others argue that NCS places undue emphasis on the instrumental value of nature and on the need for conservation to improve human well-being [10,12,13]. Major concerns have also been raised about the NCS support for partnerships with industries that have a history of environmentally destructive practices [8,10,12]. In addition, opponents note that the focus on instrumental values of ecosystems may fail to conserve many species, especially those with few uses for human communities [12,14].

An alternative to NCS conservation, the “Half Earth” (HE) approach, suggests a substantial expansion of protected areas, to cover half the earth’s surface [8,15]. Those proposing the Half Earth (HE) solution tend to take a biocentric approach to conservation, emphasizing the intrinsic value of species and ecosystems (Figure 1). HE proponents argue that protecting areas from human encroachment provides the best hope for reducing human impact on biodiversity. Based on analyses of species-area relationships [8], researchers suggest that protecting 50% of the planet’s surface would conserve approximately 85% of all species. HE proposals have been widely touted at global conservation fora, and have been supported by the highly publicized establishment of large protected areas, including Papahānaumokuākea Marine National Monument in Hawaii and Ross Sea Marine Protected Area in Antarctica.

HE proposals also face questions regarding how large-scale expansion of strict protected areas can be reconciled with the land- and resource-use rights of local and Indigenous Peoples [16–18]. Others argue that HE proponents place too much blame on human population growth and ignore inequalities in human societies, which drive dramatic differences in consumption patterns, and shape the impact different human groups have on biodiversity [19].

Although the labels for these efforts (NCS and HE) are new, the debate between them has roots at least a century deep in conservation history [20]. In the early part of the 20th century, John Muir famously pushed for protected areas that preserved “natural” landscapes in perpetuity, in opposition to Gifford Pinchot’s vision of “sustainable use” of resources to support the growing and expanding U.S. population. More recently, from the 1980s and into the 2000s, a similar debate continued, as advocates for “fortress conservation” called for more human-free protected areas, in response to rising popularity of projects that sought to involve local people, respect Indigenous

Peoples' rights and integrate conservation with sustainable development [21–23]. Fundamental to the arguments is the existence of opposing ethical frameworks (Figure 1, [14,20]). NCS proponents argue for instrumental values of nature, whereas HE emphasizes the intrinsic value of species and ecosystems [7,8,10,14,20]. The long-standing nature of the debates may reflect the remarkably stable nature of environmental values, which can be conserved across generations [24]. In reality, to ensure long-term progress in curbing biodiversity loss, conservationists must find a way to transcend these debates [25].

3. Perils of Fruitless Debate

Important issues require public debate. But the seemingly never-ending debates on conservation strategies hinder conservation progress in four important ways. First, these arguments waste valuable time and resources. Second, the debates overlook the common goal of conserving biodiversity. Third, the emphasis on choosing sides fails to recognize the need for diverse solutions to match the many contexts and scales of conservation. Finally, the debates also largely ignore a central question (Figure 1): who will be involved (and how) in conservation actions?

Conservation has frequently been referred to as a crisis discipline, and the data summarizing the global status of conservation support this narrative. For example, nearly one-third of vertebrate species are decreasing in population size and range [26], and 42% of the invertebrate species on the International Union for the Conservation of Nature's (IUCN) Red List are threatened with extinction [27]. However, in order to address these challenges and meet the biodiversity targets defined by the Convention on Biological Diversity, conservation funding, it has been argued, may need to increase by an order of magnitude [28]. In response to these mounting challenges and budget shortfalls, conservation planning and actions need to be as efficient as possible. Unfortunately, the debates over the best course for conservation actions have too often "descended into vitriolic, personal battles in universities, academic conferences, research stations, conservation organizations, and even the media" [25]. These battles can prohibit collaboration, reduce the efficiency of decision-making, and slow progress toward conservation goals.

Nevertheless, the conservation goals of all involved in these debates share some common ground. Although differences exist in the reasons provided for conservation (e.g., instrumental vs. intrinsic values) and in the proposed solutions (Figure 1), a central tenet of both NCS and HE is the vital importance of biological diversity. A focus on this shared vision, as well as on the need for diverse solutions, can provide a path forward past the debates.

Many aspects of the debate—namely why, where, and how to conduct conservation—do not represent hard decisions involving mutually exclusive options. Rather, a diversity of views on these fundamental questions can present alternative approaches which, when matched appropriately with a given conservation context, can have the best chance for success. All conservation actions take place within social-ecological systems. Interlinked social and ecological processes operate at multiple temporal and spatial scales to form webs of feedback loops that shape all these systems [29]. The dynamic nature of social-ecological systems adds to their inherent complexity, creating frequent surprises and substantial uncertainty regarding future conditions [29]. Therefore, no set of conservation tools will work effectively over a long period of time and across all cases [30].

Instead, tools should be chosen that match a given social-ecological context. Effective solutions also require adjustments to the tools being used as conditions change. Ironically, the debate that has gripped conservation for over a century has largely ignored an emergent idea in the discipline: the importance of diversity for shaping adaptive capacity. No conservation agency would deny the need to support and bolster *biological* diversity as a means of ensuring the ability of biological systems to adapt to future changes in the environment. However, conservation researchers and practitioners have not been as quick to recognize the importance of similarly fostering *cultural* diversity for adaptive capacity. Cultural diversity embodies different worldviews and knowledge systems that represent a wealth of conservation approaches [31]. Conservation will be more effective if it embraces

the diverse values of these various approaches, which increase the constituency for conservation and the probability that a viable solution can be found for the challenges present within any given social-ecological context.

Conservation is not just a matter of choosing among specific tools. Nor, for many stakeholders, is conservation just an outcome measured by how much biodiversity is maintained. Conservation is also a social process [32]. All conservation actions require concerted effort by human communities, and all conservation impacts human communities. Who is affected, and how they are affected, varies across different contexts, different forms of conservation action, and different cultural, economic and social groups. Failing to consider and manage the impacts on humans of the conservation process has often undermined the ethical standing and effectiveness of conservation actions. This includes forced evictions of local and Indigenous Peoples in creating “protected areas”, and the exclusion of key stakeholders—and their experiences and insights—from the conservation process, all of which undermine support, and contribute to growing animosity toward conservation regulations [33].

4. A New Way Forward

Biocultural approaches to conservation represent a synthesis of theory across multiple fields linked to biodiversity conservation, including social-ecological systems thinking (e.g., [29,34]), commons theory (e.g., [30,35–37]), biocultural diversity and heritage (e.g., [38,39]), indigenous natural resource management and traditional ecological knowledge (e.g., [31,40,41]), and different models of participatory and people-centered conservation (e.g., [42–47]). This synthesis points to the potential for pluralistic, partnership-based, and dynamic approaches to guide conservation processes past the trap of divisive debates [48].

Opportunities and challenges for conservation occur in a myriad of different social-ecological contexts. Those in sub-Antarctic islands, for example, are obviously different from those in Panama City. Therefore, we cannot assume that conservation approaches applied to each setting should be similar. Biocultural approaches emphasize that conservation will be most effective when the process matches the social-ecological context [30]. This includes recognizing that within any given situation, multiple stakeholders will embrace different, and sometimes conflicting, objectives [42,49]. If conservation practitioners ignore the multiple needs and objectives at play, they risk undermining the long-term effectiveness of conservation initiatives [50].

Incorporating multiple objectives into conservation planning requires ways of dealing with compromises and the development of mechanisms for balancing trade-offs among potentially competing interests [50]. Conflicts among stakeholders will invariably arise, which points to the importance of establishing conflict resolution mechanisms as a central component of all conservation processes. When deliberative processes are in place that reflect equitable sharing of power and resources, then conflict is more likely to lead to improved understanding among the parties involved and long-term social learning [43,45,51,52].

Different stakeholder groups hold diverse worldviews, value orientations, knowledge systems, and social institutions that guide their ideas and actions [31,53]. In addition to intrinsic and instrumental values, “people also consider the appropriateness of how they relate with nature and with others, including the actions and habits conducive to a good life, both meaningful and satisfying. In philosophical terms, these are relational values (preferences, principles, and virtues associated with relationships, both interpersonal and as articulated by policies and social norms)” [54], p. 1462. These relational values, according to Chan et al. [54], are universal, and they fit particularly well with Indigenous worldviews [53]. Biocultural approaches to conservation draw on pluralistic values (intrinsic, instrumental, and relational). Value orientations form a core component of worldviews, which are the foundation of the social institutions and knowledge systems that shape natural resource management in all societies [31]. By incorporating pluralistic systems of management and governance [55], biocultural approaches increase the adaptive capacity of conservation to cope with diverse, dynamic, and complex problems [48].

Biocultural approaches to conservation emphasize that many types of partnerships are fundamental to the conservation process [48]. Human actions at multiple scales, from local to global, produce the direct and indirect threats that effective conservation must address. Given the multi-scale and multi-faceted nature of these threats, effective conservation responses require collaboration among multiple stakeholder groups, who bring to the table knowledge and institutions developed at relevant scales to tackle various threats [40]. Evidence from multiple fields supports the assertion that conservation success is more likely when power sharing occurs within and across multiple levels of governance, from local to global [56]. For example, biodiversity conservation in a given area may be mostly about livelihoods at the local level, about tourism development at the national level, and about endangered species and habitat protection at the global level. These are equally important priorities, and biocultural approaches to conservation will need to be deliberated and negotiated across all these levels of governance [44].

Governance comprises the interactions through which humans seek to solve problems and create opportunities, including the institutions, or rules-in-use, that guide interactions [37,57]. Theory across multiple disciplines contends that flexible governance arrangements that integrate horizontal (within same level) and vertical (between levels) institutional linkages enable more effective adaptation to dynamic social and ecological conditions [35,44,51,58]. Effective conservation partnerships are based on mutual respect for the rights, knowledge, practices, and responsibilities of stakeholders. The stakeholder relationships at the center of conservation processes are most effective when they encourage the social learning needed to adapt conservation approaches to changing social and ecological conditions [59].

Rapid global change has altered the contexts within which conservation actions occur. Climate change, economic and demographic changes, rising inequality, and globalization all alter the landscape of conservation. A diversity of possible approaches will always be required for conservation to succeed in different parts of the world. But successful conservation also requires both ecological and social adaptive capacity and mutual learning to enable conservation actions to adapt over time as conditions further change [60]. Biocultural approaches meet this challenge using adaptive management and adaptive governance, resilience, and social learning. Adaptive management concerns specific conservation interventions and actions, and involves “the integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn” [61]. Adaptive governance considers who has the power over conservation decision-making, and includes the devolution of power and rights through dynamic polycentric institutional arrangements that are self-organizing, self-enforcing, and allow for social coordination across scales [51]. Resilience involves forward-looking planning and action to keep options open and retain flexibility [34,52]. Social learning is an iterative process of perspective sharing, through which “communities of practice” develop adaptive strategies for problem solving [62,63]. Over time, as the groups involved share across distinct knowledge systems, develop working relationships, and co-produce knowledge, they can address more and more complex problems [59]. The mechanisms used for management, governance, and learning will be most effective when they draw on multiple, diverse, and nested knowledge systems and institutions to adjust interventions to meet changing conditions [48].

Although strong theoretical support exists linking principles of biocultural approaches (Table 1) to more just and effective conservation outcomes, more empirical research is needed to measure the degree to which adherence with biocultural principles shapes social and ecological outcomes. Assessing the impact of biocultural approaches also requires indicators of conservation success. Many different indicators have been implemented in conservation. Ideally, outcome indicators should be linked to policy targets and accurately depict local realities [64]. We suggest that the recently developed biocultural approaches to indicator development (e.g., [64–66]) provide the best approach for incorporating multiple viewpoints on changes to human well-being and the environment, and capture the links between social and ecological components of social-ecological systems.

Table 1. Example of the application of biocultural approaches to conservation.

Principles of biocultural approaches to conservation [48]	Example (from Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve and Haida Heritage Site)
Acknowledge multiple stakeholders and objectives	Government of Canada and the Council of the Haida Nation manage the terrestrial and marine area as a whole to accomplish objectives linked to both ecological and cultural integrity [68]
Use intergenerational planning and institutions for long-term adaptive management and governance	Haida maintain intergenerational commitment to place, and management plans use adaptive management and governance integrated across local and national levels [68]
Recognize that cultural dynamics shape conservation	Haida science has been a foundation for environmental management for millennia, and Haida culture is constantly evolving and adapting to new challenges and opportunities [68]
Tailor interventions to social-ecological context	The conservation process in Gwaii Haanas represents the unique historical, social, and environmental context, and varies substantially from other initiatives in Canada in terms of cultural and social inputs and the integration of terrestrial and marine systems [67]
Devise novel, diverse, and nested institutional frameworks	Management of Gwaii Haanas draws on institutions of Haida Nation and of Parks Canada, and both nations have equal representation [68]
Prioritize partnerships and relation building	Gwaii Haanas conservation process is based on a cooperative relationship that uses consensus building as a fundamental tool for decision-making [67]
Incorporate distinct rights and responsibilities of all parties	The Gwaii Haanas agreement draws on existing legislation and Aboriginal rights, acknowledges disagreement over sovereignty, and makes explicit the shared responsibility for co-management [67,68]
Respect and incorporate different worldviews and knowledge systems	Gwaii Haanas incorporates Haida and Western knowledge and science into all aspects of planning and management [41]

5. Biocultural Approaches in Action—The Case of Gwaii Haanas

Examples of biocultural approaches to conservation exist across the world. Here, we outline the on-going conservation process in Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site in British Columbia, Canada, which we argue embodies the principles of biocultural approaches to conservation (Table 1) [41,48]. This multi-faceted reserve, encompassing nearly 5000 km² of land and ocean, is co-managed by the Haida Nation and the Federal Government of Canada. The terrestrial portion was designated in 1993, and the adjacent marine reserve in 2010. The combined reserve incorporates pluralistic approaches to conservation management and governance. Management follows *yahguudang*, the Haida concept of “respect for all living things”, with an ultimate goal of protecting all the area’s native species and habitats while meeting the Haidas’ needs for food, health, and well-being.

Gwaii Haanas also reflects participatory governance and continued Haida use of their territory, while recognizing the immense biological richness of the region. Partnerships are central to the co-management model, in which the Haida Nation, which has a major part of its homeland on Haida Gwaii, and the Federal Government of Canada share responsibilities and use consensus building as the foundation for decision-making [67]. The Haida Gwaii Watchmen program, originally established by the Haida Nation to monitor, steward, and protect Gwaii Haanas, serves as a model for other First Nations undertaking management of their traditional territories. The conservation process used in Gwaii Haanas also exemplifies dynamic institution-building as the co-management arrangements have evolved via social learning [59], and the reserve has grown to encompass both terrestrial and marine components.

6. Conclusions

Conservation actions need to take into account that social-ecological systems are always changing. Moreover, given rapid global change, conservation planning that meets these additional challenges has to be appropriately dynamic. The degree to which a given case may follow principles of biocultural approaches to conservation in Table 1 will vary over time and from one place to another.

The learning-by-doing that is necessary for adaptive governance will require developing indicators and an appropriate evidence base. The challenge before IPBES [5,53] and other international initiatives is to develop such an evidence base and indicators for conservation progress that are inclusive of biocultural approaches, alongside mechanisms for deliberative action, negotiation, and partnering among actors.

Conservation of the world's biodiversity will continue to fail to meet targets if scientists and practitioners are not effectively able to partner with stakeholders and Indigenous landowners to form novel and dynamic institutions. Moreover, in disregarding diverse sources of knowledge and institutions, conservation practitioners risk missing chances for innovation and just, sustainable conservation solutions. We suggest that recent conservation debates are a distraction from the real challenge facing biodiversity maintenance: how to take lessons from biocultural approaches to conservation, such as that of Gwaii Haanas, and apply them effectively and sensitively to different social-ecological contexts.

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