"The Importance of Benthic Habitats for Coastal Fisheries" (Kritzer et al. 2016): Soft Bottoms Are Biologically Productive, Not "Abiotic"

Kritzer and colleagues (2016) surveyed the biological significance of diverse benthic habitats along the US East Coast for support of fisheries production. They observed that, somewhat surprisingly, soft-sediment bottoms, which they termed "coastal inert substrate," were very important habitats, scoring relatively high in the matrix of habitat features and ecosystem services they surveyed. They and others often focused on the importance of biogenic habitats, such as seagrass beds, coral reefs, marshes, oyster reefs, and mangroves (table 1 in Kritzer et al. 2016). Such habitats are undoubtedly significant in supporting coastal fisheries, likely out of proportion to their relative coverage in coastal ecosystems. The analysis shows, however, that soft-sediment habitats are not only a very large portion of total coastal habitat but also biologically significant to many coastal fisheries.

"Coastal inert substrates" were further subcategorized as "loose fine bottom," "loose coarse bottom," "firm hard bottom," or "structured sand" (table 2 in Kritzer et al. 2016). The first three of these subcategories were described as "abiotic substrate" (the last subcategory included features sometimes formed by organisms). The obvious inference from this description is that soft-sediment bottoms are not generally biologically productive. There is brief acknowledgment of the "less visible productivity … generated by detritus, microbes, and infaunal microinvertebrates (Thrush et al. 2001)" and a statement to the effect that these habitats generate more productivity than is generally appreciated. The characterization of soft-sediment bottoms as "inert" or "abiotic" therefore seems contradictory to the overall but brief assessment of these substrates as important but productive in their own right.

Coastal soft-sediment bottoms, in fact, support substantial primary production by taxonomically distinct microphytobenthos (Cahoon and Laws 1993, MacIntyre et al. 1996, Cahoon 1999). Microphytobenthic biomass and primary production in estuarine and coastal ecosystems can equal or exceed the biomass and primary production of phytoplankton (Hargrave et al. 1983, Cahoon and Cooke 1992, Jahnke et al. 2000) and are concentrated at the sediment–water interface, providing a food source for demersal consumers. Stable-isotope studies reveal trophic links between microphytobenthos and consumers, including fishes associated with both soft- and hard-bottom habitats in coastal waters (Sullivan and Moncrieff 1990, Thomas and Cahoon 1993, Stribling and Cornwell 1997). Demersal zooplankton represent one likely trophic link between microphytobenthos and planktivorous fishes (Cahoon and Tronzo 1992), but relatively little work has been done on this assemblage in most coastal habitats.

To be sure, Kritzer and colleagues (2016) give credit to soft-bottom substrates as "unsung habitat heroes"; clearly, there remains a need to explore more fully the *in situ* production and trophic pathways that make them so.

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Scientific Evidence for Fifty Percent?

A recent article by Dinerstein and colleagues (2017) presents an impressive and highly useful inventory of the global extent of protected area by ecozone. It also provides an assessment of the extent to which the planet has achieved a target of 50-percent protection, which the authors imply is an appropriate, science-based target for protected area coverage. We do not disagree with the value of protected areas as an important conservation strategy. However, we are concerned with the assumption implicit in the paper by Dinerstein and colleagues

(2017) that the 50-percent target is scientifically derived and appropriate.

Conservation biologists have long debated the question "how much protection is enough?" for conservation purposes. There is general agreement that the current Aichi target of 17 percent and the previous Brundtland Commission target of 12 percent are politically motivated targets and would not necessarily lead to a sufficient amount of land set aside from a scientific ecological perspective (Svancara et al. 2005).

Dinerstein and colleagues (2017) reference authors who "empirically evaluated what is needed to represent and protect habitat and ecosystems" and have agreed that it is "about half." We have closely examined the papers cited by Dinerstein and colleagues (2017) as evidence for a 50-percent target. The data in these papers are equivocal, consistent with Dinerstein and colleagues' (2017) later statement that the actual target in each region may vary. In fact, the targets presented in the papers cited by Dinerstein and colleagues (2017) vary quite dramatically and range from as low as approximately 10 percent to as high as 100 percent, depending on the set of features that are targeted for conservation (Pressey et al. 2003, Noss et al. 2012, O'Leary et al. 2016). Such findings are consistent with past literature (Svancara et al. 2005, Wiersma and Nudds 2006, Wiersma and Sleep 2016).

It is unreasonable to suggest that highly variable data and general statements such as "about half" can be codified as a single, scientifically based target. Although we acknowledge that simple targets are appealing in the context of policy development and may be clearer to communicate from a public-engagement perspective, the suggestion that there is a scientific basis for what the authors admit is an "aspirational goal" is irresponsible. Furthermore, we question the degree to which the authors are prepared to endorse the Nature Needs Half concept (Dinerstein et al. 2017), given that this notion is based on values and policy preferences and not science, just as the previously established Aichi and Brundtland targets are. The analytical work presented in the article is valuable in and of itself, without attaching a lens of conservation advocacy and normative values. Policymakers are highly capable of dealing with the realities of complex systems, of which scientific data is only one aspect. Better conservation policy will not come about by scientists masking their policy preferences as scientifically based. Rather, policy- and decision-makers will benefit from scientists who clearly communicate concepts that are derived from scientifically tested hypotheses without applying a normative lens, allowing the incorporation of ecological complexities and regional differences into sound, objectively based public policy.

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The Extinction Risk and Conservation Status of Most National Plants Are Unknown

In their recent article on the "Extinction risk and conservation of the Earth's national animal symbols," Hammerschlag and Gallagher (2017) look at the International Union for Conservation of Nature's (IUCN) Red List assessments of the conservation statuses for flagship animal species. They show that 35% of national symbol animal species are *at risk* (i.e., listed in the IUCN's categories of *vulnerable*, *endangered*, or *critically endangered*). This is clearly worrisome, and as the authors conclude, "If a country isn't able to conserve or protect its own national symbol, what hope do any other species in that country have?"

Animals are of course not the only national symbols of countries, and indeed, many countries have also designated national-symbol plants. Following on Hammerschlag and Gallagher (2017), I looked at the conservation status of national-symbol flower and tree species. Of the 67 unique tree species listed as national symbols, 9 (14%) are only identified at the genus level (e.g., oak) and therefore cannot be assessed. Of the remaining 58 species, 30 (52%) have not yet had their conservation statuses assessed by the IUCN (IUCN 2017), and 1 species (2%) is listed as being *data deficient*. Of the 26 species that have been assessed by the IUCN, 12 (46%) are classified as being of *least concern*, and 3 (12%) are *near threatened*. Four of the national tree species (15%) are *vulnerable*, and