

REPLY TO HILBORN:

We agree that MPAs can improve fish catch in the South and Southeast Asia

Reniel B. Cabral^{a,b,c,1}, Darcy Bradley^{a,b,c}, Juan Mayorga^{a,b,c,d}, Whitney Goodell^d, Alan M. Friedlander^{d,e}, Enric Sala^d, Christopher Costello^{a,b,c}, and Steven D. Gaines^{a,b,c}

We appreciate Hilborn (1) for reminding us that South and Southeast Asia are the regions where marine protected areas (MPAs) could improve fisheries catches. We fully agree, and in fact, our results indicate that many areas in these regions could benefit from MPAs (figure 1 of ref. 2). We want to clarify, however, that the figure referenced by Hilborn to argue that our results were not credible (figure S4 of ref. 2) shows a future scenario where all fisheries globally are well managed. In that scenario, it makes sense to place MPAs in areas away from the coastal zones to minimize trade-offs with fishing. Nonetheless, while only a small fraction of those regions were included as part of the top priority of a globally optimized MPA network, our global network (figure 2 of ref. 2) is just one solution out of several other network designs that could improve future fish catch. In practice, regions or countries may want to optimize local food benefits from MPAs.

The globally optimized MPA network solution was driven by factors besides fisheries status such as the size and geographic extent of individual stocks. While it is known that a conservation action in one country can affect other countries (3), we recognize that our simplified assumption about adult fish and larvae movement could overestimate the geographic extent of spillover effects; indeed, this was the subject of a reply to our paper by Ovando et al. (4, 5). We note that we only considered a limited number of stocks for which species-level data are available. Many of the stocks in the South and Southeast Asian regions are

either unreported or reported only under a broad category of “miscellaneous nei” (6). These unreported and “unassessed” stocks are on average in worse shape compared to those that are monitored or reported at the species level (7). As such, our results provide a conservative indication of catch-increasing MPAs in this region, a conclusion that we think accords with the thrust of Hilborn’s reply. More granular data on unreported stocks, and incorporating more detailed models of spatial movement would likely give rise to larger areas in South and Southeast Asia where MPAs could improve catch.

We note that we use the business-as-usual policy scenario of ref. 8 as a pessimistic benchmark of the future of global fisheries. Recent data showing reduced fishing pressure in some regions, particularly in developed countries, are a welcome development. As we highlighted in our paper, the magnitude of fisheries benefits from MPAs rests on how global fisheries will be managed in the future; our model shows that countries that reduce fishing pressure will see commensurate reductions in the optimal size of MPAs. For regions where fisheries reform is elusive, particularly in South and Southeast Asia, our paper shows that MPAs can help improve fish catch. It is worth noting that even in Europe [where many stocks are overfished (9)] and the United States, there are opportunities for significant yield-improving MPAs in some fisheries (e.g., see demonstrated improvements reported in refs. 10 and 11).

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^aBren School of Environmental Science and Management, University of California, Santa Barbara, CA 93117; ^bMarine Science Institute, University of California, Santa Barbara, CA 93117; ^cEnvironmental Market Solutions Lab, University of California, Santa Barbara, CA 93117; ^dPristine Seas, National Geographic Society, Washington, DC 20036; and ^eHawai'i Institute of Marine Biology, University of Hawai'i, Kane'ohe, HI 96744

Author contributions: R.B.C., D.B., J.M., W.G., A.M.F., E.S., C.C., and S.D.G. wrote the paper.

The authors declare no competing interest.

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¹To whom correspondence may be addressed. Email: rcabral@ucsb.edu.

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