UNIVERSITY OF CALIFORNIA, SANTA BARBARA

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO   SANTA BARBARA • SANTA CRUZ

National Center for Ecological Analysis and Synthesis
1021 Anacapa Street, Suite 300
Santa Barbara, California 93101-5504
www.nceas.ucsb.edu

Joshua G. Smith
National Center for Ecological Analysis and Synthesis
josgraysmith@gmail.com

April 8, 2024

Dear PNAS Editorial Board:

On behalf of the authorship team, I am pleased to submit our paper entitled, "Conservation benefits of marine protected areas accrue across a large ecologically connected network" for consideration as a Research Article in *Proceedings of the National Academy of Sciences*.

Marine protected areas (MPA) are a globally implemented ocean conservation tool. While many studies have evaluated MPA performance within individual protected areas or across single ecosystems, few have explored the conservation outcomes of entire networks of MPAs across multiple biological ecosystems, and the features (age, size, pre-implementation fishing intensity, etc.) that explain network performance. In this study, we synthesized decades of long-term biological monitoring data spanning four primary ecosystems (surf zone, kelp forest, shallow reef, deep reef) in California's large MPA network to evaluate conservation performance. We also identify the MPA features that best explain performance. Across the statewide network of MPAs, biomass of species targeted by fishing was positively associated with the level of regulatory protection and was significantly greater inside no-take MPAs, while species not targeted by fishing had similar biomass in MPAs and areas open to fishing. In contrast, species richness and diversity were not as strongly enhanced by MPA protection, an important result for guiding development and setting expectations of new MPAs and networks. Conservation performance increased with MPA age, pre-implementation fisheries landings, and habitat diversity. Our results show that important drivers of single MPA effectiveness also stand at the network scale and highlight key features of conservation effectiveness.

Our findings suggest that an ecologically connected network of MPAs can have positive conservation benefits that accrue across multiple ecosystems. Although the conservation performance of MPAs can vary across individual MPAs, coastal geographies, and ecosystems, a scientifically designed and functionally coherent network can provide net positive benefits that are greater than its individual parts. With international targets aimed at protecting 30 percent of the world's oceans by 2030, our study is exceptionally timely and shows that MPA design and assessment frameworks should consider performance at multiple ecologically relevant scales, spanning individual MPAs to multiple ecosystems and coordinated networks.

Thank you for your consideration.

Sincerely, on behalf of all authors,

Joshua Smith, Ph.D.

Recommended PNAS Editorial Board Members:

Mary Power
Alan Hasting

Recommended NAS members :

Jane Lubchenco
Nancy Knowlton
Jeremy Jackson
Juan Carlos Castilla
Stephen Palumbi

Recommended reviewers:
Graham Edgar
G.Edgar@utas.edu.au
University of Tasmania

Mark Costello
mark.j.costello@nord.co
Nord University

Melinda Coleman
melindaann.coleman@uwa.edu.au
University of Western Australia

Paolo Guidetti
paolo.guidetti@szn.it
Integrative Marine Ecology Department, Stazione Zoologica Anton Dohrn

Sylvaine Giakoumi
sylvaine.giakoumi@szn.it
Stazione Zoologica Anton Dohrn

Enric Sala
esala@ngs.org
Pristine Seas, National Geographic Society

Marissa Baskett
mlbaskett@ucdavis.edu
University of California Davis