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PeerJ Life & Environment

PRESS RELEASE

Estimating the impact of new high seas activities on the environment: The effects of ocean-surface macroplastic removal on sea surface ecosystems



Image: Naja Bertolt Jensen

"The surface is the skin through which our ocean breathes. It is a critical nursery ground for hundreds, possibly thousands, of species, and it is also one of the most vulnerable regions to human impacts. This is why we must treat the surface with exceptional care. It is an extremely unique and fragile environment, and small impacts at the surface could ripple into large impacts above and below the waves." - Dr. Rebecca Helm, Assistant Professor of Environmental Science at Georgetown University

New research published in [PeerJ Life and Environment](#) by Rebecca Helm et al. at [Georgetown University](#) demonstrates why it is important that methods of assessment and evaluation of ecosystem impacts of novel high seas activities account for uncertainty, using The Ocean Cleanup (TOC) as a model.

The open ocean beyond national jurisdiction covers nearly half of Earth's surface, is largely unexplored, and is an emerging frontier for human industry. Understanding how human activity impacts high seas ecosystems is critical for our management of this other half of Earth.

"This work highlights how little we truly know about the high seas, and why research on high seas ecosystems is so important. Even with the best available science and knowledge, we are not able to predict the scope of impacts, which could range from a modest decline in population numbers to a total collapse," says Rebecca Helm, an Assistant Professor of Environmental Science at Georgetown University.

The TOC's aim is to remove plastic from the ocean surface by collecting it with large nets. However, this approach results in the collection of surface marine life (neuston) as by-catch. Using an interdisciplinary approach, *Helm et al.* explore the social-ecological implications of this activity.

Through the use of population models to quantify potential impacts on the surface ecosystem, the study determines the links between these ecosystems and society through an ecosystem service approach and reviews the governance setting relevant to the management of activities on the high seas.

The results show that the impact of ocean surface plastic removal largely depends on neuston life histories (which are unknown), and range from potentially mild to severe.

"Humans will continue to push into the high seas, and it is essential that we have strong science on high-seas ecology to ensure human activities are not putting ecosystems at risk," says Helm.

"Imagine walking into a forest and knowing nothing about the trees. You have names for them, but you do not know how fast they grow, what nutrients they need, what species live among their branches or what species feed on their leaves. This is our state of knowledge for the ocean's surface ecosystem. This is why we must be extremely careful about how we interact with this environment."

The broader social-ecological implications of this impact could be felt by stakeholders both beyond and within national jurisdiction, demonstrating how high seas activities may impact society closer to shore.

The legal framework applicable to TOC's activity is insufficiently specific to address both the ecological and social uncertainty the authors describe, demonstrating the urgent need for detailed rules and procedures on environmental impact assessment and strategic environmental assessment to be adopted under the new International Agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction which is currently being negotiated.

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Media Contacts

For the authors:

Dr. Rebecca Helm, Georgetown University rh1203@georgetown.edu

For PeerJ:

Euan Lockie: press@peerj.com

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