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Bonnevie, Ida Maria; von Thenen, Miriam; Hansen, Henning Sten

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Carlos M. Duarte,
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*CORRESPONDENCE

Ida Maria Bonnevie
✉ idarei@plan.aau.dk

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Editorial: Spatial planning for sustainable use of marine ecosystem services and resources

Ida Maria Bonnevie^{1*}, Miriam von Thenen²
and Henning Sten Hansen¹

¹Department of Sustainability and Planning, Aalborg University Copenhagen, Copenhagen, Denmark,

²Coastal and Marine Management Group, Leibniz Institute for Baltic Sea Research Warnemünde, Rostock, Germany

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ecosystem services (ES), marine spatial planning (MSP), cumulative impact assessment, ecological connectivity, deep sea, decision support, ecosystem classification, spatial analyses

Editorial on the Research Topic

[Spatial planning for sustainable use of marine ecosystem services and resources](#)

1 Introduction

Life depends on healthy oceans that provide ecosystem services (ES) to humans, including provisioning, regulating, supporting, and cultural ES (Kovalenko et al., 2023). However, biodiversity, habitats, and the delivery of marine ES and resources are increasingly threatened by growing human activities in the oceans (Worm et al., 2006). Blue-growth activities, such as shipping and energy, eutrophication, and climate change represent major pressures that affect marine ecosystems (Halpern et al., 2008; Ehlers, 2016). Over the past two decades, increasing scientific attention has focused on the need to preserve and restore healthy marine waters and their role in adapting to climate change (Santos et al., 2020). This challenge calls for holistic approaches that advance our knowledge. Within the contributions to this Research Topic (see Figure 1), three themes are central to driving further research to expand our understanding in this interdisciplinary field.

2 Extending the geographic scope to the deep sea

While terrestrial and coastal regions are highly used and valued for their ES (Barbier et al., 2011), less is known about marine offshore areas (Townsend et al., 2018), especially those vast regions beyond national jurisdiction (ABNJs) (Zaucha and Jay, 2022). These areas offer important ES but at the same time are also threatened by growing pressures, e.g. overexploitation and climate change (IUCN, 2022). To target the deep-sea knowledge gap

non-renewable resources, indigenous renewable resources, imports, and environmental load, in addition to levels of sustainability. With a similar focus on carrying capacity, Hu et al. study how to actively increase a resource – in this case, a fishery resource. They combine a habitat suitability model with a model on optimal growth conditions for *Portunus trituberculatus* larvae to calculate suitable areas in Liaodong Bay and release larvae into them to test their actual suitability. Carrying capacity is, however, not only related to the suitability of habitats but also to the ecological connectivity between them. Podda and Porporato provide a comprehensive review of how ecological corridors, promoted in Europe by the EU Biodiversity Strategy for 2030, have been approached in marine spatial planning. They show how few studies exist on marine ecological corridors but the methods used involve least-cost theories of expected species movements and circuit theories that identify species movement bottlenecks that have ecological importance for ES delivery, biodiversity, and climate change resilience. In this supplementary way, the three papers explore ways to understand and improve habitat and resource-carrying capacities in support of ES.

5 Perspectives

The geographic and methodological diversity of the papers shows how marine ecosystems play an essential role globally and require transdisciplinary approaches. All papers contribute to more holistic ES assessments. At different scales, in crowded and more unknown places, we need to have a better understanding of marine ES and resources and how to deal with the issues affecting them. Future research should aim to operationalise ecosystem

classification frameworks in deep waters while advancing methods for spatial assessment of ES, pressures, and their spatial interlinkages, and investigating sustainable ES carrying capacities, ecological connectivity, and uncertainties.

Author contributions

IB: Conceptualization, Formal analysis, Investigation, Methodology, Resources, Visualization, Writing – original draft, Writing – review & editing. MT: Conceptualization, Formal analysis, Investigation, Methodology, Resources, Writing – original draft, Writing – review & editing. HH: Conceptualization, Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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