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Editorial: Coastal rewilding as a nature-based solution

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Editorial on the Research Topic

Coastal rewilding as a nature-based solution

Coastal and marine ecosystems provide a wide range of ecosystem services, including habitats for rich biodiversity, improved water quality, coastal protection against erosion, carbon storage, and cultural benefits such as recreation, aesthetics, and human well-being. Drawing from terrestrial ecology, the concept of rewilding to degraded coastal and marine ecosystems has the potential to address the interconnected crises of climate change, biodiversity loss, and pollution. While the understanding and implementation of rewilding in terrestrial systems is relatively advanced, “coastal and marine rewilding”, is still in its infancy (Comerier, 2024). No official definition of the concept of rewilding of coastal ecosystems exists, but it is used currently as another term for protection and restoration of coastal and marine habitats as nature-based solutions (NbS), which aim to provide mutual benefits to biodiversity and society at the land-sea interface (O’Leary et al., 2023). Here, we define “coastal rewilding” broadly as a combination of passive and active protection and restoration approaches such as: (1) allowing natural colonization of species by the “doing nothing approach” in abandoned areas of previous coastal habitats used for human activities, such as salt extraction, land- or sea farming, and by the designation of protection of natural habitats against human pressures, (2) using geo-engineering to restore natural hydrology of coastal wetlands, by inactivation of drainage systems and managed realignment (Pétillon et al., 2024), and (3) restoration of habitat forming species such as biogenic reefs, macroalgae, seagrasses and salt marshes. The success and speed of recovery can vary due to the complexity of biological, biogeochemical and physical ecosystem processes, the level of habitat fragmentation, the rewilding approach, management and stakeholder engagement. Furthermore, sea-level rise, increased frequency of storms and heatwaves can, in combination with other human pressures and impacts, delay recovery and should be critically considered when planning coastal rewilding. Trade-offs between blue carbon sequestration vs. greenhouse gas emission, land-use vs. restoration, spread of non-indigenous vs. native

species, ecological vs. societal/economic/cultural challenges should be also addressed for obtaining successful upscaling of these approaches.

The goal of this Research Topic is to advance knowledge on coastal rewilding by covering aspects of ecosystem functioning- and services related to biodiversity, biogeochemistry, blue carbon, greenhouse gases, flood-risk reduction as well as address potential stakeholders conflicts, interests of society and diverse stakeholders. Additionally, this Research Topic aimed to explore the recovery success of coastal rewilded areas in terms of scale (extension) by large-scale remote sensing, and overall best co-creation practices during planning, execution and monitoring of rewilding approaches.

The Research Topic received a total of three papers discussing two main topics: (1) opportunities and challenges of blue carbon markets in Aotearoa New Zealand (Steward-Sinclair et al.) and (2) restoration of shellfish with one paper focusing on site selection tests of green-lipped mussels (Alder and Hillman) and another on reef design and habitat provision (Pollack et al.). We have learned that despite a carbon market is not established in Aotearoa New Zealand, several projects in restoration of coastal habitats could provide blue carbon credits offsetting costs of restoration or lost revenue to landowners. However, uncertainties related to complex legal frameworks in the ownership of a changing foreshore due to sea-level rise is a potential challenge and should be critically addressed in current management and decisions (Steward-Sinclair et al.). Alder and Hillman highlighted that shellfish restoration can benefit from small and short-term tests of mussel translocations that can help in refining suitable large scale restoration sites with unknown risks. For reef restoration, Pollack et al. found that mound-shaped oyster reefs, despite more costly, provided higher survival of oysters and epifaunal densities than flat-shaped ones demonstrating that it is important to consider habitat design for obtaining higher restoration outcomes.

Although this Research Topic received relatively few articles, the field of coastal rewilding and restoration of coastal and marine habitats are getting increased focus on the global agenda propelled by international agreements including the Kunming–Montreal Global Biodiversity Framework (KM-GBF) and the Nature Restoration Law/EU Biodiversity Strategy. In addition, the United Nations Decade on Ecosystem Restoration (2021-2030) highlights and fosters restoration of coastal and marine habitats. One example of efforts towards coastal rewilding as NbS, is the project “REWRITE” funded by the European Commission’s Horizon Europe program (GA 101081357) in 2023 with the goal to “upscale Rewilding and Restoration of Intertidal sediment ecosystems for carbon sequestration, climate adaptation and biodiversity support”, which will spark new coastal rewilding research in salt marshes, seagrasses, and microphytobenthos and pave the way to informed decisions towards a climate resilient society.

We thank all contributing authors for joining this Research Topic. We hope that the papers will inspire and contribute to the

development of coastal rewilding approaches within the framework of nature-based solutions.

Author contributions

COQ: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. VM: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. AS: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. ED: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. DW: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. DK-J: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. VA-B: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, 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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