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What Counts as Restoration on Working Fishing Grounds? From concepts to practical management.

Mark Dickey-Collas

Binding commitments on ecosystem restoration are now impacting the practical reality that most marine space is used, managed, and socially contested. In fished seascapes, “degradation” and “restoration” are often invoked without an agreed reference, without operational limits, and without a conceptual understanding of restoration in productive systems.

This contribution synthesises recent conceptual developments around fisheries and restoration into a framework for “restoring fished seascapes”. It proposes a shared logic for ecological condition in systems that are both productive and changing, distinguishing productivity and ecosystem change from degradation. It translates that logic into operational recovery benchmarks and indicators that can be tracked using existing fisheries and marine data streams. It recommends a co-development approach for agreeing thresholds, decision rules, and review cycles, so that restoration planning recognises fishers’ stewardship options, avoids simply displacing pressure, and clarifies how management responses escalate when risk remains high.

The output is a practical concept-to-management pathway: a small set of condition classes, a decision tree for “what counts”, and a minimum monitoring package linked to management triggers. It is intended to support socially legitimate, ecologically sound transitions where restoration objectives and sustainable fisheries management are treated as interdependent, not competing, goals.

From habitat to harvest: practical restoration measures and reporting evidence that work for fisheries

Eirini Glyki

Binding commitments are moving marine restoration from ambition to delivery. GBF Target 2 and the EU Nature Restoration Regulation (NRR) both require substantial progress by 2030, while raising questions for fished systems: how to distinguish change of productive ecosystems from degradation, and how to define “restored” in working seascapes.

This contribution will synthesise the expected outcomes of the April 2026 workshop “From Habitat to Harvest: restoration that works for fishers”. The workshop was designed to position fisheries as active contributors to habitat restoration and to clarify how fisheries management can support NRR implementation through practical, workable measures. It focused on productive fishing grounds, mixed-use areas and working seascapes. Participants were fishers, nature restoration planners and researchers thus provide a broad spectrum of views and experiences.

The presentation will distil the workshop-level findings, resulting in a transferable set of insights on opportunities and constraints to deliver and provide evidence of restoration where fishing continues.

Clarifying Marine Restoration Pathways: Disentangling MPAs, Nature-based Solutions, Hybrid Approaches and Grey Infrastructure

Louise C. Flensburg

Marine and coastal ecosystems are facing accelerating biodiversity loss and declining ecological condition due to climate change, overexploitation, pollution, habitat conversion, and expanding coastal infrastructure. The scale of degradation demands ambitious and coherent restoration efforts. In response, a range of approaches has emerged, including Marine Protected Areas (MPAs), Nature-based Solutions (NbS), Nature-Inclusive Design (NID), hybrid solutions combining ecological and engineered elements, and conventional grey infrastructure. Although often grouped under shared sustainability narratives, these interventions differ significantly in objectives, mechanisms, spatial scale, and conservation ambition. Clear distinctions are essential to ensure that actions contribute to genuine ecosystem recovery rather than simply mitigating impacts.

The EU-funded TRANSEATION project examines how these restoration and protection measures are conceptualized and implemented, synthesizing evidence from 113 peer-reviewed studies. The analysis reveals substantial terminological ambiguity particularly where NbS are conflated with MPAs, NID, hybrid coastal solutions, and wide variation in restoration scale and monitoring approaches. This lack of conceptual clarity and standardized assessment limits comparability weakens evidence-based decision-making, and obscures whether interventions are sufficient to improve ecological status at meaningful scales.

By disentangling these approaches and mapping their scale and intent, the project highlights the urgent need for harmonized definitions, evaluation criteria, and science-based guidance to align marine restoration efforts.

Helping nature support humans – The role of discourses in the governance of deep-sea restoration in the European Seas

Johanna Sophie Buerkert

Deep-sea ecosystems in the European seas are degraded and damaged due to various anthropogenic activities and pressures on the ocean floor. The EU Nature Restoration Regulation (NRR), which requires Member States to restore at least 20% of land and sea by 2030 should contribute to remedying this problem. However, this will require significant investment into developing deep-sea restoration technologies and into their subsequent deployment and monitoring. The Horizon Europe Project REDRESS (Restoration of deep-sea habitats to rebuild European seas) aims to contribute to the EU commitments towards restoring degraded deep-sea ecosystems by providing solutions to prioritize future restoration actions, extend deep-sea restoration to previously neglected habitat types, and demonstrate the feasibility, potential, and value for success of deep-sea ecosystem restoration. As part of REDRESS we assessed the governance arrangements surrounding deep-sea restoration activities in 5 cases (Dohrn Canyon, Azores, West of Shetland, Catalan Margin and Guilvinec Canyon) where deep sea restoration is currently being trialed. Governance arrangements consist of the actors, rules, resources, and discourses that surround the restoration process. The study of these governance arrangements allows us to map the emerging deep-sea restoration landscape and identify barriers and enablers for successful active and passive restoration measures. We conducted around 50 interviews across Europe with researchers, non-governmental organisations, policymakers and industry actors on the topic of deep-sea restoration. Our findings show that deep sea restoration is an emerging topic and suggest that the *discourses* surrounding deep sea restoration may be drivers for the deep-sea restoration governance arrangements. In many of the cases that we studied, the potential benefits for society and actors in the marine space that can be derived from deep-sea ecosystems are a central element of the discussion. This perception of potential benefits is contrasted with the lack of feel- and visibility of deep-sea ecosystems. The prospect of societal and ecological benefits has the potential to unite restoration researchers, decision-makers and potential industrial actors in the marine space, and make the importance of healthy deep-sea ecosystems more tangible to the wider public. However, the actual value of ecosystem services that deep-sea restoration can provide is mostly understudied. Due to the centrality of ecosystem services to the deep sea restoration discourse, more research on this aspect might be needed in order to move the roll-out of deep-sea restoration forward.

A sea full of measures: EU conservation goals for benthic habitats will require wide-ranging spatial measures

W. Nikolaus Probst

The use of marine space by human activities is continuously increasing, resulting in a competition between human use and spatial measures for marine conservation. The EU Marine Strategy Framework Directive (MSFD) and the Nature Restoration Law (NRL) are two important legal means to implement ambitious spatial conservation targets for benthic habitats within the waters of EU member states. This study analyses how the targets of MSFD and NRL are currently met in the German waters of the North Sea and which areas the full implementation of both legislations might require. The current spatial conservation measures, which ban demersal trawling within certain zones of designated marine protected areas (MPA), are not sufficient to reach the targets of the MSFD and NRL. Extending the exclusion of demersal trawling to the entire area of the MPAs would increase the average coverage for all habitat types/groups from 19 % to 73 % except for offshore sand and mud habitats. These could be further protected, when including areas for offshore wind farms, where trawling is also banned. However, to date it is unclear, if and how these (or other human use) areas could be included legally into spatial conservation regimes. Hence a debate on how to better combine human activities with spatial

conservation targets is urgently needed to allow for the achievement of the ambitious MSFD and NRL targets in marine waters of EU member states.

Empirical estimates of recovery after cessation of disturbance for benthic invertebrates

Jan Geert Hiddink

Recovery of benthic invertebrate communities following disturbance is a key process governing the resilience of seabed ecosystems exposed to human pressures such as bottom trawling, aggregate dredging, and emerging activities including seabed mining. Quantifying and predicting recovery rates is essential for conservation planning and for balancing exploitation with the protection of vulnerable habitats. However, robust predictors of recovery remain limited.

Here, empirical time-series data were collated from published studies to evaluate the drivers of passive recovery in marine macrobenthic invertebrates after events or interventions that substantially depleted abundance or biomass, or created newly available substrate. Studies were included across all substrate types, spanning recovery after cessation of disturbance as well as colonisation following the introduction of new substrates, and covering both individual species and whole communities. Abundance and biomass trajectories were extracted and logistic population growth curves were fitted to estimate the logistic recovery parameter r . Recovery rates were highly variable across taxa and settings, but clear environmental patterns emerged. Average recovery rates were significantly higher on sediment compared with hard substrates. Recovery rate decreased with increasing depth and with the spatial scale of the disturbance. Biomass recovered more slowly than abundance, indicating that functional recovery may lag behind numerical recolonisation.

These results demonstrate that recovery rates can be quantitatively estimated from time-series data and strongly structured by environmental context. Slower recovery on hard substrates, in deeper waters, and after larger disturbances provides a basis for improving predictive frameworks for habitat and species recovery. Linking recovery rates to life-history constraints such as maximum lifespan allows advancement of mechanistic prediction of seabed resilience under anthropogenic pressure.