POLICY BRIEF

Small-scale fisheries and co-management schemes

Main findings

- Granting **spatially explicit use rights for fisheries** combined with co-management creates a sense of ownership and responsibility and can **improve both economic output** and **biodiversity conservation** in small-scale benthic fisheries.
- Areas with **high levels of protection and enforcement** are **most effective** at **simultaneously meeting goals** for both **fisheries and biodiversity conservation**. **Greater distance** from **human pressure improves effectiveness**.
- **Models** incorporating **within-species genetic variation of commercial fish species** with **regional physical environmental factors** can help to explain important **long-distance dispersal** events. Knowledge of fish dispersal beyond the immediate surroundings of protected areas is important for effective management of fisheries.

Key policy recommendations

- Promote local co-management and granting of exclusive fishing rights in exchange for compliance with science-based management guidelines to benefit both the fishery and biodiversity conservation.
- Include both fully and partially protected areas in networks to optimise fishery and biodiversity conservation gains. Adjacent location of fully and moderately protected areas increases the effectiveness of both.
- Use spatially explicit biophysical models and within-species genetic diversity to guide the design of fishing effort allocation and optimal placing, sizing and spacing of protected areas within networks.

Context

European coastal and marine habitats and species, provide important ecosystem, economic and social welfare benefits (e.g. fisheries, aquaculture, coastal protection, carbon storage and recreation). The value of benefits depends on sustainable management of resources. Biodiversity, including commercially exploited fish, is a central component of ecosystems and their services. More ecologically and genetically diverse ecosystems are more resilient and able to adapt to change.

Tools to preserve this biodiversity and the ecosystem services it provides include the EU Common Fisheries Policy (CFP), the Marine Strategy Framework Directive (MSFD) and other sectoral policies (including land-based) and designation of Marine Protected Areas at European, national and local level.

In the most recent update of the CFP the European Commission acknowledged that some fish stocks were still being overfished. The 2020 European Court of Auditors report noted provisions to coordinate fisheries and marine protection policy are not fully used and few available funds are used for conservation measures. The budget for 2021-27 European Maritime Fisheries and Aquaculture Fund[1] (EMFAF) will have a particular focus on supporting small-scale fisheries, protecting marine ecosystems and contributing to climate change mitigation and adaptation.

The 2016 European Commission's 'fitness check' concluded that there are still gaps in the network of European Natura 2000 protected areas and that effectiveness of the network is hindered by factors such as full stakeholder engagement and effective management of sites[2]. MPAs vary in their objectives and the degree of protection provided: full protection is where no extractive use is permitted; partial protection allows multiple low impact uses while prohibiting certain high impact activities. The 2020 report on implementation of the MSFD concluded the framework needs to be strengthened to tackle pressures such as overfishing and unsustainable fishing practices. The EC's new Biodiversity Strategy for 2030 aims to strengthen the protection of marine ecosystems and restore them to good environmental status, including establishment of strictly protected areas for recovery of fish stocks and habitats and expansion of protected area networks. Furthermore, a new action plan to conserve fisheries resources and protect marine ecosystems will be developed in 2021.

This brief considers how the results of some **BiodivERsA-funded research projects** can inform the next implementation cycles of the CFP, MSFD and European and local mechanisms for managing fisheries and protected areas post 2020. The brief specifically builds on results from the research projects PERCEBES, REEF-FUTURES, RESERVEBENEFIT and BUFFER.

Key results

Research has shown that for small-scale benthic fisheries, co-management systems with strong governance can improve performance of both the fishery and wider environmental sustainability. A set of social factors is key to the sustainability of such schemes[3].

Granting spatially explicit use rights for fishing can improve both the performance of benthic fisheries and environmental sustainability

Fishery co-management schemes have grown in popularity, but certain factors need to be adopted to improve their success. Management of stalked barnacle fisheries in SW Europe ranges from less organized, large-scale systems (greater than 100 km in SW Portugal and Brittany in France) to highly participatory systems which are co-managed at small spatial scales (10's of km and below in Galicia and Asturias in Spain). Analysis of this diversity of arrangements showed that the key to achieving social and ecological sustainability in small-scale fisheries was: intermediate to high levels of implementation of four governance elements[4]:

- exclusive rights granted to fishers;
- shared decision making between fishers and authorities;
- active participation of fishers in all aspects of the fishery (data collection, assessment and management); and
- nested spatial scales of management.

1. EMFAF is due to replace the 2014-2020 European Maritime and Fisheries Fund (EMFF)
2. Assis and coworkers 2021
3. Rivera and coworkers 2019
4. Aguión and coworkers 2021

In addition, research on seven co-managed Territorial Use Rights for Fishing (TURF) in Asturias (Spain) revealed that strong leadership and conflict resolution mechanisms can compensate for low levels of cooperation[5].

Stakeholder perceptions can influence the success of a fishery. Stakeholder perceptions of the Asturian stalked barnacle fishery were assessed in terms of fishery management and conservation.

Perceptions varied with socioeconomic factors such as location, age, years in the management system, alternative income sources and income. A trade-off is often perceived between exploitation of the fishery and conservation of biodiversity, but despite the variation in perceptions, the co-management system had successfully generated a strong conservation ethic in its resource users. When generating fishery management policies, taking account of variations in fishers' perceptions of the relative importance of exploitation and conservation is likely to improve sustainability of the fishery[6].

Diversity and abundance of macroinvertebrates and fish species of kelp forests were compared between areas with Territorial Use Rights for Fishing (TURF), no-take reserves and open access areas in Chile. The study found that highly enforced territorial user rights areas and no-take reserves had similar densities of both reef fishes of economic importance and macroinvertebrates. Densities of both were significantly lower in TURF areas with low enforcement, and lower still in areas with open access. Well enforced territorial user right areas could thus be as important for conservation of biodiversity and fisheries as no-take reserves[7].

Level of regulation and knowledge of connectivity between sites are both important for effective management of fisheries and biodiversity within networks of Marine Protected Areas

Most MPAs are partially protected, i.e. they allow some extraction of resources. Using a regulation-based classification system rather than an objective-based system the ecological effectiveness of MPAs can be assessed[8]. Highly and moderately regulated areas exhibited higher biomass and abundance of commercial fish species, whereas fish abundance and biomass in weakly regulated areas differed little from unprotected areas. The effectiveness of moderately regulated areas was enhanced by the presence of an adjacent fully protected area[9].

MPAs may be set up to achieve single or multiple social and ecological goals and have different targets and may be close to or distant from human influences. The success of coral reef MPAs with separate and combined goals for fisheries, ecological function and biodiversity was modelled. Implementation of a fully protected MPA was predicted to help achieve multiple goals for many sites. Management was found to provide substantial benefits to most reefs for fisheries and ecological function goals, but not for biodiversity (measured as biological trait diversity of reef fishes). Minimal conservation gains were found in locations where human pressure was most intense, particularly where reefs were already degraded[10].

Estimates of dispersal distances for marine species are often limited by the geographic extent of sampling designs (for some species actual dispersal may be much wider than the area sampled)[11].

Long-distance (>40-km) dispersal from fisheries no-take zones is poorly documented yet such dispersal could provide benefits such as re-stocking fished areas or connecting MPAs into networks. Oceanographic models to estimate dispersal are useful but they need to be validated using knowledge of population genetics. Genomics (the study of a large proportion of a species' genes rather than a few individual genes) is a useful tool to define stock estimation and estimate dispersal distances[12]. Genetic markers were identified for three species of exploited Mediterranean fish (white seabream, striped red mullet and comber)[13]. A continuous sampling strategy along 1,000km of coastline showed that most dispersal is local (within 10s of km), but less frequent long-distance dispersal events can occur and drive genetic connectivity at regional scales[14].

In a heavily exploited area of the central Philippines, the development of a network of no-take marine reserves over time was modelled considering various factors which might influence fish abundance and population persistence. Protecting sites with high larval supply of exploited species into the population would yield highest benefit in terms of fish abundance and maintenance of populations outside MPAs[15].

5. Rivera and coworkers 2019
6. Rivera and coworkers 2017
7. Gelcich and coworkers 2021
8. Horta e Costa and coworkers 2016
9. Zupan and coworkers 2018
10. Cinner and coworkers 2020
11. Manel and coworkers 2019
12. Manel and coworkers 2019
13. Fietz and coworkers 2020
14. Benestan and coworkers 2021
15. Kininmonth and coworkers 2019

Policy recommendations

Diversify the range of measures used to manage fisheries including through granting Territorial Use Rights for Fisheries (TURF) and networks of Marine Protected Areas. Incorporate no-take zones and zones with moderate levels of regulation; consider long-range species dispersal and proximity to areas of high human pressures when identifying and managing MPAs for multiple goals including fisheries.

BiodivERsA funded projects have provided examples of management of small-scale fisheries which benefit both fishers and biodiversity conservation; and specific information to include when identifying locations of MPAs and goals and objectives for effective protection of fish and fisheries.

The preparation of the 2021 action plan as part of implementing the European Commission's Biodiversity Strategy for 2030 is an opportunity to guide the development of targets and measures and encourage the use of tools for management which will support and integrate both conservation of fisheries resources and protection of marine ecosystems:

- **Use funding from the European Maritime Fisheries and Agriculture Fund (EMFAF) to promote co-management and granting of exclusive fishing rights in suitable fisheries**. Effective co-management can benefit both the fishery and conservation of biodiversity.

- **Grant exclusive fishing rights in exchange for compliance with science-based management guidelines tailored to local needs**. Involve both fishers and other stakeholders in shared decision making to develop management guidelines improves compliance.

- **Surround no-take zones for fish conservation with moderately regulated zones**. No-take zones restore ecological resilience while moderately regulated areas allow for less damaging human uses but have lower ecological outcomes. The efficiency of both is improved by locating them adjacent to each other.

- **Use biophysical models and within-species genetic diversity and dispersal to guide management of fisheries in networks of MPAs**. When developing fisheries management measures for individual MPAs, take into account possible intermittent long-distance (>40km) dispersal of target species between MPAs in a network and in the wider environment.

Links to sources

PERCEBES project

RESERVEBENEFIT project

BUFFER project

REEF-FUTURES project

Scientific publications used in this policy brief can be found in the Information Sheet of this brief, downloadable from www.biodiversa.org/policybriefs

Photos: Jorge Chachero and Stephanie Manel

About this Policy Brief

This Policy Brief is part of a series aiming to inform policymakers on the key results of the biodiversity research projects funded by BiodivERsA and provide recommendations to policymakers based on research results.

The series of BiodivERsA Policy Briefs can be found at www.biodiversa.org/policybriefs.

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The key research results presented here were validated by researchers from the PERCEBES, RESERVEBENEFIT, and BUFFER research projects.

The policy recommendations made do not necessarily reflect the views of all BiodivERsA partners.

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