Effectiveness of Marine Protected Areas – Exploring different perspectives

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Introduction

One of the 17 Sustainable Development Goals (SDGs) that were presented by the United Nations in 2015 is SDG14 *Life below water*. It focuses on the conservation and sustainable use of the oceans, seas and marine resources for sustainable development. SDG Target 14.5 called for *the conservation of at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information by 2020.* An indicator for this target is the coverage of marine protected areas (MPAs) in relation to marine areas (United Nations, n.d.). MPAs are an ´area-based management tool´ for long-time marine conservation. There are different kinds of MPAs. The strictest kind is called a ´no-take´ MPA, which forbids any kind of fishing, trawling or commercial activities, while activities related to science research is permitted in all kinds of MPAs. The aims are to make the area more resilient to climate change and to make it able to provide ecosystem services for a long time. As of today, the marine protected area coverage is 7,93% (Protected Planet, 2022).

This paper will present and discuss the perceived benefits and costs associated with MPAs from the view of three important stakeholders: The local fishers, whose main interest is maintaining their rights to fish, the conservation scientists, who want to protect ecosystem services and biodiversity, and finally, the tourism industry, who is seen as a promising alternative to fishing and aquaculture. Since different stakeholders often have contrasting interests, it is important to discuss the conflicts and challenges to make an MPA as effective as possible.

Conservation Scientists: Protecting ecosystems and biodiversity

Coastal ecosystems are among the most productive worldwide, but at the same time extremely vulnerable to anthropogenic changes: key habitats are being lost at rates 2-10 times faster than those in tropical forests. The main cause behind this is overfishing, accompanied by pollution, invasive species, and climate change. While conventional approaches to address this issue (like quotas) have not proven to be generally successful, MPAs can be a tool to preserve ecosystem complexity and connected services, which is critical for the conservation and sustainable use of marine resources and biodiversity (García-Charton et al., 2008).

The ecological effects of MPAs can be assessed on different levels: populations, communities, ecosystems, and habitats, making them important for different targets of SDG14 *Life below Water*: Target 2 *Protecting and restoring ecosystems*, target 3 *Reducing Ocean Acidification* and target 5 *Conservation of areas*. However, the extent of their response to protection can vary based on geographic location, the species' characteristics, the type of communities in the MPA, and its design (García-Charton et al., 2008).

On the population level MPAs increase the abundance of species, their mean size and age, with strongly protected MPAs being the most effective as they can reverse the evolutionary shifts on traits caused by selective fishing pressure. This applies especially to commercial species, which often are big and predatory, while non-commercial species hardly respond to protection measures. Top predators often regain their dominance, which can cause shifts in community assemblages and hence in the area's ecological functioning. Through the protection of the MPA's biodiversity the stability and resilience of its ecosystem increases, thereby improving its capability to provide ecosystem services and reducing its vulnerability to disturbances, which is particularly relevant in the face of climate change and human exploitation (García-Charton et al., 2008). This makes them vital for SDG13 *Climate Action*.

Depending on the habitat, the protection of nursery grounds and spawner abundances can help population structure to recover. Moreover, MPAs increase fecundity and thus the production of eggs and larvae (García-Charton et al., 2008).

These effects reach further than the MPA, as biomass and biodiversity spread beyond its borders. This so-called spill-over effect is caused by a net emigration of adult and juvenile fish as well as eggs and larvae,

benefitting both surrounding ecosystems and fisheries. Furthermore, while harvesting can reduce genetic diversity, MPAs can function as reservoirs for rare alleles and increase genetic variation and heterozygosity (García-Charton et al., 2008).

However, an MPA's effectiveness heavily depends on its location and characteristics, which is why some scientists say that current MPAs are not effective enough, being established in areas of low production, which diminishes the effects of conservation efforts. Some are even located in ecologically "dead zones" and can hence be defined as "paper parks" – parks that are only made to meet conservation goals on paper.

Fishers: Conflicts between cultural values and biodiversity protection

Restrictions regarding where and how much to fish may lead to hyper-competition between fisheries due to limited resources. When only a certain amount of marine resources is allowed to be extracted from the ocean, fewer fishing boats are able to sustain themselves economically. In no-take MPAs, the fishers would not be allowed to take out any fish, which could impact local fishers in that they need to find new fishing grounds. However, the spill-over from MPAs, can enhance the fisheries catches outside the MPA's borders. Moreover, MPAs and other fisheries management have shown to be helping overfished fish stocks to recover (Di Franco et al., 2016).

Successful management in MPAs can lead to healthier fish stocks, higher income for the fishermen, as well as social acceptance of the management practices. However, this presumes that there is a high MPA enforcement, presence of a management plan, fishermen are engaged in MPA management, and sustainable fishing is promoted (Di Franco et al., 2016).

Economic benefits from fisheries depend on a healthy ocean, and achieving economic growth and food security is an important prerequisite for SDG1 *No poverty* and SDG2 *Zero hunger*. However, the rapid economic growth and mass food production needed to lift people out of poverty can lead to overexploitation of marine resources. At the same time, creating MPAs can reduce access to resources needed to alleviate poverty. However, the benefits of MPAs, such as improved fish stocks and spill-over can create a reliable food source in the long-term (ICS, 2017).

Fishing or other harvesting of marine resources can make up the primary livelihood of coastal communities. Making a living, as well as upholding their culture and traditions can make local fishers sceptical towards fishing restrictions in MPAs. Governance of MPAs therefore needs to consider compensation or alternative livelihoods for those dependent on fishing, since the lack of access to marine resources can cause short-term hardships (Ma, 2018).

Tourism industry: An alternative source of income

The implementation of more marine protected areas calls for exploring other alternative sources of income beside fishing and aquaculture by diversifying the economy. This need is especially felt in vulnerable communities, where other sources of income may be less available. Non-consumptive tourism related to water, such as scuba-diving or watching wildlife, is widely discussed as such an alternative (Lucrezi et al., 2013).

As with most things, water-related tourism is connected to a number of SDG goals, for example SDG 8 *Decent work and Economic growth.* As fisheries become more restricted, some argue that the resulting increase of poverty can, and should be, alleviated by tourism growth. This also makes a connection to SGD9 *Industry and innovation* and SDG12 *Responsible consumption*.

As this type of tourism requires the conservation of aesthetically pleasing surroundings, which tend to be productive and biodiverse, the tourism sector is talked about as a promising stakeholder whose needs align the most with the intention of MPAs (Lucrezi et al., 2013). Since the industry gains economic security with higher conservation efforts, an increase of non-consumptive tourism may provide an incentive for local people to invest in the conservation of their local environment. Such activities may also serve as an opportunity to increase awareness of the vulnerable ecosystems tourists enjoy.

However, it is debated if even non-consumptive tourism is considered to have a net positive or negative impact on marine ecosystems. In one study, the emergence of mass tourism was reported to increase damage done to the local coral reefs in Australia, as uneducated divers would more often leave their mark on the vulnerable organisms (Harriott, Davis and Banks, 1997).

Conflict also arises when MPAs are established without the input of the local tourism industry. This was the case in the Canary Islands when an MPA, established with the intention of conserving fish stocks for the future sustainability of the fishery business, did not allow diving of any kind (Jentoft et al., 2012). While the rules were changed after diving tourism proved to become an economically important source for the community, this case study shows that MPAs must be implemented with the input of several stakeholders, as the exclusion of the tourism industry led to less acceptance of the management tools (Jentoft et al. 2012).

Conclusion

When comparing all the different perspectives presented above, it becomes clear how stakeholders´ motives and interests differ. Without including all the different stakeholders in the process of decision making when planning an MPA it will most likely not reach the highest level of effectiveness and create conflicts among the different actors. The major source of conflict is competition for space, as this is the resource that is most important for all stakeholders. For an MPA to be ecologically effective it needs to cover a certain area so that biodiversity recovers, while the fishermen's livelihood depends on fishing grounds. This again clashes with the tourism sector, which relies on accessible aesthetically pleasing surroundings. Also, in the case of no-take areas they only benefit conservation and research purposes. When planning an MPA it is therefore important to clearly define its objectives and goals to be able to define and include all relevant parties. Including the different stakeholders in the process and monitoring the progress increases the effectiveness of the MPA.

So far, research has mostly focused on MPAs' effects on single groups of stakeholders, providing rather one-sided views on their effectiveness. However, in the future, cross-disciplinary research could be the most beneficial to achieve maximum MPA effectiveness, thereby exploring mutual advantages for all stakeholders.

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