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How can we protect valuable marine habitats for fisheries?

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Abstract

Have you ever wondered where the fish you eat comes from? Many fisheries all over the world are declining and need protection. But it is hard. Fishery species don't stay in one place. In fact, many fishery species use many habitats over their lifetime. Marine Protected Areas (MPAs) can help protect marine ecosystems and fisheries. They can restrict fishing or ban harmful fishing equipment.

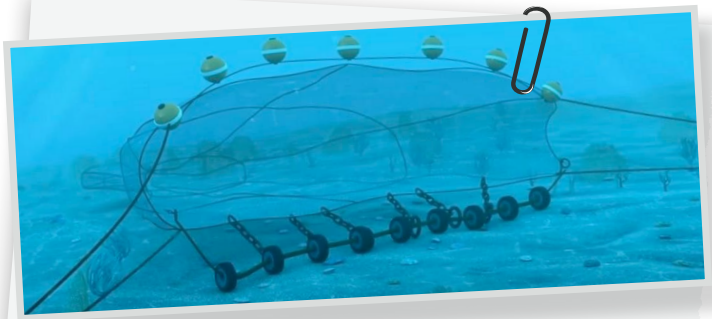
We wanted to understand the role that MPAs and different habitats have in supporting fisheries. So we looked at data from fisheries in Jersey and France. We found that subtidal sediments were the most valuable habitats. Yet they were the least protected by MPAs. We also found that different species were protected to varying degrees depending on the habitats they relied on. It will be important to consider species habitat use when designing management plans for fisheries in the future.

Introduction

Marine **ecosystems** are very valuable. People depend on them for food and recreation. Marine ecosystems even help people make money through tourism and commercial **fisheries**. They can also provide protection from storms and help stabilize the shoreline. The things that healthy ecosystems do for us are called **ecosystem services**. It is important that we **sustainably** manage marine ecosystems. That way we can maintain the ecosystem services they provide.

One way to help is to manage marine ecosystems by protecting them. **Marine Protected Areas (MPAs)** are places that have rules designed to keep ecosystems healthy. This could be by limiting fishing or banning harmful equipment. These rules often also target certain species or habitats. They help make commercial fisheries more sustainable and ensure that people have food and economic stability. Each MPA has different rules based on local concerns.

To make MPAs work, we need to understand the species that live there. Many species use different habitats at different points during their lives. Unfortunately, complete information about habitat use is rarely used when designing MPAs. We were curious about how well MPAs protected habitats that were important to fishery species. We also wanted to know how valuable those habitats were.



Bottom-towed fishing gear drags nets and weights along the seafloor. It can damage habitats and kill unintended organisms.
Photo: Seafood Watch

Luckily, we found a good case study to help us answer our questions. Jersey (a self-governing dependency of the UK) and France share **fishing grounds**. There are a variety of habitats in the area. There are also multiple MPAs within the fishing grounds (making up 6.5% of the area). **Bottom-towed fishing** gear is prohibited in the MPAs because it can destroy bottom habitats. It can also disrupt or kill species that live there. The information we gained will help us design better sustainable management plans for the future.

Methods

We looked at four years of data from fisheries in both Jersey and France (Fig.1). We focused on the five most valuable species that were caught. These include: lobster, brown crab, spider crab, scallop, and whelk. We calculated the mean annual profit of each country for their catch as a whole, as well as for each species separately. This is called the **landings value**.

Next, we figured out what different habitat types were in the fishing grounds. We divided the habitats into five categories: **intertidal**, **subtidal hard substrate**, **subtidal sediment**, **seagrass**, and **maerl**.

We looked at previous research to learn about the habitats our species used. We found information about **spawning** areas, nursery areas, and feeding areas. Then we took our landings value for each species and divided it evenly across the habitats that were used. With this information we calculated two things:

1. The landings value of the fishery as a whole that comes from each habitat.
2. The overall landings value of each habitat (as a percentage) that was protected within MPAs.

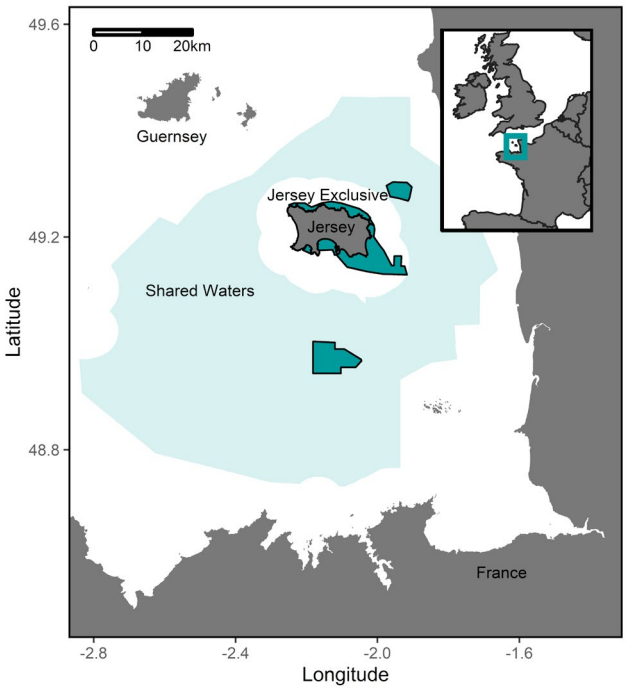


Figure 1:
The location of Jersey in the Normano-Breton Gulf between the UK and France. The shaded areas show shared fishing grounds. The smaller green areas show the locations of the three MPAs that prohibit bottom-towed fishing gear.

Results

We found that the mean annual landings value for Jersey and France was £14,664,729 ($18,119,226). Jersey's most valuable fishery species was lobster. In contrast, France's most valuable fishery species were whelk, spider crab, and scallop.

We saw that habitat use varied among species, and all habitats were used by multiple species. We found that:

- The subtidal sediment had the highest value. But only 2.73% was protected by MPAs (Fig. 2).
- The seagrass and intertidal areas had the lowest values. Yet they were highly protected by MPAs (97% – seagrass; 88% – intertidal).
- 42.29% of the landings value for lobsters came from habitats protected by MPAs. In contrast, only 8.75% of the landings value for scallops and 8.8% of the landings value for whelks came from habitats in protected areas.

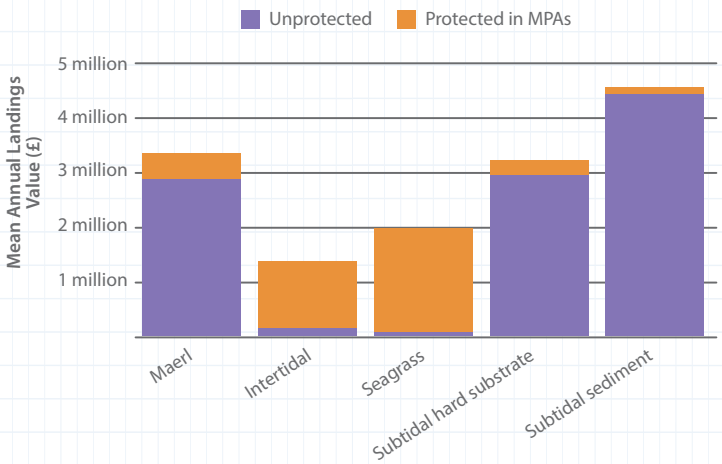


Figure 2:
Landings value for each habitat type in Jersey and France.

Which habitat is the most valuable? The least?

Discussion

Habitat use needs to be a consideration in fishery management plans. Many habitats contribute to the landings value of fishery species. Species use different habitats over their lifetimes. They may not be able to switch habitats if one gets destroyed.

Subtidal sediment was the most valuable habitat in our study, but it was the least protected. Both Jersey and France use bottom-towed fishing gear to catch scallops in subtidal sediment. The same habitat supports lobster in its early life cycle, which is a more valuable species for Jersey fisheries.

Any future management plan needs to consider both Jersey's and France's fisheries. It will also need to balance potential habitat destruction and commercial profit to be sustainable.

Unfortunately, a lot of MPAs do not protect all habitats equally from harmful fishing practices. It could be helpful to have MPAs with lots of habitat types that restrict bottom-towed fishing gear. This would help maintain **biodiversity**, habitat connectivity, and value for fisheries. It could also add economic value to activities such as recreational fishing, diving, and tourism.

Conclusion

Healthy marine ecosystems provide food, tourism opportunities, and protection from storms. We can help marine ecosystems by protecting them from harmful practices.

- If you eat fish, make sure it is sustainably caught. You can find more information from MCS Good Fish Guide and Seafood Watch.
- See how you can get involved in nearby ocean protection organizations.
- You can also contact your local representatives about new MPAs or protected areas near you.

Check your understanding

1. What are ecosystem services? Give four examples of ecosystem services that marine ecosystems provide.

2. Why is bottom-towed fishing gear bad for the environment? What other fishing practices could be bad for the environment?

3. Maerl and subtidal sediment are important habitats for scallops. There is 56.70 km^2 of maerl and 1440 km^2 of subtidal sediment in the shared fishing grounds. Only 8.38 km^2 of maerl and 39.25 km^2 of subtidal sediment are protected within the MPAs. What percentage of maerl is protected by the MPAs from bottom-towed fishing gear? What percentage of subtidal sediment? Which habitat receives more protection from MPAs?

4. What is an MPA? Do you think the MPAs in our case study were beneficial to the fisheries? Justify your answer.

Glossary of Key Terms

Biodiversity – the variety of life or the number of different species in an area.

Bottom-towed fishing gear – a fishing practice that captures species by towing a net along the seafloor. Weights are used to make sure the net stays at the bottom. The gear can damage or destroy seafloor habitats.

Ecosystem – a group of organisms that interact with each other and with their physical environment.

Ecosystem services – the goods and services that are provided by the natural environment. They are important to environmental and human health. For example, ecosystems can provide food and clean water. They can help regulate disease and the climate. They can also help protect human investments like shoreline property.

Fishery – an area where fish are caught for commercial or recreational purposes. It can either be a defined body of water or a collection of fishing activity that has been agreed upon by countries and fishers.

Fishing grounds – an area in a body of water where fishing is usually good. These areas can be legally defined or they can be known informally by fishers.

Intertidal – the habitat that is exposed to air when the tide goes out and is covered by water when the tide comes in.

Landings value – the amount of money that can be earned for the fish that are brought to port to be sold. The value can change based on the market value for fishery species.

Maerl – a hard coralline algae that forms spiky beds along the seafloor.

Marine Protected Area (MPA) – an area of the ocean where the government has placed limits on human activity. Some MPAs can be highly protected and no organisms may be taken or destroyed. Other MPAs can protect certain species or certain habitats or prohibit certain practices like types of fishing.

Seagrass – a flowering plant that has adapted to grow on the seafloor, forming dense meadows.

Spawn – the release or deposit of eggs into water by aquatic animals.

Subtidal sediment – habitats that are always covered in water and are not hard. They consist of things like soft sands and muds that can be burrowed into.

Subtidal hard substrate – habitats that are always covered in water and are hard. They consist of things like rocks and boulders.

Sustainably – doing things in a way that allows people to coexist with nature over long periods of time. Sustainable practices ensure there is a balance between economic growth, environmental care, and social well-being.

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