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How can we protect the seabed from storms?

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Abstract

Have you seen any unusual weather recently? One of the changes we may see because of climate change is more severe storms in the UK. When storms hit the coastline, they create strong waves. This really shakes up the organisms living on the seabed. But do methods of fishing also make a difference? Some areas of the sea are protected from destructive fishing methods. These areas are called Marine Protected Areas. We wanted to find out if the organisms in these areas are better at facing and recovering from severe storms than fished areas.

Introduction

Humans have been burning **fossil fuels** for energy. This releases carbon dioxide gas in our atmosphere. As a result, we're starting to feel the effects of **climate change**. One of those effects is more extreme weather, including severe storms. These can create big waves that affect **organisms** living on the seabed.

Marine Protected Areas, or MPAs for short, cover about 7.4% of our oceans. Some are feature-based. This means they're protecting just one **species** (like the great scallop), or one habitat (such as a **temperate reef**). Others offer whole-site protection. This means all parts of the area are protected from destructive fishing.

One of the most destructive fishing methods is called **bottom-towed fishing**. This is effective at catching lots of fish for people to eat. But it also causes a lot of damage as the wide nets drag along the seafloor. The nets destroy other species as well as the fish they are meant to catch. Even when these fished areas become protected, it takes a while for all the corals, seaweeds and animals to recover. Storms disturb the areas, making recovery slower.

What will happen to the UK's seabed creatures and habitats if there are more storms? It's important that we find out. Habitats like temperate reefs have many important functions. For example, they give young fish a safe home to grow bigger. They also help take carbon dioxide gas from our atmosphere so we can breathe better.

A

B

Bottom-towed fishing causes a lot of damage to the seabed. Compare image A of a healthy seabed in an MPA to image B of a UK seabed after bottom-towed fishing. **Photos:** Marine Scotland (A) and The Marine Conservation Society (B).

Methods

Our study took place in Lyme Bay, in the southwest of the UK. The MPA there is 206 km^2 (80 square miles). It's one of the UK's largest protected marine areas. Destructive bottom-towed fishing was banned there in 2008.

We gathered three types of data both inside the MPA and outside it, where bottom-towed fishing is still allowed.

1. Wave power. We gathered wave data using floating **buoys** near the protected areas. We observed wave height and the time between waves once they reached the same height. Then we calculated wave energy and power to see storm impacts on the coastal reef.

2. Samples from the seabed. We monitored the areas from 2008 to 2018 using underwater video cameras. We counted and identified both organisms that move and those that don't.

3. Data analysis. We looked at what species of organisms there were in different locations, and how many there were. This way, we could find out if there were fewer of them after the storms. We did this to see if protecting an area from fishing helps it deal better with storms.

Results

What did we learn from monitoring inside and outside the MPA? The wave power data shows us that storms were at their most extreme between 2013 and 2014. The waves crumbled corals, emptied scallops and left fish floundering! The effects of the storms on the reef communities seemed pretty devastating (Figure 1). But the protected area was able to recover from storm damage. After all, it had recovered from destructive fishing before. Bottom-towed fishing still happened outside the MPA. So, the community of organisms was already less diverse. This meant recovery from storms wasn't as noticeable: the unprotected areas remained in a degraded state. Overall, these results suggest that **resilience** to storms is higher in protected areas.

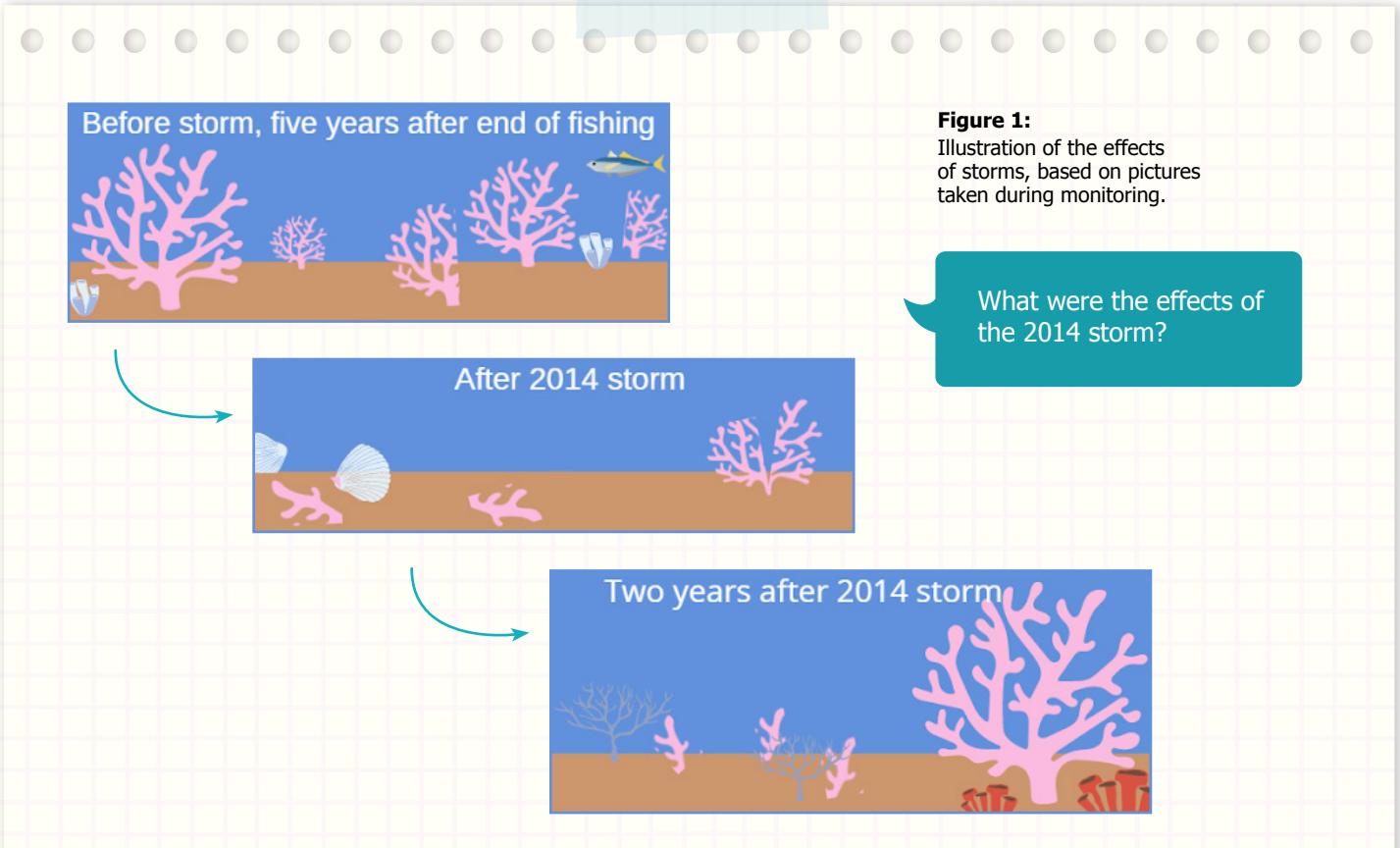

Figure 1:
Illustration of the effects of storms, based on pictures taken during monitoring.

Discussion

Why is resilience against extreme storms higher in protected areas? Areas with more species and organisms have the potential to recover faster and better after extreme storms than heavily fished areas.

But this doesn't mean the MPA had more **resistance** to storms than fished areas. It suffered damage from the storms, too. In fact, since the MPA has more species than fished areas, the losses were often greater. The waves really damaged some species, such as the rare pink sea fan coral. But the storms actually helped others, like the hermit crab. Shifting sands revealed more food for hermit crabs to eat.

So, although the MPA didn't have better resistance, it did have better resilience. It was more able to recover from the storm than the heavily fished area.

Conclusion

We need more research to understand how increasingly severe storms affect our temperate reefs. We also still don't fully know the extent of the threats posed by climate change in the future.

Because there are so many humans on this planet now, small actions can really add up. Here are some things you can do to help:

- Use less plastic! Choose products packaged in recyclable or biodegradable material and use reusable containers whenever you can.
- Pick fish products with labels showing that they were sustainably caught.
- Join in with fun eco-events like beach cleans.

Glossary of Key Terms

Bottom-towed fishing - a method of catching fish by dragging dredges and nets along the seabed.

Buoys - an anchored floating device that looks a bit like a balloon.

Climate change - a change in climate patterns attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Fossil fuels - an energy-dense material, such as coal or oil, that comes from organisms that have been dead and buried for millions of years.

Marine Protected Area, MPA - an area of the ocean with rules that limit the amount and type of fishing that can happen there. This helps the sea creatures in that area to recover.

Organism - an individual life-form, such as a pink sea fan.

Resilience - the capacity to recover quickly from difficulty.

Resistance - the ability not to be affected by difficulty.

Species - a group of similar organisms, such as dogs or cats.

Temperate reef - marine systems in cool waters with a hard, rocky bottom.

Pink sea fan.
Photo: Paul Kay, Defra

Check your understanding

1. Why is bottom-towed fishing harmful?

2. Can you explain the difference between resilience and resistance?

3. Temperate reefs are an important habitat due to their vital functions such as providing safety to young fish. Can you think of any other habitat in nature which is important to the organisms around it? Why is it important? Could it be under threat?

4. Besides using less plastic, choosing sustainable fish products, and helping with beach cleans, can you think of other choices you could make to help protect the environment?

5. Aside from an increase in the number of storms, can you think of any other effects of climate change that we may face in the future? If you can't think of any, discuss this with a partner or have a look online.

REFERENCES

Emma Sheehan, Luke Holmes, Bede Davies, Amy Cartwright, Adam Rees, and Martin Attrill (2021) *Rewilding of Protected Areas Enhances Resilience of Marine Ecosystems to Extreme Climatic Events.* Frontiers in Marine Science.
https://www.frontiersin.org/articles/10.3389/fmars.2021.671427/full

Lyme Bay Fisheries & Conservation Reserve
https://www.lymebayreserve.co.uk/

Met Office: Effects of climate change.
https://www.metoffice.gov.uk/weather/climate-change/effects-of-climate-change

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