

# How can protecting lobsters be good for fishermen?



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## Abstract

Millions of animals, plants, and other organisms live in the ocean. Humans rely on marine *ecosystems* for seafood and other resources. **Fishing is important, but if fishermen are not careful, they can overfish and damage the ocean habitats with their fishing gear.** So, many people are working to protect the ocean.

However, sometimes people living closest to the ocean worry that protecting it might harm their jobs. Fishermen depend on the ocean's resources. If they are not allowed to continue fishing,

they will lose their jobs and cannot provide fish for people to eat. Our study shows this worry is not necessarily true. Protecting the marine environment can actually benefit fishermen, and therefore all of us.

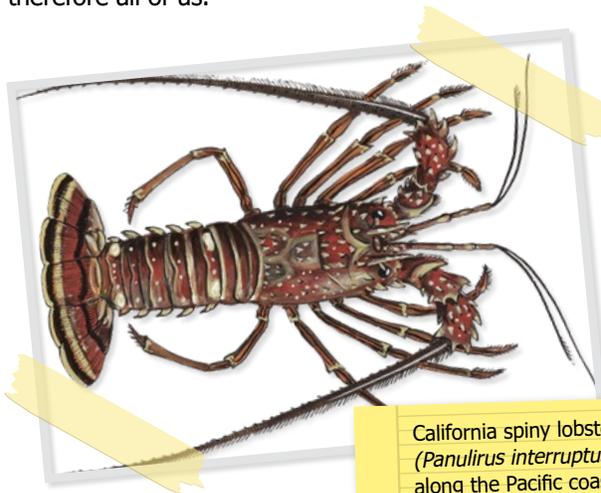
## Introduction

**One way to protect the ocean is to establish *Marine Protected Areas (MPAs)*.** In these areas fishing may be forbidden, allowing the animals there to flourish without human interference. MPAs are specifically created to enhance *biodiversity*.

But of course, establishing MPAs is easier said than done. Many people earn their income by fishing, and we all rely on fish to eat. Many worry that reducing the area where fishing is allowed could cost *fishers* (fishermen and women) their only income. *Fishery* managers must take that into account when deciding which areas should be protected.

But is this fear justified? Following the results of other studies, we thought that establishing MPAs could benefit fishermen in the area.

After all, if animals could reproduce without simultaneously being targeted for fishing, their population would increase. **At some point, too many individuals will be living in the same area and would compete for food and places to hide from their**



California spiny lobster (*Panulirus interruptus*) lives along the Pacific coast of the U.S. state of California and the Baja California peninsula.

predators. So some fish would leave the MPA and wander into adjacent fisheries to look for food and hiding places. We call this *spillover*. This means that fishermen would find more catch around the MPA than in other areas.

We designed an experiment to test this theory in the California spiny lobster fishery. **We wanted to see if protecting lobsters in certain zones would let them reproduce enough to positively affect the fishermen's catch in the surrounding areas.** Then, we compared the *biomass* of lobsters, lobster *landings*, and other measurements.

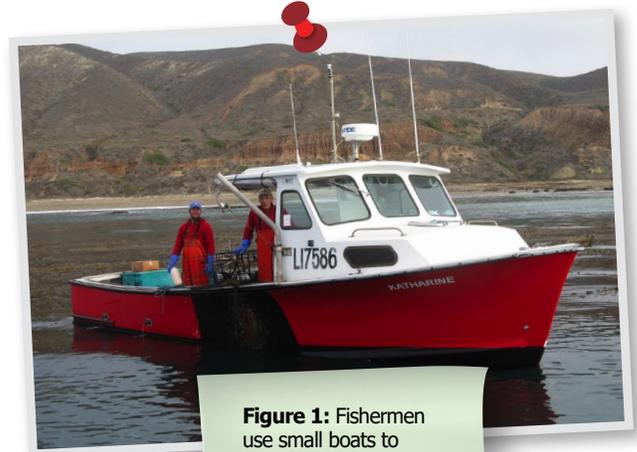
## Methods

The fishery managers split the fishery into four blocks and established two MPAs in one of them. Therefore, in one of the blocks, the fishing area was reduced by 35%. The three adjacent blocks were open for fishing as usual.

We gathered two types of data:

1. Fishermen's landing reports to the fishery. These include the number of lobsters they caught, how much they weighed, the number of traps they have pulled, and which block they were fishing in (Figure 1). These data were collected 6 years before and 6 years after the MPAs were established.
2. Scuba diver's reports. Once a year from 2012 (the beginning of the MPA) to 2018, we sent scuba divers into the four blocks right before the start of the fishing season. They used handheld lights to search the reef habitat for lobsters, count them, and estimate their size.

Then we compared data from the blocks with and without the MPAs. We wanted to see where the greatest catches occurred and if this changed over the years.

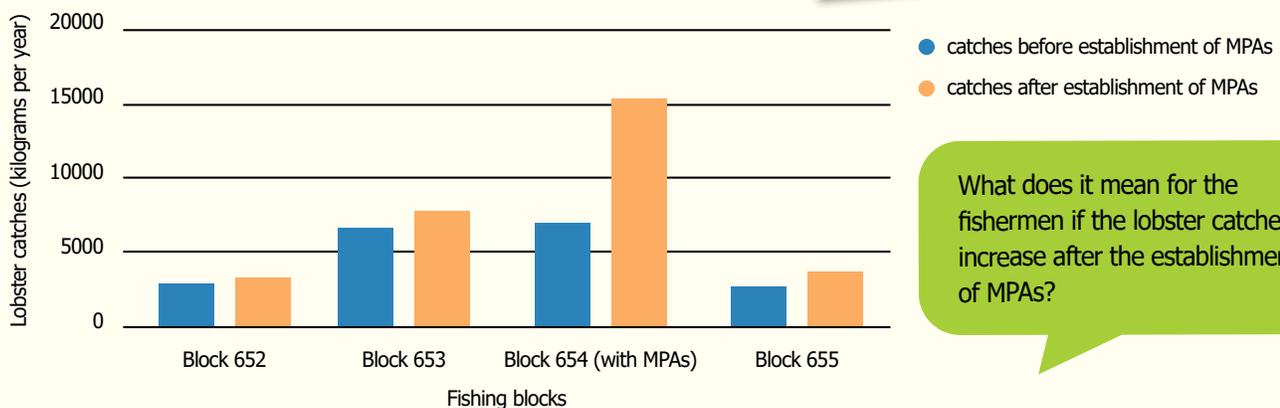


**Figure 1:** Fishermen use small boats to deploy lobster traps (wired boxes with bait inside). They are set on the bottom of shallow reef habitats where lobsters live.

## Results

We found that the catch of lobster in the fishermen's reports increased in all fishing blocks during the period after the MPAs were established compared to beforehand (Figure 2). The increase in the catch in the block with MPAs was three times higher than in the other blocks.

Exactly the same was true for lobster density counted by the scuba divers: it generally increased in all the blocks. The increase was three times higher in the block with the MPAs.



**Figure 2:** Lobster catches increased in all four blocks.

What does it mean for the fishermen if the lobster catches increase after the establishment of MPAs?

## Discussion

Our data showed that reducing the fishable area actually resulted in more lobsters being available for fishing. How? The answer is spillover! The best explanation for these results is that lobster abundance increased in the reserves where they were not fished for 6 years. Then lobsters spilled out of the MPAs to find food and hiding places. This allowed fishermen to make a greater catch.

**MPAs in fisheries allow us to hit two birds with one stone. They can protect marine ecosystems and increase fishermen's landings.**

This shows that MPAs do not necessarily harm fishermen, even though they lose fishable areas. Instead, they can make up the lost catch by harvesting the spillover.

Of course, we tested our theory only in one specific area, and we cannot say for sure that exactly the same will happen

in other places. However, other scientific studies have also revealed that spillover enhances fisheries. Most likely, the size of the effect depends on how heavily the area was fished before the establishment of MPAs. How much of the area is closed for fishing is also important.

It is also possible that other reasons, not just the lack of fishing, led to the lobster spillover. It could be that right outside the MPAs there are reefs with better habitats, causing more lobsters to leave the protected area. Therefore, exactly how MPAs are designed is very important for fishing and conservation purposes.

Still, it is clear that the introduction of no-fishing zones into this fishery was a win-win situation for both lobsters and fishermen.

## Conclusion

People sometimes worry that protecting our environment will mean an economic loss for humans. But this does not always have to be true. In some cases, it is exactly the opposite.

You could say that to protect marine life you should stop eating fish (even if you like the taste). This may be a good idea until

you start thinking about the fishermen who may lose their jobs. **So let's take the smarter route and find solutions that work for everyone: humans, plants, animals, and especially lobsters!**

## Glossary of Key Terms

**Biodiversity** – how many different species (bacteria, animals, plants, etc.) live in one specific area. High biodiversity means that lots of different species share this habitat.

**Biomass** – the summed mass of all lobsters that were observed in a specific area.

**Ecosystem** – a complex biological network of all life forms living in it (ranging from things as little as viruses or bacteria up to plants and animals) that somehow interact with each other.

**Fishers** - a collective noun in place of "fishermen" reflecting that both men and women fish.

**Fishery** – a place where fish are raised and harvested for commercial purposes.

**Lobster landings** – the number and/or weight of all caught lobsters.

**Marine protected area (MPA)** – parts of the ocean established to protect marine natural environments, natural resources, and plant and animal life. There are different kinds of marine protected areas. In some MPAs, fishing is forbidden. In others, there may be a research facility that helps us to understand certain natural events or processes.

**Spillover** – If a lot of individuals of one species live in the same area (for example, because they were protected in that location) it might get too crowded for them. To find enough shelter and food, some individuals move from inside the MPA to the surrounding area.

### Acknowledgment:

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*Goggio Family Foundation*

## Check your understanding

1 In the block with the two MPAs, how much was the reduction in the size of the fishable area?

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2 What is a spillover and what are the possible causes?

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3 How are lobsters caught?

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4 Why is it sometimes hard to establish an MPA?

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5 Can you find out where MPAs along the Californian coast already exist?

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## REFERENCES

Hunter S. Lenihan, Jordan P. Gallagher, Joseph R. Peters, Adrian C. Stier, Jennifer K. K. Hofmeister & Daniel C. Reed (2021) *Evidence that Spillover from Marine Protected Areas Benefits the Spiny Lobster (*Panulirus interruptus*) Fishery in Southern California*. Nature Scientific Reports

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