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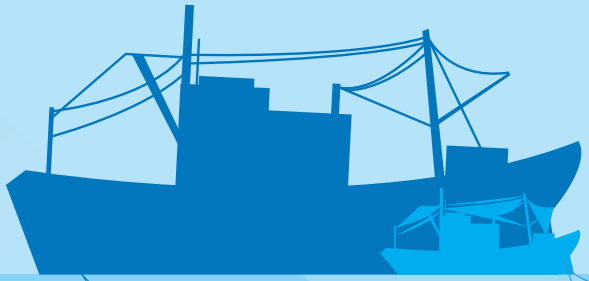
Counting the fish catch - why don't the numbers match?



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Abstract

Reading level: Upper elementary to middle school

Fish and marine animals like shrimp (we'll call them all fish here), are an important food source for many people in the world. They provide vital nutrients to people with poor diets.

There are various large and small-scale fisheries. Some people sell their catches, while others catch fish for their families to eat. In order to know the total amount caught, we need accurate data on all fisheries catches.

We carried out a data collection project to calculate total catches from all marine fisheries in the world from 1950 to 2010.

This made us realize that catches *peaked* at a much higher amount than the officially reported figures. It also showed us that they are now declining much faster than people thought.

We need to check on fisheries better so that we have more accurate data. This will help us to be able to make the right decisions to protect global fish stocks.

Introduction

In many *developing* countries, fish is the main animal protein available to rural people.

But the growing popularity of fish in *developed*, or *rapidly developing* countries, means that people want more fish than their own fish stocks can give them.

That means countries have to get more fish from other places. They either send their own fishing boats into the waters of developing countries, or buy fish from them.

This can make it hard for small-scale fisheries that sell to local communities in developing countries to compete against the larger, industrial fisheries selling internationally (Fig.1).

The Food and Agriculture Organization of the United Nations (FAO) receives annual catch data from its member countries. This is the only global data set of fisheries statistics. It gets used by scientists and agencies to create fishing policies.

Figure 1:
Industrial fishing boats often drag nets through the sea to catch fish

Unfortunately, many countries don't accurately report on their small-scale fisheries. In fact, there are several data sets that they may underestimate:

- Artisanal (small-scale, selling catch)
- Subsistence (small-scale, for the fishers' own consumption)
- Recreational (small-scale, for fun)
- Discards (accidental catch thrown back to sea)
- Illegal catches

(Fig. 2)

This means that FAO catch data may be much less than the actual fisheries catch. Although FAO and many scientists knew that they had underestimated the figures, nobody realized just how serious the problem was.

We tried to find the real figures of global marine fish catches.

Figure 2:
Artisanal fisheries like these can catch a lot of fish!

Methods

To calculate the total catch for all marine fisheries between 1950 and 2010 we used an approach called catch reconstruction. For each maritime area, we added up three layers of data:

Layer 1 - Domestic catch

These are catches taken by the boats of that country

We considered four sectors:

1) Industrial
2) Artisanal
3) Subsistence
4) Recreational

We assigned catches to either landings (fish that people keep and bring into land) or discards.

We used the FAO data as our starting point. We then added data from studies of scientific literature, speaking with local experts, and talking to the country's department of fisheries. These departments often had more detailed information than what the country sent to FAO!

When data was missing, we used catch estimates for a single area, sector or year to make our best guess for the country. We then joined the time periods between points.

To get the reconstructed catch, we added the additional "unreported" catch data to the reported catch data submitted to FAO.

Layer 2 - Catches from foreign fleets

These are catches taken by boats of one country in another country's waters.

Layer 3 - Tuna and other *pelagic* fish

We assigned catches to each area according to the data available.

Results

1) Global pattern

FFAO data suggest that global marine fisheries catches peaked in 1996 at 86mt (million tonnes), and then slightly *declined*. The FAO labels this as a *stable trend* in global catches.

We found that global catches between 1950 and 2010 were 50% higher than FAO data, and catch actually peaked at 130 mt. Catches are now declining over three times more rapidly than reported. (Fig. 3)

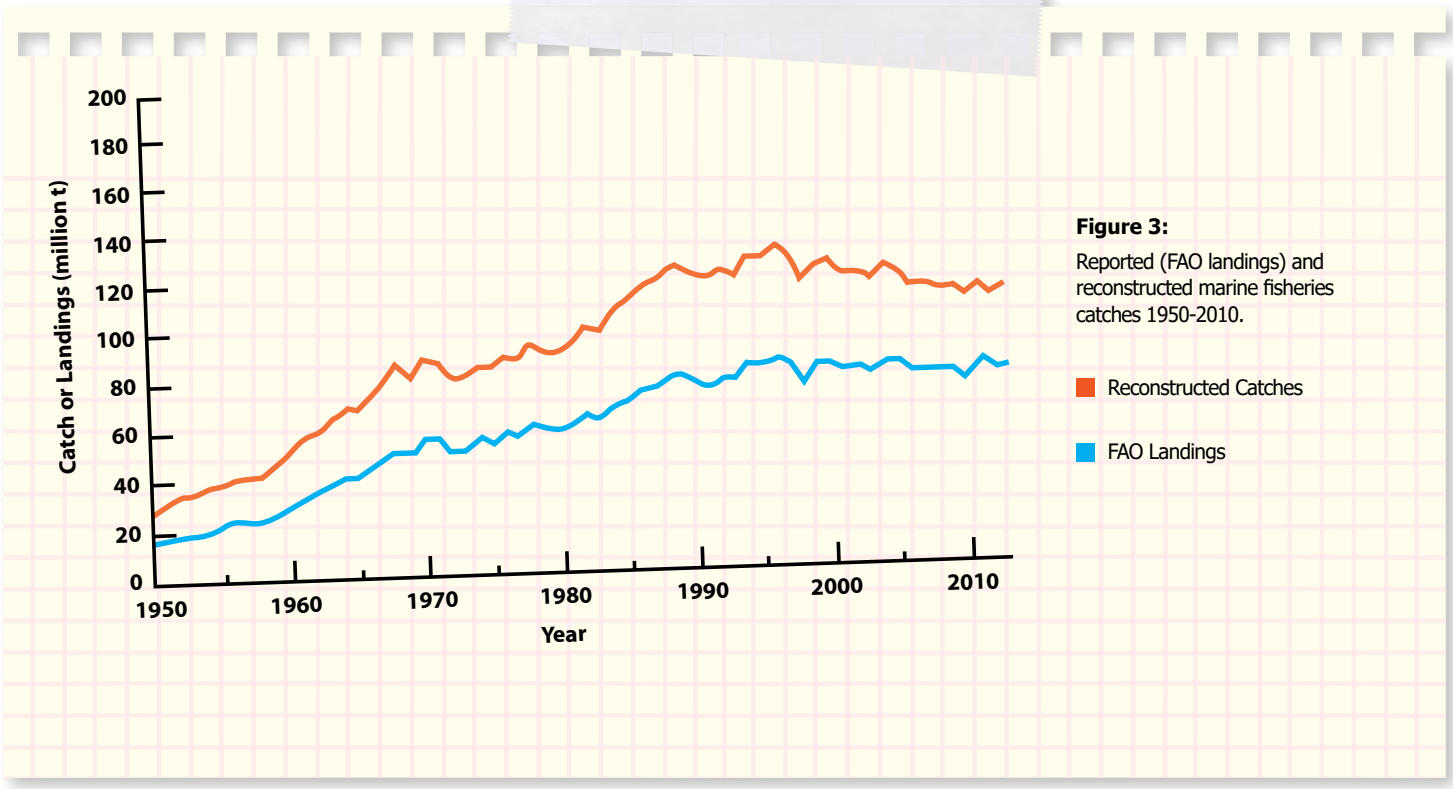

Figure 3:
Reported (FAO landings) and reconstructed marine fisheries catches 1950-2010.

2) Spatial pattern

We saw declining catches in some *maritime* areas, like the Northwest Atlantic. Other maritime areas like the Indian Ocean still show increasing reported catches, but we aren't as certain about these.

3) Fishing sector

Industrial fisheries catch has fallen from 87mt in 2000, to 73mt in 2010. This is the main cause of the global total decline in catches since 1996.

Artisanal fishing catches are growing little by little, from 8mt per year in the 1950s to 22mt in 2010.

Subsistence fisheries caught 3.8mt per year and recreational fisheries caught under 1mt per year. These catches are rarely reported to FAO.

Discards peaked in the late 1980s and have fallen to an average of 10.3mt per year from 2000 - 2010. This fall is one reason the global catches are lower.

Discussion

Industrial fisheries catches are falling, but it is hard to see because countries have started to include artisanal and other small-scale catches in their official catch data. This can make the trend look more stable than it is, when it is just because countries didn't always report these fisheries sectors before.

Our study showed that stock rebuilding is an important policy and more countries should do it in more areas. It also suggests that it could help even more than people thought it would.

Our reconstructed catch data study for all countries is the first of its kind. We hope it will help to create better policies to govern the world's fisheries. The first step should be for national policies to recognize how big the catches are from fisheries that they are not including in their official data collection systems. This could then help to improve their systems

Conclusion

The UN created the FAO database to help people make decisions to protect marine *ecosystems*. It is therefore really important that its data are accurate. However, we found that the trend of global marine fisheries catches is actually one of decline, while FAO suggests that it is stable. Our study shows that there is a need to improve the accuracy of this database.

At the end of any science experiment, you have to make your conclusions and recommendations. If you don't have good data from your experiment, your recommendations won't be very good either. So make sure that you're confident in your data!

Glossary of Key Terms

Developed country – A country that has a longer history of industry and is economically ahead of other countries. This includes the US and Canada, and countries in Europe.

Developing country – A country that doesn't have as much industry and is economically behind other countries.

Rapidly developing country – A country that has an economy that is growing very fast. Their people are getting richer fast, so usually they eat more meat and fish. We define Brazil, Russia, India and China as rapidly developing countries.

Decline – Go down or become smaller.

Ecosystem – A community of animals that interact with each other, and their physical environment.

Maritime – Related to the ocean.

Peak – The highest point, or to get to the highest point.

Pelagic fish – Fish that live in a part of the sea known as the Pelagic zone. This means that the fish live most of their lives away from land. You can also think of these as 'open ocean animals.

Stable trend – When the numbers aren't going up or down very much, but mostly staying the same.

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