

ACNA5001



OVERFISHING



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OUTLINE

1) WHAT IS OVERFISHING?

TRAGEDY OF THE COMMONS

ENVIRONMENTAL IMPACT OF FISHING

ACTIVITY: FINPRINT GAME

THE RISE OF AQUACULTURE

ACTIVITY: INTERPRETING GLOBAL FISHING WATCH

OUTLINE

1) WHAT IS OVERFISHING?

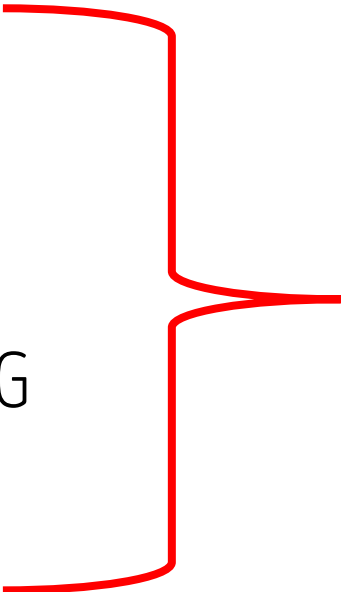
TRAGEDY OF THE COMMONS

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1hr

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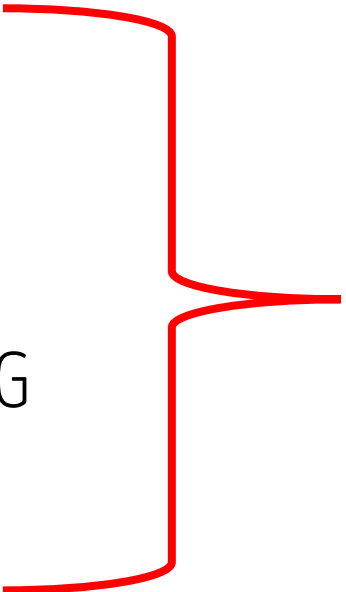
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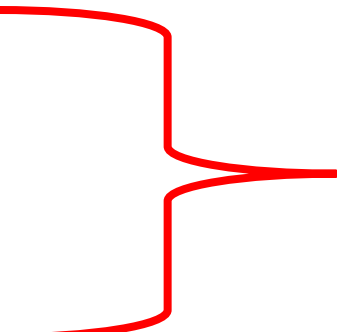
ACTIVITY: FINPRINT GAME

THE RISE OF AQUACULTURE

ACTIVITY: INTERPRETING GLOBAL FISHING WATCH



1hr



40mins

WHAT IS OVERFISHING?

Overfishing occurs when too many fish in a particular stock are caught and there are not enough adults to breed and sustain a healthy population.



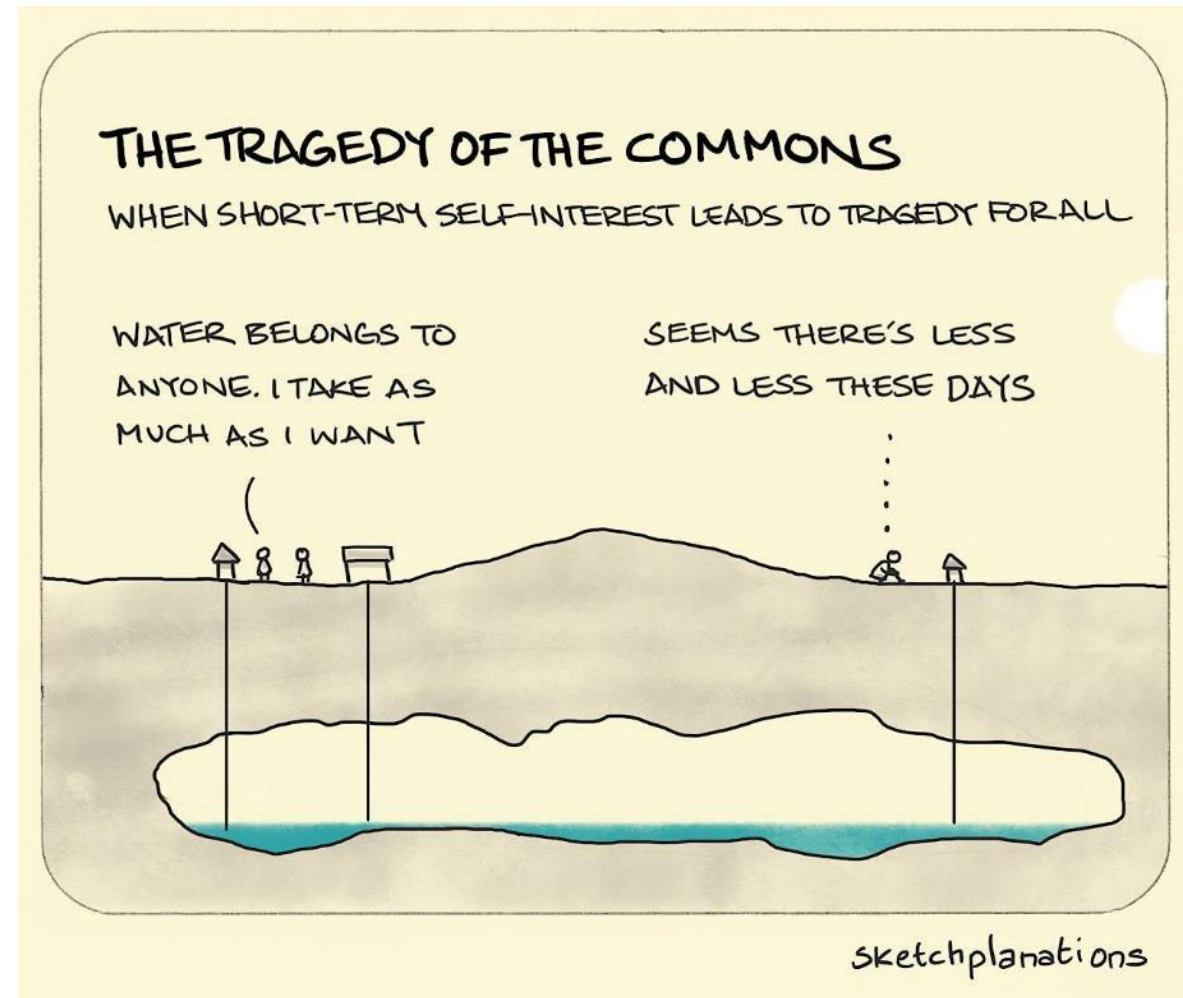
TRAGEDY OF THE COMMONS



TRAGEDY OF THE COMMONS

Fisheries provide the classic example of the tragedy of the commons, which occurs when property rights are incomplete and access to a resource is open.

The migratory nature of most fish species makes it difficult to establish and protect rights to fish in the sea, so the rule of capture prevails. The result is often overexploitation of the resource.



[The tragedy of the commons - Sketchplanations](#)

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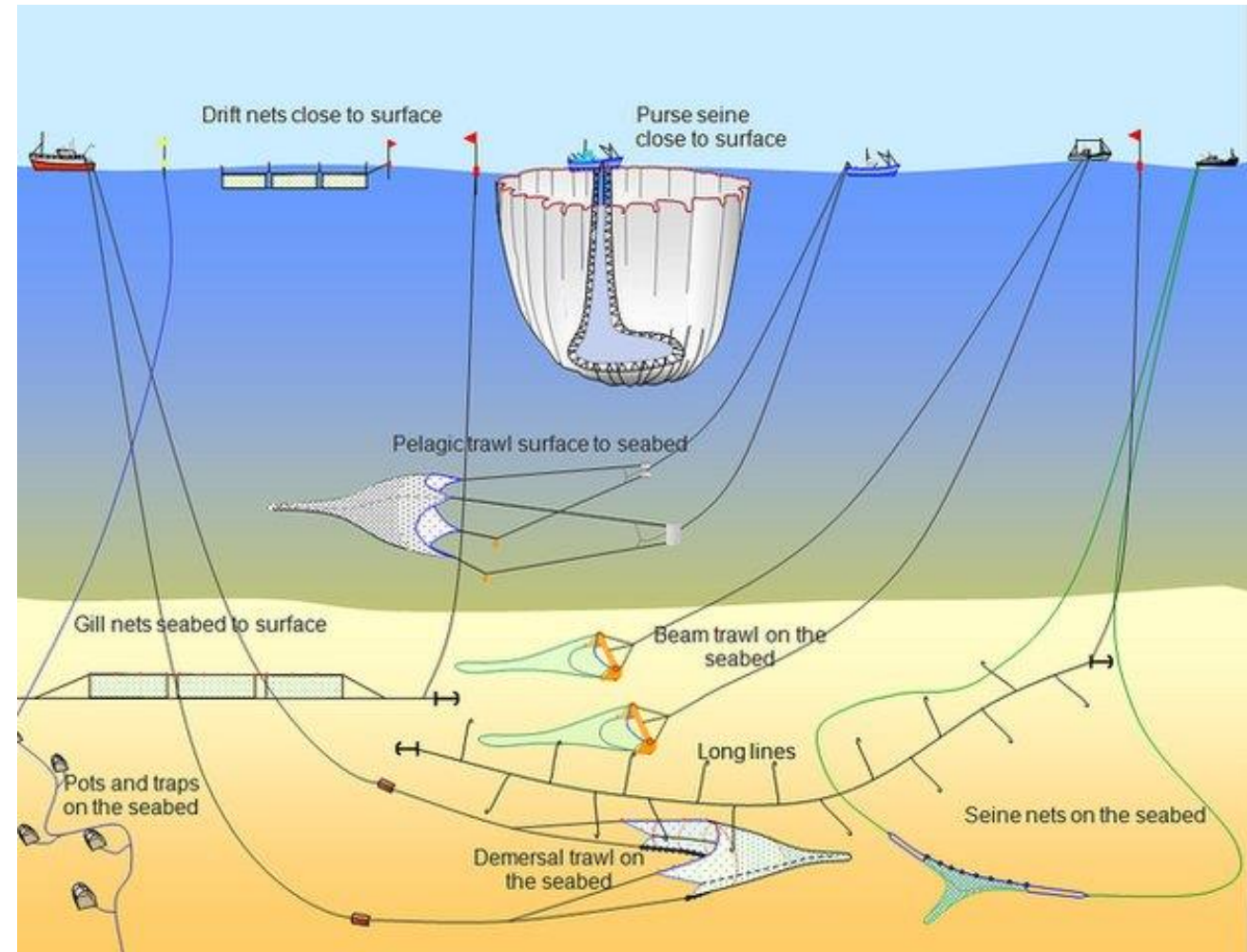
TRAGEDY OF THE COMMONS

In the mid-20th century, countries around the world worked to build their fishing capacities to ensure the availability and affordability of protein-rich foods. Favourable policies, loans, and subsidies spawned [a rapid rise of big industrial fishing operations](#), which quickly supplanted local fishers as the world's main source of seafood.



9

[The supertrawler just 14 miles off Brighton capable of landing 6,000 tonnes of fish | ITV News](#)



[What is Overfishing - Panic in the North Atlantic \(weebly.com\)](#)

[How overfishing threatens the world's oceans—and why it could end in catastrophe | National Geographic](#)

TRAGEDY OF THE COMMONS

These large, profit-seeking commercial fleets were aggressive, scouring the world's oceans and developing ever more sophisticated methods and technologies for finding, extracting, and processing their target species.

Consumers soon grew accustomed to having access to a wide selection of fish at affordable prices.

[How overfishing threatens the world's oceans—and why it could end in catastrophe | National Geographic](#)

[Global Fishing Fleets | Project Regeneration](#)



CAPTURE FISHERIES PRODUCTION 2016

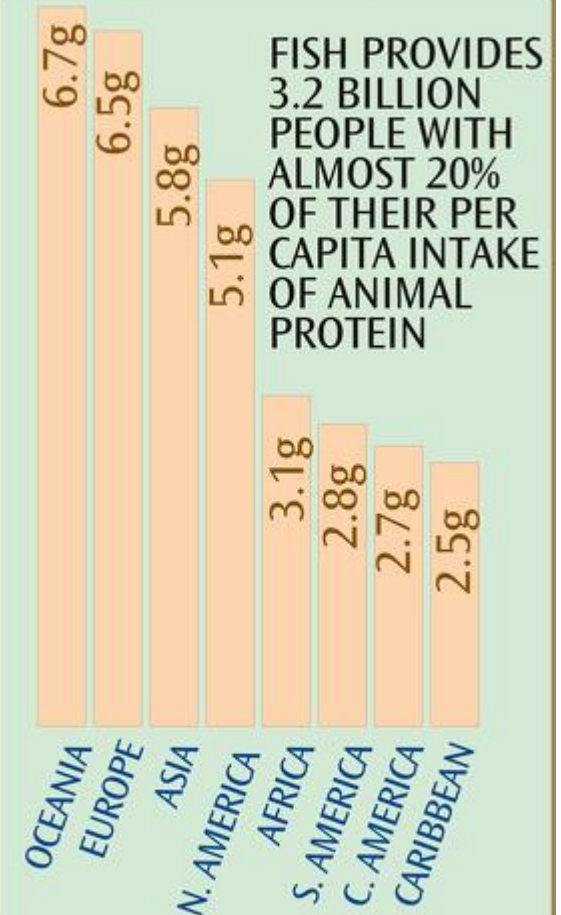
	COUNTRY	TONNES
1	CHINA	17,800,000
2	INDONESIA	6,584,419
3	INDIA	5,082,332
4	USA	4,931,017
5	RUSSIA	4,773,413
6	PERU	3,811,802
7	JAPAN	3,275,263
8	VIETNAM	2,785,940
9	NORWAY	2,203,360
10	MYANMAR	2,072,390
11	PHILLIPINES	2,027,992
12	CHILE	1,829,238

UN FAO Fishstat; data.worldbank.org/indicator

www.theglobaleducationproject.org

HUMAN FISH CONSUMPTION

GRAMS OF PROTEIN
PER CAPITA/DAY

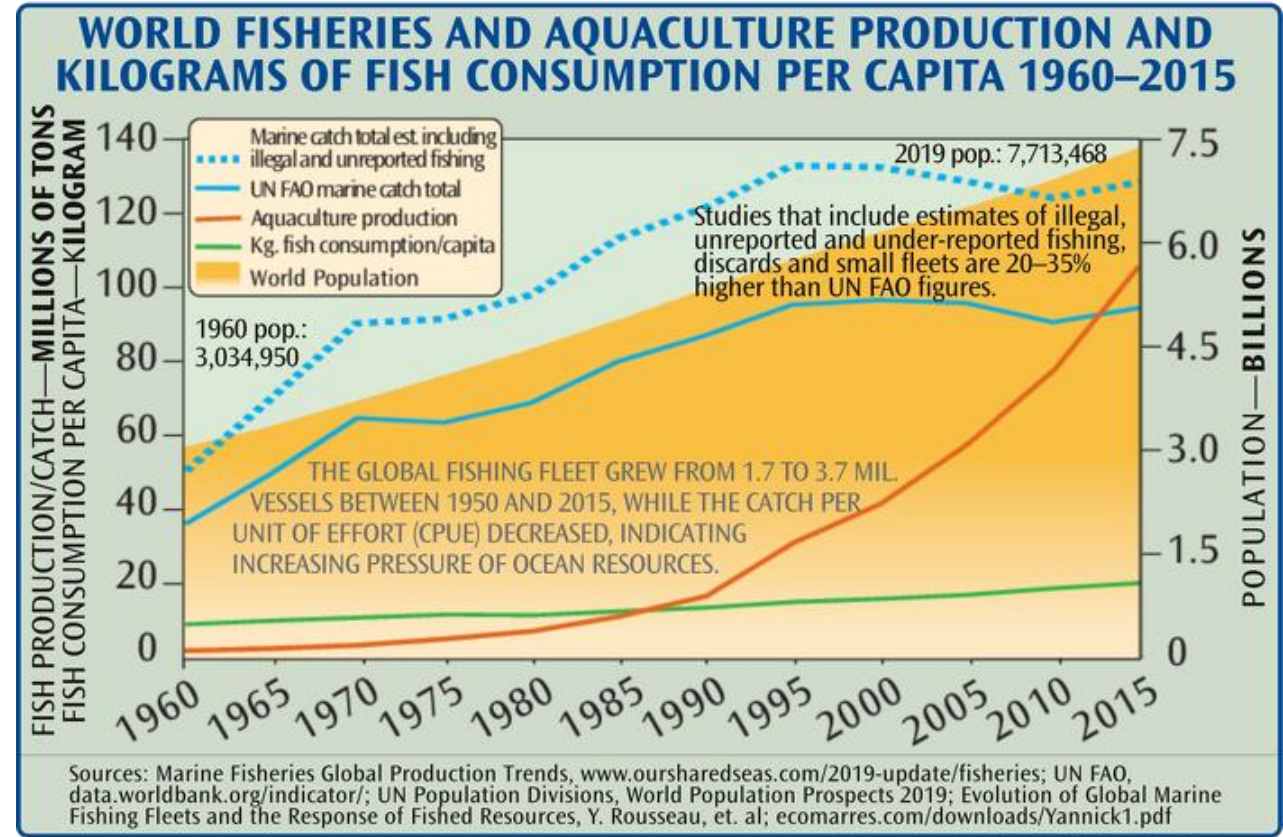


FAO Fisheries and Aquaculture, fao.org/fishery/statistics; State of Fisheries and Aquaculture 2018, www.fao.org/state-of-fisheries-aquaculture

www.theglobaleducationproject.org

TRAGEDY OF THE COMMONS

- But by 1989, when about 90 million tonnes (metric tons) of fish were taken from the ocean, **the industry had hit its high point**, and yields have declined or stagnated ever since.
- Fisheries for the most sought-after species, like orange roughy, Chilean sea bass, and bluefin tuna, have collapsed for lack of fish.
- In 2003, a scientific report estimated that industrial fishing had reduced the number of large ocean fish to just 10 percent of their pre-industrial population.



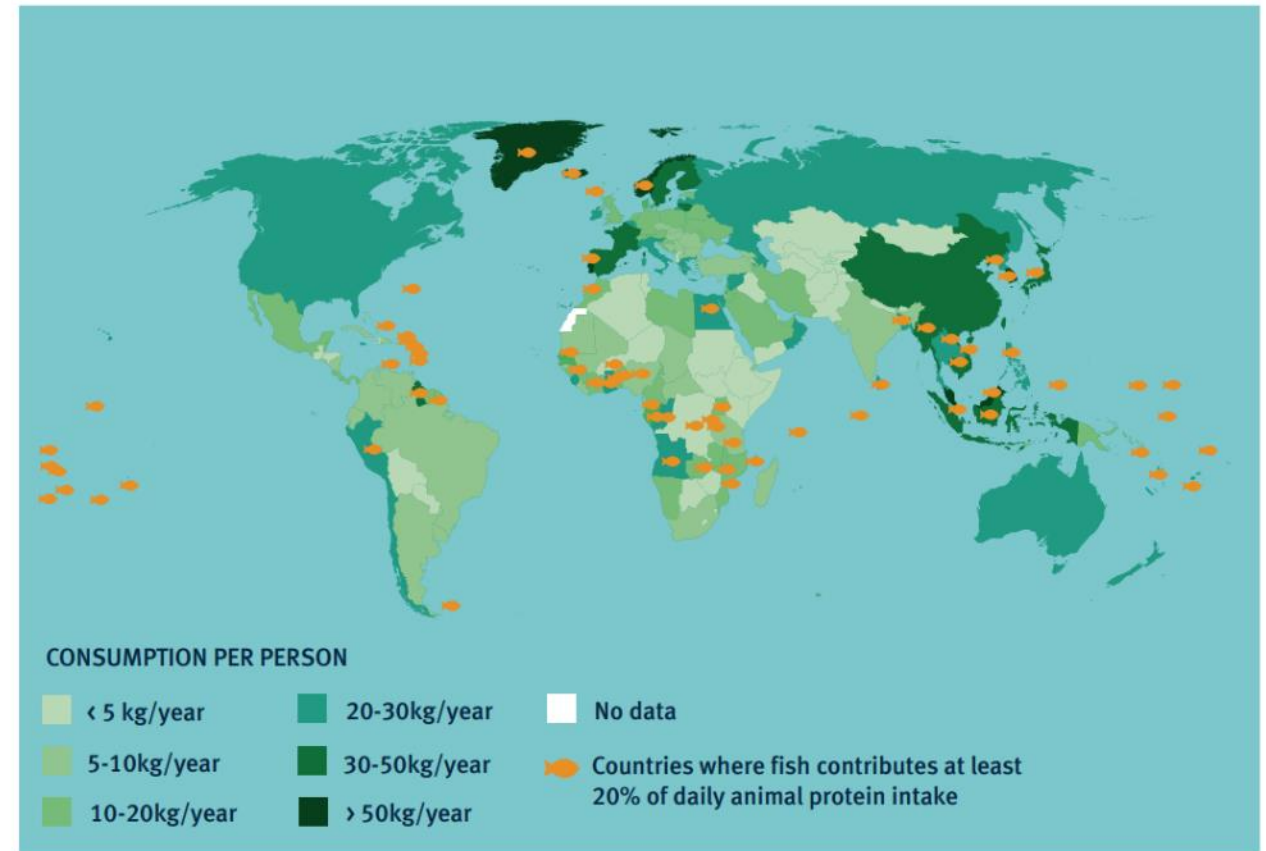
www.theglobaleducationproject.org
[Chart of Total World Fisheries and Aquaculture Production Per Capita \(theglobaleducationproject.org\)](http://www.theglobaleducationproject.org)

WHY OVERFISHING OCCURS



OVERFISHING

Global production of fish and seafood has quadrupled over the past 50 years. Not only has the world population more than doubled over this period, the average person now eats almost twice as much seafood as half a century ago. [Fish and Overfishing - Our World in Data](#)



WHAT ARE THE IMPACTS OF OVERFISHING?



STATUS OF STOCKS

Facts & Figures: The cold hard facts about overfishing - Fish Forward (WWF)



OF THE WORLD'S FISH STOCKS ARE
OVERFISHED



OF THE WORLD'S FISH STOCKS ARE FULLY
FISHED



OF THE WORLD'S FISH STOCKS ARE
UNDERFISHED

- Wild fish populations are declining.

In 1974, 90 percent of fish stocks were within biologically sustainable levels.

- Today, that figure has decreased to 66 percent. Left unchecked, overfishing can cause a fish population to collapse, meaning the population's abundance is less than 10 percent of the original amount.

Status of Stocks 2020 | NOAA Fisheries

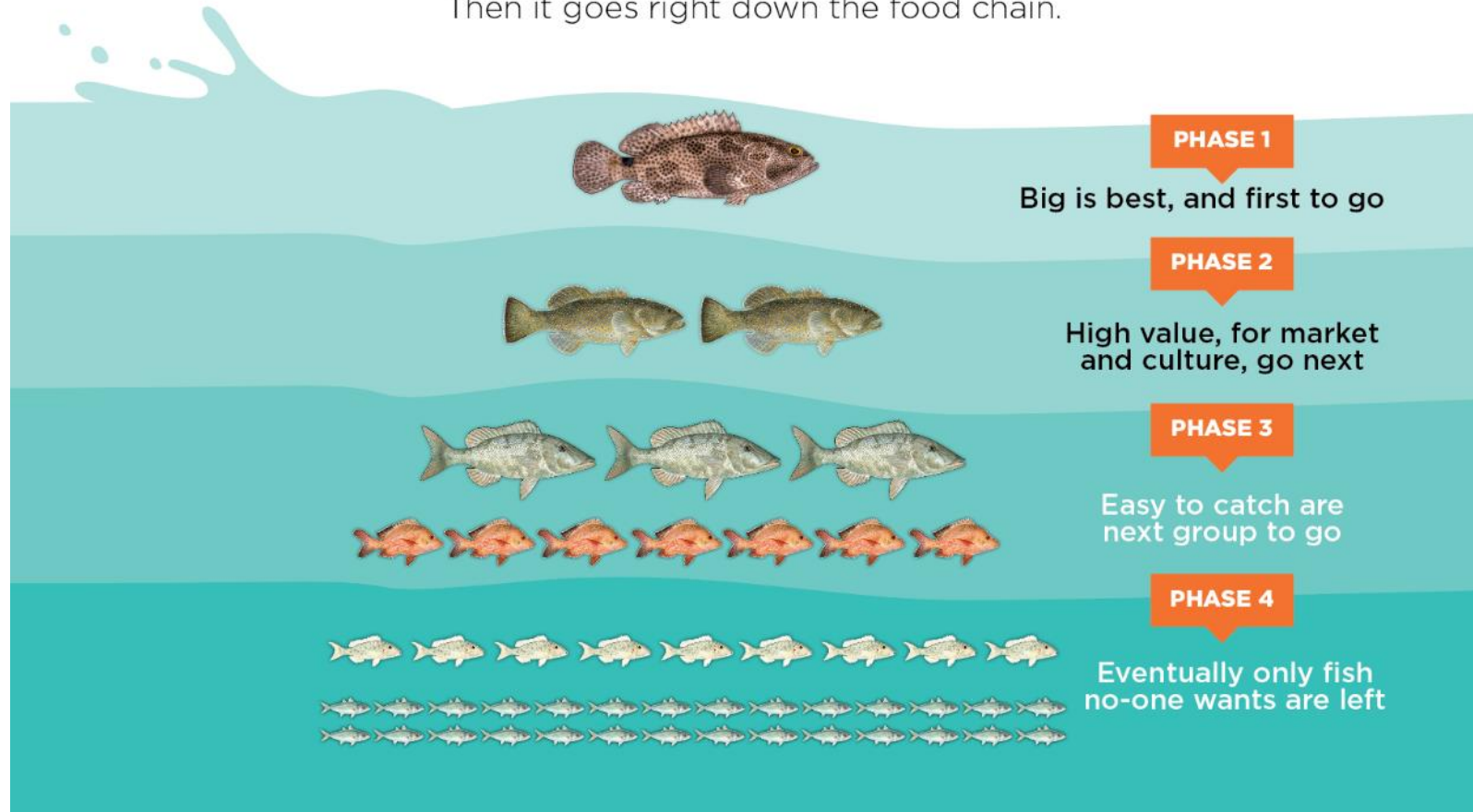
What Is Overfishing | Marine Stewardship Council (msc.org)

PHASES OF OVERFISHING

PHASES OF OVERFISHING

Overfishing typically happens in the same way everywhere.

First, the biggest, most valuable fish, disappear.
Then it goes right down the food chain.



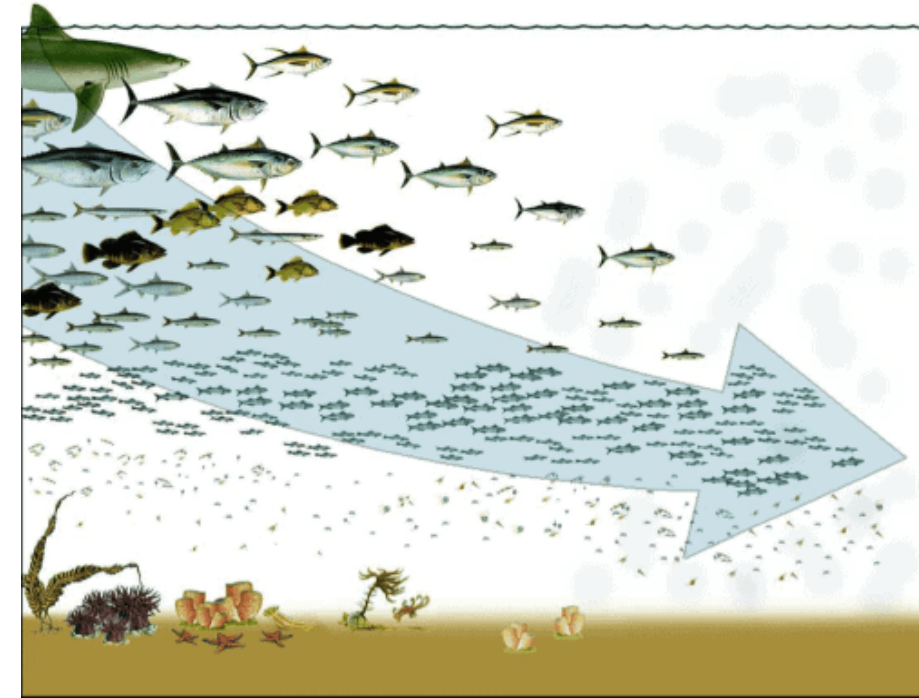
•Large fish are the first to go. Fish that are large, live a long time, and are slow to reproduce are among the most vulnerable to overfishing. These traits also make it hard to rebuild their populations once overfishing stops.

[What's for Dinner? — 4fjmovement.org](http://4fjmovement.org)

[Avoid overfishing | Seafood Watch](#)

FISHING DOWN THE FOOD WEB

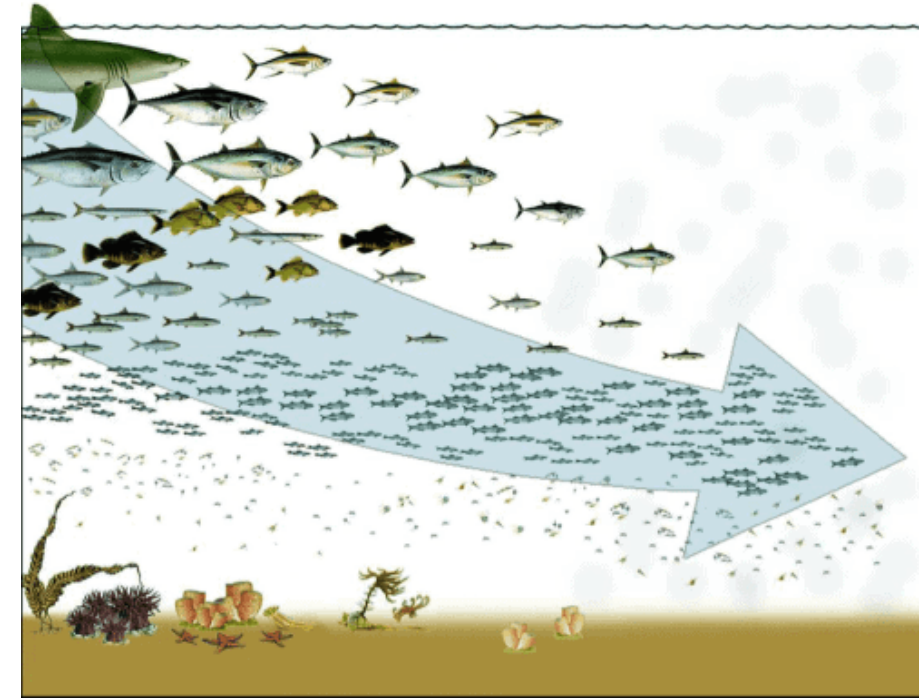
- **Fishing down the food web.** When the bigger fish are no longer plentiful, fishermen move on to smaller species, like sardines and anchovies.
- This phenomenon is known as “fishing down the food web.” These species are often important prey for other animals, and their removal can harm the entire food web.



[Fishing Down the Food Chain? - Sustainable Fisheries UW \(sustainablefisheries-uw.org\)](http://sustainablefisheries-uw.org)

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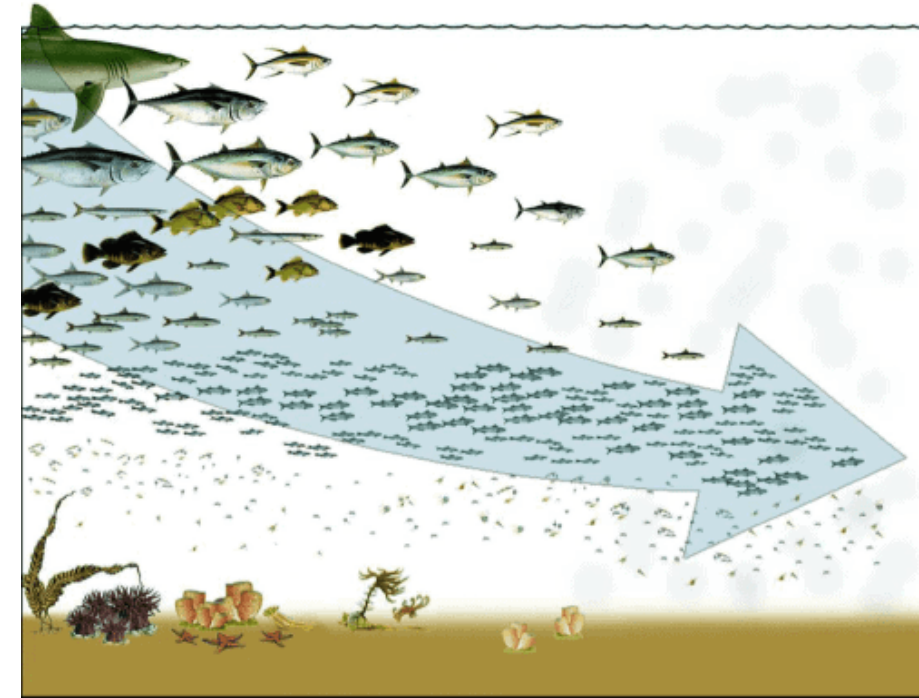
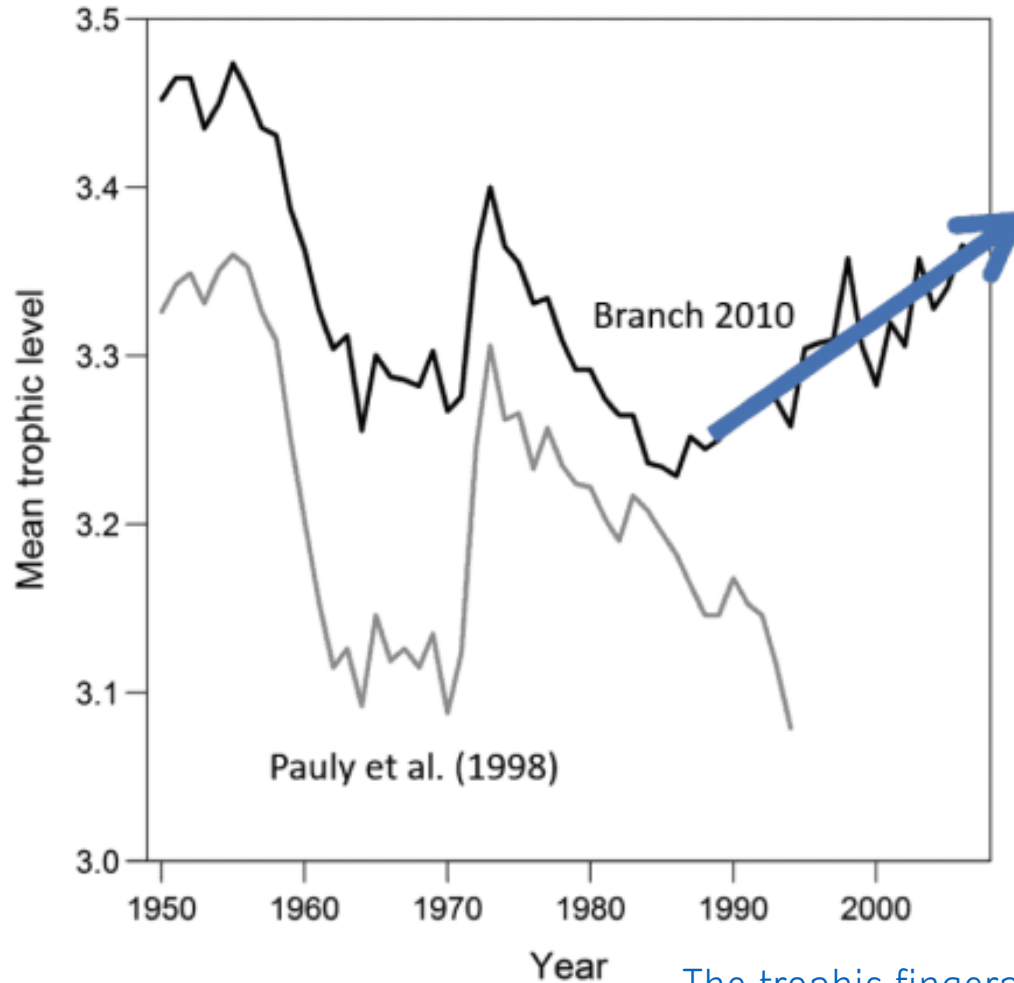


[Fishing Down the Food Chain? - Sustainable Fisheries UW \(sustainablefisheries-uw.org\)](http://sustainablefisheries-uw.org)

- But are we really fishing down the food web?

TROPHIC LEVELS?

Trophic levels = how high in the food chain a fish eats



Fishing Down the Food Chain? - Sustainable Fisheries UW (sustainablefisheries-uw.org)

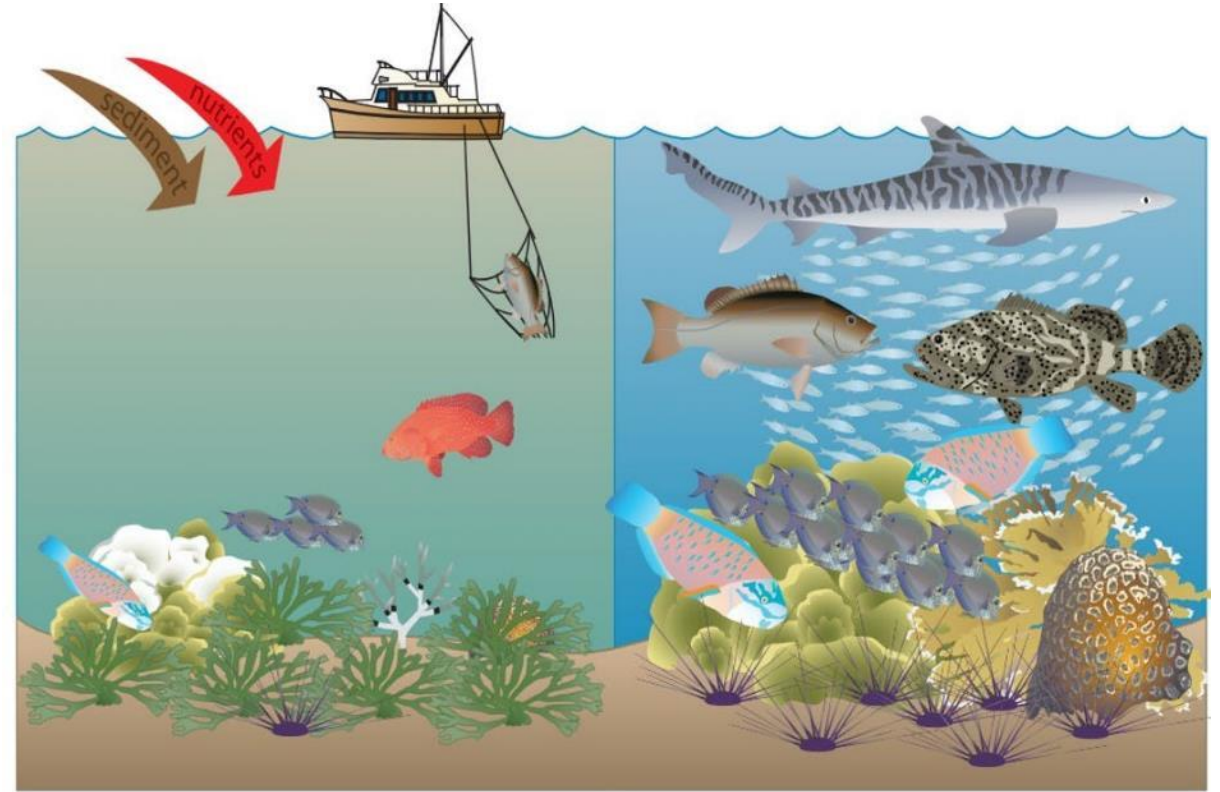
•But are we really fishing down the food web?

The trophic fingerprint of marine fisheries | Nature

Avoid overfishing | Seafood Watch

HARM TO ECOSYSTEMS

- **Harm to ecosystems.** Removing fish that play key or outsized roles in food webs also alters the larger dynamics of ocean ecosystems.
- For example, many fish eat the algae that keep coral reefs clean and thriving. In areas where these species have been overfished, the algae overgrow the reef, killing corals and negatively impacting the many species that call the reef home.



[Nutrient Pollution, Overfishing and a loss of Herbivorous species: Phase Shifts - Coral World Ocean Park \(coralworldvi.com\)](http://coralworldvi.com)



THREATS TO CORAL REEFS OVERFISHING

OVERFISHING

How does overfishing threaten coral reefs? (noaa.gov)

Coral reef fish are a significant food source for over a billion people worldwide. Many coastal and island communities depend on coral reef fisheries for their economic, social, and cultural benefits.

BUT too much of a good thing can be bad for coral reefs.



FISHING NURSERIES

Nearshore habitats serve as nurseries for many fish. Catching young fish in nets removes them before they can help replenish the population.

MARINE DEBRIS

Traps set too close to reefs and marine debris, such as ghost traps, lost nets, monofilament, and lines, can damage coral reefs, which take a long time to recover.

INDISCRIMINATE FISHING

Use of non-selective gears, like nets and traps, often removes more herbivorous fishes. These fish eat algae and help keep the ecosystem in balance.



FISHING SPAWNING AGGREGATIONS

Some species gather in large numbers at predictable times and locations to mate. Spawning aggregations are particularly vulnerable to overfishing.



FISHING TOO MANY BIG FISH

Large fish produce more young that are likely to survive to adulthood. Their absence means fish populations dwindle over time.



HOW YOU CAN HELP



Educate yourself on local fishing rules and regulations. Your state fishery agency or bait and tackle shop can help you learn more.



Make sustainable seafood choices. Learn more at www.FishWatch.gov.



Only take what you need. Catch and release fish that you don't plan to eat.



Be a responsible aquarium owner. Know where your fish come from and DO NOT release unwanted fish into the wild.

ECONOMIC AND SOCIAL COSTS

- **Economic and social costs.** The ocean's ecosystem and the food on our tables aren't the only things affected by overfishing.
- **Fisherfolk** find it increasingly difficult to make a living. For example, cod fishing had been a way of life for hundreds of years along the New England coast.
- Then in the early 1990s, overfishing drove the cod fishery to collapse when the population fell to one percent of its historical levels. Thousands of fishers and fish plant workers lost their jobs and livelihoods in the region — devastating the coastal economy.

ECONOMIC AND SOCIAL COSTS



ECONOMIC AND SOCIAL COSTS



THE RISE OF AQUACULTURE



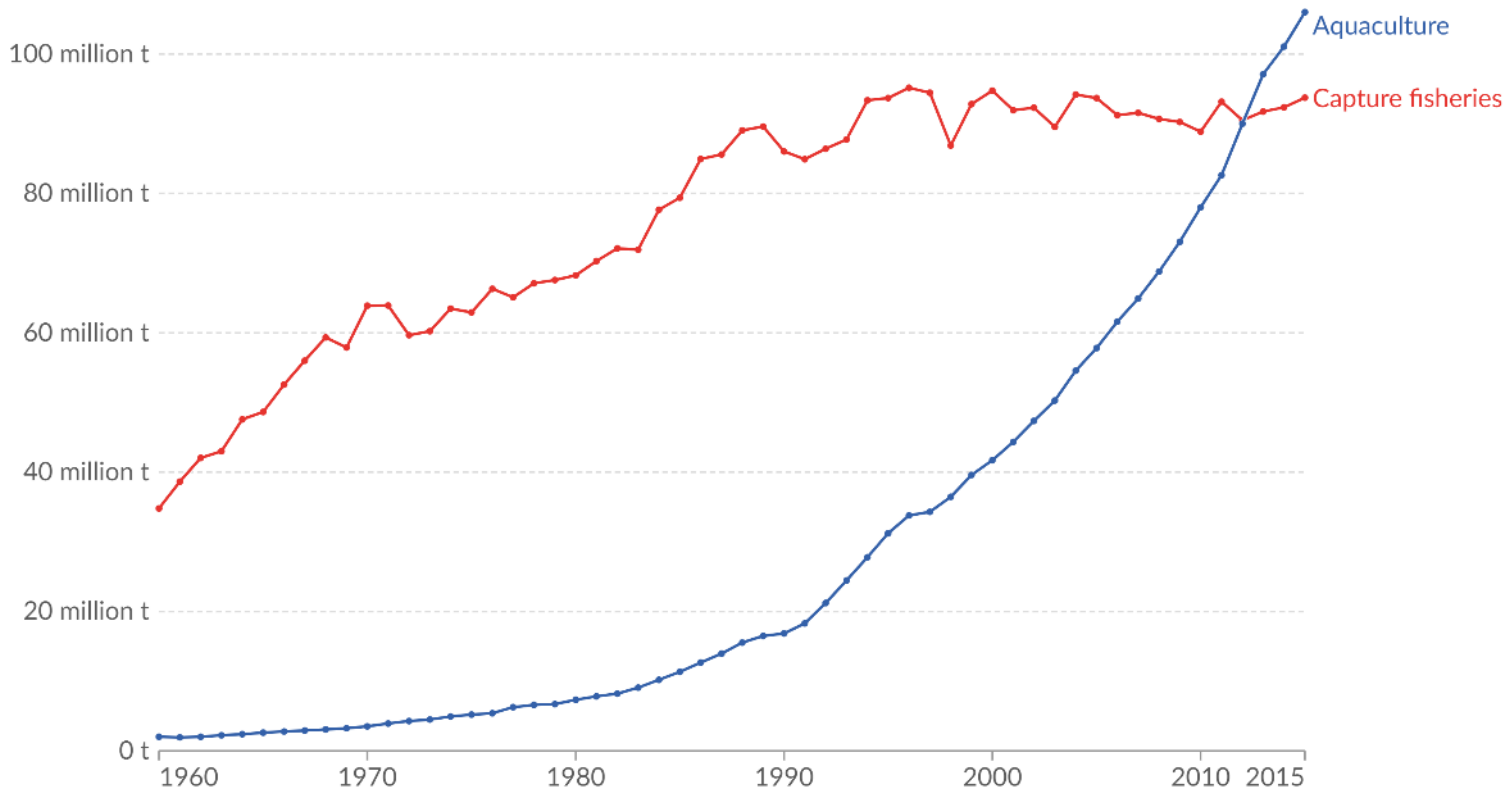
Aquaculture is breeding, raising, and harvesting fish, shellfish, and aquatic plants

SEAFOOD PRODUCTION: WILD FISH CATCH VS. AQUACULTURE

Seafood production: wild fish catch vs. aquaculture, World

Our World
in Data

Aquaculture is the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Capture fishery production is the volume of wild fish catches landed for all commercial, industrial, recreational and subsistence purposes.



Data source: Food and Agriculture Organization of the United Nations (via World Bank)
OurWorldInData.org/fish-and-overfishing | CC BY

[Fish and Overfishing - Our World in Data](https://OurWorldInData.org/fish-and-overfishing)

GREENHOUSE GAS IMPACT

OVERVIEW: THE AVERAGE GREENHOUSE GAS IMPACT OF 1 KG OF SEAFOOD

(in kilograms of CO₂ equivalents)

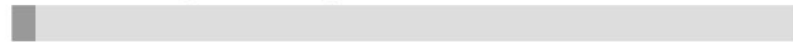
Potatoes: 0,1 kg CO₂e / kg



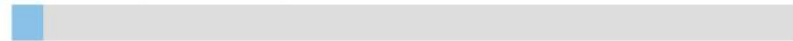
Small pelagics: 0,4 kg CO₂e / kg



Chicken: 2 kg CO₂e / kg



Carp: 3 kg CO₂e / kg



Salmon aquaculture: 4,7 kg CO₂e / kg



Shrimp bottom trawl: 34,8 kg CO₂e / kg



Beef (meadow systems): 38 kg CO₂e / kg



Sheep: 48 kg CO₂e / kg



300 km by car: 63 kg CO₂e / kg



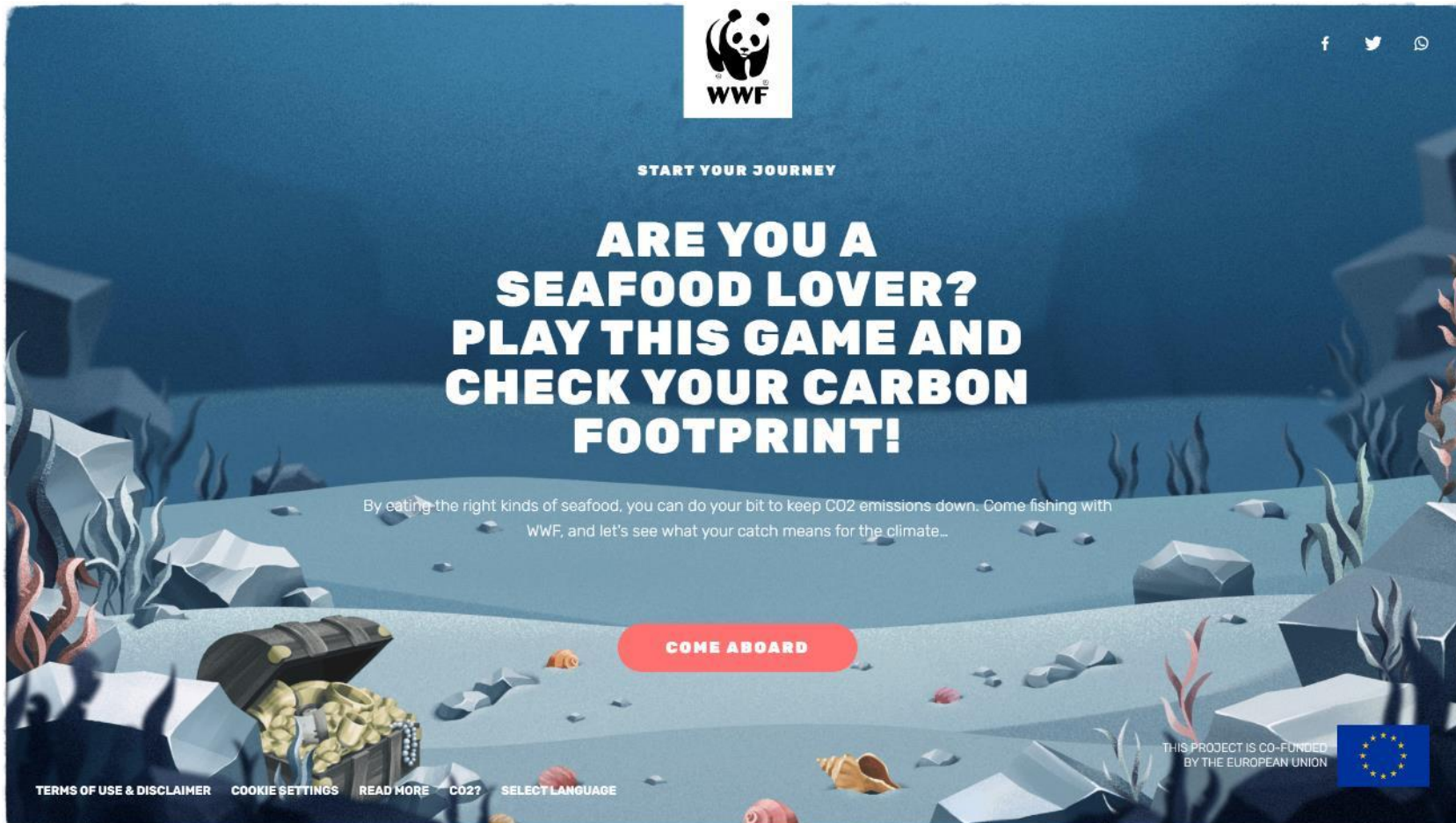
A **carbon dioxide equivalent** or CO₂ equivalent (CO₂e) is a metric measure that converts emissions from various greenhouse gases on the basis of their global warming potential to the equivalent amount of carbon dioxide with the same global warming potential.

[Fingerprint game - reduce your seafood carbon footprint - Fish Forward \(WWF\)](#)

ACTIVITY: FINPRINT GAME

Click on the following link and create some fishing scenarios. Try to identify fishing practices that have a high carbon footprint, and fishing practices that have a lower footprint.

[WWF Fingerprint Game \(wwf-fingerprint.org\)](https://www.wwf-fingerprint.org)



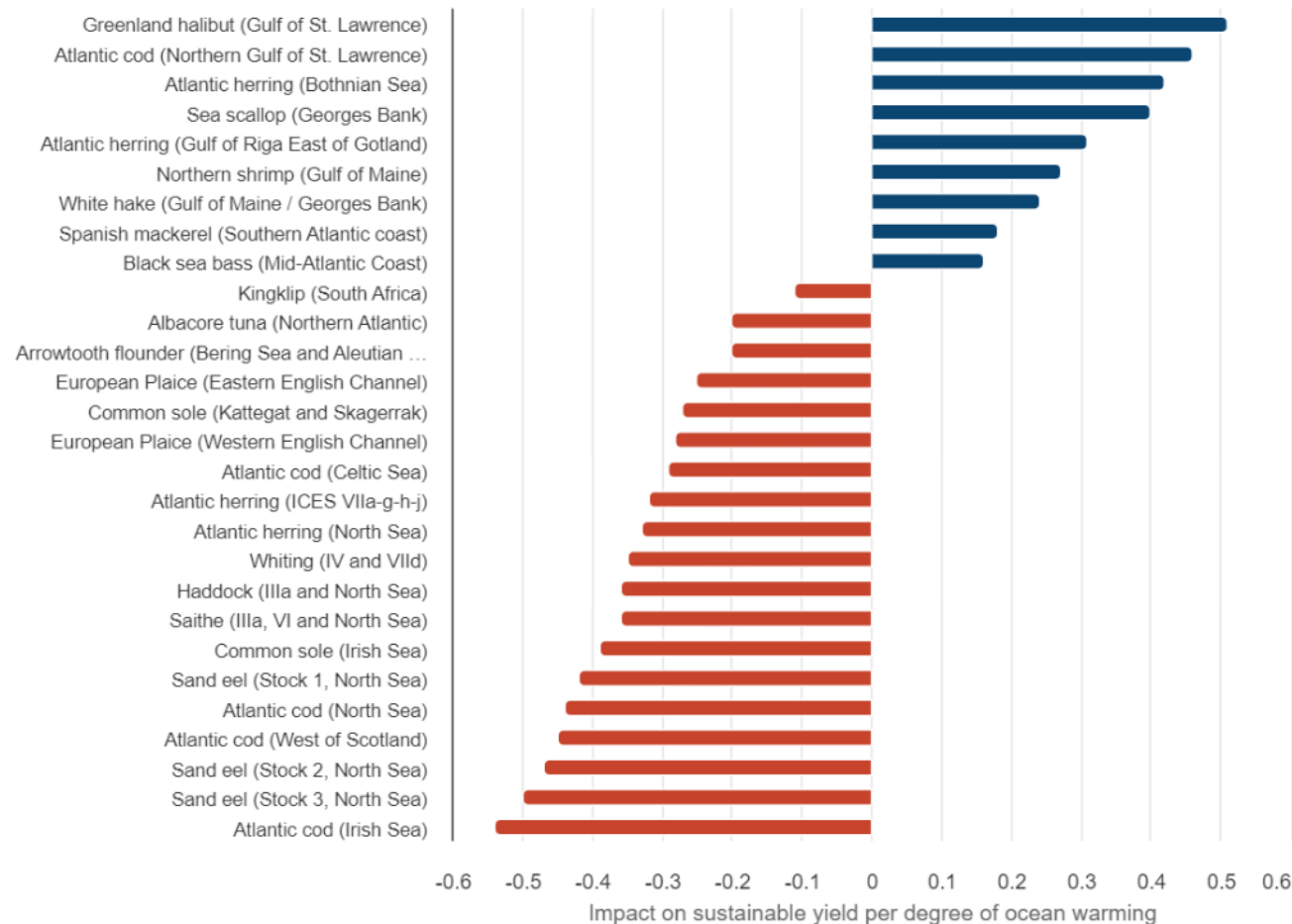
TAKE A BREAK



RISING OCEAN TEMPERATURES AND COMMERCIAL FISH POPULATIONS

Rising ocean temperatures threaten many commercial fish populations

Impact on sustainable yield per degree of ocean warming



[Ocean warming has caused 'sustainable' fish stocks to drop by 4% since 1930s \(carbonbrief.org\)](https://carbonbrief.org)

LOGLINER IN OPERATION

LONGLINE FISHING BOATS

Nobody knows exactly how many longline boats are out in the ocean but estimates indicate there are over 5000 longline vessels fishing for tuna and tuna like species in the world.

OVER 5000 LOGLINE VESSELS



SIZE

Longline fishing boats can be up to 60m long, however, most are so-called small scale vessels of less than 24m.



Source: Greenpeace Out of Line. The failure of the global tuna longline fisheries.

LOGLINES + HOOKS

up to 150 km long



up to 3000 hooks

MARINE ANIMALS DYING

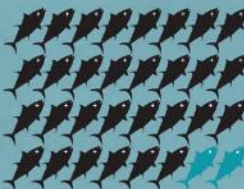
300,000 sea turtles and at least 160,000 seabirds and millions of sharks die annually in longline fisheries.

300,000
SEA TURTLES

160,000
SEA BIRDS

MILLIONS
SHARKS

OVERFISHING



All target tuna species now either overfished, being overfished or depleted.

SHARK FINNING

Sharks often targeted for their high value fins make up as much 50% of catches in some longline fisheries.



UP TO

50%

OF CATCHES CAN BE SHARKS

PIRATE FISHING AND TRANSHIPMENT

Many vessels transfer their catches at sea resulting in high amounts of unreported and illegal fishing.



MISTREATMENT OF CREW

Vessels can stay at sea for several years keeping their crew in a captive environment.

1 YEAR | 2 YEARS | 3 YEARS



SOLUTIONS

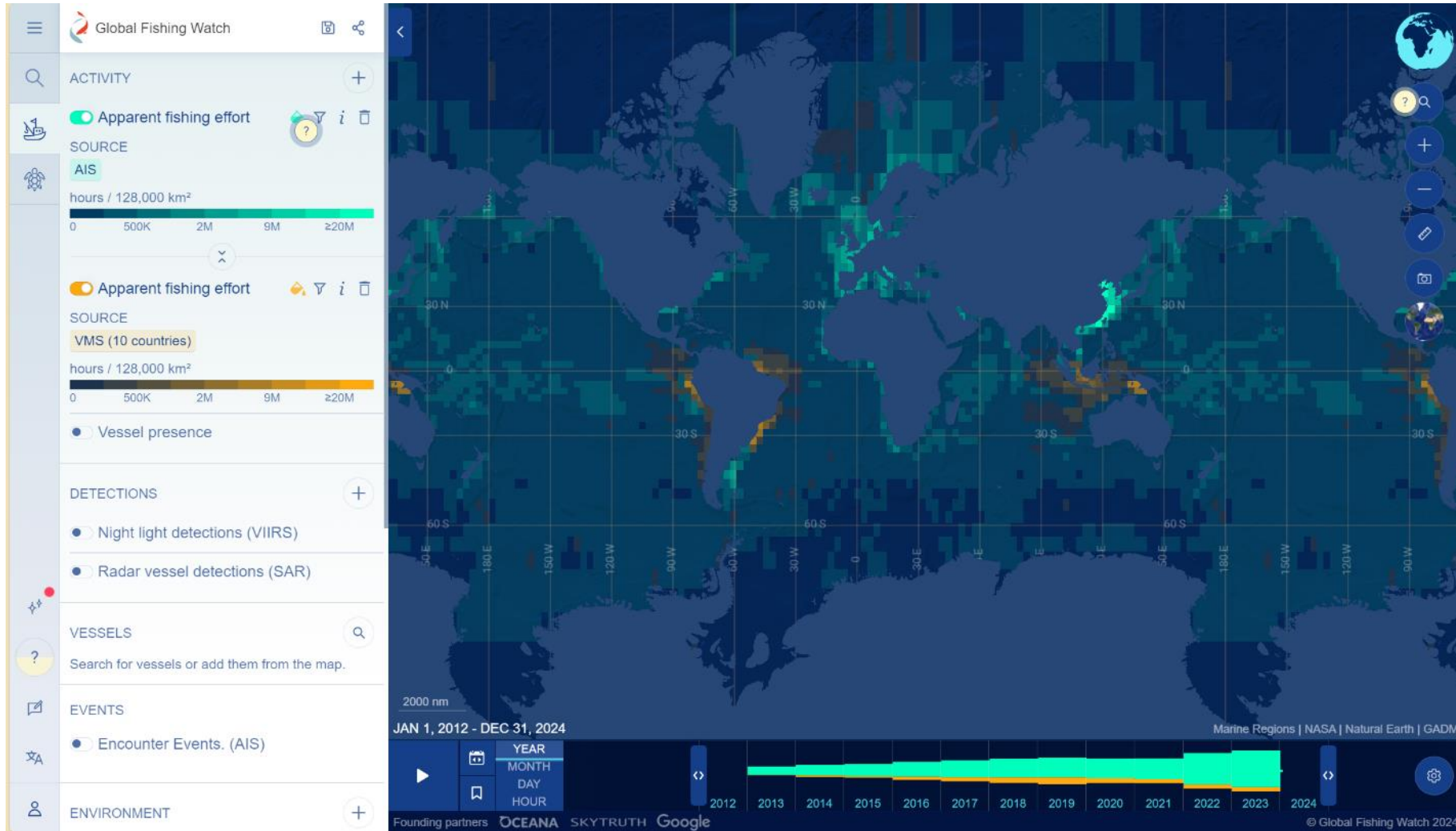
- ⬇ Reduce fishing capacity and enforce sustainable catch limits
- ✕ Ban all at-sea transshipments
- 🏠 proper monitoring and 100% observer coverage

MITIGATE BY-CATCH BY:

- ⚠ Not targeting sharks and banning shark finning
- 🌀 Use circle hooks and other best practise mitigation methods

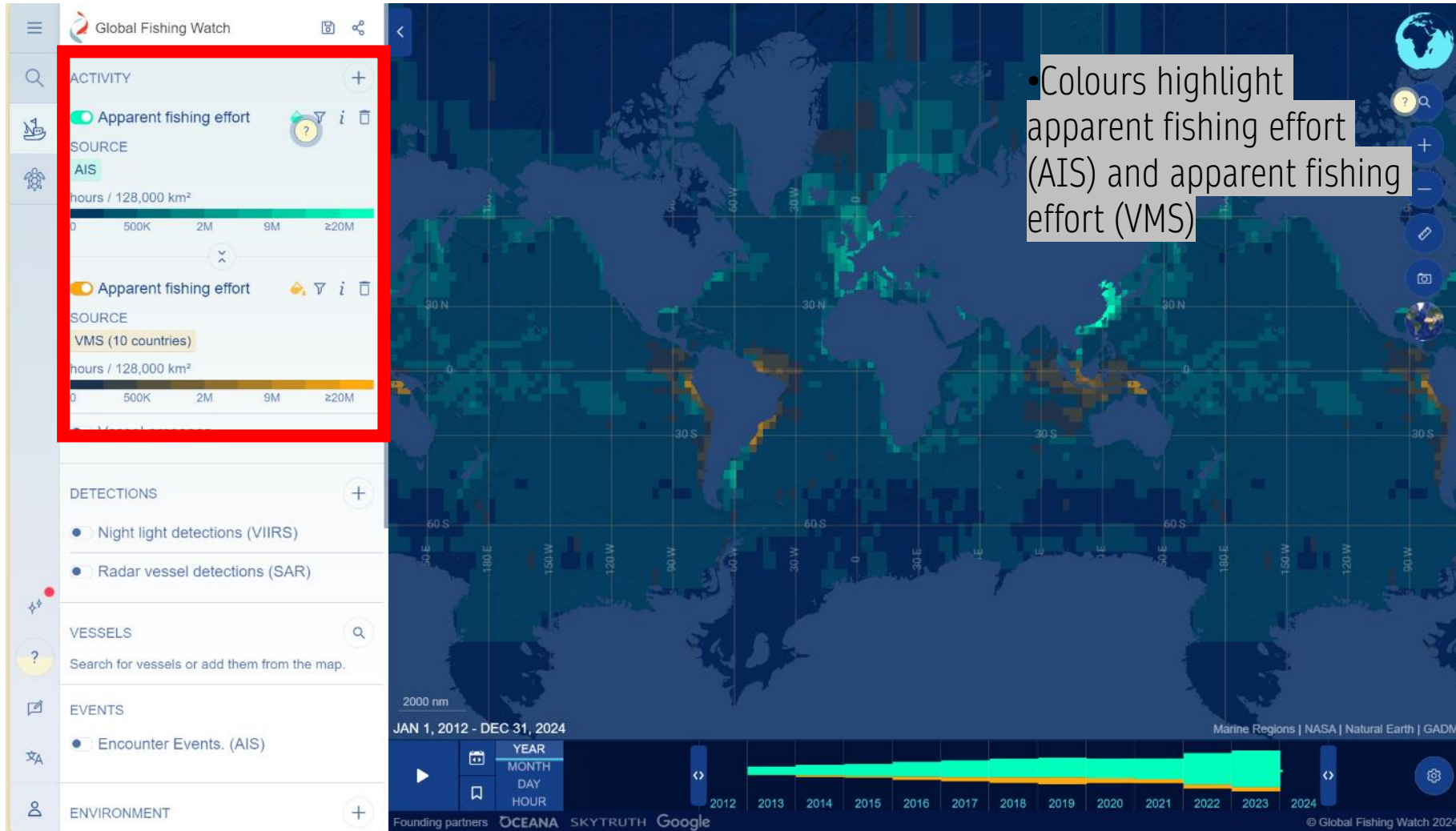
ACTIVITY

GLOBAL FISHING WATCH: [GFW | MAP](https://gfw.org)
(GLOBALFISHINGWATCH.ORG)



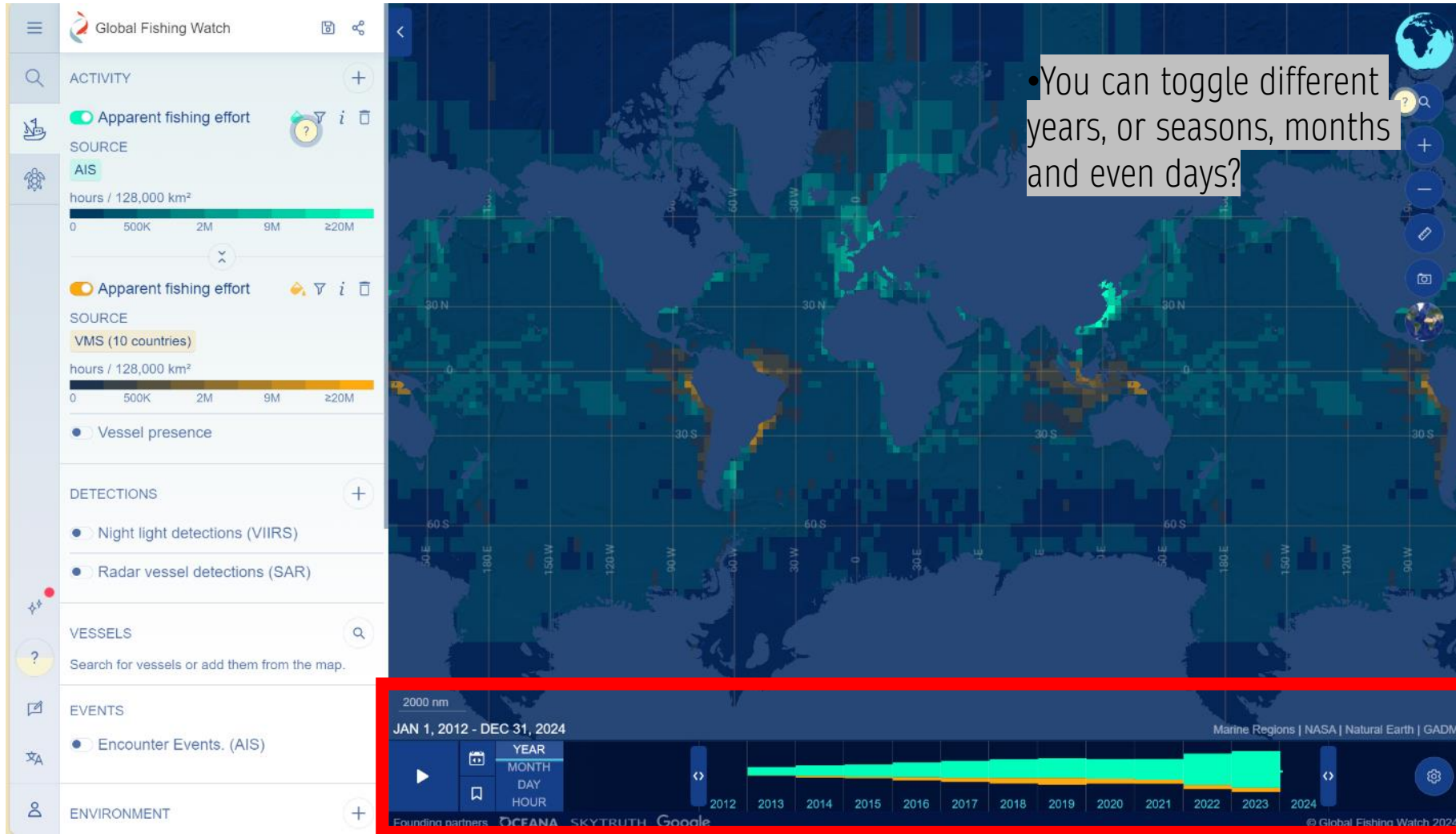
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([GLOBALFISHINGWATCH.ORG](https://www.globalfishingwatch.org/))



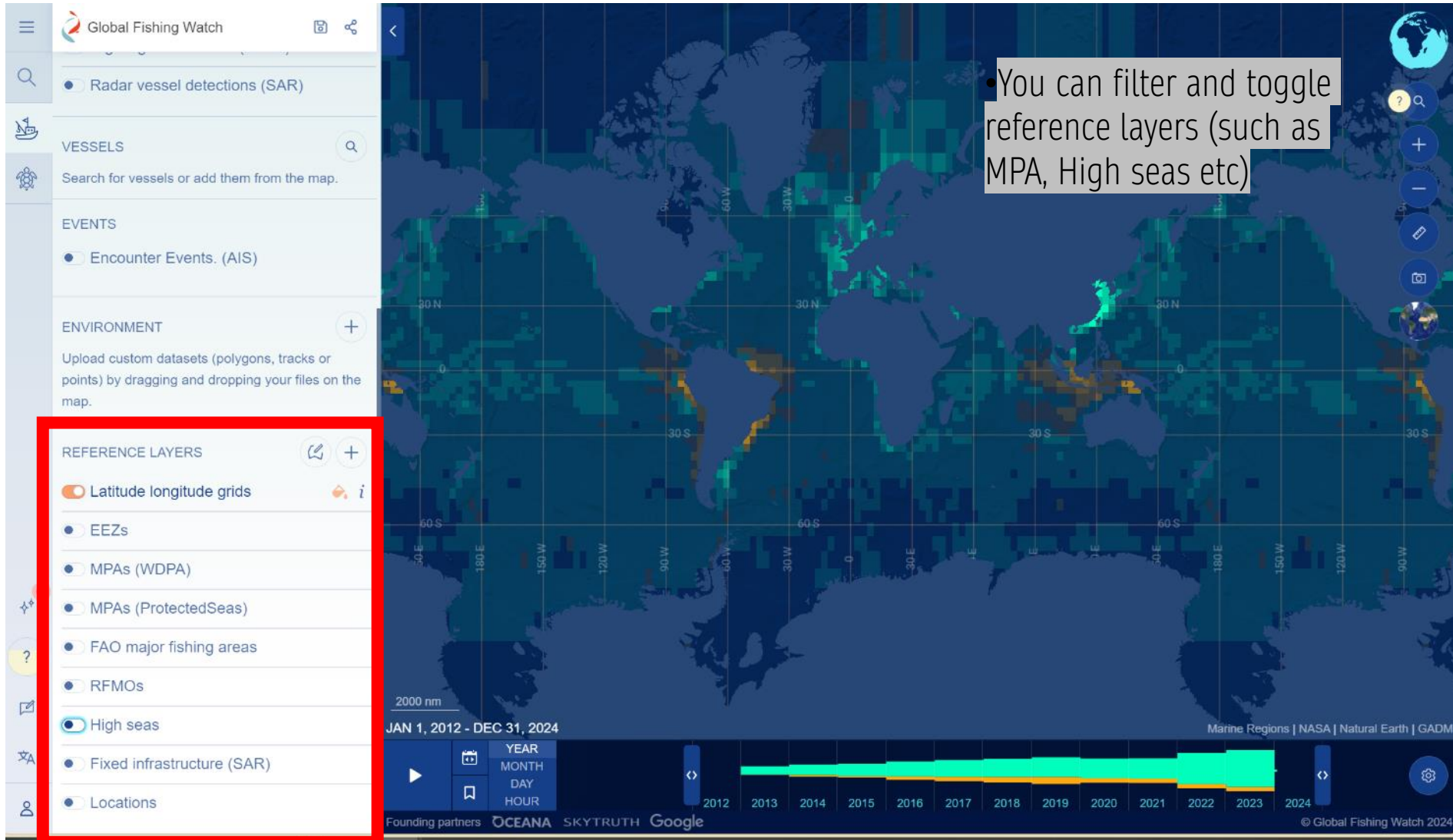
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ACTIVITY

a) Using Global fishing watch ([GFW | Map \(globalfishingwatch.org\)](https://globalfishingwatch.org)) and the following link: [Fish and Overfishing - Our World in Data](#)

- Find an area where there is high apparent fishing effort.
Describe the distribution of these areas.

ACTIVITY

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Describe the distribution of these areas.

b) Next click on the link: [GFW | Marine manager \(globalfishingwatch.org\)](https://globalfishingwatch.org)

You have become the Marine Manager for your chosen area.

What issues do you think you have for overfishing? Think about key management objectives.

(You may need to look at the Our World in Data link for a global context).

[GFW | Marine manager \(globalfishingwatch.org\)](https://globalfishingwatch.org)

FURTHER READING

[Half of the UK's key fish populations are overfished, report finds - Oceanographic \(oceanographicmagazine.com\)](#)

[The transboundary nature of the world's exploited marine species | Scientific Reports](#)

[ACNA5001: Overfishing \(readings\) \(uwtsd.ac.uk\)](#)

[msc-insights-january-2021.pdf](#)