UNIVERSITÀ
DEGLI STUDI DI TRIESTE

LAUREA MAGISTRALE IN SCIENZE PER L'AMBIENTE MARINO E COSTIERO

Biologia ed Ecologia della Pesca

Impact of Fishing on Marine Ecosystems

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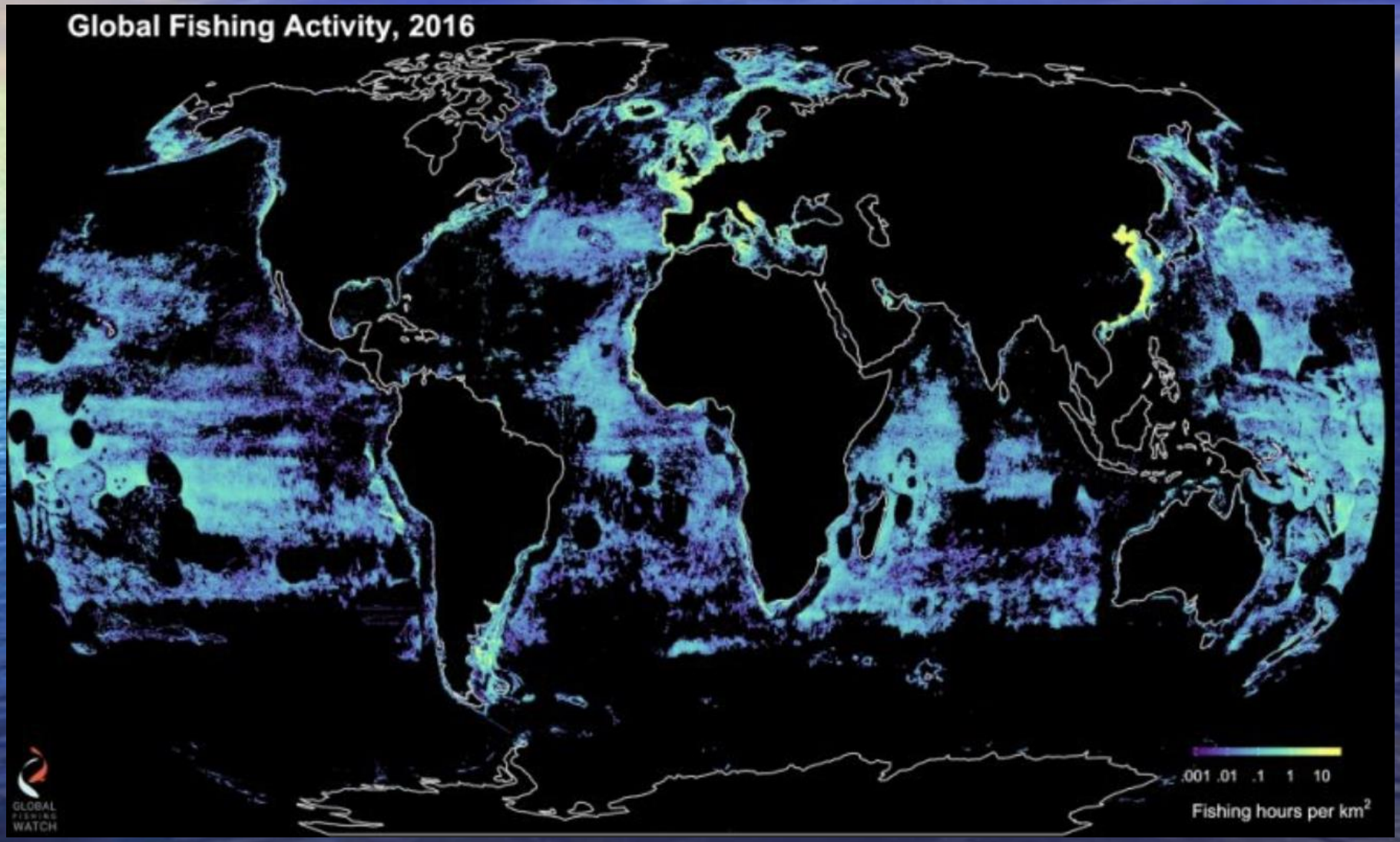
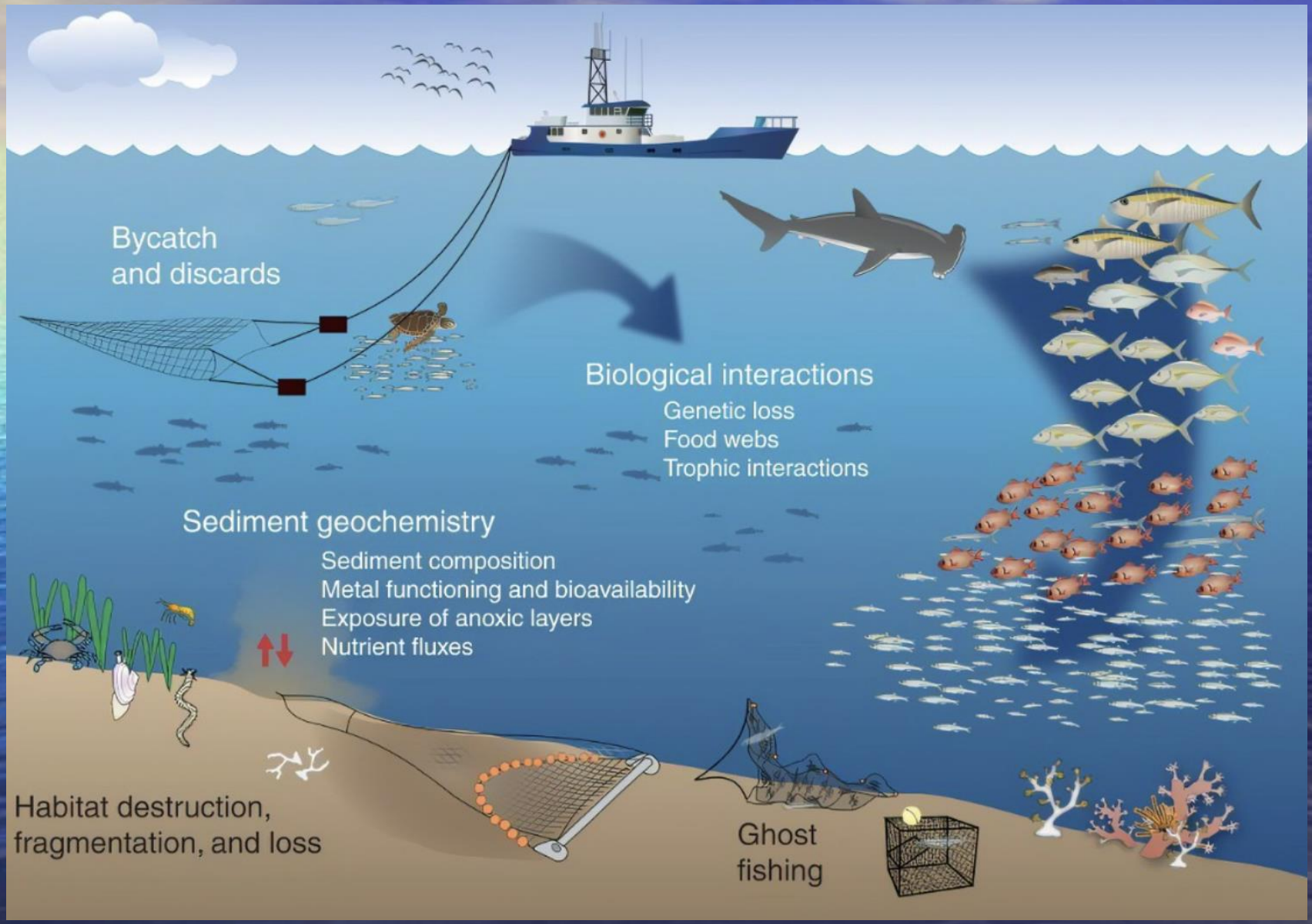
Fishing is a major human activity influencing marine ecosystems globally.

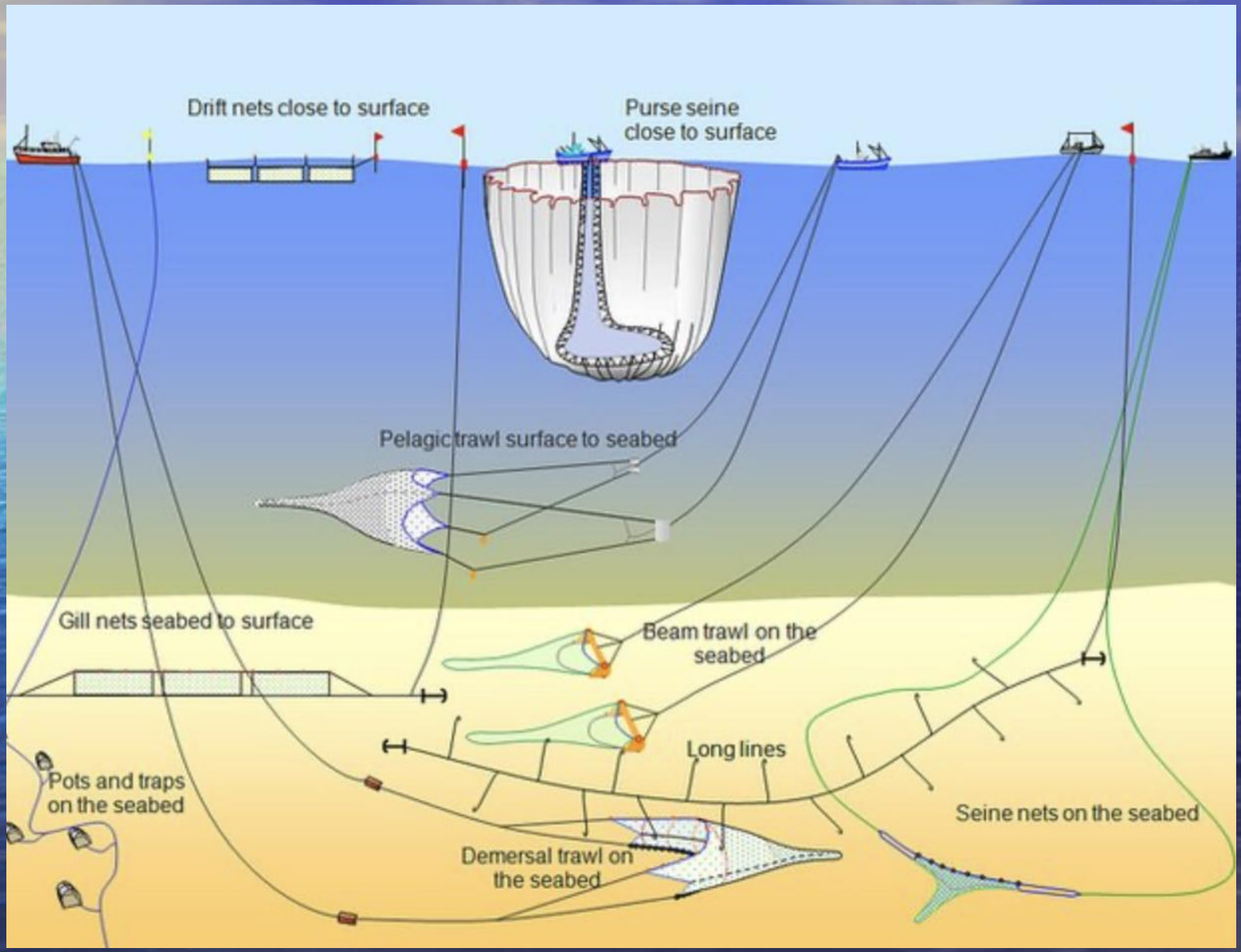


Marine ecosystems include coral reefs, deep-sea habitats, seagrass beds, mangroves, pelagic zones.



Marine biodiversity supports food webs, human livelihoods, and climate regulation.

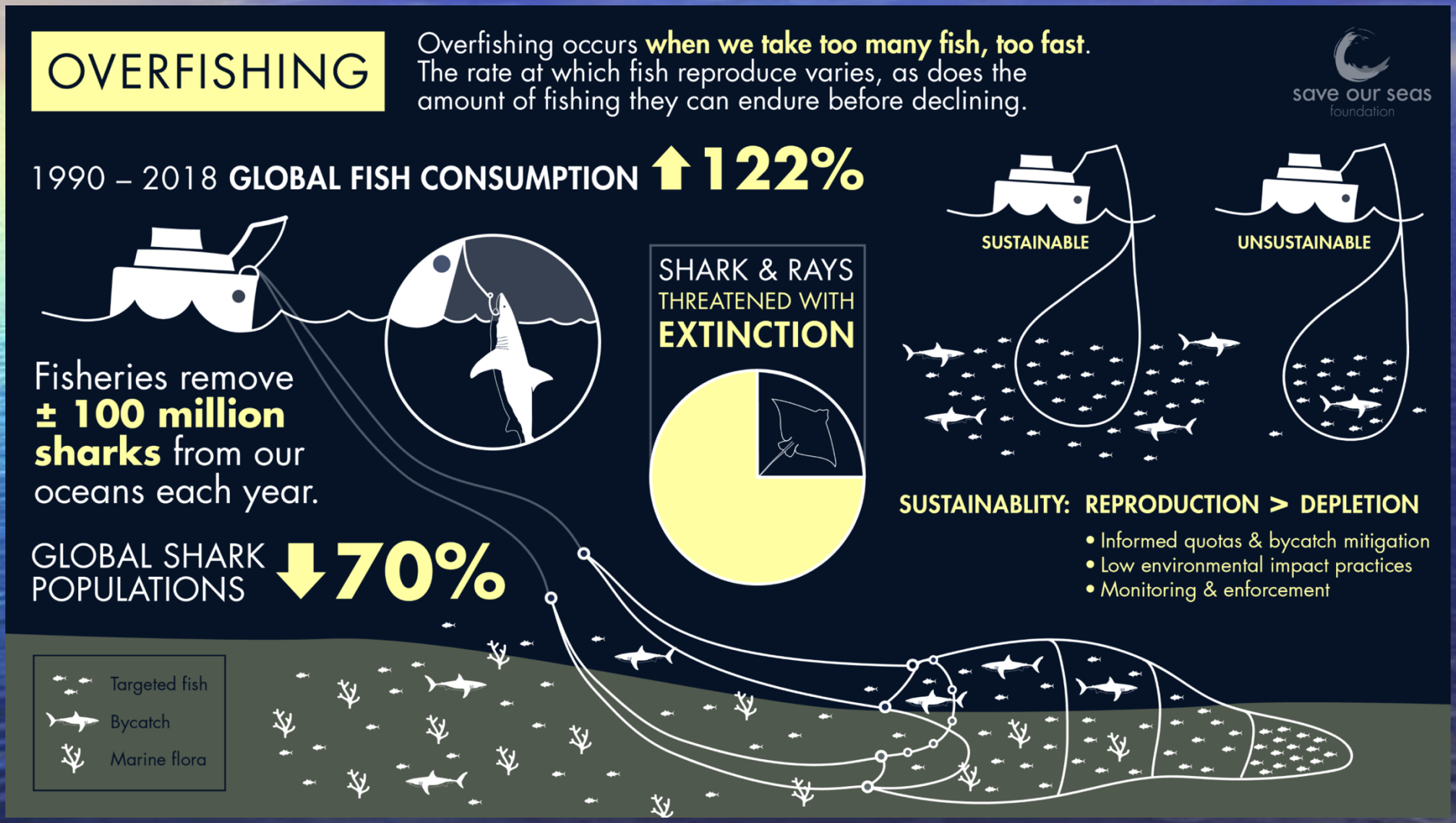
Fishing methods vary in scale and technology, influencing ecosystem impacts



Commercial fishing is an industrial-scale operation using large vessels and advanced gear to catch fish for global markets, while artisanal fishing is small-scale, community-based fishing that uses traditional methods and small boats for local consumption

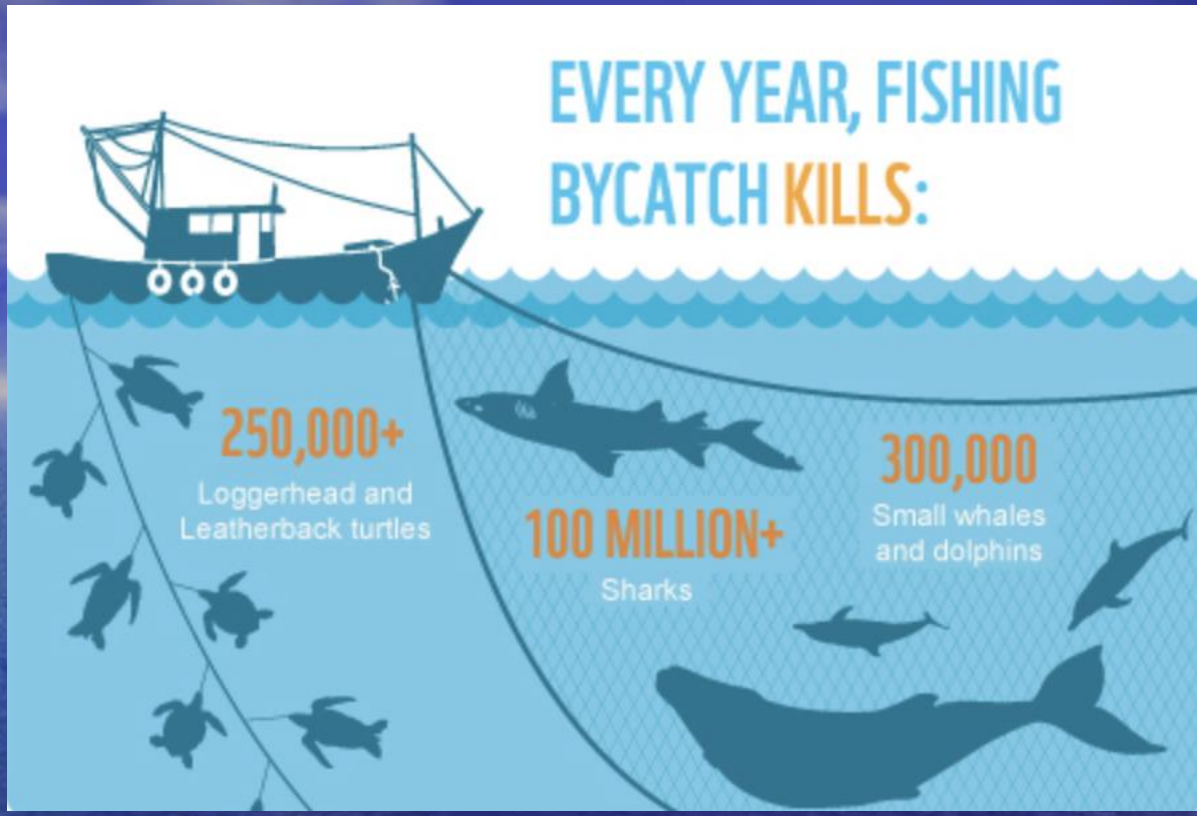
FISHERY / BENEFITS	LARGE SCALE	SMALL SCALE
Subsidies	$$$$$ 25-27 billion	$ 5-7 billion
Number of fishers employed	about 1/2 million	over 12 million
Annual catch for human consumption	about 30 million t	same: about 30 million t
Annual catch reduced to fishmeal and oils	35 million t	Almost none
Annual fuel oil consumption	about 37 million t	about 5 million t
Catch per tonne of fuel consumed	= 1-2 t	= 4–8 t
Fish and other sealife discarded at sea	8–20 million tonnes	Very little

Overfishing depletes fish stocks faster than they can reproduce

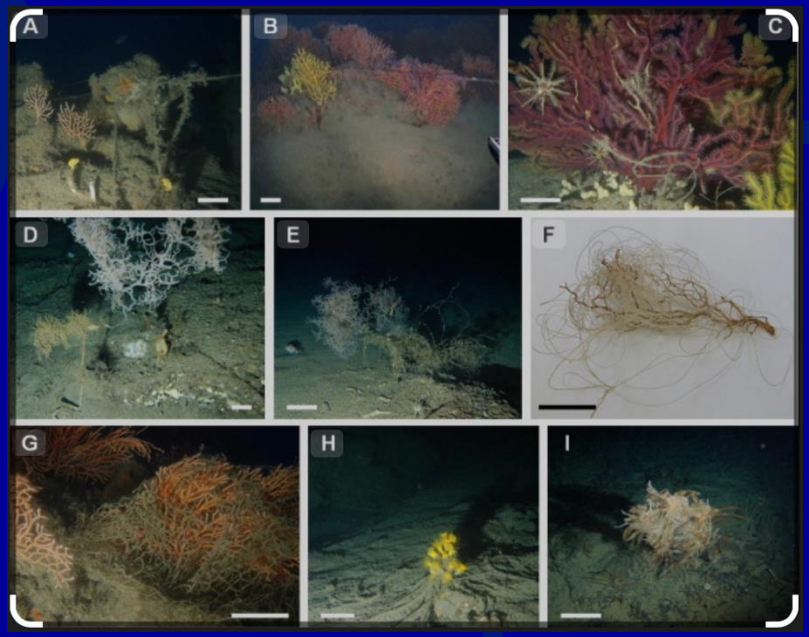



Bluewild
ECOFIVE

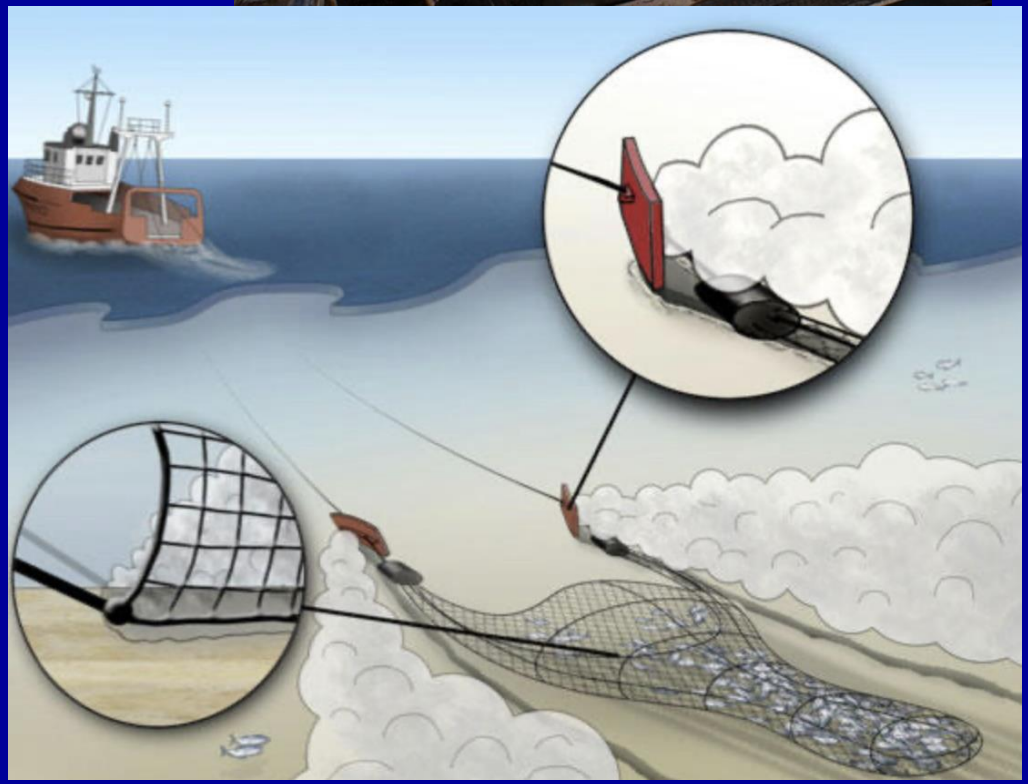
Bycatch: Unintentional capture of non-target species such as turtles, dolphins, sharks



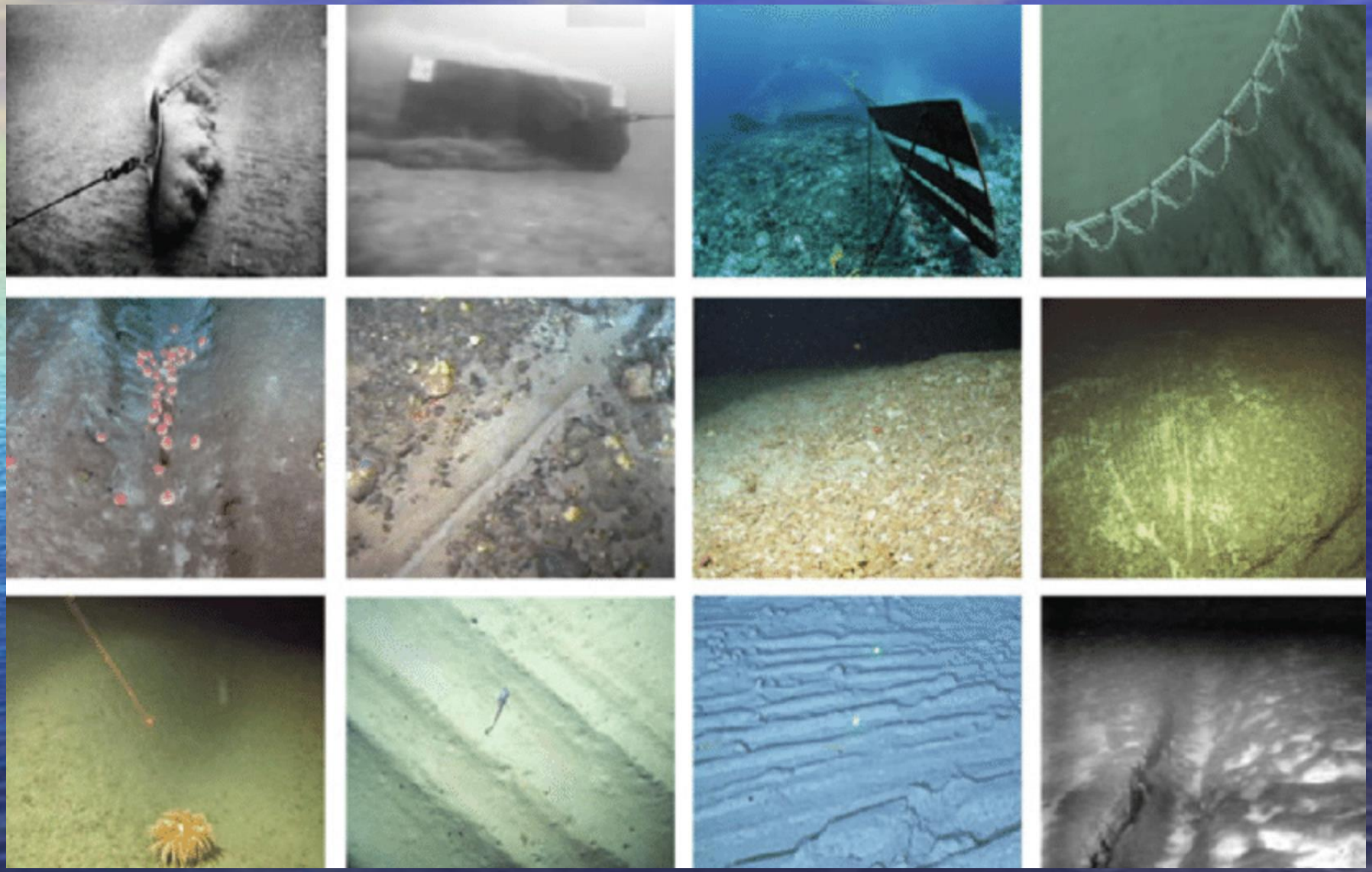
Fishing can physically damage habitats such as reefs and seagrass beds



Dragging heavy nets across seabeds disturbs benthic ecosystems.

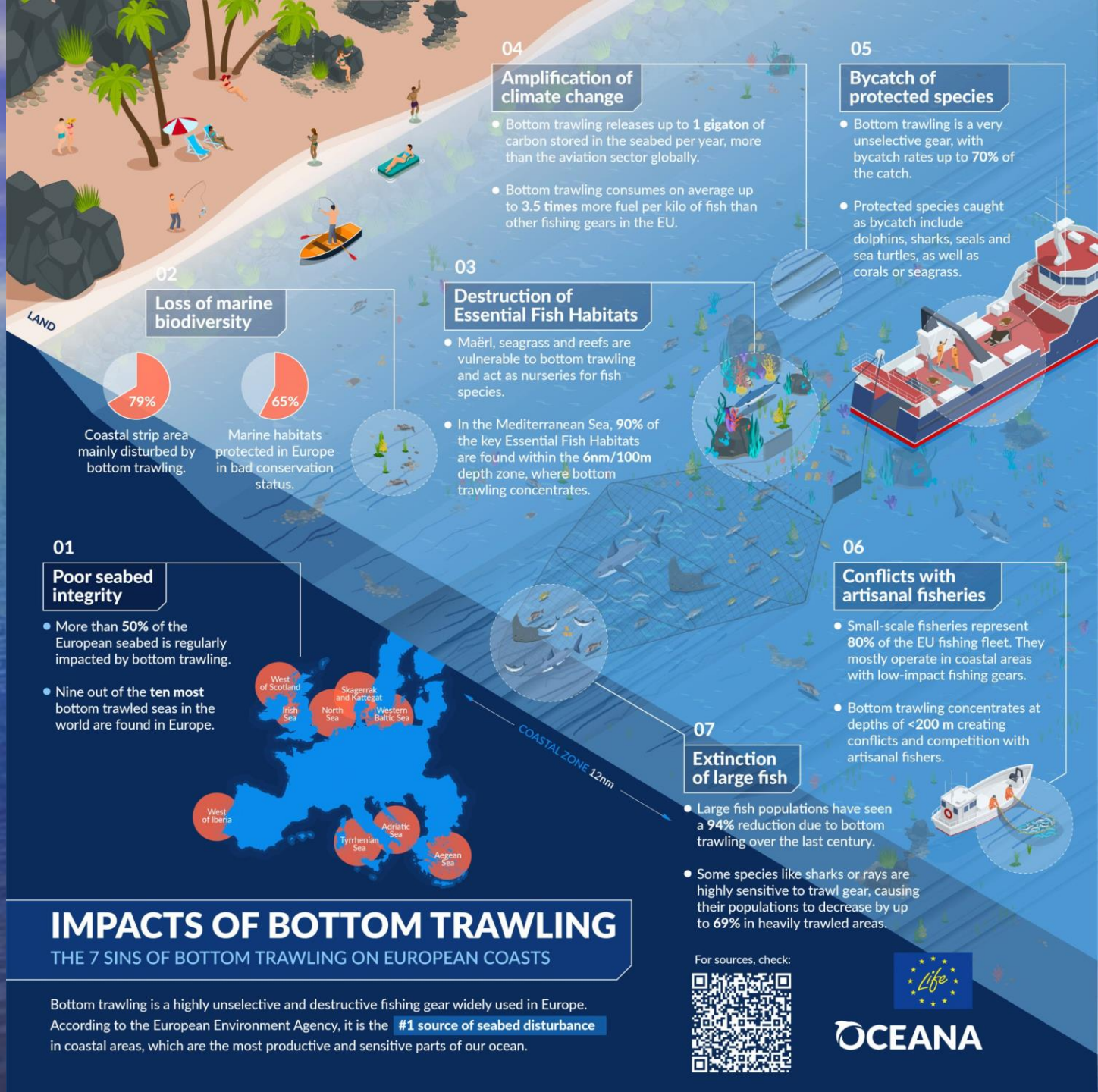


Destroys benthic habitats; resuspends sediments



Mediterranean trawling:

The seven sins



Lost fishing gear continues catching organisms

Blast Fishing (Explosives)

POISON FISHING

Cyanide is extremely damaging to coral reefs, where it kills corals by poisoning their symbiotic algae and destroying their structure

The cyanide concentration slows photosynthesis in the algae, causing the coral to lose its color, and it also eliminates a major food source for the coral. Even at very low doses, cyanide leads to increased coral mortality

ILLEGAL, UNREPORTED and UNREGULATED FISHING

ILLEGAL FISHING

- No authorisation
- Goes against conservation and management of Regional Fisheries Management Organisations (RFMOs)
- Goes against national laws or international obligations

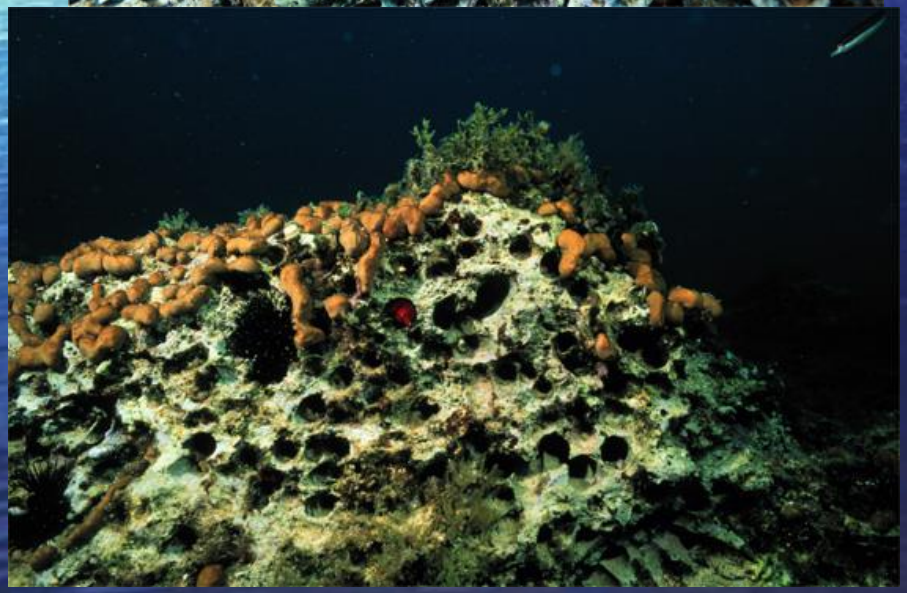
UNREPORTED FISHING

- Not reported
- Reporting contravenes international, RFMO or national laws and regulations

UNREGULATED FISHING

- Fishing vessel has no nationality
- Fishing activities jeopardise fish stocks

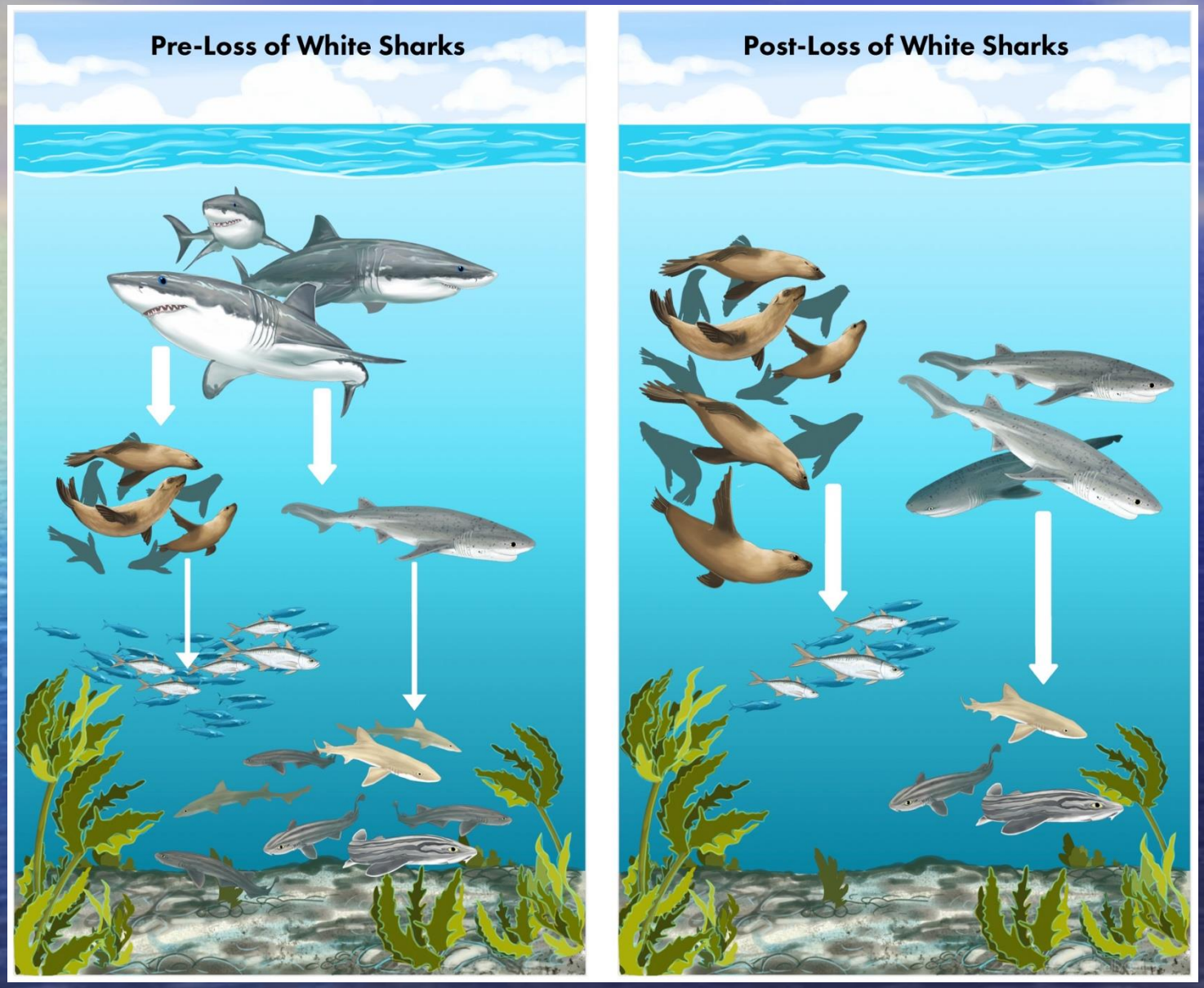
The illegal and destructive fishery of date mussels (i.e. the endolithic mollusc *Lithophaga lithophaga*) reduces the bio-physical complexity of Mediterranean rocky reefs and dramatically impacts biodiversity



Shark Finning

Removal of fins causes shark population collapse

Removal of predators alters trophic cascades



Front. Mar. Sci., 25 March 2025

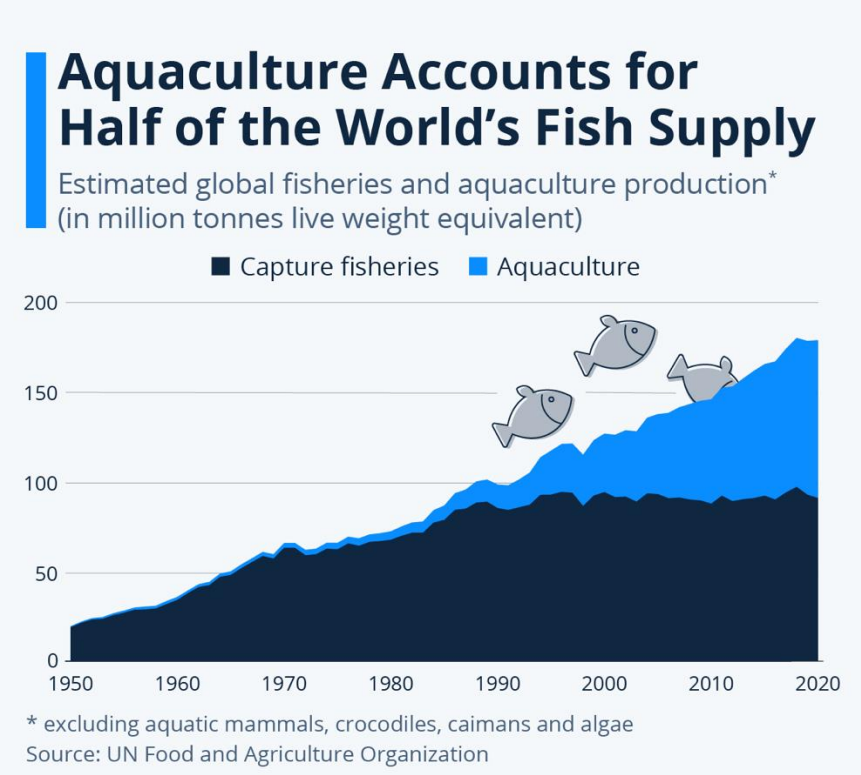
Seagrass Meadows Impact trough anchoring

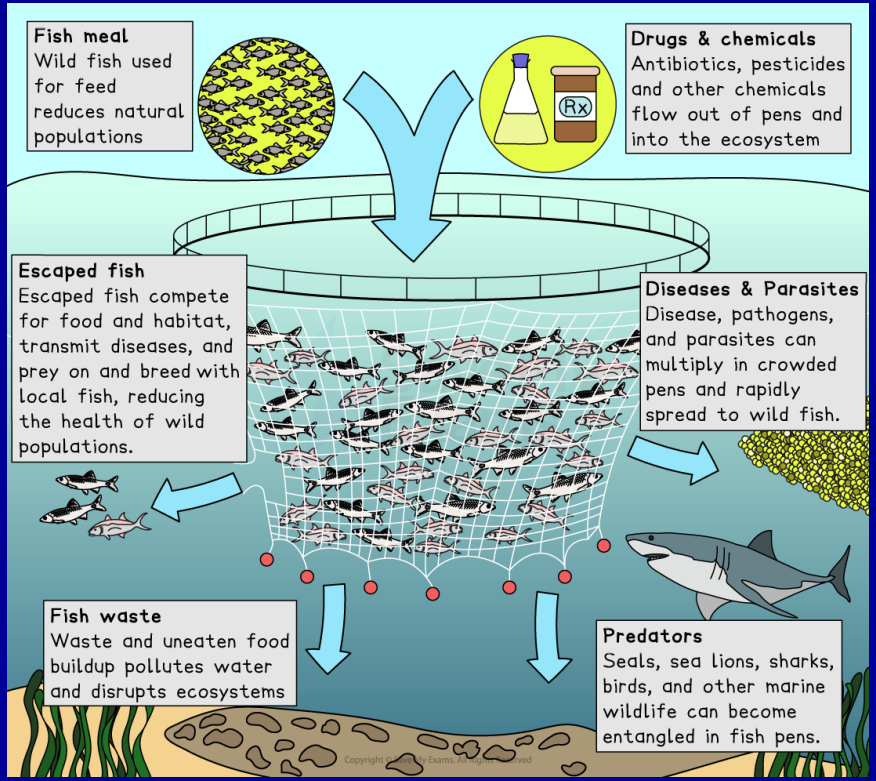
Destructive fishing methods, specifically dynamite fishing, can destroy coral reefs, reducing them to rubble with little structural complexity, severely hindering their natural ability to stabilize and regenerate.

in the past 60+ years, the practice of towing giant fishing nets along the sea floor has caused the extraction of 25 million tonnes of fish that live 400 metres or more below sea level leading to the collapse of many of those fish populations

Frontiers in Marine Science,
doi: **10.3389/fmars.2018.00098**

Global seafood demand and poverty both drive overfishing by incentivizing excessive fishing. High demand from a growing global population and the importance of fisheries for livelihoods in developing nations pressure fishermen to catch more fish. Poverty exacerbates this cycle, as communities dependent on fishing lack the resources to compete with large-scale industrial fleets, leading to unsustainable practices and further depletion of fish stocks





Aquaculture meets the growing demand for fish but has negative environmental impacts, including habitat destruction, water pollution from waste and chemicals, disease transmission to wild populations, and pressure on wild fish stocks for feed

Fisheries management uses tools like **quotas** (limits on total catch), **closures**(seasonal or area-based restrictions), **gear rules** (like mesh size or net type restrictions), and **size limits** to prevent overfishing and ensure a sustainable catch. These methods are used to control either the amount of fish caught (**output controls**) or the effort and efficiency of fishing (**input controls** and **technical measures**)

Types of Management Actions

Catch Quotas: Specify overfishing limits (OFL), allowable biological catch levels (ABC), and total allowable catch (TAC)

Gear Types and Seasons: identification of legal gear types, and seasons to distribute harvest in time to avoid ger conflicts, reduce bycatch and marine mammal interactions

Bycatch and PSC: Bycatch and prohibited species catch limits, time/ area/ gear type closures

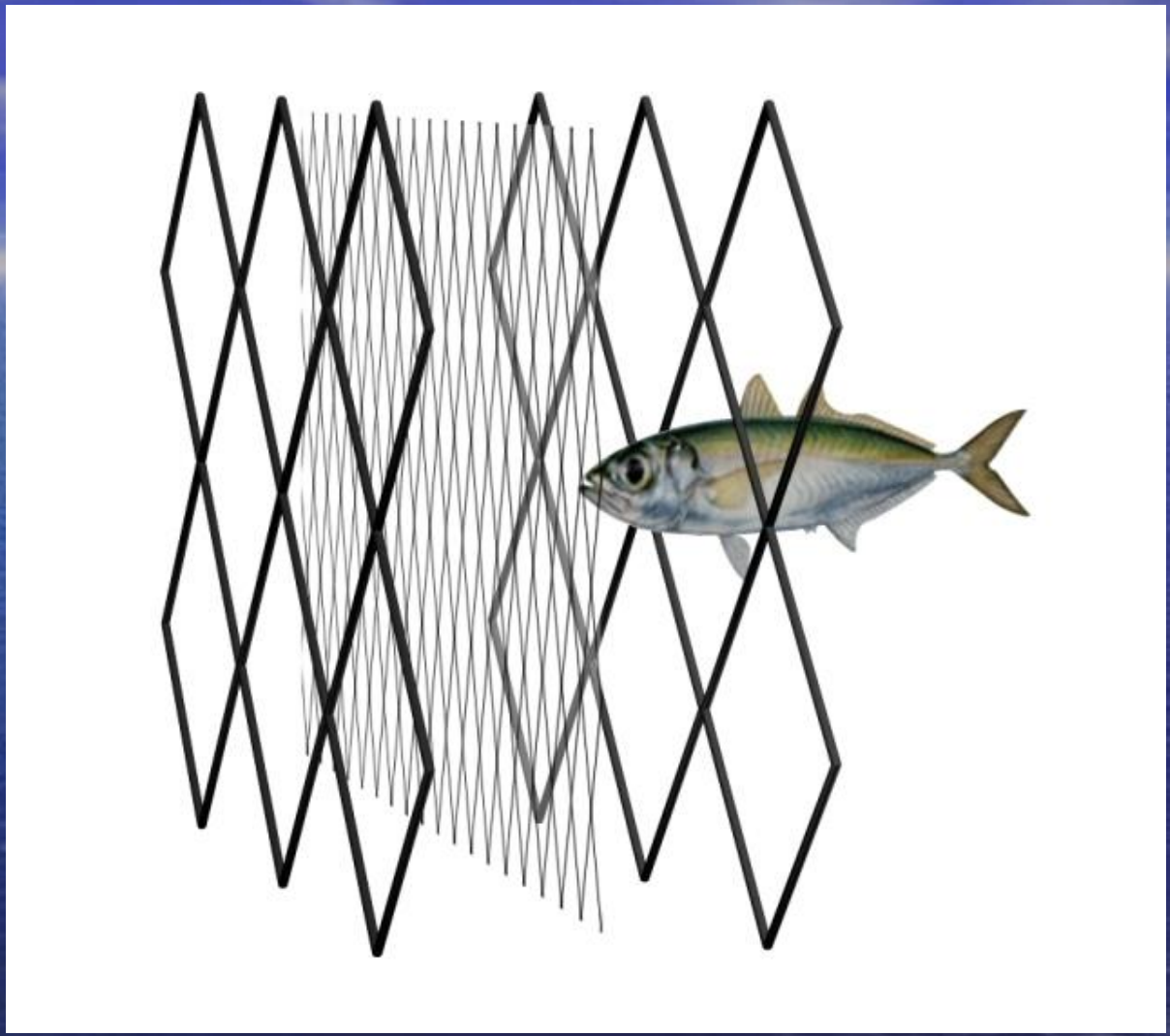
Protected Resources: Time and area closures to protect critical areas, prey species limitations

Habitat: Description and identification of essential fish habitat for all managed species, gear/area closures to protect key areas

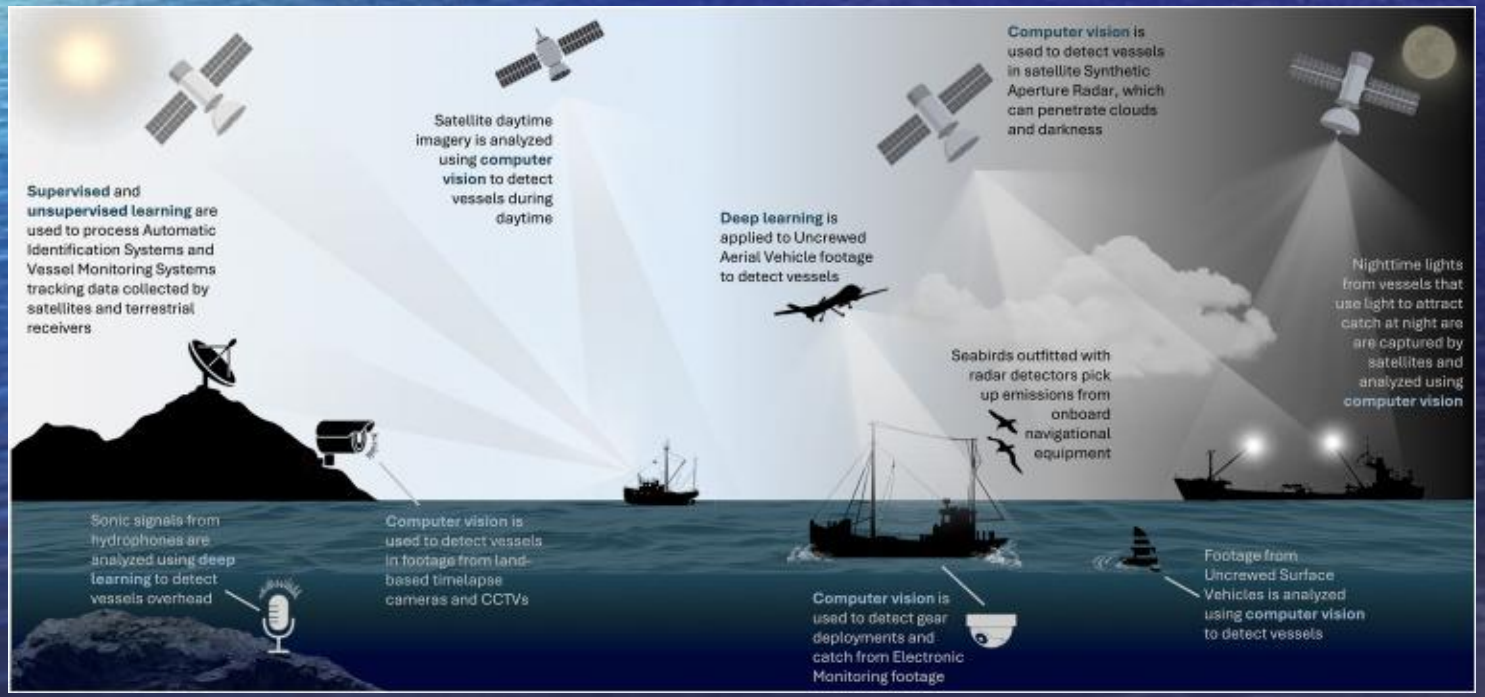
Community Protections: Harvest quota set asides for communities, regional delivery restrictions

Limited Access Privileges: Create limited access programs, sector allocations, rationalization privileges

Selective fishing gears are fishing methods and equipment designed to **target and capture specific species, sizes, or sexes of fish** while allowing non-target organisms (bycatch) to escape unharmed. This approach is crucial for sustainable fisheries management, helping to ensure the conservation of juvenile fish and the overall health of marine ecosystems

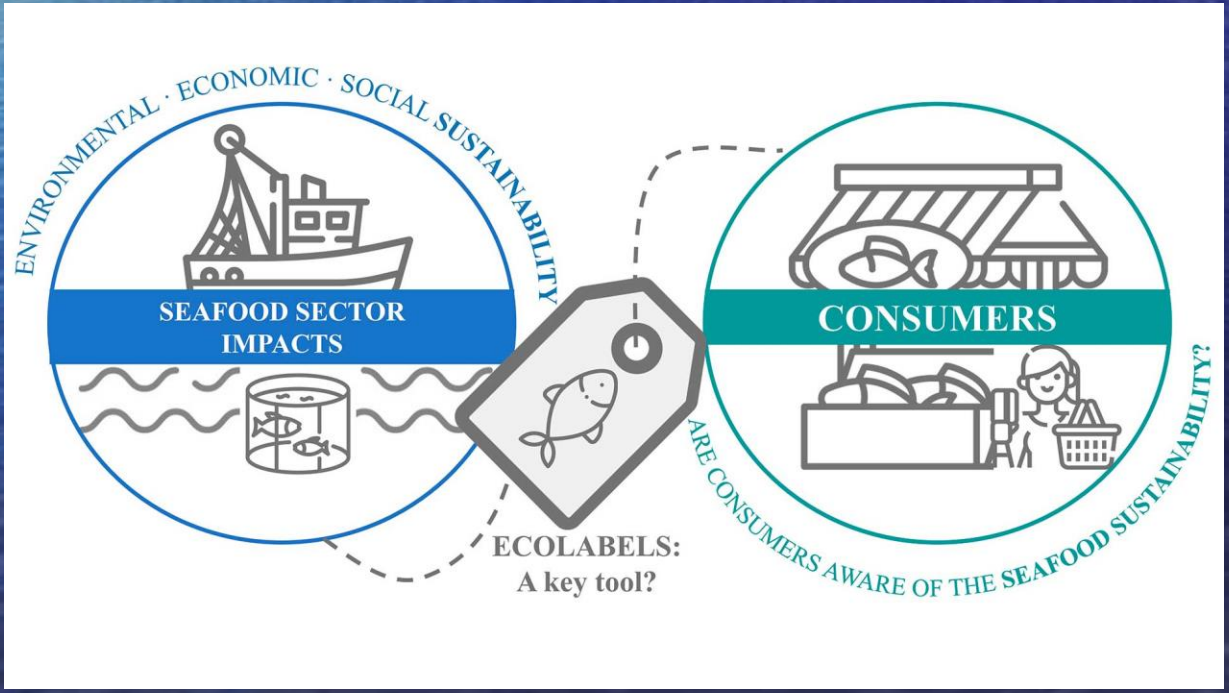


Satellite tracking and patrols support compliance by allowing authorities to remotely monitor fishing activity, predict illegal operations, and strategically deploy limited patrol resources . Satellites can detect vessels even without transmitting signals, while patrol boats and other enforcement measures serve as a deterrent and a means of responding to suspicious activity flagged by the satellite data. This combined approach makes monitoring more efficient, cost-effective, and effective than relying on traditional patrols alone



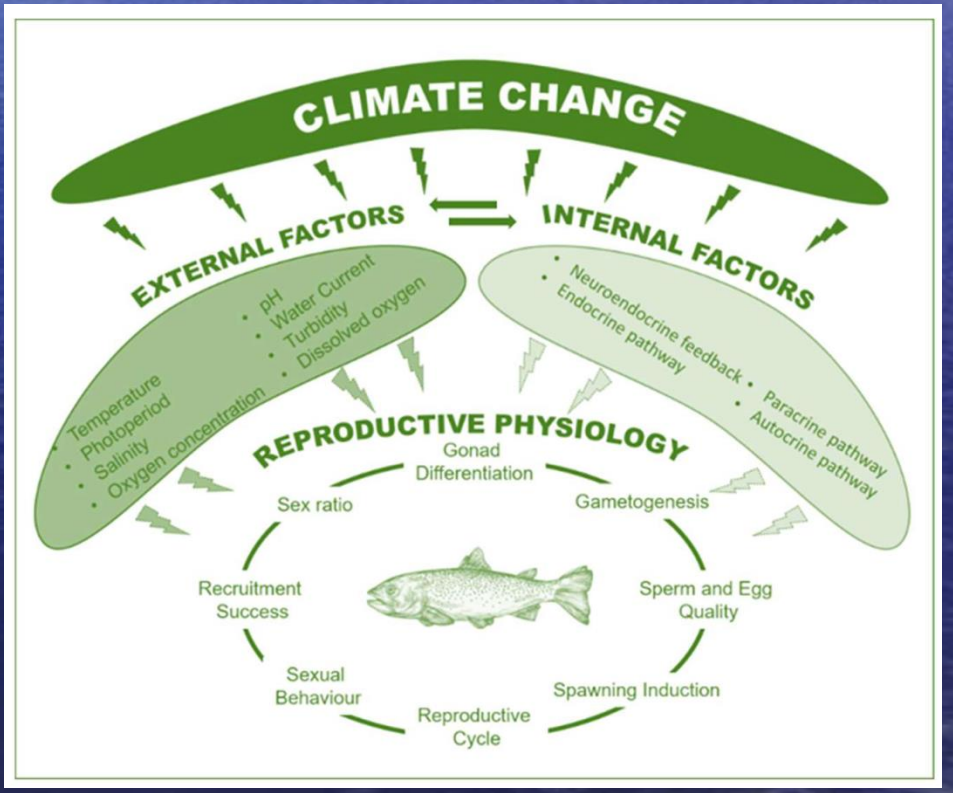
Consumer Role

Eco-labels and conscious seafood choices are critical in supporting sustainability by providing **market-based incentives** for responsible fishing and aquaculture practices and helping consumers make **informed, environmentally responsible purchasing decisions**

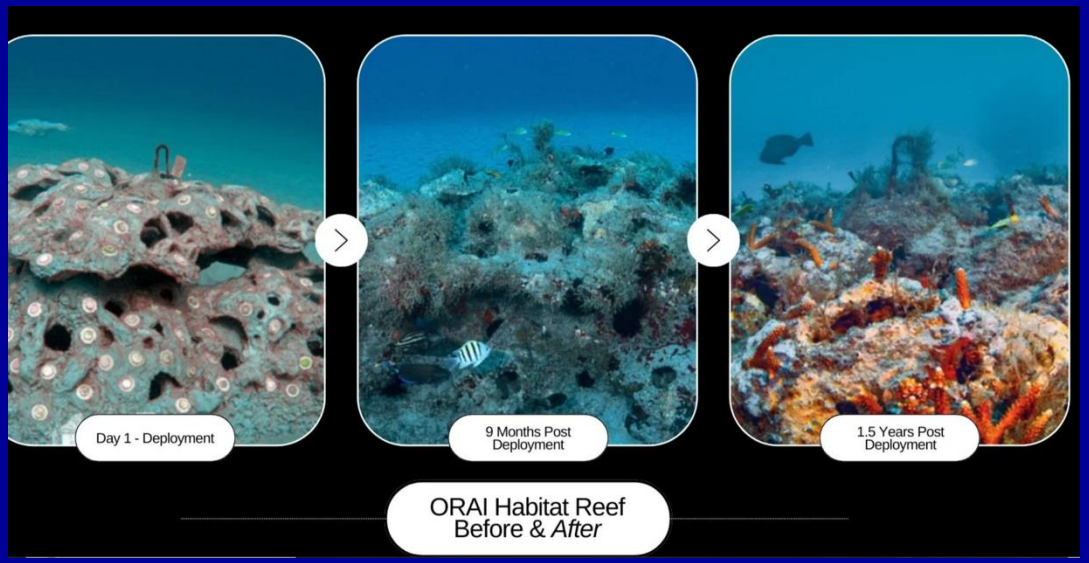


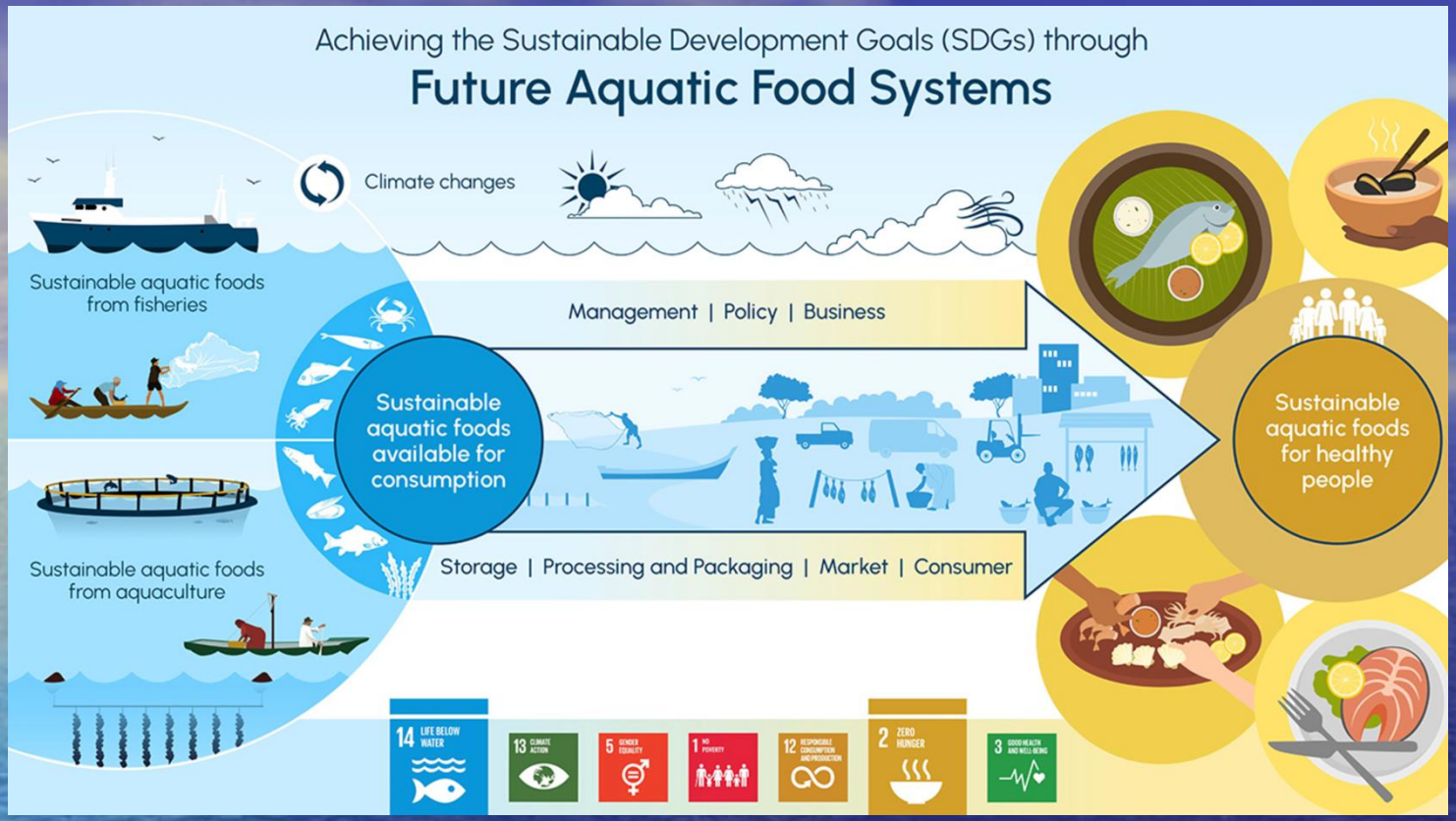
The interplay of climate change and overfishing globally.

Climate stress and fishing pressure combine to cause a decline in fisheries by creating a "one-two punch" effect on fish populations, making them more vulnerable to collapse . Climate change, through warming waters, ocean acidification, and deoxygenation, stresses fish physiologically, reduces their food sources, and causes them to migrate. When combined with overfishing, which removes fish faster than they can reproduce and disrupts population structures, these effects create a devastating feedback loop that severely damages marine ecosystems and fisheries



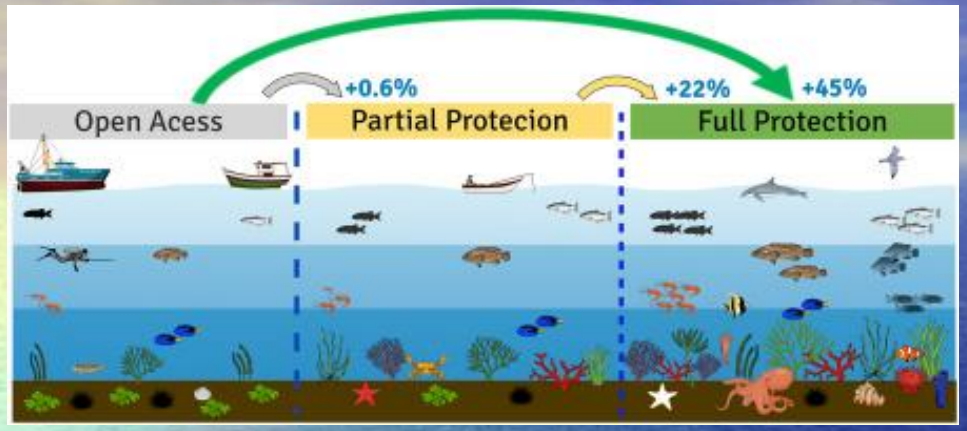
- Seagrass and coral reef restoration programs involve various strategies to help habitats to recover from damage



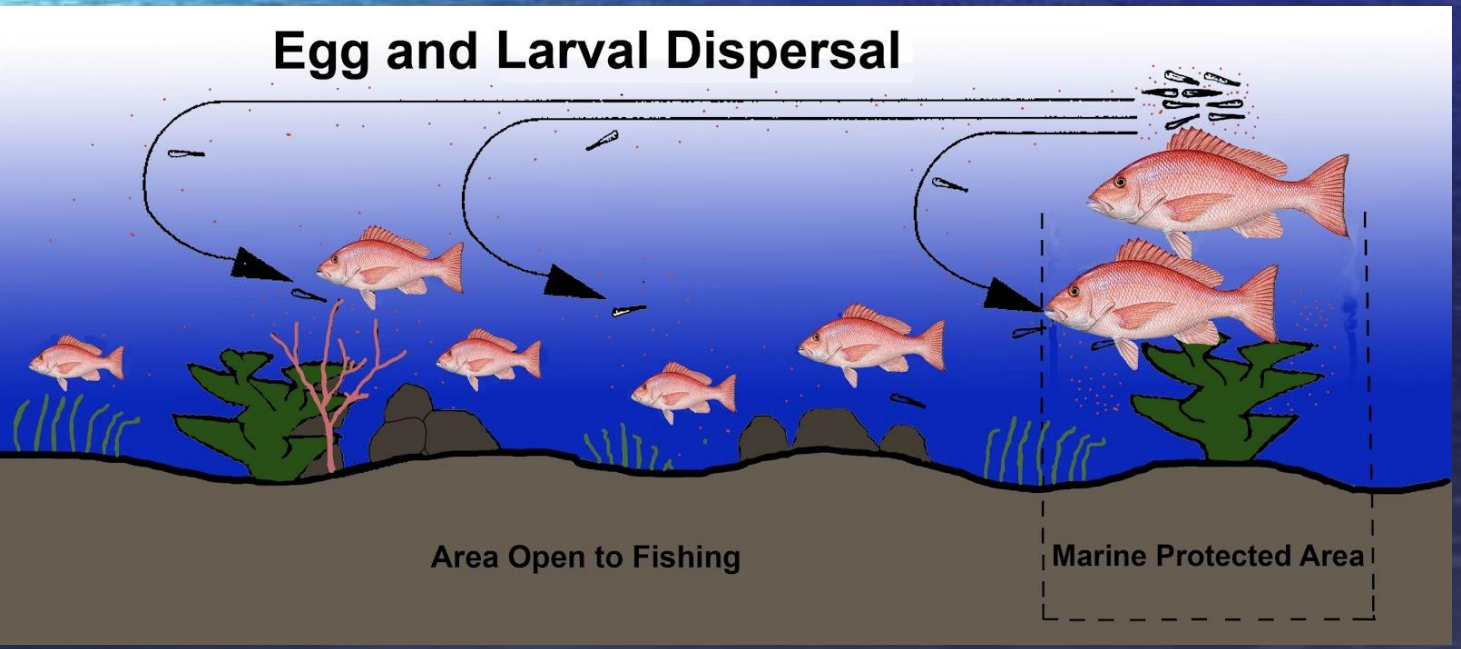


Balancing marine food production with conservation involves strategies like improving management of wild fisheries, sustainably expanding aquaculture (like farming mussels and seaweed), and increasing efficiency in food systems. Creating marine protected areas, though potentially reducing immediate production, can safeguard biodiversity and ensure long-term recovery and resilience of marine resources. A key approach is science-based management, integrated policies, and shifting demand to support sustainable practices for both production and conservation goals.

Front. Ocean Sustain., 29 November 2024



Properly enforced Marine Protected Areas (MPAs) can allow fish stocks to recover by providing a refuge from overfishing and other threats, leading to increased fish biomass, size, and diversity. This recovery effect can benefit adjacent fisheries through "spillover," where larger fish and more offspring move out of the protected area, replenishing surrounding waters and supporting local communities and economies.



- Sustainable fishing is vital for ocean health and human well-being because it protects marine biodiversity, ensures future food security, supports coastal communities, and helps maintain the ocean's role in regulating the climate. It involves managing fish populations to avoid overfishing, minimizing bycatch, and protecting marine habitats to ensure these resources can replenish themselves for future generations.