OVERFISHING

Overfishing happens when the number of fish caught is more than the number of fish that need to be left in the ocean to reproduce and replace animals lost to the fishery. Then both the fish population and the fish catch decline, causing both ecological and economic harm.

April, 2015

WHAT ARE THE CAUSES OF OVERFISHING?

THE UNSUSTAINABLE FISHING METHODS USED AND THE SCALE OF THE CATCH

– 10,000 tonnes of fish from the oceans every hour (over 90 million tonnes a year) –

are having devastating effects on both the fish targeted and virtually all other marine creatures, from seabirds to coral.

As the human population has increased, so has the demand for fish.

UNSUSTAINABLE FISHING

The modern fishing industry has giant ships with big engines, using advanced, fish-finding sonar that can pinpoint schools of fish quickly and accurately.

More powerful engines allow bigger boats to pull larger nets in deeper waters.

And, as nearshore fisheries continue to collapse, commercial fishing is expanding into deeper and more distant waters.

UNSUSTAINABLE FISHING PRACTICES
BYCATCH

Guitarfish, rays, and other bycatch are thrown overboard as waste off a boat near La Paz, Mexico

Photo: Brian J. Skerry/National Geographic

Whereas sustainable fisheries catch target species and little else, many unsustainable fisheries catch a large number of untargeted fish and other marine animals while fishing for one or more specific fish species.

This is know as BYCATCH.

BYCATCH can include undersized individuals or juveniles of the target species.

Sea turtle bycatch

Recent estimates show that for every 4 kilograms of fish caught worldwide, fishermen throw away more than 1 kilogram of other marine animals (bycatch).

FISH BYCATCH

Bycatch caught while fishing for tuna

Beautiful Manta Ray caught as bycatch

Juvenile shark caught as bytach in gillnet

Photo courtesy of Jason Rubens, WWF-CANON

Basking shark bycatch

BYCATCH IS NOT ONLY FISH

Sea turtles, whales, some dolphins, and some seabirds migrate across vast areas of ocean between nesting and feeding grounds, traveling thousands of miles each year.

As they travel, they are susceptible to being caught in ocean fishing gear, which is often hard to see or contains bait that they may eat.

Hundreds of thousands of sea turtles, seabirds, and marine mammals, including whales, dolphins and porpoises, die as bycatch from inefficient, destructive fishing practices.

The annual global bycatch mortality of **SMALL WHALES, DOLPHINS AND PORPOISES** is estimated to be more than 300,000 individuals.

Photo: Sergey Krivokhizhin
(Brema Laboratory, Simferopol)

Dolphins and porpoise caught as bycatch in fishing nets.

Pygmy killer whale longline bycatch

Common dolphin caught in the Mackeral trawl fishery

Large-scale fishing operations threaten 86% of these animals.

SEALS AND SEA LIONS are also frequent bycatch victims.

They forage for food on the ocean floor, where commercial nets may be placed. If they become entangled, they cannot get to the surface for air and they drown.

California sea lions hang trapped in a gillnet off the coast of Baja California, Mexico

Researchers estimate **SEA TURTLE bycatch at 8.5 million or more,** from 1990 to 2008, for the 3 major types of fisheries worldwide.

Sea turtle caught on longline hook

Sea turtles fatally caught in net

Drowned turtle on a shrimp trawler

Photo courtesy: Sea Turtle Restoration Project

Researchers have found that bycatch is the most serious threat to all sea turtle species, most of which are now either vulnerable or endangered.

Hundreds of thousands of <u>SEABIRDS</u> are also killed when they become entangled in fishing nets or caught on longline hooks when they dive for bait.

Albatross and Shearwater hooked on longlines

Gillnet seabird bycatch

SOME METHODS OF FISHING SUCH AS TRAWLING AND LONG-LINING RESULT IN BYCATCH RATES OF 50% OR MORE. THE UNWANTED ANIMALS ARE TOSSED BACK INTO THE WATER DEAD OR DYING.

Bycatch from a trawling boat fishing for Orange Roughy.

There is one in the top left-hand corner.

Photo courtesy of RightBite Program, John G. Shedd Aquarium

TYPES OF UNSUSTAINABLE FISHING PRACTICES

Enormous fishing vessel with massive nets

→ BOTTOM TRAWLING

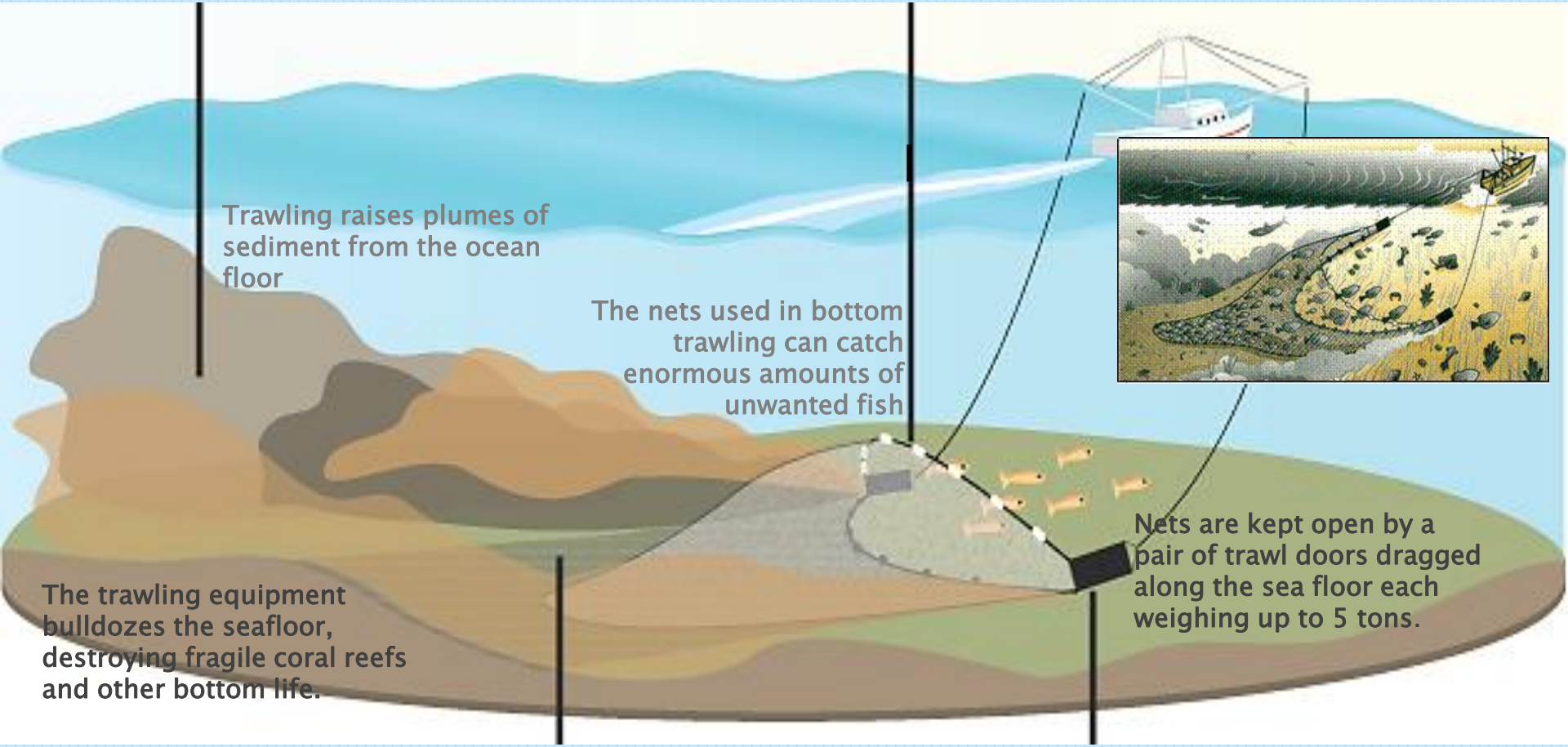
Large, commercial trawlers drag a large weighted net along the sea bed and grab up everything, whether they can sell it or not, devastating entire marine ecosystems and depleting some species to the point of collapse.

Trawling occurs in some of the most ecologically sensitive habitats in the ocean, such as seamounts on the high seas.

Bottom trawling is considered the most destructive of all fishing methods.

Background – trawlers anchored in Bahia de Navidad, México
Photo: Michelle Mech

DIAGRAM OF A BOTTOM TRAWLER



Large bottom trawlers can be over 100 meters long and can operate to depths of 800 metres or more. The larger bottom-trawl nets can be as large as 40-feet tall and 200-feet wide.

IMPACTS OF BOTTOM TRAWLING

Bottom trawling damages marine habitats by removing, crushing, flattening, or overturning the living structures on the seafloor that provide hiding, feeding and breeding areas for many fish and other marine life, as well as safe places for juvenile fish to grow into adults.

Untrawled and trawled seafloor, deep Oculina Reefs, Florida. Photo: R.Grant Gilmore, Dynamac Corperation, Lance Horn, UNC Wilmington.

Untrawled and trawled seafloor, Tasmanian seamount corals, Australia. Photo: Tony Koslow, CSIRO

Because many bottom-dwelling organisms, such as live corals and sponges up to 4,500 years old and reefs formed 8,000 years ago, are very slow growing, even a single trawl can cause losses that may not be reversed for decades or centuries, if at all.

BOTTOM TRAWLING BYCATCH

Bottom trawling catches millions of pounds of unwanted fish and also other marine life such as crabs, corals, marine mammals, sharks, and endangered sea turtles, hat are then discarded.

Bottom trawling is responsible for over 50% of all bycatch in the world.

SHRIMP TRAWL FISHERIES ARE THE SINGLE GREATEST SOURCE OF BYCATCH, accounting for over 27 % of total estimated discards or an estimated 11 million tonnes of discarded fish every year, while producing only 2% of all seafood.
For every 1 kilogram of shrimp, 3 to 15 kilograms of unwanted creatures die.

Up to 90% of the catch from this shrimp trawler fishing in the Gulf of Mexico was thrown overboard as bycatch.
Image: Elliott Norse

DO YOU EVER THINK OF THIS WHEN YOU ARE EATING SHRIMP?

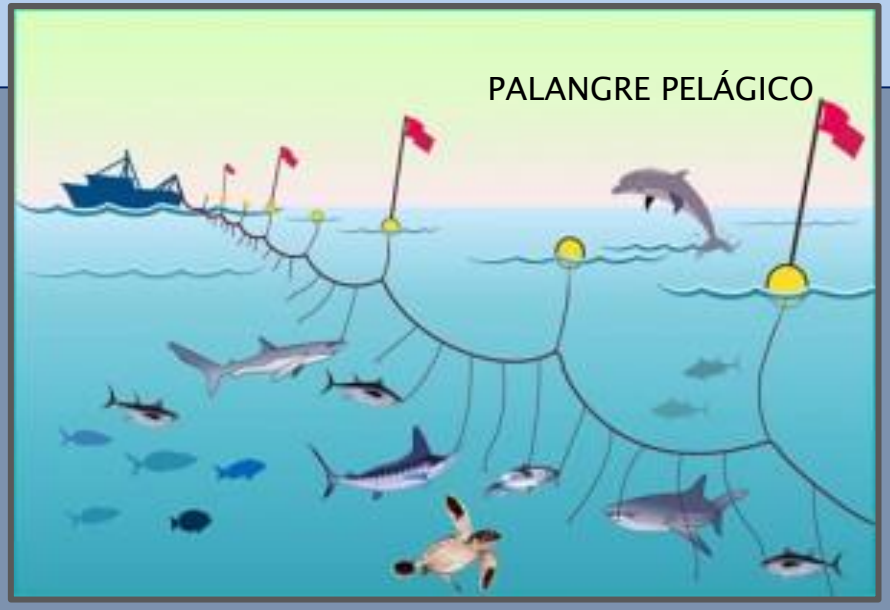
Shrimp fishing catch –

Look closely and <u>COUNT THE NUMBER OF SHRIMP</u> compared to the other fish and shellfish that are bycatch.

→ LONGLINING

Longlines, with up to 100 kilometers of up to several thousand baited hooks, are set near the surface or along the ocean floor.
When cast out and left to catch fish – usually for 12 to 24 hours – the bait on the longlines attracts other sea life, such as sharks, sea turtles, marine mammals, and sea birds.

It is estimated that global longline fisheries set 1.4 billion hooks each year (2000). That's 3.8 million hooks per day!



LONGLINING BYCATCH

Longline fishing bycatch rates are as high as 50% of non-target species. Each year, longline fishing, **kills over 300,000 seabirds, including 100,000 albatrosses.**

Bycatch for a pelagic longline fishing vessel operating for 1 month

Photo credit: Peter Ryan

Green sea turtles caught during longline fishing

MORE THAN 250,000 LOGGERHEADS, 60,000 LEATHERBACK TURTLES and MILLIONS OF SHARKS are caught each year by commercial longline fishing, with longline bycatch being particularly common in the Pacific Ocean.

Blue whale caught as bycatch on longline fishing hook
Photo courtesy: Terry Goss, Marine Photobank

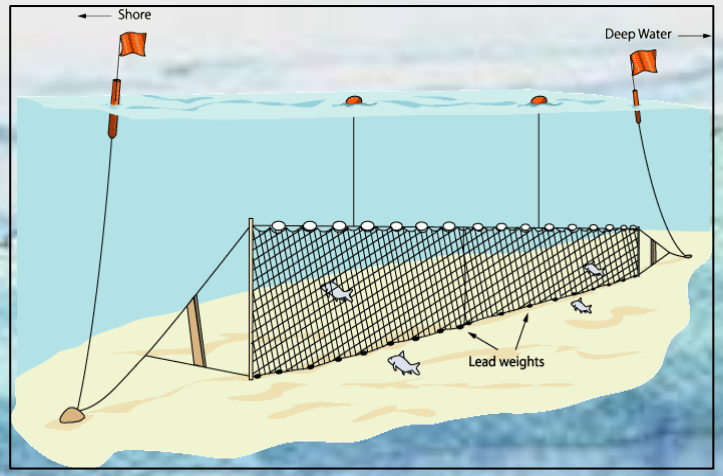
The highest reported bycatch rates for longline fisheries occurred off Mexico's Baja California peninsula.

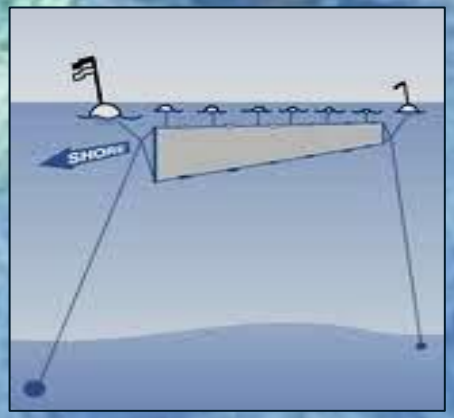
Loggerhead turtle caught on a longline hook as bycatch of a Swordfish fishing vessel
Photo: MarMas/Oceana

GILLNETTING

Gillnetters use walls of netting that can stretch as far as 5 kilometres and to depths of over 200 metres – either anchored to the sea floor or allowed to float at the surface.

The nets allow smaller fish to swim through, and larger fish are caught by their gill covers when they try to back out, thus the name “gillnet”.





Floating and bottom gillnets

Background image courtesy of www.kodiakmaritimemuseum.org

GILLNETTING BYCATCH

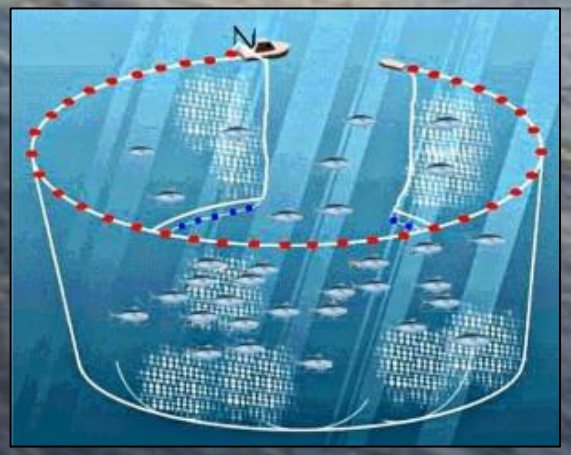
Because the gills, fins, flippers, or wings of any larger fish or mammal or bird are caught when they swim into a gill net, gillnetting results in high levels of bycatch, especially:

- Sea turtles, sharks, and seals.
- Dolphins, porpoises, and whales. Gill nets are difficult to see or detect with echolocation so they frequently run into them when swimming or feeding. **Most of the world's catacean bycatch occurs in gillnet fisheries.**
- Seabirds, especially in small-scale coastal gillnet fisheries – particularly birds that dive into the water to pursue their prey.

Migratory marine animals are particularly vulnerable.

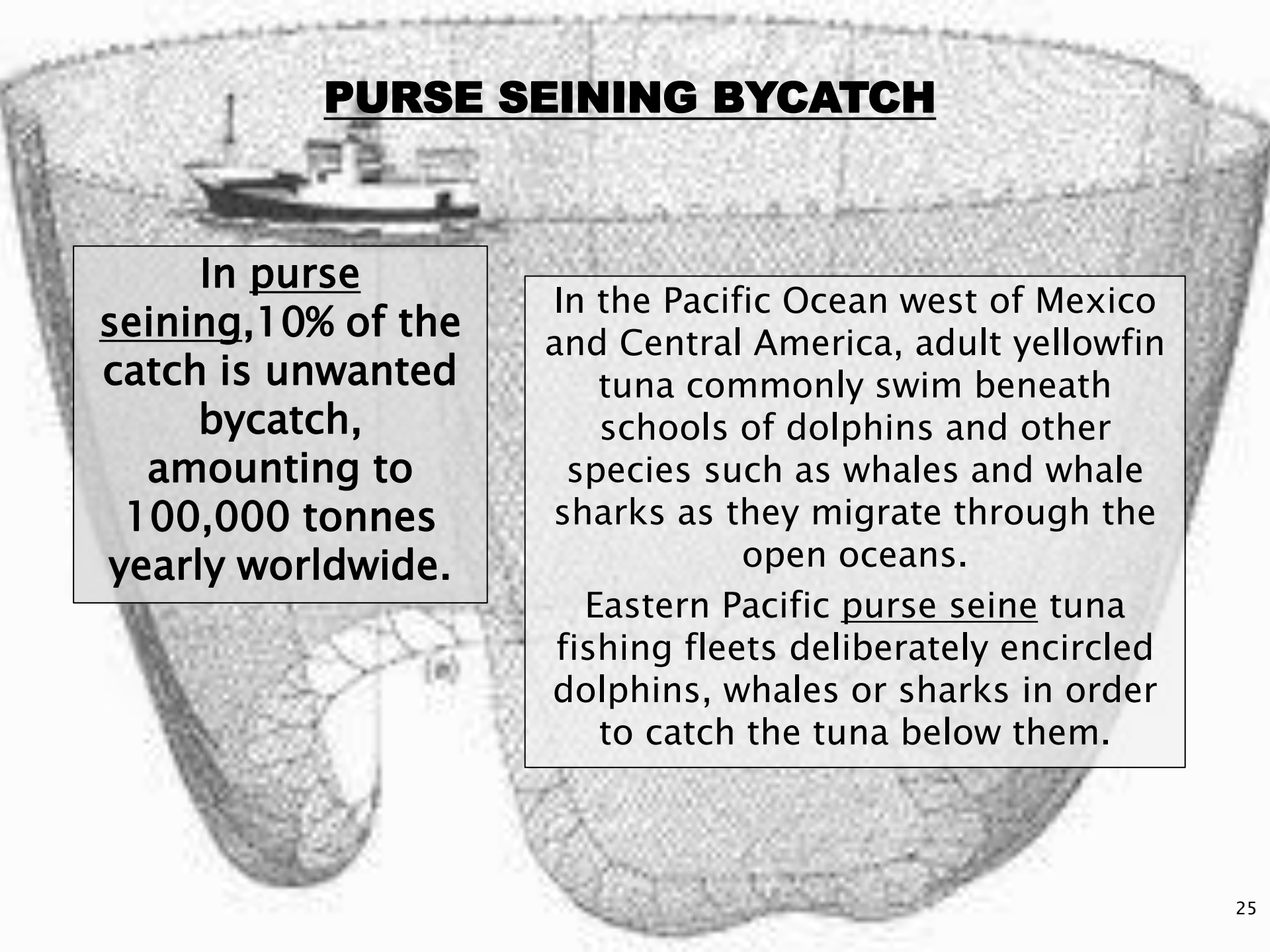
PURSE SEINING

Purse seiners use a large wall of netting to encircle schools of fish.
Fishermen pull the bottom of the netting closed—like a drawstring purse—to herd fish into the center.
These nets can be up to 2 kilometers in circumference and up to 50 meters deep.
60 to 70% of tuna are caught by purse seiners.



This purse seiner catches several hundred tons of mackerel

PURSE SEINING BYCATCH



In purse seining,10% of the catch is unwanted bycatch, amounting to 100,000 tonnes yearly worldwide.

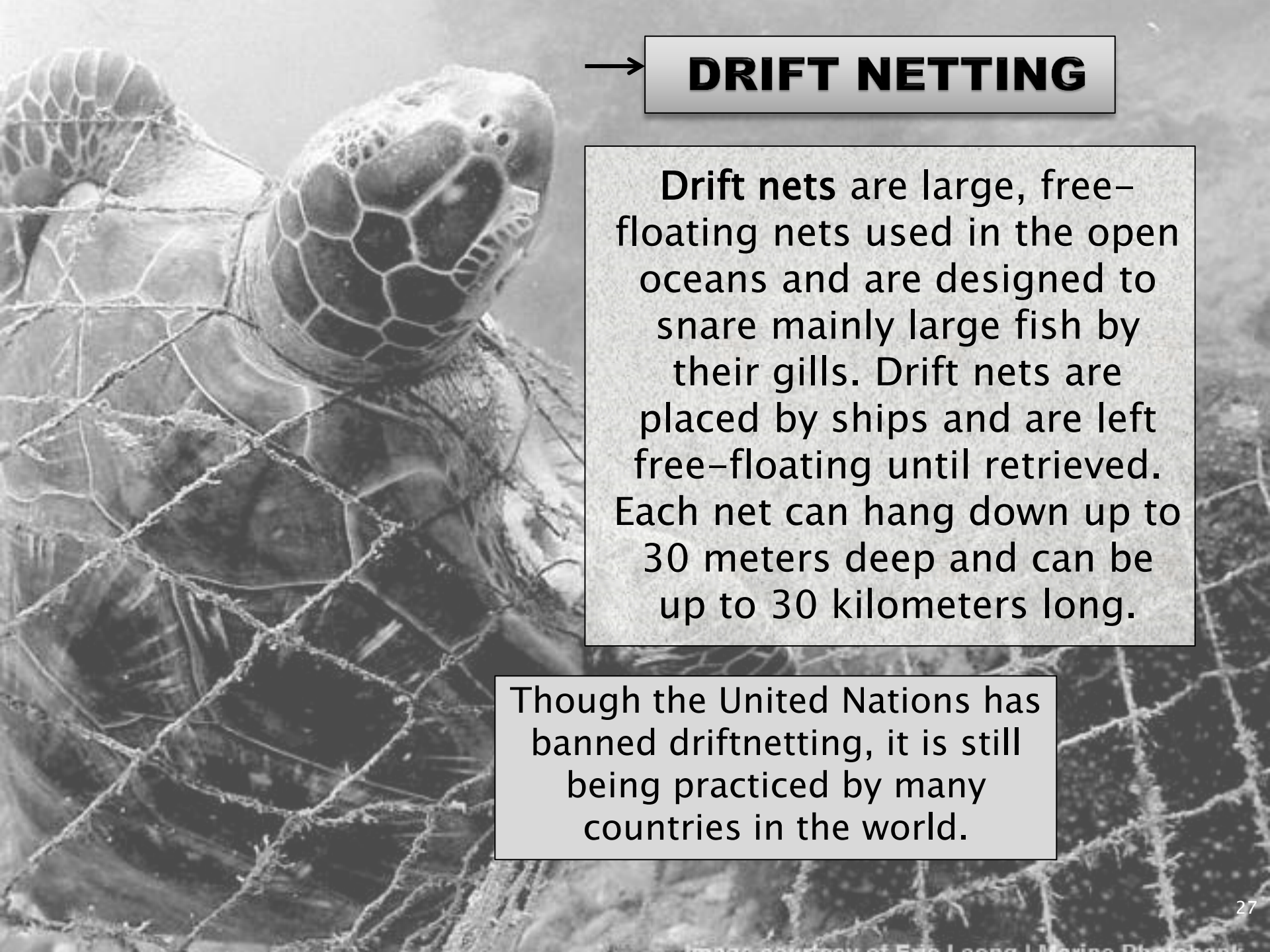
In the Pacific Ocean west of Mexico and Central America, adult yellowfin tuna commonly swim beneath schools of dolphins and other species such as whales and whale sharks as they migrate through the open oceans.

Eastern Pacific purse seine tuna fishing fleets deliberately encircled dolphins, whales or sharks in order to catch the tuna below them.

Since 1959, an estimated 7 million dolphins in the <u>Eastern Pacific purse seining</u> tuna fishery have died . This works out to well over 100,000 dolphins per year.

Recent improvements in fishing gear and an international agreement has lowered the fatalities to 1,000 dolphins per year, still the largest documented cetacean bycatch in the world.

Dolphins caught in the top of a purse seine net



DRIFT NETTING

Drift nets are large, free-floating nets used in the open oceans and are designed to snare mainly large fish by their gills. Drift nets are placed by ships and are left free-floating until retrieved. Each net can hang down up to 30 meters deep and can be up to 30 kilometers long.

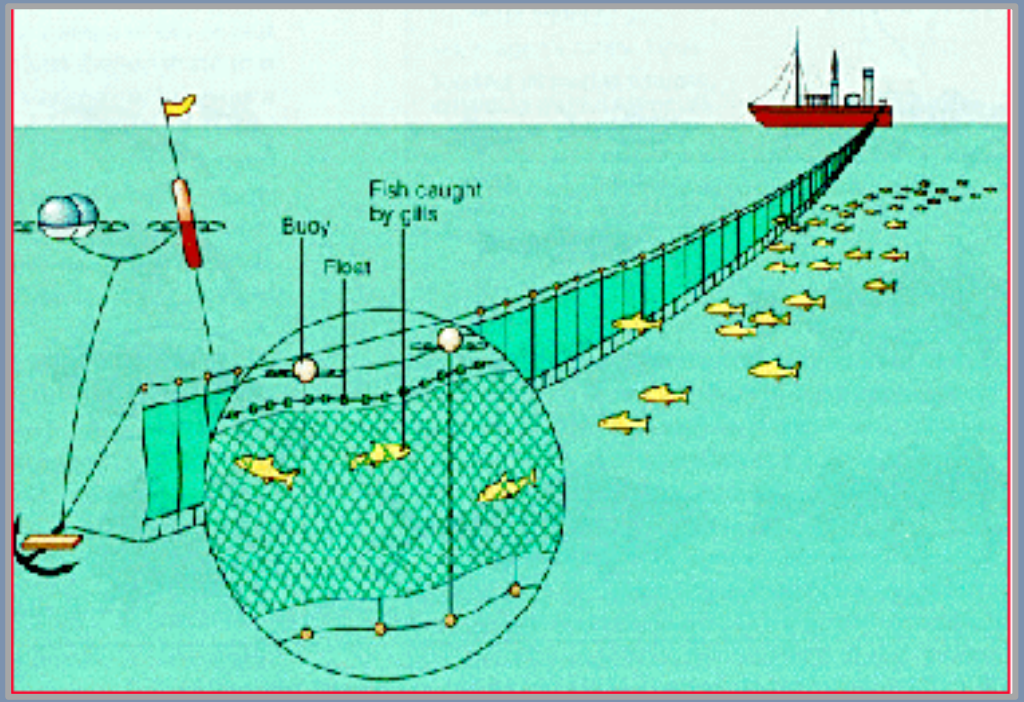
Though the United Nations has banned driftnetting, it is still being practiced by many countries in the world.

DRIFT NETTNG BYCATCH

Because drift nets are generally deployed in the open ocean and are not retrieved for days they catch many non-target fish, turtles, seabird, and marine mammals, which are removed from the nets and thrown back, dead, into the ocean.

It is estimated that 90,000 sea birds die each year in drift nets.

Drift netting is an extremely destructive fishing practice.



SMALL-SCALE FISHERIES - BYCATCH

Small-scale fisheries operated by hand from small open boats can also have high rates of bycatch mortality and account for over 11% of the world's bycatch.

This is because seabirds, marine mammals, and sea turtles frequent coastal areas that are in the range of small-scale fisheries.

Photo: Michelle Mech

For example, in Baja California Sur, small-scale gillnet and longline fleets have high levels of green turtle bycatch and an annual bycatch of over 1000 Loggerhead turtles – one of the highest sea turtle mortality rates in the world.

→ FACTORY SHIPS

In the past, fishermen had to return every day so that their fish would be kept fresh. Now there are factory ships, also called fish processing vessels, which are large ocean-going vessels with large on-board facilities for processing and freezing caught fish.

- They can store a thousand tonnes of fish in immense holds.
- They fish for weeks or months at a time.

The world's largest freezing trawler by gross tonnage is the 144-metre-long *Annelies Ilena.* It is able to process 350 tonnes of fish a day and store 7,000 tonnes of graded and frozen catch. On board forklift trucks are used to help unloading.

In a single expedition the *Annelies Ilena* catches the same as what 7000 traditional fishermen would catch in a whole year.

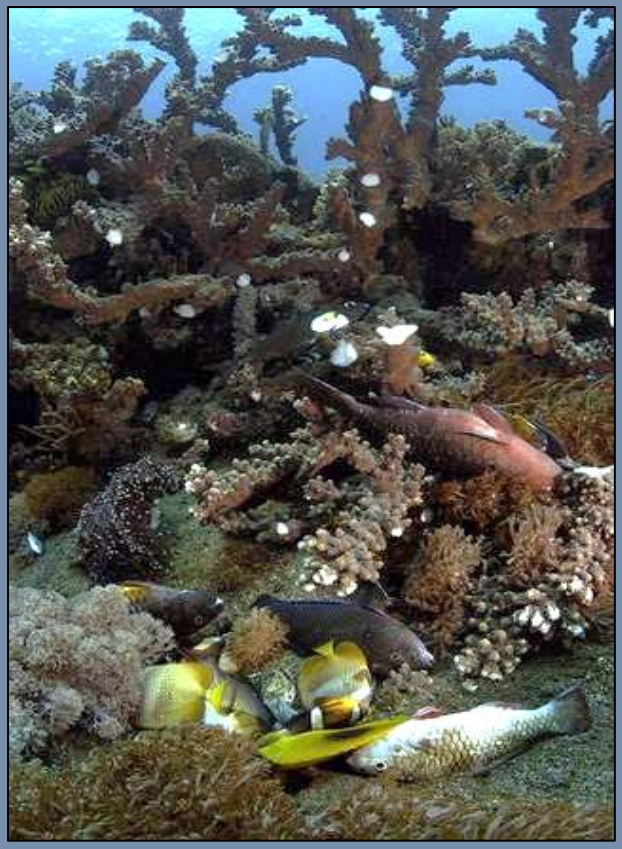
FACTORY FISHING TRAWLER

There are various types of FACTORY SHIPS, including trawlers, longliners, seiners, and squid jiggers.

There are over 38,000 (FAO) vessels greater than 100 tons in the world's factory fishing fleet.

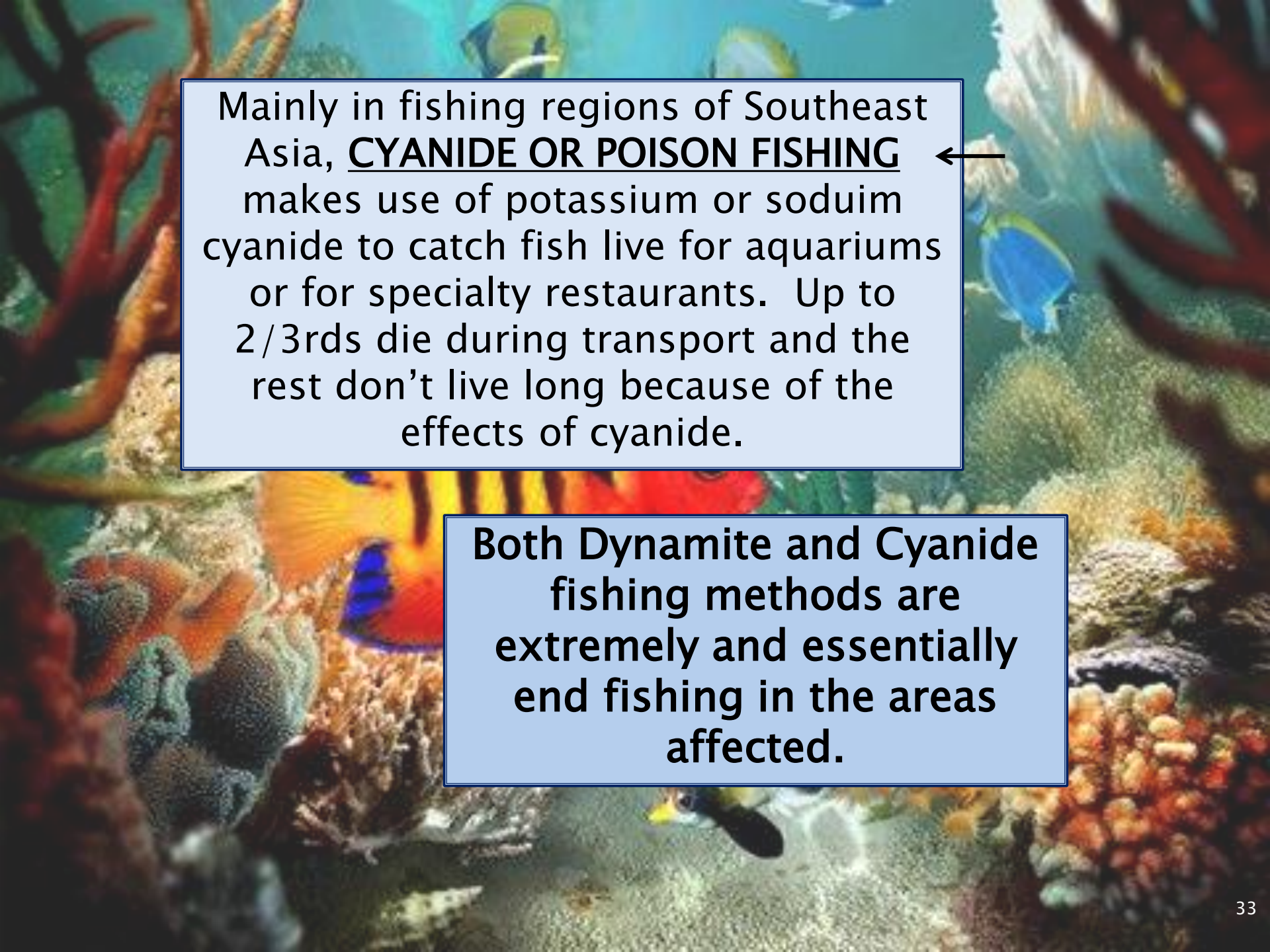
UNSUSTAINABLE FISHING PRACTICES – CORAL REEFS

In some parts of the world, **BLAST OR DYNAMITE FISHING** utilizes explosives to stun or kill tropical fish.



The effects of blast fishing on a reef
Photo: NOAA

Besides killing and injuring fish, it leaves behind rubble and broken corals on the sea floor, destroying the habitat for all reef species.



Mainly in fishing regions of Southeast Asia, **CYANIDE OR POISON FISHING** ← makes use of potassium or soduim cyanide to catch fish live for aquariums or for specialty restaurants. Up to 2/3rds die during transport and the rest don't live long because of the effects of cyanide.

Both Dynamite and Cyanide fishing methods are extremely and essentially end fishing in the areas affected.

UNSUSTAINABLE AND EXTREMELY WASTEFUL FISHING – SHARK FINNING

18,000 shark fins drying on a roof top in Hong Kong

SHARK FINNING

Canadian researchers estimate that shark mortality could be as high as 270 million (2010) each year. That's over 30,000 sharks each hour – most commonly caught on longline hooks. The majority are killed for their fins.
Sharks only kill 5 people annually.

Shark fins are usually removed while the sharks are alive and then the sharks are returned to the sea. Almost 65% (or up to 170 million), of sharks killed suffer this slow and painful death.

Hundreds of newly unloaded, wet and bloody shark fins drying in the afternoon sun on a street in Hong Kong
Photo: Alex Hofford/EPA

Shark fins are used for shark-fin soup, a delicacy widely consumed in China and in Chinese communities in other countries. The fins only add texture to the soup, not flavour.

VICTIMS OF SHARK FINNING

Shark caught on longline
Photo credit: AOCA

Live shark being definned
Photo credit: PITOMA

Definned and bleeding to death

Dying slowly on the ocean bottom Photo: Dan Beecham / Save Our Seas Foundation

Sharks have multiple nerve endings under their skin to detect touches.

Sharks take many years to mature and have long gestation periods and low reproductive rates. In some cases of overfishing, recovery, if possible at all, would take decades, or even upwards of a century.

IMAGINE WHAT IT WOULD BE LIKE TO BE A SHARK CAUGHT ON A LONG-LINE HOOK:

- First struggling to get free for up to 24 hours before you are hauled onto the deck of a boat.
- Then, while you are still alive, having hunters cruelly cut the fins off the sides of your body and your tail. (Imagine having your arms cut off in this way.)
- After that you are either left on the deck of the boat to bleed to death or thrown back into the water where you are now unable to swim and slowly sink towards the bottom where you will:
  - starve to death,
  - bleed to death,
  - slowly be eaten by other fish, or
  - drown because you can't force water through you gills to get oxygen.

Photo: Katrien Vandevelde

Photo courtesy: pewenvironment.org

Some shark finning statistics:

- Indonesia, India, Taiwan, Province of China, Spain, and Mexico are the top 5 providers of shark fins, but finning is common throughout the world. (FAO 2011)
- A bowl of shark-fin soup can cost up to $100 or more.
- One kilogram of dried shark fin can sell for US$700. A fin from trophy species like whale and basking sharks can sell for up to $20,000 or more.

Sharks are probably the most threatened group of species that we have in the ocean. The world's shark population is estimated to have declined by 90%. Some species have declined up to 98%.

Thresher and Mako Shark fins cut off and collected on the shores of San Marcos Is, Mexico

Photo: Brian J. Skerry, National Geographic Stock

Whale shark killed for its fins. These gentle sharks feed mainly on plankton, can live up to 100 years or more, and can grow up to 12 metres in length.

In recent years, over 80 countries have implemented some form of shark fin ban.

- Several countries protect sharks by prohibiting any kind of shark fishing within their waters. Some of these countries also prohibit the import and sale of shark fins.
- But the majority of countries still allow fishing for sharks and shark finning and only ban discarding the shark body at sea, which means less space for fins. Either (1) the whole shark or (2) the shark body and fins must be brought back to shore and the fins must not exceed a set percentage (usually 5%) of the total weight.
- **Under regulation (2), which is more difficult to regulate, sharks can still be definned while they are alive.**

Even with shark finning bans, which are often poorly enforced, there is currently no reduction in the volume of fins traded and little reduction in global shark catches.

Some shark bodies are used for food, or their skin for leather (most of it tanned in Mexico), but sharks are still being fished out faster than they can reproduce.

In a world already experiencing food shortages, discarding the bodies of sharks is also a total waste of a potential food source.

It is vitally important that countries totally ban most shark fishing and the import and sale of shark fins. This would help significantly in stopping the depletion and possible extinction of many shark species.

Consumer awareness and attitude must also be changed to stop the demand for shark fin soup. This is beginning to happen.

During shark processing in Japan, workers remove fins from thousands (75 tons) of dead blue sharks caught in just one day

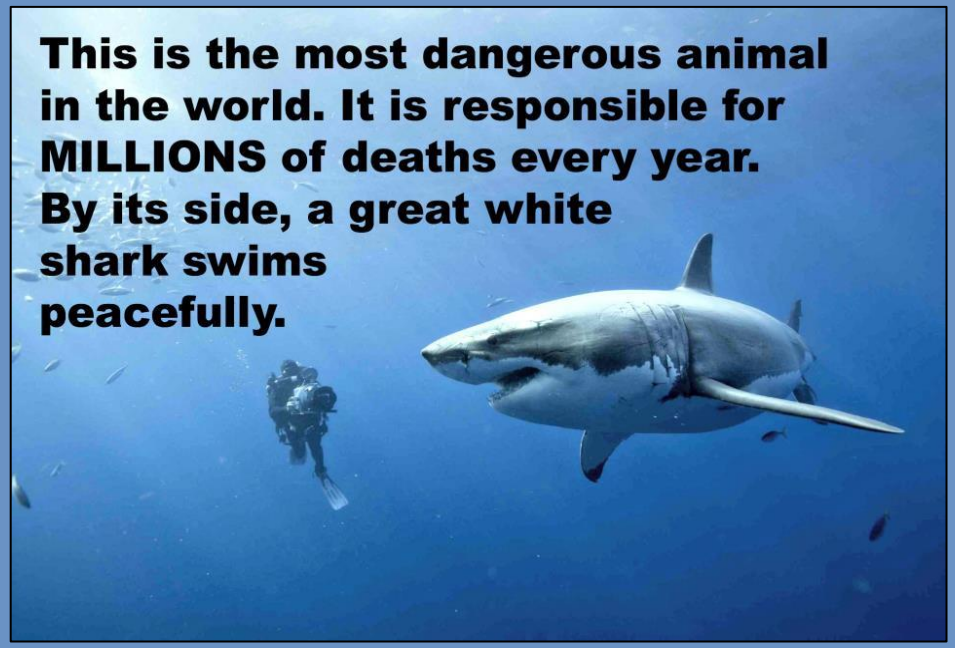
As well, as the shark population declines Manta and Devil Ray cartilage is increasingly being used as filler for shark-fin soup.

Background Photo: Chris Newbert-Corbis

SHARKS have survived for 450 million years. They were here 150 million years before the dinosaurs when life had just begun on land.

Sharks are our friend, not our enemy. They are the world's top predator and control life on 2/3rds of the planet. They help to maintain the balance of the ecosystem, and, in turn, many of the populations of the fish we depend on for food.

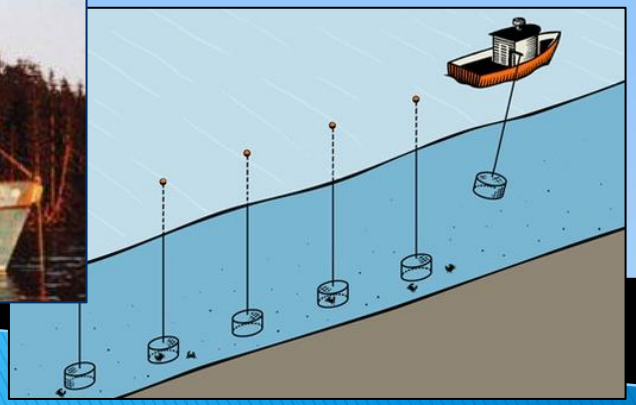
They also control the population of species that feed off photoplankton, which supply our oxygen, and which are already declining because of ocean warming.



We need sharks in order for our own long-term survival here on Earth. If we kill all the sharks, we destroy the entire marine ecosystem.
"Life on land depends on life in the oceans… It's not just about saving sharks, it's about saving ourselves." Rob Stewart, *Sharkwater*

SUSTAINABLE FISHING PRACTICES

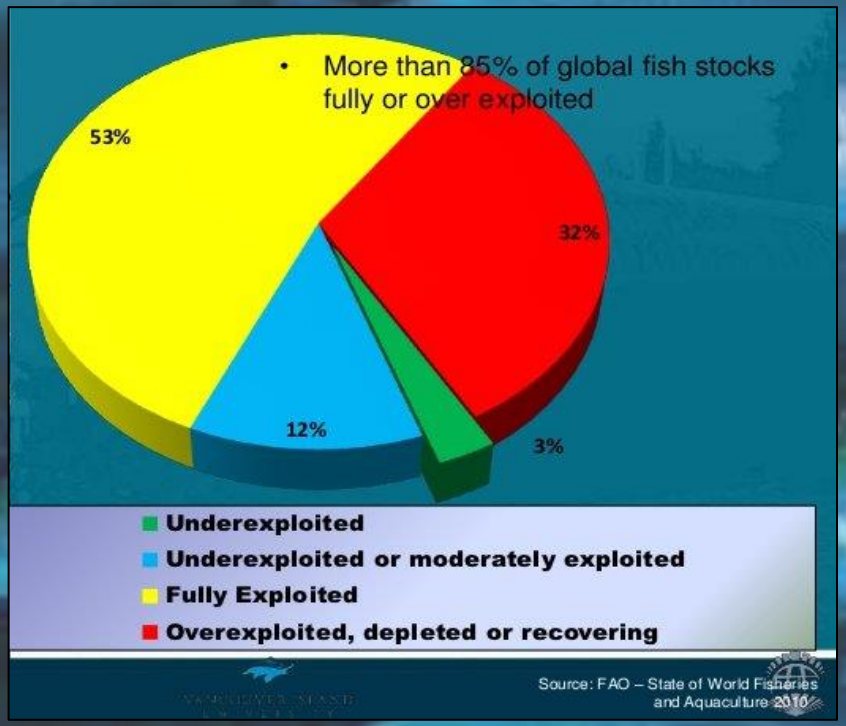
Fishing methods such as trolling, - which involves towing individual lines with hooks from a moving boat, use of a rod with one or more hooks, jigging, hand-lining, and traps, are generally sustainable fishing practices.



WHAT ARE THE RESULTS OF OVERFISHING?

WHAT ARE THE RESULTS OF OVERFISHING?

85% of the world's fisheries are fully- to over-exploited, depleted, or in a state of collapse. (FAO)



Populations of top predators, a key indicator of ecosystem health, are disappearing.

Worldwide, about 90% of the stocks of large predatory fish stocks, such as bluefin tuna, sharks, swordfish, marlin, and halibut – have already been fished out.

THE IMPACTS OF OVERFISHING

- We are working our way down the food chain by fishing out the largest and most valuable fish one after the other. This is also upsetting ecosystems.
- We are removing increasing volumes of fish at the lower end of the food chain and the fish that are left at higher levels are deprived of the prey they need to rebuild their populations.
- As overfishing limits the potential of stock to recover, we are at risk of losing valuable food sources many depend upon for food and jobs.
- We are also decimating species that are important for ecotourism.

Photo courtesy of Frank Hyde

OCEAN ECOLOGY

When a species is eliminated from an ecosystem, it often allows other species to thrive and take over.

An example is the large crops of jellyfish that are already thriving because their predators and competitors are overfished. Jellyfish are threatening fish stocks as they compete for food, eat fish eggs, poison fish, and are causing havoc in commercial fisheries.

Huge Nomura's jellyfish that can weigh up to 200 kg are now flooding the waters around Japan.

SPECIES LOSS HAS OTHER INDIRECT RESULTS

For example, in many areas where several fish species are almost fished out, people are targeting parrotfish. However, parrotfish are really important for reefs. Their fused teeth make them uniquely capable of scraping seaweed away.

Parrotfish feeding on coral

Where seaweed eaters get scarce, seaweed blooms and where it blooms, it suffocates the corals and prevents reef growth. Without parrotfish, reefs would likely become moundlike and dominated by seaweed. It is not possible to have both widespread overfishing and healthy coral reefs.

Background photo via ARC, courtesy of Treehugger

REDUCING BYCATCH

Some steps have been taken to reduce bycatch in many countries. For example:

- In longline fisheries, setting lines more quickly and at greater depths catches less turtles, sharks and marine mammals; setting hooks at night can reduce seabirds getting caught on hooks; and using circle hooks can prevent catching turtles.
- Some shrimp fisheries are using turtle extruder devices to avoid killing sea turtles, while other net fisheries are using escape hatches to avoid catching dolphins.

SOME STEPS THAT COULD BE TAKEN GLOBALLY TO REDUCE OVERFISHING?

- Reduce the number of fishing boats across the world.
- Place more limits on catches.
- Implement more sustainable fishing practices.
- Protect large areas of the ocean through a network of marine reserves off-limits to fishing. These can make a significant difference to ocean health and create safe places for fish and other marine mammals to breed.
  - Today about 12.7% of the world's land area is under some form of protection.
  - By contrast only 2.8% of the world's oceans are within marine protected areas (MPAs), and less than 1% of these areas are fully protected and fall under no-fishing zones.

64% of the oceans are considered 'high seas', for which no one specific nation has ownership or governance, and where controlling illegal, unreported, and unregulated fishing (accounts for an estimated 20% of the world's catch) is extremely difficult. International cooperation is required to improve global fisheries management.

WHAT CAN INDIVIDUALS DO TO REDUCE OVERFISHING?

- As individual consumers of fish, we can try not to eat fish that are considered endangered, or those caught using destructive fishing practices or with high levels of bycatch, and we can try to educate other people to do the same.
- As individual fishermen, fishing practices can be changed to significantly reduce bycatch, including juvenille fish, and fishing of species that are low in abundance or ecologically important.

Most of the effects of overfishing are still reversible if people take strong measures now.

Related video: Brian Skerry reveals the ocean's glory . . . And horror
http://www.ted.com/talks/lang/es/brian_skerry_reveals_ocean_s_glory_and_horror.html

Photo courtesy: http://itp.suzkirkpatrick.com

OVERFISHING

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