

Human Impact on the Sea COVID VERSION

Fisheries

- The major fisheries are concentrated in the waters overlying the continental shelves around the world. The largest catches of fishes occur on the continental shelves of northwest Europe, western South America and Japan.
- Among the thousands of species of marine fishes, only a very few species make up the majority of the catch throughout the world. The herrings, sardines, and anchovies account for the largest tonnage of fishes, accounting for almost half the catch. Why?
- Major fishing techniques include the use of trawl nets, purse-seine nets, long-lines, and drift nets. Supertrawlers make up 1% of the global fleet, employ 2% of the world's total crew and harvest 50% of the world's total catch.

Maximum Sustainable Yield vs. Optimum Yield

- The maximum sustainable yield is the largest number of fishes that can be harvested year after year without diminishing the stocks. Currently, 70% of the world's fisheries are overexploited and the global fishing fleet is 250% larger than needed to catch what the oceans can sustainably produce.
- U.S. fisheries are governed by the Magnuson-Stevens Fishery Conservation and Management Act of 1976. It states that "Conservation and management measures shall prevent overfishing while delivering optimum yield from each fishery on a continuing basis. Optimum Yield is the maximum sustainable yield modified by any relevant economic, social or ecological factors."

Problems with Fisheries

- In recent years, there have been abundant examples of the decline of fish stocks of all types in all areas of the world. The top 25 ocean predator populations have decreased 90%. Global catch has been decreasing every year since 1988 even though fishing technologies have improved.
- Another source of destruction in fisheries is the bycatch. Bycatch refers to nontarget organisms and undersized target organisms that are captured by the fishing gear. In the shrimp industry, up to 10 pounds of bycatch are discarded for every pound of shrimp caught.
- A largely overlooked problem that contributes to the death of huge numbers of marine organisms is lost fishing gear. Lost nets or traps may continue to capture in what is termed ghost fishing.

Mariculture

- Aquaculture is the rearing of selected aquatic plants and animals under controlled conditions to increase the amount of food available to humans. The term for marine aquaculture is mariculture.
 - Fish farming involves cultivating fish in a controlled environment.
 - Fish ranching involves holding anadromous species (live part of their lives in fresh water and part in salt water) in captivity for the first few years, releasing them, and then harvesting them as adults.

Invasive Species

- Invasive Species (ie. alien species, introduced species, nonnative species) are species that are deliberately or accidentally introduced into an ecosystem by humans. Important examples of invasive species include the zebra mussel, the lionfish, the burmese python and the northern snakehead.

Sources of Pollution

- Various toxic chemicals produced by the industrialized nations find their way into the oceans' ecosystems. These chemicals are transferred through food chains, becoming more concentrated through the process of biological magnification. This not only harms the marine organisms, but also renders some fish inedible by humans.
- The runoff of excess fertilizers and sewage into coastal waters can lead to eutrophication (resulting in low dissolved oxygen).

Climate Change

- Climate Change has influenced oceans in two major ways:
 - Warming temperatures have led to coral bleaching, melting of the ice caps, and a changing in the patterns of deep water upwelling.
 - Ocean acidification, caused by absorbed CO₂ in the ocean converting to carbonic acid, has led to decreased shell forming and the dissolving of coral reefs.

Marine Organisms of the Day

1. Atlantic Bluefin Tuna (*Thunnus thynnus*): Bluefin are the largest tuna and can live up to 40 years. They migrate across oceans and can dive more than 4,000 feet. Bluefin tuna are built like torpedoes, have retractable fins and their eyes are set flush to their body. They are tremendous predators from the moment they hatch, seeking out schools of fish like herring, mackerel and even eels.

<https://www.youtube.com/watch?v=CGVDK7aTaZw> (1:09)

2. (Bruce) Great White Shark (*Carcharodon carcharias*): Great White Sharks can detect one drop of blood in 25 gallons of water (100L) and can sense tiny amounts of blood in the water up to 3 miles away. They are the largest predatory fish on Earth, weighing up to 5,000 pounds. They can also swim up to 15 miles an hour (the fastest human swimmer ever recorded swam 5.3 miles an hour). They are listed as an endangered species due to overfishing and accidental catches in gill nets, but the exact number of great whites in the world is unknown.

<https://www.youtube.com/watch?v=kXaIykJdtwM> (4:03)

3. American Lobster aka Maine Lobster (*Homarus americanus*): The lobster is one of the largest types of crustacean with some lobster species known to get to weigh over 45 pounds. Lobsters live on rocky, sandy, or muddy bottoms close to the shoreline to beyond the edge of the continental shelf as the lobster prefers the shallower ocean water. Lobsters have been known to get to 100 years old, sometimes older and the lobster continues to grow in size throughout its life.

https://www.youtube.com/watch?v=jv3opUhYC_Y (3:41)

4. Antarctic Toothfish aka Chilean Seabass (*Dissostichus mawsoni*): Antarctic toothfish are large, pelagic predators that live in southerly waters influenced by the Antarctic Circumpolar Current at depths between 300 and 2,500 meters. Living up to 48 years, it is believed they reach sexual maturity between 13 and 17 years of age. This is of concern due to the popularity of the fish, which is marketed as Chilean Seabass.

<https://www.youtube.com/watch?v=CztBS7StN48> (3:55)

5. White Shrimp aka Common Shrimp (*Litopenaeus setiferus*): An important U.S. fishery, White shrimp are crustaceans with ten walking legs and five pairs of swimming legs located on the front of the abdomen. Young shrimp live and grow in nursery areas with muddy bottoms and low to moderate salinity. White shrimp commonly inhabit estuaries & coastal areas out to about 100 feet offshore.

<https://www.youtube.com/watch?v=EnHoDBjSimE> (3:37)

6. Striped Marlin (*Kajikia audax*): Found in tropical and warm temperate waters of the Indian and Pacific oceans, the striped marlin is pelagic and seasonally migratory, moving toward the equator during the cold season and away again during the warm season. The most distinguishing characteristic is its high, pointed first dorsal fin, which normally equals or exceeds the greatest body depth.

<https://www.youtube.com/watch?v=1CKjFUVs3Qg> (3:48)

7. Nile Tilapia (*Oreochromis niloticus*): Tilapia is the most aquacultured fish in the world. Tilapia are low in saturated fat, calories, carbohydrates and sodium, and are a good protein source. Tilapia rarely compete with other "pond" fish for food. Instead, because they consume plants and nutrients unused by other fish species and substantially reduce oxygen-depleting detritus; adding tilapia often increases the population, size and health of other fish.

<https://www.youtube.com/watch?v=zZ6pI6AOYtc> (2:58)

8. Polar Bear (*Ursus maritimus*): Polar bears are classified as marine mammals because they spend most of their lives on the sea ice of the Arctic Ocean. Considered talented swimmers, they can sustain a pace of six miles per hour by paddling with their front paws and holding their hind legs flat like a rudder. They were the first species to be classified as endangered solely due to global warming.

<https://www.youtube.com/watch?v=0mgf6t9VEc> (3:36)

9. Goliath Grouper (*Epinephelus itajara*): Groupers mature as females, but can change their sex after sexual maturity. They normally swallow their prey instead of biting off chunks, and chew it using huge crushing tooth plates in their pharynx. The largest grouper ever recorded weighted 310 kilograms, or 686 pounds.

<https://www.youtube.com/watch?v=y0eCyugm6f0> (1:24)

10. Red Volitan Lionfish (*Pterois volitans*): A lionfish can live without food for 3 months and only lose 10% of their body mass. In fact, obese lionfish are being found with internal organs that are completely covered in fat and suffering from liver damage. Lionfish are being increasingly found in brackish water, where the water salinity is about 6 parts per thousand compared to the ocean at 33 parts per thousand.

<https://www.youtube.com/watch?v=GzaeYzAC8Ro> (3:20)

Finding Nemo Clips for the Exam

6 – Nemo Lost

25 – Darla!

26 – Fishing Net