

Anthropogenic Threats to Fishery Resources

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SUMMARY

According to FAO's "The State of World Fisheries and Aquaculture 2022," approximately 58.5 million people, directly or indirectly (as full-time, part-time, occasional, or unspecified workers), depend on the fishing industry for their livelihood and employment. In addition it also contributes to every country's economic development by increasing the GDP. In India, fisheries generate 1.1% to the national economy. But, nowadays, this sector's resources are being depleted and overexploited by many anthropogenic activities. This article focuses on the various effects of those activities, including ocean acidification, overfishing, habitat loss, ocean deoxygenation, deep sea mining, oil spills, invasive species, diseases caused by humans, pollution, toxic chemicals, and eutrophication, as well as the steps being taken to mitigate those effects.

INTRODUCTION

Fishing has been used as a multipurpose activity in developing nations, providing sources of income, subsistence, and protein. Fishermen's livelihoods are frequently complicated, but on a larger scale, they are crucial to reducing poverty and ensuring food security (DFID, 2010). Throughout human existence we have relied on aquatic resources for a variety of purposes, including food, recreation and economic opportunities. However, it's our action that have an impact on the area's resources and wildlife. Along with rapid population growth, significant technological advancements, and significant changes in land use which affect the resources and the organisms that live there. Humans have always used aquatic resources for personal gain and benefit. However, many fishing stocks all over the world have significantly declined as a result of technological advancements, larger ships, and improved fishing gear. The surface waters of the world's oceans, seas, rivers, streams, and lakes are not only a source of livelihood, entertainment, and food but are also home to tens of thousands of different species, ranging in size from the tiniest microscopic algae to the largest whales. These animals no longer feel secure in their habitats, which is unfortunate.

Few human activities given below amongst other harmful practices account for the death of trillions of aquatic organisms every year.

- Overfishing
- Oil spillage
- Plastic dumping
- Acidification
- Habitat loss
- Pollution
- Invasive species
- Deep sea mining

These destructive practises are tipping the ecosystem's balance to the extreme as well as causing these creatures to go extinct. So let's look at the human activities that endanger fishery resources.

What is an Anthropogenic threat?

The anthropogenic threat designates a deliterious or harmful effects caused by "human activities" to the environment. The threat may adversely affect humans, other organisms, biomes and ecosystem. The frequency and severity of hazards are key elements in some risk analysis.

Factor, cause and effects of anthropogenic threat:

Factors:

- Rapid growing population
- Industrialization
- Urbanisation
- Economic development

Causes :

- Pollution
- Land degradation
- Deforestation
- Soil erosion

Effects:

- Discharge of toxic effluents and inflow of nutrients
- Degradation of coastal and open sea ecosystem
- Impairment of aquatic organisms (Fish, Mammals, Whales, Turtles etc)
- Diseases and loss of biodiversity (Extinction)

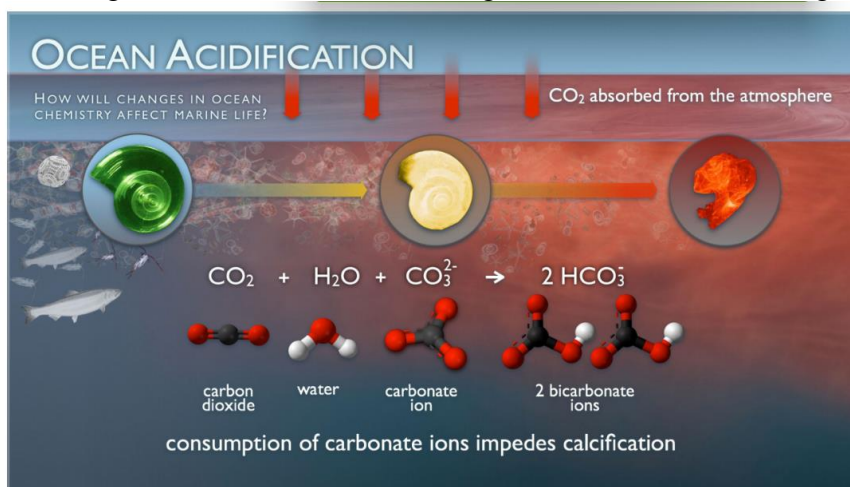
Threats to aquatic resources:**Ocean Acidification**

Ocean acidification is one of the major threat posed by humanity to the fishery resources around the world. It occurs because of the too much amount of carbon dioxide is being released into the atmosphere. Normally the ocean absorbs 30% of the Carbon dioxide released in to the atmosphere. The rate at which we are pumping it into our atmosphere is a concern,

However there are two major sources for this influx of atmospheric CO₂:

- Fossil fuel emissions
- Deforestation.

Fossil fuel emissions are the gases that are spewed out of most cars, airplanes, power plants, and factories that are burning fossil fuels (coal, oil, or gas). Since the industrial revolution, consumption of fossil fuel has increased exponentially resulting in the slew of climate change-related issues, including ocean acidification.

**Ocean Acidification**

Deforestation is a two-fold issue. Forest fire is similar to burning fossil fuels. As both emits lot of carbon dioxide into the atmosphere. Forests are significant because large area of plant life (also in the ocean) are known to be “carbon sinks”, absorbing carbon dioxide for photosynthesis. Carbon dioxide levels have historically been balanced; and the CO₂ produced was absorbed. Deforestation not only produces more CO₂, but it also destroys one of the things that helps absorb it. Ocean acidification can harm marine life by dissolving the shells and skeletons of organism made of calcium carbonate. The faster the shells dissolve, the more acidic the ocean. To survive, animals that produce calcium carbonate structures, such as corals, sea urchins, sea snails, and oysters, must expend extra energy either repairing or thickening their shells and exoskeletons. Animals' ability to grow and reproduce may be harmed if they use energy to repair or thicken their shells. While some animals may be able to survive and reproduce in more acidic waters, they will most likely shrink. This can have repercussions throughout the food chain, potentially affecting other animals that rely on them for food, such as whales and even humans.

Overfishing

Overfishing is simply catching fish from the sea at such a high rate that fish stocks become too depleted to recover. Overfishing is threatening the future of both ocean and land dwellers. It can occur in any size of water

body, such as ponds, wetlands, rivers, lakes, or oceans, and can cause resource depletion, reduced biological growth rates, and low biomass levels. Overfishing can lead to critical depletion, in which the fish population is unable to sustain itself. Some forms of overfishing, such as shark overfishing, have disrupted entire marine ecosystems.



Overfishing

Unsustainable fishing in coral reef areas can lead to the extinction of key reef species in a variety of locations. Such losses frequently have repercussions not only on the coral reef ecosystems themselves but also on the local economies that rely on them. Furthermore, certain types of fishing gear can cause significant physical harm to coral reefs, seagrass beds, and other aquatic resources.

Habitat Loss

The term "loss of habitat" refers to the reduction in the amount of space available for a specific species or group of species to survive or reproduce. Humans are causing significant habitat loss in the coastal ecosystem. Specifically, seagrass meadows, mangrove forests, and coral reefs are all in global decline as a result of human disturbances. Coral reefs are among the most productive and diverse ecosystems on the planet, but One-fifth of the world's coral reefs have disappeared in recent years as a result of human interference. In order to survive in oligotrophic waters, coral reefs are microbially driven ecosystems that depend on marine microorganisms to store and recycle nutrients. But these same microorganisms can also set off feedback cycles that accelerate coral reef declines, with ripple effects on marine food webs and biogeochemical cycles. If coral reef conservation is to be successful in the future, a better understanding of the intricate microbial interactions within coral reefs is required.



Coral Reef - Habitat Loss

Seagrass ecosystem services, which are currently valued at approximately \$US1.9 trillion per year, include nutrient cycling, the provision of food and habitat for many marine animals, including the endangered dugong, manatee, and green turtles, as well as significant facilitation for coral reef fish. Trawling and dredging have had a significant impact on seagrass meadows, and we have lost approximately 30,000 sq km (12,000 sq mi) of seagrass meadows in recent decades.



Seagrass- Habitat Loss

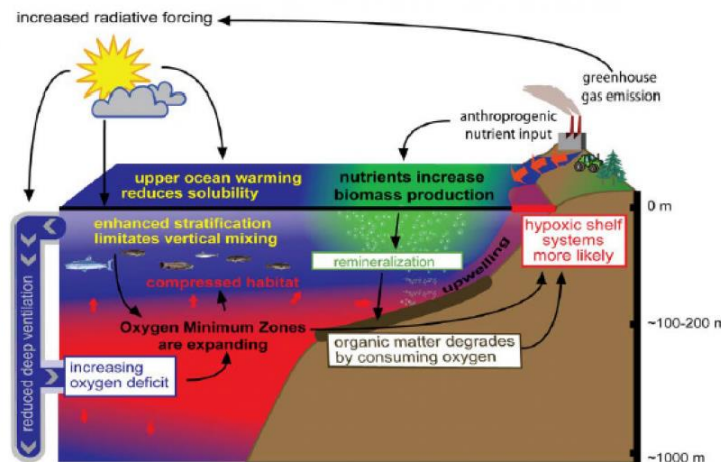
Mangrove forests acts as the nursery habitat for many commercial fish and shellfish. It is home to 341 threatened aquatic species around the world. Since 1980, one-fifth of the world's mangrove forests have been lost due to direct transformation practises such as mining, dredging, construction, or aquaculture. The most pressing threat to kelp forests may be overfishing of coastal ecosystems, which facilitates their shift to depleted urchin barrens by removing higher trophic levels.



Mangrove- Habitat Loss

Ocean Deoxygenation

The expansion of oxygen minimum zones in the oceans as a result of burning fossil fuels is known as ocean deoxygenation. It is an additional stressor for marine life. Aquatic animals, mammals ,other marine life, humans who depend on marine life for food or a living, are at risk due to the relatively quick change. Ocean productivity, nutrient cycling, carbon cycling, and marine habitats are all impacted by ocean deoxygenation.

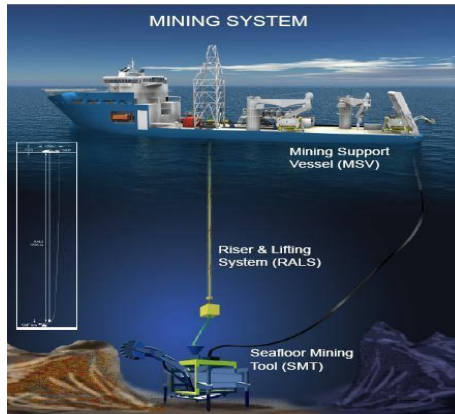


Ocean Deoxygenation

Ocean warming exacerbates ocean deoxygenation and further stresses the marine organisms, by limiting the nutrient availability and increases the ocean stratification through density and solubility effects meanwhile which increases metabolic demand.

Deep Sea Mining

The deep sea is the region of the ocean below a depth of 200 metres, and the practise of mining for minerals there is referred to as deep-sea mining. This has a negative impact on marine ecosystems and biodiversity. Deep-sea habitats may change or be destroyed by machine-aided excavation and gauging of the ocean floor. This results in the extinction of species and the fragmentation or loss of the structure and functionality of the ecosystem. Particle plumes are produced by the stirring up of fine sediments on the seafloor caused by deep-sea mining. Noise, vibration, and light pollution caused by mining equipment and surface vessels, as well as potential leaks and other hazards, could have an impact on species like whales, tuna, and sharks.



Deep Sea Mining

Oil Spill

Oil spills can be very harmful to marine birds, sea turtles and mammals, and also can harm fish and shellfish. Fur-bearing mammals, like sea otters, lose their ability to insulate, and the feathers of birds lose their ability to repel water, leaving them vulnerable to the elements. Many animals, including birds, try to clean themselves with oil or eat oiled prey, which causes them to ingest poison. Oil can be digested by fish and shellfish as well, which may alter their ability to reproduce, grow, or even cause their demise. Commercially significant species like swordfish, tuna, mahi-mahi, grouper, oysters, and prawns could also experience population declines or become too contaminated to be caught and consumed safely. The most common causes of damage in shallow waters are either improper use of dispersants too close to the shore or strong wave action mixing oil into the water column. The death of bottom-dwelling (benthic) animals and those living in the sediment is caused by high concentrations of the toxic components of crude oil that are produced when it is dispersed into shallow water



Oil Spill

Invasive Species

A non-native species that has the potential to spread to the point where it harms the environment, the economy, or human health is considered an invasive species. When Molnar et al. studied the migration routes of numerous marine invasive species in 2008, they discovered that shipping was the primary method of invasive species transfer in the ocean. The two primary methods used by ships to move marine life to different ocean environments are

- Hull fouling
- Movement of ballast water.



Invasive Species - Hull Fouling Organism

Consequences of invasive species:

- Spread of new diseases,
- Introduction of new genetic material,
- Alteration of underwater seascapes,
- Threat to the ability of native species to find food

Human Induced Diseases

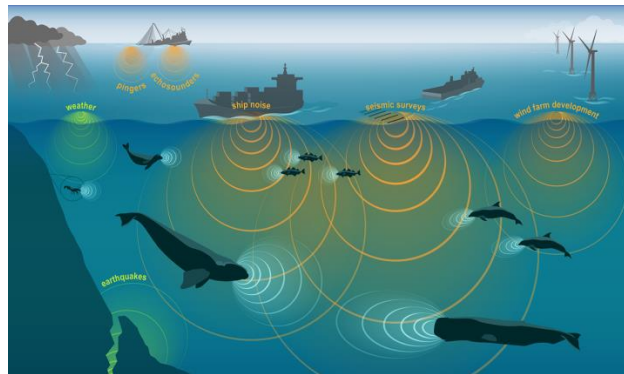
Ocean environments change quickly, allowing disease to spread. Disease-causing microbes have an advantage in ocean ecosystems because they can adapt to new ocean conditions much faster than other marine life. Protozoans, fungi, bacteria, and viruses are included in this group of organisms. While these pathogenic organisms can adapt quickly, rapid environmental changes weaken other marine life. Microbes are also multiplying due to human waste polluting the ocean and aquaculture, the farming of aquatic life. These practices increase the survival of microbes by introducing new pathogens and extra nutrients into the ocean.

Pollution

Anthropogenic activities has the potential to contaminate water supplies. They harm natural systems and lower the quality of freshwater and marine water resources. The pollution that passes directly into water from factories and cities can be reduced through treatment at source before it is discharged. Only a small portion of chemicals are subject to regulation, and worries about contamination from unregulated chemicals are spreading. Antibiotics and other pharmaceutical products, such as painkillers, are affecting both surface and underground water resources. There is a need to focus on protecting water resources. There are different kinds of pollution such as

Noise Pollution:

The aquatic resources that organisms have evolved around for tens of thousands of years have a natural soundscape. Human interference with this soundscape has largely drowned out the sounds that organisms need for mating, fending off predators, and travelling. Noise pollution in aquatic environments has been brought about by ship, boat propellers, engines, industrial fishing, coastal construction, oil drilling, seismic surveys, warfare, seabed mining, and sonar-based navigation.



Noise Pollution

Noise pollution is especially damaging the marine mammals (whales and dolphins) that rely on echolocation to communicate, navigate, feed, and find mates, but excess sound interferes with their ability to use echolocation and hinder the mammal to carry out these vital tasks.

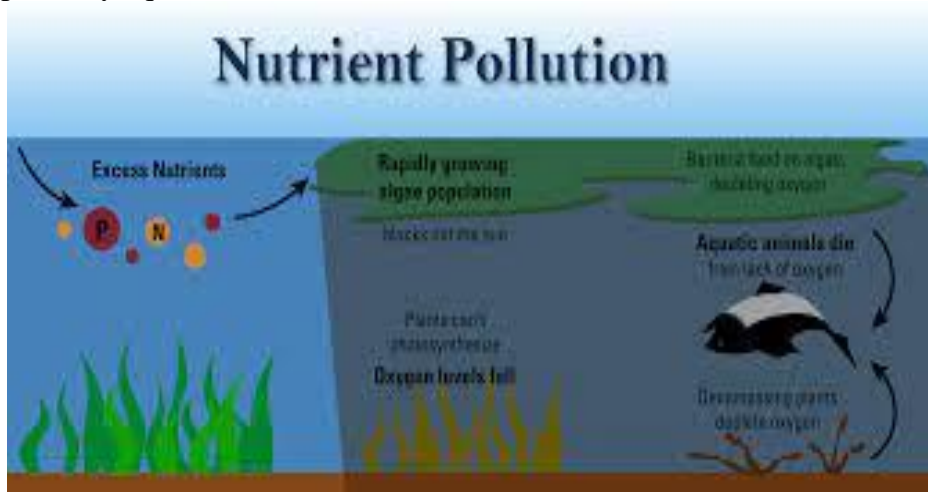
Plastic Pollution: Every year, more than 300 million tonnes of plastic are produced, of which half are used in single-use items like packaging, bags, and cups. Every year, at least 14 million tonnes of plastic are dumped into the ocean. From surface waters to deep-sea sediments, 80% of all marine debris is made up of plastic pollution. Larger plastic waste can be ingested by marine species, filling their stomachs and giving them the impression that they have eaten something substantial when in reality they haven't. This can cause seabirds, whales, fish, and turtles to starve to death while having stomachs full of plastic. Additionally, marine life may suffocate or become entangled in trash made of plastic.



Plastic Pollution

Nutrient Pollution:

Nutrient pollution is a primary cause of eutrophication of surface waters, where too many nutrients, typically nitrates or phosphates, encourage the growth of algae. Following its death, this algae sinks and is subsequently decomposed by aquatic bacteria.



Nutrient Pollution

The five main causes of nutrient pollution are listed below.

- Municipal sewage is the most frequent source of nutrient runoff. Storm water runoff, leaks, or the intentional dumping of human sewage into water bodies are all ways that this sewage can enter waterways.
- The use of chemical fertilisers in agriculture can cause excess nitrogen and phosphorus to enter waterways and seep into groundwater or be washed away in rainwater.
- An additional source of nutrient pollution is stormwater drainage. Stormwater, which enters the nearby rivers and streams and eventually the ocean, can pick up nutrients and fertilisers from residential properties and impervious surfaces.
- Aquaculture, which involves the controlled cultivation of aquatic organisms, is the fifth major source of nutrient runoff. Excrement, leftover food, and other organic waste produced by these activities add an excessive amount of nutrients to the nearby water. Thus, nutrient pollution has a significant negative impact on fishery resources.

Toxic Chemicals

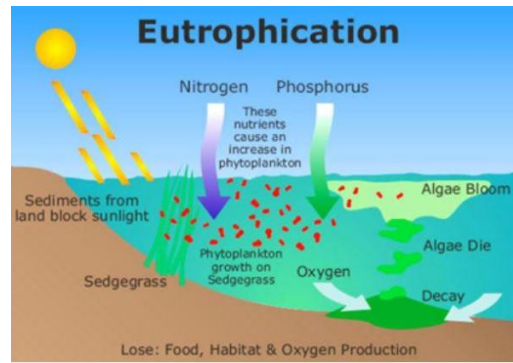
Tiny particles that are ingested by plankton, benthic animals (deposit feeders or filter feeders) can become coated with toxic chemicals. Toxins are thus concentrated higher up in the ocean food chains. Numerous particles combine chemically in a way that depletes oxygen, resulting in anoxic estuaries. Similar to toxic metals and pesticides incorporation into marine food webs. In this manner, marine toxins are passed from farmed land animals back to people.



Toxic Chemicals

Eutrophication

The process of eutrophication begins when nutrients from agricultural runoff enter lakes and oceans, causing an excessive increase in phytoplankton. The zooplankton population rises as a result of this phytoplankton overgrowth, which lowers the oxygen level. Over the past century, phytoplankton concentrations have risen in coastal waters while falling more recently in the open ocean.



Eutrophication

Control Measures

- We ought to adhere to the 4R principles of discard, reduce, reuse, and recycle.
- Effective ways to manage plastic pollution include entrapment devices, doorstep waste collection techniques, incentive-based approaches, and beach cleaning operations.
- Ship oil tanks should not be overfilled, and there should be room left for fuel expansion.
- Establishing sewage treatment and effluent treatment facilities • Regulating or limiting the use of synthetic pesticides, plastics, and fertilisers, among other things
- For pollution to be controlled, public involvement and awareness are crucial.

CONCLUSION

There are widespread efforts underway to restore the fishery resources to their former splendour, and there is almost always something we can do to ensure that the aquatic resources continue to provide us with what we require. Due to technological expansion and development over the last few decades, fisheries have undergone rapid change. Declaring a closed season, protecting endangered species, and forbidding destructive fishing techniques will all contribute to safeguarding the fishery resources for upcoming generations. Humans have harmed the environment in a variety of ways, but there are also numerous ways we can improve and care for the fishery resources on which we rely so heavily.

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