

THE IMPACT OF OVER FISHING ON MARINE ECOSYSTEM AND NEED FOR SUSTAINABLE FISHING PRACTICES



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Introduction

Overfishing has posed a significant challenge to marine ecosystems, leading to widespread consequences and underscoring the urgent need for sustainable fishing practices. The combination of increasing global demand for fish and advances in fishing technology has resulted in the depletion of numerous fish populations, disrupting not only the targeted species but also the intricate balance of entire marine food webs.

The immediate consequence of overfishing is the decline of fish populations, which can lead to the collapse of fish stocks and hinder their ability to recover. Consequently, this not only puts specific fish populations at risk, but also compromises the stability and productivity of the entire ecosystem. The diminishing populations can disrupt predator-prey relationships and alter the structure of marine communities, potentially triggering a chain reaction throughout the food web. Moreover, overfishing can have significant economic and social ramifications. Many communities rely on fishing for their livelihoods, and the depletion of fish stocks can result in economic hardship and social instability. Additionally, the loss of fish populations can negatively impact global food security and nutrition, particularly in regions where fish serve as a primary source of protein and essential nutrients. Embracing sustainable fishing practices offers a means to alleviate these impacts and conserve marine ecosystems. The implementation of strategies like catch limits, gear restrictions, and marine protected areas can help to rebuild overexploited fish populations and restore the balance of marine ecosystems. By allowing fish populations to regenerate, sustainable fishing practices not only protect the targeted species but also contribute to the overall health and resilience of marine ecosystems.

In embracing sustainability, it is crucial to consider the long-term benefits for both the environment and the fishing industry. By ensuring adherence to sustainable practices, we can work towards preserving marine ecosystems and supporting the long-term viability of the fishing industry.

Impact of Over Fishing in Sri Lankan Waters by Indian Fishermen

The overexploitation of fish stocks by Indian fishermen in Sri Lankan waters has had a considerable negative impact on the marine ecosystem and the economic well-being of local fishermen. This issue has become a pressing concern for the Sri Lankan government and those reliant on the sea for their livelihoods and sustenance.

The excessive fishing activities of Indian fishermen have led to a notable reduction in the fish population in Sri Lankan waters. This has not only disrupted the ecological balance,

but also jeopardized the income-generating potential of local fishermen who depend on the sea for their livelihoods. The depletion of fish stocks also has broader economic repercussions, as it diminishes the availability of seafood for consumption and export. Moreover, the use of prohibited fishing methods and encroachment into restricted areas by some Indian fishermen has exacerbated the problem. This disregard for conservation regulations has created instability in the marine ecosystem and jeopardized the sustainability of the fisheries.

In response to this issue, the Sri Lankan government has taken measures to boost surveillance and patrols in the waters to discourage illegal fishing activities. Additionally, diplomatic efforts have been initiated to engage with the Indian government to find a mutually beneficial resolution to the problem. It is evident that the impact of overfishing in Sri Lankan waters by Indian fishermen is a multifaceted issue that demands a cooperative approach for resolution. Finding a sustainable solution is imperative for the preservation of the marine environment and the well-being of those reliant on it.

Collaboration with Local Fishermen on Conservation Efforts

Collaborating with local fishermen on conservation efforts is a crucial step towards addressing the issue of overfishing and protecting the marine environment. Engaging fishermen in conservation initiatives can lead to more sustainable fishing practices and foster a sense of ownership and responsibility for the long-term health of the marine ecosystem.

One way to collaborate with local fishermen is to involve them in the development of resource management plans. By including their traditional knowledge and expertise, resource management strategies can be tailored to the specific needs and realities of the local fishing communities. This collaborative approach not only ensures that the conservation efforts are practical and effective, but also empowers fishermen to be stewards of the resources they depend on. Furthermore, providing education and training on sustainable fishing methods and the importance of conservation can empower local fishermen to become ambassadors for responsible fishing practices within their communities. Workshops, seminars, and outreach programs can be organized to increase awareness about the impacts of overfishing and to promote the adoption of sustainable alternatives. Incentivizing sustainable fishing practices through government programs or partnerships with non-governmental organizations can also encourage fishermen to actively participate in conservation efforts. This can include providing access to alternative livelihood opportunities, financial incentives for adopting sustainable practices, or support for transitioning to eco-friendly fishing gear and techniques.

Establishing co-management systems, where local fishermen work alongside government agencies and other stakeholders to jointly manage fisheries and marine resources, can further enhance collaboration. By involving fishermen in decision-making processes and allowing them to have a voice in shaping policies and regulations, a sense of shared responsibility and accountability. In addition, following strategic solution could be

implemented among consumers, fishing communities and other stake holders as a collaborative effort for sustainable utilisation of fishing resources.

- a. **Ocean Stewards Subscription:** A service that links consumers with local fishermen dedicated to sustainable fishing techniques. Subscribers receive a monthly package of freshly caught, responsibly sourced seafood directly from the fishermen, along with information on their conservation efforts. A portion of the proceeds goes toward funding conservation projects.
- b. **Conservation-Focused Fishing Tours:** An eco-tourism company that collaborates with local fishermen to offer guided fishing trips focused on catch-and-release practices. Participants learn about local marine ecosystems and conservation efforts while enjoying a day on the water with experienced fishermen. A percentage of the tour fees supports conservation initiatives.
- c. **Fishermen's Cooperative for Conservation:** An organization that unites local fishermen and environmental experts to work together on conservation efforts. Co-op members have access to resources for implementing sustainable fishing practices and collaborate on initiatives such as marine protected areas and research projects. The co-op also assists fishermen in marketing their sustainably caught seafood.
- d. **Grants for Fisheries Conservation:** A program that provides financial support to local fishermen for implementing community-based conservation projects. Fishermen can apply for funding to support initiatives such as ghost gear retrieval and marine education programs. The program is funded through partnerships with conservation organizations and government agencies.
- e. **Professional Sustainably Caught Seafood Certification:** A program that assesses and verifies local fishermen's sustainable fishing practices. Once certified, fishermen can market their seafood as sustainably caught, attracting environmentally conscious consumers.

One successful example of sustainable fishing initiatives can be found in the Gulf of California, Mexico. Here, the Vaquita marina, the world's smallest and most endangered cetacean, faces the threat of extinction due to bycatch from illegal fishing operations. In response, the Mexican government, in partnership with environmental organizations and local communities, has implemented a multi-faceted approach to protect the Vaquita and promote sustainable fishing practices. This includes the establishment of a two-year gillnet ban, the use of alternative fishing gear, and compensation programs for fishermen transitioning to sustainable practices. These efforts have shown promising results in reducing Vaquita bycatch and fostering a collaborative approach to conservation and sustainable fishing.

In the Pacific Islands, specifically in Palau, traditional fishing practices have been integrated with modern conservation strategies to manage marine resources sustainably.

Palau has established an extensive network of marine protected areas, including no-take zones, to protect critical habitats and promote the recovery of fish stocks. The implementation of these protected areas has not only led to the restoration of marine biodiversity but has also supported the cultural traditions and livelihoods of Palauan communities, demonstrating the coexistence of sustainable fishing practices with cultural heritage and economic well-being.

Moving to the European Union, the Baltic Sea region has seen successful efforts in promoting sustainable fishing through the adoption of ecosystem-based management approaches. By considering the interconnectedness of species and habitats, the EU has implemented measures such as catch limits, technical regulations, and selective gear requirements to prevent overfishing and mitigate environmental impacts. These regulations have contributed to the recovery of key fish stocks, leading to increased economic benefits for fishing communities while ensuring the preservation of the marine ecosystem.

In the waters of the United States, the Monterey Bay Aquarium's Seafood Watch program has played a crucial role in raising awareness about sustainable seafood choices among consumers and businesses. By providing science-based recommendations on sustainable fisheries and aquaculture practices, the program has influenced market demand for responsibly sourced seafood, leading to the incentivization of sustainable fishing practices and the conservation of marine biodiversity.

These success stories highlight the diverse approaches and collaborative efforts that have led to tangible improvements in sustainable fishing practices across different regions. Through the implementation of effective regulations, the engagement of local communities, and the integration of traditional knowledge with modern conservation strategies, these initiatives serve as models for achieving the long-term sustainability of fisheries and the preservation of marine ecosystems.

Challenges and Solutions to Address Overfishing in Sri Lankan Context

Addressing the issue of overfishing by Indian fishermen in Sri Lankan waters presents several challenges that need to be carefully considered. One of the primary challenges is the enforcement of regulations and monitoring of fishing activities in the shared waters between India and Sri Lanka. The lack of effective surveillance and regulation has allowed overfishing to persist, leading to the depletion of fish stocks and ecological imbalance.

Another challenge is the need for cooperation and coordination between the governments of India and Sri Lanka to establish sustainable fishing practices and enforce measures to prevent overfishing. This requires diplomatic efforts and mutual understanding to create policies that protect the marine ecosystem while ensuring the livelihoods of fishermen from both countries. Furthermore, programs that assist local fishing populations in finding alternate sources of income are necessary to alleviate the socioeconomic effects of overfishing. Developing sustainable fishing practices, promoting aquaculture, and

diversifying income opportunities can help mitigate the adverse effects of overfishing on the economic well-being of coastal communities.

In addition to the challenges, there are potential solutions that can be explored to address overfishing in Sri Lankan waters. Among these include the establishment of marine protected areas, where fishing is prohibited to facilitate the recovery of fish populations and the restoration of environmental stability. Such designated areas can serve as sanctuaries for marine life and contribute to the long-term sustainability of fisheries. Additionally, education campaigns and capacity-building projects can increase public understanding of the value of marine resource protection and sustainable fishing methods. Empowering local fishermen with knowledge and skills to engage in responsible fishing can contribute to the preservation of fish stocks and the restoration of the marine ecosystem. Further, it is essential for both countries to engage in constructive dialogue and collaborative efforts to tackle the issue of overfishing to ensure the long-term health and sustainability of the marine environment in the shared waters between India and Sri Lanka. In addition, both countries need to adopt sustainable fishing practices to protect their marine ecosystems and ensure food security for their populations. In addition, some of the possible actions could be demonstrated as a sustainable approach towards this issue (National Geographic, 2010):

- a. Strengthening legal frameworks and enforcement mechanisms to combat illegal fishing.
- b. Enhancing data collection and analysis to monitor stock status and trends.
- c. Promoting integrated coastal zone management (ICZM) to balance conservation and development objectives.
- d. Encouraging community participation and empowerment in fisheries management.
- e. Diversifying income sources for fishers through value addition, marketing support, and alternative livelihoods.
- f. Improving infrastructure and services for fishers such as ports, storage facilities, processing plants, credit schemes, etc.
- g. Collaborating with regional partners such as Sri Lanka's neighbours Maldives, Pakistan, Bangladesh, etc., to share best practices and address common challenges.

The Promotion of Sustainable Fishing Practices through Government Regulations

It is impossible to overestimate the importance of government rules in promoting ethical fishing methods and safeguarding the wellbeing of marine ecosystems. Through the establishment and enforcement of regulations, authorities can address the impact of overfishing, safeguard vulnerable species, and ensure the long-term viability of fisheries. These regulations are designed to effectively manage fish stocks, reduce bycatch, and encourage responsible fishing practices, ultimately contributing to the preservation of marine biodiversity and the economic well-being of fishing communities.

The establishment of catch limits is a key tactic used by government legislation to support sustainable fishing practices. Authorities can avoid overfishing and promote the recovery of fish populations by imposing limitations on the amount of fish that can be harvested. These limits are often based on scientific assessments of fish stocks, considering factors such as reproductive rates and overall population health. Additionally, the use of seasonal closures and area-based restrictions can aid in protecting critical habitats and spawning grounds, further supporting sustainability efforts. Apart from imposing harvest limits, rules also cover fishing gear and techniques to reduce environmental effect. The promotion of selective gear and techniques that reduce bycatch helps prevent the unintentional capture of non-target species. Furthermore, the establishment of marine protected areas (MPAs) offers safe spaces for fish populations to grow and spawn without the pressures of fishing, contributing to overall sustainability.

Transparency and accountability within the fishing industry are also promoted through government regulations. Accurate reporting of catches, monitoring of fishing activities, and traceability measures work to combat illegal, unreported, and unregulated (IUU) fishing practices. These efforts help ensure that fishing operations are conducted in a responsible and sustainable manner.

Legal Frameworks

It is fact that, the United Nations Convention on the Law of the Sea (UNCLOS, 1982) provides the primary legally recognized worldwide framework for fisheries management. UNCLOS makes it very clear that the coastal state has the primary authority over the fisheries within the EEZ. Hence, government role against IUU fishing is vital. In addition, there are other international agreements also support sustainable management of fisheries.

- a. 1993 Food and Agriculture Organization (FAO) Compliance agreement.
- b. 1995 FAO Code of Conduct for Responsible fisheries.
- c. FAO International Plan of Action.
- d. Management of fishing capacity.
- e. Illegal, Unregulated and Unreported (IUU) fishing.
- f. Reykjavic declaration on responsible fisheries.
- g. UN general Assembly resolutions to provide for Sustainable Fisheries.

Nevertheless, despite the existence of multiple international agreements, conventions, and organizations, overfishing, IUU fishing, and destructive fishing techniques continue to pose a danger to the management of sustainable fisheries (Colombage, 2019). The Sri Lanka's legal framework on combatting overfishing is mainly based on the Fisheries and Aquatic Resource Act No 2 of 1996, which regulates fishing operations in the Sri Lankan EEZ (Karunathilaka, n.d.). This act was amended by No 35 of 2013, which asserts the rules for fishing operations in the high seas. The act also provides for penalties for illegal fishing, such as fines, imprisonment, confiscation of vessels and equipment and revocation of licenses.

However, some experts have suggested that Sri Lanka needs to strengthen its legal framework and enforcement mechanisms to combat overfishing and fisheries crime. For example, a policy paper by (Canyon et al., 2021) recommends that Sri Lanka should adopt a comprehensive national strategy and roadmap for addressing gaps in the effective implementation of the FAO Agreement on Port State Measures (PSMA), which aims to prevent, deter and eliminate IUU fishing at ports. The paper also suggests that Sri Lanka should enhance its data collection and analysis capabilities, promote integrated coastal zone management (ICZM), encourage community participation and empowerment in fisheries management, diversify income sources for fishers through value addition and marketing support, improve infrastructure and services for fishers such as ports, storage facilities, processing plants, credit schemes, etc., and collaborate with regional partners such as India's neighbours Maldives.

Implementation of Sri Lanka Fisheries Monitoring

Sri Lanka monitors its fisheries resources mainly through the use of a Vessel Monitoring Service (VMS) system, which was introduced in 2018 with the support of the International Organization for Migration (IOM) and the Government of Australia. The VMS system consists of 4200 multi-day fishing vessels (MFV) that are equipped with VMS transponders, which enable the Department of Fisheries and Aquatic Resources (DFAR) to track their movements in real time. The DFAR can use this information to enforce regulations, prevent illegal fishing, ensure compliance with international agreements, and manage the fishery stock.

The VMS system is also integrated with other monitoring tools, such as satellite imagery, acoustic monitoring, and fish landing data. These tools help to assess the status and trends of fish stocks, identify areas of high or low catch potential, detect bycatch and discards, and evaluate the impact of fishing activities on marine ecosystems.

The VMS system has improved the sustainability of Sri Lanka's fisheries industry by reducing illegal fishing, increasing compliance with rules and regulations, enhancing data quality and reliability, facilitating coordination among stakeholders, and promoting best practices among fishers. However, some challenges remain, such as ensuring adequate funding for maintenance and operation of the VMS system, addressing technical issues such as signal interference and data loss, raising awareness and capacity among fishers and other users of the VMS system, and strengthening legal frameworks and enforcement mechanisms to combat illegal fishing. (Pramod, n.d.), also emphasis more about following collaborative systems of fishery monitoring tools:

Vessel Monitoring System (VMS): This is a system that uses transponders or other devices to track the movements and activities of fishing vessels in real time. The VMS can help to prevent illegal fishing, enforce regulations, ensure compliance with international agreements, and manage fishery stocks. Some examples of countries that use VMS are Sri Lanka, Malaysia, Indonesia, and Thailand. However, some challenges include ensuring adequate funding and maintenance for the VMS, addressing technical issues such as signal interference and data loss, raising awareness and capacity among fishers and other users of

the VMS, and strengthening legal frameworks and enforcement mechanisms to combat illegal fishing.

Satellite Imagery: This is a technique that uses satellites to capture images of the sea surface or coastal areas. Satellite imagery can help to assess the status and trends of fish stocks, identify areas of high or low catch potential, detect bycatch and discards, and evaluate the impact of fishing activities on marine ecosystems. Some examples of countries that use satellite imagery are Norway, Australia, France, and Japan. However, some challenges include ensuring high resolution and accuracy of satellite images, dealing with cloud cover and atmospheric conditions, integrating satellite data with other sources of information such as acoustic monitoring or fish landing data, and addressing ethical issues such as privacy and security.

Acoustic Monitoring: This is a technique that uses sound waves to measure the physical characteristics or biological responses of fish or other marine organisms. Acoustic monitoring can help to estimate catch rates, biomass levels, migration patterns, growth rates, sex ratios, age structures, health status, etc. Some examples of countries that use acoustic monitoring are India, China, Brazil, and South Africa. However, some challenges include ensuring high quality and reliability of acoustic data collection methods such as tagging or drifting devices, dealing with noise pollution from human activities or natural sources such as tides or waves, integrating acoustic data with other sources of information such as visual observations or fish landing data, and addressing ethical issues such as animal welfare.

Conclusion

In conclusion, there is a severe issue with overfishing and sustainable fishing methods that impacts both the marine ecosystem and the millions of people who depend on fish for their lives. When fish are taken faster than they can reproduce, this is known as overfishing, and it depletes fish stocks and upsets food chains. Bycatch, or the capture of undesirable or endangered species including sharks, seabirds, dolphins, and turtles, is another effect of overfishing.

Sustainable fishing practices aim to prevent overfishing and ensure the production and long-term health of marine resources. Sustainable fishing practices include setting catch limits, monitoring stock status, enforcing regulations, promoting selective fishing methods, reducing bycatch, and supporting alternative livelihoods for fishers. It is also suggested that many countries face different challenges and opportunities in managing their fisheries resources. Some countries have adopted comprehensive national strategies and roadmaps for addressing gaps in the effective implementation of international agreements on fisheries management. Some countries have also improved their data collection and analysis capabilities, integrated coastal zone management (ICZM), encouraged community participation and empowerment in fisheries management, diversified income sources for fishers through value addition and marketing support, improved infrastructure and services for fishers such as ports, storage facilities, processing plants, credit schemes, etc., and collaborated with regional partners such as Sri Lanka's neighbours Maldives.

However, some countries still need to strengthen their legal frameworks and enforcement mechanisms to combat illegal fishing. Some countries also need to address technical issues such as signal interference and data loss in their vessel monitoring systems (VMS). Some countries also need to raise awareness and capacity among fishers and other users of VMS. Some countries also need to strengthen legal frameworks and enforcement mechanisms to combat illegal fishing.

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