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Bottom Trawling - A Potential threat to the Ecology and benthic communities of gulf of mannar

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It is now widely appreciated that an important aspect of protecting fish stocks is the conservation of the habitats and animal communities on which those stocks depend. Over the years, fish catching techniques and devices have undergone remarkable variations, every time improving their efficiency. Trawl net exploits fish and other organisms from the bottom of the seas. Bottom trawls are sometimes referred to as bulldozers mowing down fish and destroying the structure that provides fish stocks with the necessary environment.

Trawl ground gear can penetrate upto 6 cm into bottom sediments and otter boards have been found to dig into the bottom to a depth of 0.3 m. Obvious mortalities are generated when benthic species are brought to the surface and then discarded. Not the least of these are mortalities due to increased predation following the redistribution of benthic species to surface waters and on the seabed.

The effects of physical disturbance processes on marine benthic communities remains an issue of considerable theoretical and practical importance, particularly with respect to the impact of fisheries activity and possible conflict with wildlife conservation objectives. Possible effects of trawling on benthic resources include,

- ✦ Changes in sediment structure.
- ✦ Changes in in-faunal and epi-faunal community structure
- ✦ Survival of animals retained by the cod-

end and those escaping through the meshes of the cod-end

- ✦ The feeding behaviour of predators and scavengers that aggregate in trawled areas

One of the major environmental problems associated with bottom trawling is the practice of discarding non-target species into the sea to save holding space for the more valuable target species. These 'discards' finally die out, though a portion of them may form food for scavengers of the sea, thus contributing to the trophic web. Global discards, especially in shrimp trawl fisheries are provisionally estimated at 27 million t with a range from 17.9 to 39.5 million t. Shrimp trawl fishery, particularly for tropical species, were found to generate more discards than any other fishery type and account for just over one-third of the global total. It may be noted that species of currently low economic value may become important target species in the future.

Many of the marine invertebrates, which constitute the 'non-target' species in trawl catches, have sensitive life history tactics. They have generally low reproductive rates and adult survivorship is critical to maintain healthy populations. They are seriously affected by by-catch and it is imperative that adequate "brood stocks" be maintained in natural conditions. The invertebrates are broadcast spawners and to ensure fertilization, males and females must be surprisingly close together when they spawn (the distances are often in the order of 1-3 m) which implies a need for

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a high density of breeding animals. This is particularly important to sessile animals, such as sponges, hydroids, bryozoa, tunicates, etc.

Gulf of Mannar Biosphere

Biosphere reserves are protected areas of representative environment. The Gulf of Mannar is one of the marine biospheres situated along the coastline of east coast of India and Srilanka (8°46' - 9°14'N; 78°09' - 79°41'E). It has an area of 10,500 sq. km and 21 islands are situated in this biosphere. The Gulf of Mannar is one of the biologically richest and important habitat for marine algae, sea-grass, coral reef, pearl banks, sacred chank bed, fish and shellfish resources, mangrove endemic and endangered species. There are approximately 3,600 species of flora and fauna in this ecosystem. The 21 islands are declared as national marine park by the Government of India and state of Tamilnadu in 1986 for the purpose of protecting marine wildlife and its environment.

Bottom trawling

Mechanized trawling industry, which came into vogue during early '70s, has expanded considerably, especially due to the remunerative export demand for shrimps. In the later years, other items were also added to the list of "target groups" of trawlers, including lobsters, cephalopods, swimming crabs and commercial sized finfishes in the fish trawl nets. In the Gulf of Mannar, the trawling grounds lie between 79° and 79°25'E longitude and 8°46' and 9°10'N latitude, about 20-26 km away from the coast. Sea bottom is largely muddy or sandy, though some areas have coral structures. Depth of operation ranges from 20 to 42m. Fishing takes place round the year in the Gulf of Mannar. During May-September when the sea will be rough due to southwest monsoon, trawlers operate in the daytime. During October-April, about half of the trawler units engage in night fishing, while the other half go for 2 night - 1 day fishing (locally known as thangal fishing).

About a hundred trawler units are operating in the Gulf of Mannar from the two main landing centres, Pamban and Mandapam.

Effects of trawling on benthic ecosystem

Investigations world over have indicated apparent adverse effects of trawling on the sea bottom, epibenthic assemblages, seagrass beds and on the nutrient enrichment of coastal waters. The rate of decline in the catches of commercially important green tiger shrimp in the Gulf of Mannar could be due to the indiscriminate destruction of seagrass beds by trawling, which form a critical biotope of this prawn. Comprehensive information on the impact of bottom trawling on sea bottom, life cycles of non-target species, post-harvest loss and in-edible biota destruction, the migration of various species and prey-predator relationship of major component species is essential.

Realizing the importance of this issue, particularly in the context of conservation of national parks, the Ministry of Environment and Forests (MOE & F), Government of India have sanctioned a research project to study the direct and indirect impact of bottom trawling on the coastal marine living resources and to assess economic utility of non-target groups dislocated by fishing, with the senior author as the Principal Investigator.

R & D efforts

Before the initiation of the MOE & F-funded project, the senior author have made preliminary investigations on this issue during 1992-95. The study indicated that the total quantity of non-target groups landed by trawlers was greater in the Palk Bay due to increased fishing effort, but the catch rate of this benthic biota was relatively greater in the Gulf of Mannar.

Among the major objectives of the MOE & F funded project, which was initiated in 1998 include,

Collection of data on commercial trawling in the Palk Bay and Gulf of Mannar for assessing the exploited resources and the extent of disturbance on sea bottom

Study of dynamics of food chain linkages of exploited bottom fauna

Evaluation of the quantity and quality of non-target groups dislocated by trawling

Study of hydrology and productivity of trawling grounds.

Trawl catches are broadly classified into **TARGET GROUPS** and **NON-TARGET GROUPS**. The target groups include commercial sized finfishes, prawns, lobsters, crabs and cephalopods. The non-target groups include low volume ground fishes, undersized shrimps and inedible biota. In the commercial trawl catches from the Gulf of Mannar, target groups forms 66-92% and the non-target groups 8-34%. Finfishes form almost 95% of the target groups. Major groups of finfish in that order are clupeids, silverbellies, carangids, goatfishes, croakers, seerfishes and elasmobranchs. Of the non-target groups, predominant species are low volume ground fish, stomatopods, echinoderms, gastropods, inedible crabs, undersized shrimps and bivalves.

Study on the seasonal occurrence of trawl components revealed that target groups are abundant (400-650 t) during January to March, while non-target groups are abundant (30-45 t) during July-September and in December. A close look at the data on seasonal variation in trawl catch and effort at Pamban in 1998, showed that with the increase in effort,

the catches of target groups declined and non-target groups registered a relative increase. This could prove critical, as no economic advantage is achieved by way of increasing trawling effort in the Gulf of Mannar, at the same time the less economic species are dislocated, which could impart disastrous effects on the delicate trophic equilibrium of this ecosystem.

In a recently conducted experimental trawling in the Gulf of Mannar off Mandapam (5 km off the coast, 7 m deep), seaweeds and seagrass formed about 85% of the catch. It is not surprising that many of the commercial trawlers, fishing in waters below 10-15 m depth, would net in huge quantities of these plants and dislocate them. Mere observation of the catch landed on shore would not reveal the real picture, as they would unload the sea grass back into the sea. As mentioned earlier, these plant beds are vital for many commercial important groups of organisms to survive and their destruction would bring about irreparable damage to sustained production from this coastal ecosystem.

Conclusion

The irrepressible quest for more and more quantities of target groups, especially prawns, has resulted in several new innovations in fishing methods. There is a possibility that extensive bottom trawling could disturb the benthic biota, paving the way to recruitment hazards and bottom diversity degradation. It is imperative to conduct serious study on the post-harvest loss and non-target group destruction, biological interactions and survival in the marine benthic ecosystem. An attempt is already on to generate adequate data base with a view to formulating suitable management measures for a sustainable resource utilization and for controlling indiscriminate destruction of benthic non-target biota.