Marine Debris - A threat to sustainable fisheries

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One of the major threats faced by fishermen operating their fishing gears in coastal waters of India is the alarming influx of litter in the fishing area. There are about 4 million fishermen spread across 3288 fishing villages. Of the 1.9 lakh fishing crafts, 36.7% are motorised and 26% are non-motorised. Though the Indian EEZ is spread to an area of 1,629,607 km^2, major fishing takes place in the inshore waters (total area-225,029 km^2) and in the continental shelf (total area-393,527 km^2). There are different types of fishing craft and gear combinations and among these the most affected by marine debris is the bag type of fishing gears and the trawlers. Most coastal villages and urban cities do not have well planned solid waste management programs. With the increasing coastal population and lack of proper solid waste management protocols, the quantity of solid waste entering the coastal waters through rivers, estuaries and canals is enormous.

The interlinking canals of major estuarine systems along the Indian coast carry the domestic waste to the coastal waters which often get collected in the several bag type of fishing gears like the stake net and dol net along the Indian coast. Average discharge from estuaries is estimated as about 1422 m^3 sec-1day-1 along the west coast and 43766m^3 sec-1day-1 along the east coast and the high silt in these waters reduces the buoyancy of drifting articles, making them sink down quite close to their place of origin. Monsoon waters from the coastal areas aggravate the situation by washing off the land based litter to the open waters. It has been observed that during spring tides, the quantity of litter in the stake nets close to the coast have almost doubled the quantity of litter observed during low tide. The fishers have to spend considerable time and money to remove these from the fish catch. The fishermen throw back the litter collected back to the same waters. Thus the problem is not resolved. These issues can be easily solved by starting a proper waste collection mechanism in the villages and we can even think of giving incentives to fishers to bring back litter from fishing area.

The type of litter entering the ecosystem is also diverse and depending on the size and spread, they either settle at the site of origin or drift away, only to sink down and spread in a distant location. Similarly, smaller the size, easier it is for the particle to enter

the food chain. The marine food web starts with the plankton and observations in the plankton samples collected regularly in some of the major fishing areas have indicated the presence of micro-plastics.

These tiny particles have been found to enter the gut of filter feeding organisms like mussels, clams and oysters and also higher bony fishes like the sardines. Though the percentage occurrence of micro-plastics of size 50 micron to 5 mm is less than 5%, it still is a matter of concern. These particles can go up the food chain. The number of reports on micro and macro-plastics in the gut of fishes has increased over the years. Now CMFRI researchers have observed plastic ingestion in sardine, mackerel, anchovy, ribbon fishes, dolphin-fish, tunas and several other fishes caught from almost all states along the southwest and southeast coasts. Apart from these, plastic pieces were observed in the carcasses of sea bird and stranded whales.

One of the major sources of litter contributing to marine debris is the tourist's areas along the coast. Beaches are used for recreation and also for several religious festivals. Studies done by ICAR-CMFRI have indicated that the quantity of litter increases during festive seasons. Only very few beaches have regular cleaning programs. Littering is rampant in beaches and these have been found to affect the vulnerable ecosystems like the sea grass, coral reef and the mangroves. Though the coral reefs of India are just 0.660 % of world coral reefs, they support the livelihood of several thousand of fishers. The proximity of Indian coral reefs to the mainland makes them more vulnerable to anthropogenic impacts. Based on observations by the researchers of ICAR-CMFRI across the Indian coasts, it can be authentically stated that litter is affecting the biological functioning of critical habitats. Hence it is proposed that in all coastal villages proper facilities should be developed for disposing plastic and other non-degradable waste. Simple facilities like this would help to reduce the litter entering the coastal waters.

Another major issue is the abandoned or lost derelict gear. Researchers from ICAR-CMFRI have recorded several sightings of ghost net entanglement of turtles from the Bay of Bengal and Arabian Sea during research cruises. All these observations are messages from the deep that derelict fishing gears are swaying like ghosts threatening the benthic habitat and the marine biota. Recent reports have shown that unexpected natural disasters like cyclones along the coast lead to loss of fishing nets. These cannot be retrieved easily and the Indian fishing community is not aware about the impacts of these on the fauna. Hence it is strongly recommended that activities by NGOs and fishing communities be encouraged to remove these derelict gear, create awareness among the fishing community on the need to bring back the damaged gear and dispose the same on land. The recycling industry can also try to find ways to effectively utilize these.

If we go specifically on the type of waste, we have the Medical waste which is expected to grow at a compounded annual growth rate (CAGR) of about 7 per cent, which can reach 775.5 tonnes per day by 2022 from the current level of 550.9 tonnes daily. In the studies conducted so far, occurrence of hospital waste in coastal and marine litter is less than 5%. But extensive underwater surveys have not been conducted in coastal waters. So the threat by this waste remains largely unexplored. India along with UK

collaboration is planning to embark on a marine litter program in Indian Ocean and it is expected that this project would come up with more insight on marine debris and also solutions for effective reduction of plastic waste.

Lack of awareness about the impacts of litter on the coastal and marine ecosystem is one of the reasons for the increasing litter in marine habitats. Installation of art form has been used to create awareness among the public in Kerala. Huge installations by CMFRI of an ' Octopus' created by using plastic bottles from Cherai, an important tourist spot in Central Kerala in June 2012; a "Mad Crab" installed using wire and filled with litter collected from Fort Kochi in December 2013 and finally a "Fish cemetery" created in March 2016 with a message that plastics is now entering the food chain have been able to make the public think about the threat caused by plastic in marine ecosystem.

However, we have to go beyond all these research and awareness programs and work towards a permanent solution to this problem. Reduction in use of plastics and proper solid waste management programs are required. Moreover, there should be facilities to deposit non-degradable litter in public places. Along with these programs, we should also plan for extensive village level coastal clean- up programs to remove already accumulated litter. Marine debris is not something which can be neglected; if ignored, it can completely destroy the resources and the livelihoods depending on aquatic ecosystems.