Microplastics in the gut of anchovies caught from the mud bank area of Alappuzha, Kerala

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Marine litter or the non-degradable wastes generated due to anthropogenic activities, has been recognized as one of the major threats to coastal marine ecosystem in the 21st century. These originate mainly from land and enter the aquatic ecosystem through land runoff and also when they are discarded by human beings directly into the coastal waters. The impacts of marine litter on the ecosystem can vary from physical destruction of habitats to mild or fatal effects on aquatic biota. If the litter is large like the plastic sheet then it affects the functioning of the ecosystem which indirectly affects the fauna. However, microplastics are more dangerous and directly affect the health marine life.

Microplastics are small plastics of size less than 5mm. Some researchers consider only particles less than 1mm as microplastics. These can enter the food chain and affect the fauna directly. Larger

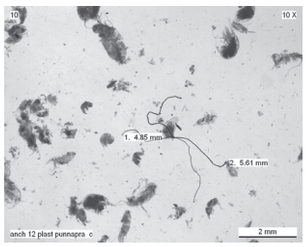

Fig.1. Picture showing threadlike microplastics in the gut of Anchovy along with other digested matter

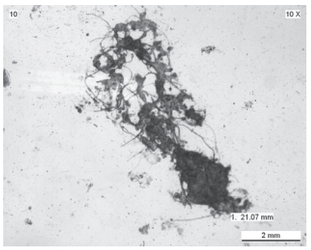

Fig. 2. Picture showing several strands of microplastics in the gut of Anchovy along with other digested matter

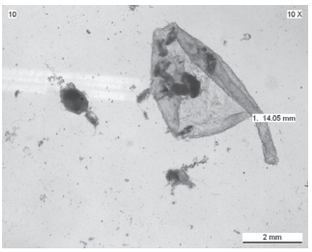

Fig. 3. Picture showing larger piece of non biodegradable waste in the anchovy gut

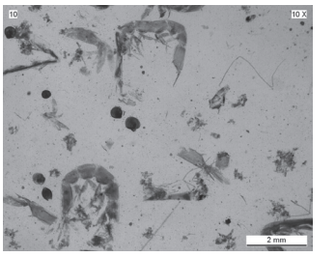

Fig. 4. Picture showing macrozooplankton and bivalve spat in the anchovy gut

plastic material which originally float in the water can become coated with silt and then float in the column waters. These can degrade, become brittle and the fragments can form micro plastics. Also fishing nets and other nylon material which wither on the beaches can fragment and then these can enter the coastal waters through land runoff or during tidal inundations.

In August 2013 (02/08/13), as a part of larger investigation on mud banks, fish samples collected from a mud bank region, Punnapara (9°44. 33' N and 76°17.52' E) in Alappuzha district, Kerala from a depth of 4 to 6 m were analyzed. Gut of two main species in the fishery, oil sardine *Sardinella longiceps* and the anchovy, *Stolephorus commersonnii* were processed as per standard fishery biological methods and the gut contents were observed under microscope.

There were no microplastics in the gut of oil sardine and the main contents were phytoplankton and micro zooplankton. However of the 16 nos of anchovies with length 6 to 12 cm (average 9.06 cm) and weight ranging from 2 to 12 gm (average weight 6.6 gm), 6 nos were found to have microplastics of length ranging from1.14 mm to 2.5 mm (Fig.1 to 3). The main food items were phytoplankton, zooplankton (Lucifer, copepod, tintinnids) bivalves and prawn (nekton) (Fig.4). One significant observation was the large number of bivalve spat in the gut of anchovies during this period. In the benthos samples also bivalve spat formed a major component (48.9%). As a part of the mud bank study, plankton and benthos were also collected and analysed. However, there were no microplastics in these samples collected from the same area. The gut content of anchovy collected from the same site during the subsequent months did not contain any microplastics.

During July- August the mud bank region had high levels of suspended solids. Unlike sardine, anchovies are known to have two feeding modes, filter feeding on small food like phytoplankton and microzooplankton and selective preying (active biting) on larger zooplankton, small nekton and benthos. The anchovies would have ingested the microplastics either from the turbid water while feeding on larger plankton like Lucifer or while preying on the benthic bivalves. In the subsequent months (non mud bank season), the gut of both the species did not have any microplastics. Incidentally there were no bivalves also.

Reports of plastic pieces of 3 cm length and 0.5 cm width in large pelagic like tuna in Arabian Sea (Ref: Sajikumar *et al.*, 2013, MFIS, No.217) and mackerel caught from the coastal waters off Mangalore (Ref.Sulochanan *et al.*, 2011, MFIS, No 208) indicate that pieces/ strands of plastic enter the food chain.

The fact that the anchovies had microplastics in their gut is a matter of concern. How these plastics affect the health of fish is not known. If these are eliminated in the faeces then there is no problem. But if they remain the body, then chances of affecting the fish directly and other marine biota through food chain is possible. Since fish consumers degut the fish before cooking, chances of microplastics affecting human beings through sea food consumption are negligible.