Rapid assessment on mass mortality of fishes in Ennore estuary of Tamil Nadu, India

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Mass mortality of fishes and aquatic organisms are reported from Ennore estuary from time to time due to water pollution . Extensive fish mortality was observed in this estuary during 20th August 2014. Dead fishes were found buoyant and spread out for about 3 km distance in the region between Ennore Thermal Power Station to Railway Bridge.

[**Key words:** wetlands, estuary, effluent, Ennore, sediment, mangroves]

Introduction

Environmental pollution is currently a major concern due to increased industrialization and urban development. Estuaries offer tremendous potential for recreation, aquaculture, extraction of freshwater and transport, and play a dominant role in the economy of coastal population. Among the estuaries in Tamil Nadu, the Ennore estuary (Latitude 13°13'51.74"N and Longitude 80°19'19.42"E), situated North Chennai, which passes through Chennai city and joins the Bay of Bengal (Figure1) at Ennore located near the Madras harbour, receives effluents discharges from fertilizer company, refineries, paint industry, thermal power station and highly populated settlements and faces mortality of fishes. One such instance was observed on 20th August 2014 and dead fishes were found floating and deposited along the northern side of Ennore estuary (Figure 2) . Ennore estuary is a complex fresh/brackish water system nearly 800m wide and elongated in the North East-South West direction.

Materials and Methods

The fish samples were collected from the spot (near bridge at NTPC), where the fishes were floating in large numbers due to wind blow, immediately and brought to the laboratory. Fish species were identified by using FAO catalogue[1]. There were 15 species belonging to 13 genus observed and species namely *Liza macrolepis* and *Mugil cephalus* were found more in numbers. List of fish species found is given at Table 1.

Table 1 List of fish species found dead in large numbers in Ennore estuary on 20th August 2014.

Sl. No	Species Name
1	*Liza macrolepis*
2	*Liza cunnesius*
3	*Etroplus suratensis*
4	*Tilapia mossambica*
5	*Leiogtiathus fasciatus*
6	*Arothron immaculatus*
7	*Triacanthus biaculeatus*
8	*Tachysurus jella*
9	*Tachysurus dussumieri*
10	*Rogadius serratus*
11	*Ambassis ambassis*
12	*Anguilla bicolar*
13	*Scylla serrata*
14	*Mugil cephalus,*
15	*Meriterix meriterix*

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Figure 1: Study area of Ennore estuary indicating location of fish mortality.

Table 2. Concentration of heavy metals in Seawater, Sediments and Organism of Ennore Creek with WHO/EPA standard values

Heavy Metals	Water samples (µg. L^{-1})	Sediments samples (µg. g^{-1})	Organism (µg g^{-1})	WHO/EPA standard
Cd	0.45 ±0.09	3.80 ± 0.75	1.76 ± 0.02	0.50 – 1.00
Cu	9.64 ± 0.41	118.3 ± 1.27	5.75 ± 0.46	0.1 -30
Pb	7.15 ± 0.17	22.90 ± 1.01	1.08±0.08	0 - 0.15
Cr	2.75± 0.05	07.56± 0.86	2.9±0.06	0-22
Zn	59.36 ± 5.32	192.50 ± 0.50	96.52±5.78	40 - 150
Hg	2.43 ± 010	0.65 ± 0.31	0.57 ± 0.09	0.2 - 0.6

Figure 2: Dead fishes found floating and deposited along the northern side of Ennore estuary.

Physiochemical analysis of various parameters showed that temperature of water ranged from 32.0 to 38.6°C, salinity between 17.5 to 36.45 psu and dissolved oxygen from 4.5 to 6.1ml/l. The pH ranged from 6.2 to 8.1. Present study heavy metal concentration in seawater, sediment and organism was carried out in this estuary were analysed initially based on the standard methodology followed by Sokal and Rohlf [2].

Results and Discussion

Heavy metals (Copper, Chromium, Zinc, Lead and Cadmium) concentration in seawater ranges as follows: Zn> Cu>Pb>Cr>Hg>Cd (59,9.64,7.15, 2.75, 2.43 and 0.45), sediment Zn> Cu>Pb>Cr> Cd>Hg (192.50, 118.3, 22.90, 7.56, 3.80 and 0.65) and tissues of *L. macrolepis* and *M. cephalus* were found above the permissible safe levels: Cu>Cr>Zn>Pb>Cd (5.03, 2.93, 1.89, 1.18 and 0.45) ppm respectively (Table 2). Presence of increased levels of heavy metals Cu, Cr, Zn and Pb might be due to many industries adjoining Ennore estuary releasing effluent discharges, which led to mass mortality of fish. This contamination may cause stress in fish, which in turn can lead to decreased reproduction, susceptibility to infection and sudden death of fish in large numbers. It was earlier reported that the Ennore creek receives untreated domestic and industrial wastewaters[3] and the heavy metal concentration in *L. macrolepis*[4], *M. cephalus* Padmini and Kavitha[5] and Padmini and Geetha[6] was already recorded as above permissible safe levels.

During the assessment, two additional things came to our knowledge. The first one was that the local fishermen often get skin problems like skin lesions and skin irritation and second one was that the landing of fishery resource was remarkably declining. Possible reason for such skin problem could be due to consumption of fishes regularly that are affected by the heavy metal pollution. However, there is a need for separate study on this aspect to assess the relationship between consumption of marine fishes infected by heavy metals and health issues of local community and fishermen along the Ennore estuary. Though the fishermen believe that the pollution in this area is also one the reasons for declining of fishery resources, it needs to be assessed independently, as this depends on

various other factors such as phytoplankton, zooplankton and so on.

It is logical to presume that the contamination of Ennore estuary by heavy metals is largely due to anthropogenic inputs. Large number of industries situated nearby use this aquatic system as big sink for all their effluent dumping. Petrochemical industries, thermal power plant, pharmaceuticals, chemicals, fertilizers; rubber factory, paint industry, automotive manufacturing unit and Ennore coal handling port are the primary anthropogenic source of pollution in this estuary.

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