

## Fish Kill in Chitrapuzha

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### INTRODUCTION

Reports on fish mortality in different parts of the country have appeared frequently. Most of these relate to organic pollution and consequent oxygen depletion. Mortality due to ammonia poisoning has recently been reported by Unnithan *et al.* (1975). The present report on fish kill in the river Chitrapuzha is also associated with high levels of ammonia in the water.

### AREA OF OCCURRENCE AND SOURCE OF DATA

Mortality of fish was reported in Chitrapuzha, a small tidal tributary of the Cochin backwaters on 5th June, 1980. The area was visited on the same day by the NIO team. Local enquiries showed that fish mortality has been happening for some years with the first pulse of monsoons and fresh water efflux from upstream. This year however, the mortality is rated to be much higher and large quantities of fish have been dying in a strip of about 5 km between Tripunithura and Chambakkara. The mortality is said to have been intense on 3-6-1980. Chitrapuzha follows a meandering course through the coastal plains prior to its joining the main body of Cochin backwaters near Thevara in Ernakulam. It also receives effluents from two major

industrial establishments located some distance from the zone of mortality. Intrusion of saline water is known to happen into the river. Salinities up to 12‰ have previously been noted by the authors. Blooms of phytoplankton probably induced by abundant nutrient supply from the effluents is also known to occur and cell counts up to  $5.01 \times 10^7$  cell/litre recorded in February, 1980.

Four stations were sampled on 5-6-1980. Station 1 was a reference-

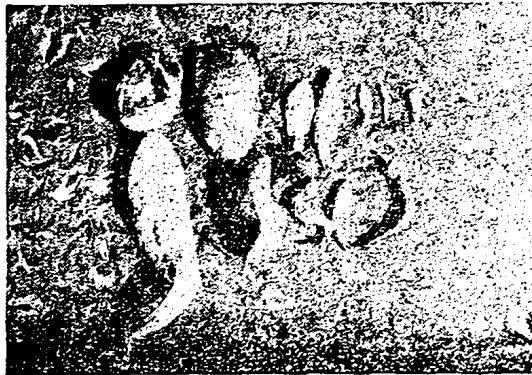


Fig. 1 The affected fishes

station located far upstream in 'clean' water. At Tripunithura (Stn 2) fishes were still dying and large numbers in varying stages of putrefaction were

found floating (Figs 1). Two locations about 1 km apart were sampled here and values given are averages of the same. Champakkara (Stn 3) is about 5 km downstream of Stn. 2 and mortality of fishes was reported in the press from here on 3-6-1980. Station 4 Kundannore is further downstream near the confluence of the river with the Cochin backwaters. Water samples from surface and bottom were collected from all the stations, as well as dead and dying specimens of fish from Stn 2. Environmental features and analytical data were gathered following standard procedures. The fishes were identified up to species level wherever possible. Stations 2, 3 and 4 were sampled again after a lapse of ten days.

#### RESULTS AND DISCUSSION

Table 1 and Figures, 1, 2 and 3 show the species affected. Some specimens of *Eteroplus suratensis*, *Scatophagus argus* and *Belone* sp.,



Fig. 2 The affected fishes

which had probably just entered the area were found moving around in a dazed state and could easily be captured by hand. Local fishermen were found

to gather these with ease in fair numbers. The entire fish population of the area seems to have been affected with the exception of *Haplochilus* sp., which were seen actively moving around with no apparent signs of distress.

Analyses of water samples showed high content of ammonia and phosphate and a notable increase in pH. Results of the analyses are summarised in Table II. The values are averages for the water column. Phosphate values at stations 2 and 3 (13.62 and 12.45ppm) indicated the eutrophicated condition of the water. Phosphate content in excess of 200 ug/l is reported to be a *prima facie* evidence of pollution and a potential cause for eutrophication (Rilley *et al.*, 1972). The high chlorophyll content (70-80 mg/m<sup>3</sup>) also shows the impact of nutrient enrichment. Oxygen saturation showed a 40% deficit in the mortality zone which came down to 11% at Station 4. While these point to the not so healthy condition of the river the immediate cause for mortality seems to be the high ammonia content of the water, which showed a sharp fall from Stations 2-4 (Table II). Station 1 however had a low value of 0.68 ppm.

Ammonia in the zone of mortality was about half that specified for trade wastes (ISI 1976a) and about 20 times that for receiving waters (ISI 1976b). Mortality of fish due to high ammonia content has been reported in Periyar in the upper reaches of Cochin backwaters also (Unnithan, *et al.*, 1975). Toxicity of ammonia to fish life seems to depend on a variety of factors, especially pH. In neutral and slightly alkaline media, concentrations as low as 2.5 ppm are reported to be fatal. High levels of the common salt of ammonium, ammonium carbonate is

also reported to be toxic in alkaline media. (Reid, 1969, Klein, 1972). The higher pH at Station 2 (8.2) as compared to 6.00 upstream and 7.65 downstream also seems to have contributed to the fatality. Analysis of effluent from the fertilizer factory on the same day however showed only low levels of ammonia (2.6 ppm) but was rich in

of having to estimate their previous state by inference in the absence of factual baseline data. Herein lies the importance of environmental monitoring to develop a catalogue of the state our water bodies are in, which would show up danger spots to be kept under close surveillance. The many uses that man puts water to are often conflicting. In planned development and use, rational collaboration rather than recrimination or litigation can produce results.

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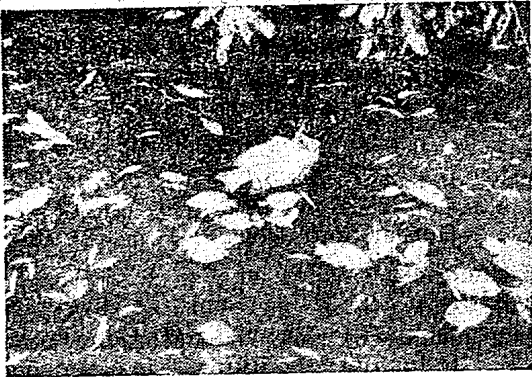


Fig. 3 The affected fishes

nutrients, had high suspended load and was alkaline (pH 12.00). Conditions in the river showed marked improvement on 16-6-1980 and the ammonia values registered an appreciable decrease. The effect of dilution from monsoonal discharges could be seen in the pH and salinity values also (Table II).

The biological communities of aquatic systems are useful indicators of the quality of water they live in and no water body that cannot sustain a fairly diverse biota should be regarded to be in a satisfactory condition. Water bodies, be they fresh, marine, or estuarine, merit treatment as a national heritage, worthy of great care. When damage is caused or suspected to them, we are in rather a unhappy position

Table 1—List of species killed during the mortality.

1. Anchoviella commersoni
2. Belone Sp.
3. Mugil cephalus
4. Arius sp.
5. Ambasis gymnocephalus
6. Scatophagus argus
7. Eteroplus suratensis
8. E. maculatus
9. Gobed fish probably Electrois sp.
10. Pomadassis sp.
11. Therapon jarbua
12. Solea sp.
13. Platycephalus tuberculatus

Table II—Salient characteristics of water during and after the period of mortality (Values are averages for the water column)

	Temp. (°C)	Sal. (‰)	pH	Ammonia (ppm N)
<b>5 - 6 - 1980</b>				
Tripunthura	29.8	3.20	8.20	23.04
Champakara	29.4	3.40	7.65	3.51
Kundannore	28.5	5.54	7.65	1.19
Clean water sample upstream	28.1	0.38	6.00	0.68
<b>16 - 6 - 1980</b>				
Tripunthura	30.5	0.45	6.60	6.18
Champakara	30.3	1.00	6.65	4.45
Kundannore	30.1	1.00	6.80	3.42

#### REFERENCES

- Indian Standards Institution, 1976a.  
*Tolerance Limits for Industrial Effluents Discharged into Marine Coastal Areas.* IS 7968-1976, Indian Standards Institution, New-Delhi.
- Indian Standards Institution, 1976b.  
*Criteria for Controlling Pollution of Marine Coastal Areas.* IS 7967-1976, Indian Standards Institution, New-Delhi.
- Klein Louls, 1972.  
*River Pollution. 2: Causes and Effects.* Butterworths, London, 432 pp.
- Reid, George, K., 1967.  
*Ecology of Inland Waters and Estuaries.* Reinhold Publishing Corp., London, 337 pp.
- Riley, J. P. K. Grashoff and A. Voipoo, 1972.  
In: *A Guide to Marine Pollution.* Compiled by Edward D. Goldberg, Gordon and Breach, Paris, 85-86.
- Unnithan, R. V., M. Vijayan, E. V. Radhakrishnan and K. N. Remani, 1977.  
Incidence of Fish Mortality from Industrial Pollution in Cochin Backwaters. *Indian J. mar. Sci.*, 6: 81-83.