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POLLUTION AND FISH MORTLAITY IN CHALIYAR RIVER, MAVOOR

Fish mortality on a large scale occurred in the Chaliyar river near Calicut from 7-3-1979 to 16-3-1979, in the region between Elamaram and Pallikkadavu. Information gathered from the inhabitants on the banks of the river revealed that large quantities of wastewater from the Gwalior Rayons Factory located at Mavoor was seen discharged into the river through the emergency outlet at Elamaram, on the evening of 6-3-1979. From newspaper reports it was understood that the factory management has agreed to have discharged large quantities of untreated wastewater into the river through the outlet at Elamaram due to a sudden crack in the effluent flowing channel from the Pulp Division. It was also reported that the discharge contained large quantities of acid and fish kills appeared in the region immediately below the outfall ie. Manthalakadavu. The possibility of occurrence of sulphuric acid in the water can be surmised as the Factory uses large quantities of this acid for cooking the wooden chips in the digesters. In the first stage, the wooden chips are cooked with sulphuric acid and then the chips are washed to remove the acid. The washed water is allowed to flow into the treatment tanks along with the alkalies with which the chips are again cooked. If a sudden crack occurs in the channel carrying this washwater to the treatment tank there is a possibility of sulphuric acid escaping into the water and killing the fish by lowering the pH of the water in the river.

Sulphuric acid, if present in large quantities in the water, will lower the pH of the water to below 4.0 and the fishes will die of acidamia causing bicarbonate loss in the body fluid. On 9-3-1979 and 10-3-1979 a 24 hrs observation was made at Oorkadavu, a point about 2 km below the main outfall through which only treated effluents are supposed to be discharged. At 0300 hrs on 10-3-1979 it was observed that groups of *Mugil* sp. moved downstream in a dazed manner and started dying enmass as they reached the observation point at Oorkadavu. The dissolved oxygen content was nil from 0300 hrs to 0800 hrs and the pH was 4.5. Nitrite was nil and nitrate and phosphate were more than what was normally observed. The Oorkadavu–Chungapally region was considered to be the zone of active decomposition and dissolved oxygen content in this region will be always less than 1 mg/l even when there is no fish mortality. Also it was observed that large number of nereid worms living on the bottom in these areas came to the surface. The worms had moved into the Kanniparamb river, a tributary of Chaliyar joining at Oorkadavu, and died in large numbers upstream. Of the fishes that died in the river, *Mugil* sp. accounted for more than any other variety of fish. Earlier, on 1-3-1979 to 3-3-79 intensive sampling was carried out at Kalpally, a point 0.5 km below the main outfall where a 72 hrs continuous observation was made. Large number of *Barbus* sp, *Etroplus* sp. and *Glassogobius* sp. were caught. It is interesting to note that among the dead fishes, the representation of these was meagre when compared to the numbers caught previously. Apart from the low pH causing the mortality, the disappearance of these fishes from the heavily polluted areas and the dislocation of the nereid worms from their habitat would also reveal the possibility of occurrence of some metallic poison in the water. The factory is understood to be using mercury to prevent growth of slime moulds in the boilers and also lead, chromium and zinc for different purposes.

There is another possibility for the large scale mortality of the fish in the receiving water which is more dangerous for the fish life than the sulphuric acid. The escape of free chlorine in the form of calcium hypochlorite into the water is proved to be fatal to fish life as it kills the fish instantaneously without lowering the pH. The factory is using chlorine for preparing the bleach liquor for bleaching the pulp and reducing the colour. Bleach liquor is prepared by injecting chlorine into a milk of lime. The supernatant is collected as calcium hypochlorite or bleach liquor and the residue which may contain 0.5 to 1 % chlorine is let out as waste. This free chlorine if allowed to remain with the highly organic waste with which it is discharged into the treatment lagoons, it will be absorbed by the organic waste. Instead, if it is let out into the river, it will wipe out the fishery resources in the water in no time. Virtually no fish survives in the waters between Elamaram and Kalpally as the Factory very often discharges wastewater into the river at Elamaram. So the possibility of free chlorine in the form of calcium hypochlorite in the wastewater causing the mortality cannot be ruled out.

The Biological Oxygen Demand of the effluent determined on several occasions earlier showed no ill effect to the biological organisms in the water. For example the B. O. D. of the effluent measured on 1–3–79 was about 800 mg/l and no fish mortality was observed downstream. But on 7–3–1979 when large scale fish

mortality was noticed the B. O. D. of the effluent was about 300 mg/l. From this it is evident that higher B. O. D. is not responsible for the sudden fish mortality and there may be some other reason responsible for the fish kills. Sulphuric acid in the water in concentrations more than normal would have caused acidamia in the fishes first and death might have resulted due to respiratory stress as they moved into the oxygen depleted zone due to the synergetic effect of the latter. The fact that no fish mortality occurred between Elamaram and the main outfall at Kalpally after 7–3–79 indicates the possibility of release of calcium hypochlorite into the water at Elamaram on the night of 6–3–79 killing the fishes immediately at Manthalakadavu. The mortality of selected species of fish and nereid worms would lead to the suspicion of presence of metallic poison in the water.

A 24 hrs observation again made at Pallikadavu, a point about 3 km downstream from the main outfall on 17 and 18-3-79 revealed signs of recovery, as good number of fishes of different genera started moving into the waters from down stream. The dissolved oxygen content in the water was also found to have increased and no fish mortality was reported at any reach in the river. Monitoring is being continued.

Government of Kerala has now decided to close down the Pulp and Fibre divisions of the Factory till pollution abatement measures are completed.

The investigations were carried out by Shri P. Karuppasamy of Calicut Research Centre of CMFRI.