J.Aqau.Biol. Vol. 15 (1 & 2), 2000 : 47 – 49.

A STUDY ON FISH KILL IN RAILADEVI LAKE, THANE, MAHARASHTRA

Pejawar Madhuri and Vaishali Somani.
Department of Zoology,
B.N.Bandodkar College,
Thane – 400 601, Maharashtra.

Key words : Fish kill, Water quality, Pollution, *Railadevi* lake.

Abstract :

A major fish kill was reported in *Railadevi* lake in Thane city on 28th February 2000. Tons of fishes belonging to the species of Indian major carps and an exotic species, *Tilapia*, were killed in large numbers. The lake is one of the major water bodies in Thane city and extensively used for fish farming. It is also taken up for beautification by the Thane Municipal Corporation (TMC).

To investigate possible reason(s) for the kill, water quality in terms of physico-chemical and microbiological parameters was studied. Total absence of DO even after 24 hrs of incident indicates that anaerobia and clogging of gills due to suspended organic matter could be the immediate reasons for the mass mortality of fishes.

Introduction :

Fish kills are reported in India right from 1940 and are usually a consequence of environmental imbalance usually due to pollution. In the last two decades it has become a recurrent phenomenon in water bodies particularly in urban areas and linked to environmental degradation due to unprecedented urbanization and industrialization (Kodarkar, 1995). Massive fish kills are reported from different parts of the country that include summer kills as reported by Siddiqui and Rama Rao (1991) and Chandrasekhar and Kodarkar (1995) in the lakes of Hyderabad (Andhra Pradesh) or winter kills as reported by Das and Panday (1982) in Nainital lake (UP). The kill discussed in the present report has occurred for the first time in this lake and possible reasons behind this phenomenon are analysed.

Railadevi lake is situated in Wagle estate area of historical Thane city. The lake has a water spresd of 60,668.9 sq. m and is partly filled with sludge. Catchment of the water body is highly urbanized and the lake is under stress from influx of sewage and solid waste.

Recently the TMC has undertaken a massive drive of lake restoration in which desilting and de-weeding was mainly undertaken as a part of lake beautification drive. To facilitate restoration the water body was divided in to two zones by a temporary divider. In the process a lot of water was also pumped out thereby disturbing its hydrological balance. The fishermen as normal practice introduced 3 to 4 lacks of fish seed in Nov, Dec' 1999. To ensure better fish yield dung, rice husk and bread was added in the water in Station I on 1st Feb ' 2000. This crude and unscientific step lead to fish kill in one week time on 28th Feb' 2000.

Material and methods :

Water samples were collected within 24 hrs of report of the kill on 28th Feb' 2000 in sterilized polythene bottles. Preliminary observations revealed that tons of fish were floating on the surface on one side of the divider (Station – I), however, the number of killed fishes was much lower on the other side (Station – II). The water quality in terms of physico-chemical and microbiological parameters was studied by methods in APHA (1981) and Goyal and Trivedi (1986) for the former and EIA (1995) for the latter.

Results and discussion :

The results of water samples collected within 24 hrs of the kill and analysed for a number of physico-chemical and microbiological parameters are summarised in Table 1. The results show that the DO was nil and values of free CO_2, suspended solids, and phosphates were higher at Station I than at Station II. Total hardness was higher at both the sampling stations. The microbial analysis indicated

Paper presented at the U.G.C. Sponsored National Conference on "Wetland Conservation in next millennium", 23 – 25th Oct'1999. Post Graduate Department of Zoology, R.A.College, Washim, Maharashtra, India.

higher Total Plate Count (TPC) at Station II, faecal coliform count was double at Station I.

Table 1. Water quality in Railadevi lake, Thane, 24 hrs after the fish kill.

Parameter	Station - I	Station - II
DO	0.00	0.00
Free CO_2	4.4 ppm	1.54 ppm
Salinity	0.39 %	0.32 %
Total alkalinity	300 ppm	210 ppm
Total hardness	400 ppm	360 ppm
Ca hardness	228 ppm	190 ppm
pH	8.4	8.46
Calcium	91.38 ppm	76.15 ppm
Silicates	90 ppm	118 ppm
Phosphates	0.429 ppm	0.117 ppm
Nitrates	0.06 ppm	0.06 ppm
Total Solids	1000 ppm	300 ppm
Total Suspended Solids (TSS)	400 ppm	0 ppm
Colour	Yellowish	Greenish
TPC at 37° C	35,000	51,000
TPC at 27° C	28400	53000
Faecal coliform MPN at 44 ° C/100 mL	250 org	130 org
Total coliform at 37 ° C/100 mL	1100 org	1100 org
Salmonella	Not Detected	Not Detected
Vibro cholarae	Not Detected	Not Detected

Mass mortality of fishes termed as fish kill ranges between death of a few fishes from old age to catastrophic mass kills and classified by APHA (1981) into Minor (1 to 100 specimens), Moderate (100 to 1000) and Major (> 1000) kills in an area of 1 to 2 km of a straem or equivalent area of a lake or an estuary. Kodarkar (1995) has summarized the factors underling the massive fish kills in lake Hussainsagar, Hyderabad, Andhra Pradesh. Some of the natural factors responsible for mass mortality of fishes are; acute thermal changes and consequent thermal shock, storms, ice and snow cover, high algal blooms and decomposition of nutrient materials, algal toxins, an abnormal rise in pH, sudden changes of salinity, parasitic infection, bacterial and viral epidemics and total anaerobia and resultant asphyxia.

Fish kills in urban areas can be directly linked to a number of man-made factors that disturb the health of an ecosystem and kills are only perceptible manifestation of such a negative impact. Earlier fish kills are reported from mega-city Hyderabad by Muley (1987) and Chandrasekhar and Kodarkar (1995). The species involved in these kills were *Notopterus, Channa* and *Cyprinus carpio.* Apart from other long term factors like infections, immediate reason given for these kills are anaerobia and thermal shock (Muley, 1987). In the major fish kill reported by Chandrasekhar and Kodarkar (1995) in Saroornagar lake, Hyderabad, factors like low DO, high turbidity and build up of ammonia are indicated as the immediate factors accounting for the phenomenon.

Hawkers (1978) has reported a major kill of fishes and invertebrates in river Ray, a tributary of upper Thames in Ovtober 1970. The kill followed massive release of untreated sewage during 99 hrs period. Mason (1981) has also reported large scale mortality of fishes and ten fold decline in invertebrate population as a result of sewage linked anaerobia. In temperate lakes fish kills followed sudden collapse of plankton (Dafni *et al., 1972;* Baria, 1981; Jeppersen *et al.*, 1990). Mason (1981) has blamed sewage linked eutrophication and resultant anaerobia as the major cause of fish kill.

In the present investigation DO level at both the sampling stations was nil. Further, in the station I free CO_2, phosphates were much higher compared with station II. Factors like low levels of water and addition of mannure must have particularly aggrevated the situation in the station I zone where massive mortality of stocked fishes was observed.

Microbiological studies have shown doubling of faecal coliform in station I zone, however, two main pathogens, *Salmonella* and *vibro cholarae* were totally absent, thereby ruling out the possibility of microbial infection as reported by Reddy *et al.* (1994) in Kalyani reservoir in Andhra Pradesh.

To summarise, anaeroxia, clogging of gills by suspended particulate matter could be immediate reasons of fish kills observed in the present incident.

Acknowledgements :

The authors are thankful to the Principal, Staff members and students of Zoology department, B.N.Bandodkar College of Science for their help.

References :

APHA, AWWA. CPCF (1981) Standard Methods for the examination of water and waste water. 15th Edition.

Barica, J. (1981) Hypereutrophy the ultimate stage of cutrophication. Water Quality Bulletin, 6, 9598 : 155 – 156.

Dafni,Z., S.Ulitzer and M.Shila (1972) Influence of light and phosphate on toxin production and growth of *Prymnesium parvum*. J. Gen. Microbiol. 70 : 99 – 207.

Chandrasekhar,S.V.A. and M.S.Kodarkar (1995) Investigation on a major fish kill (*Cyprinus carpio*) in Saroornagar lake in Hyderabad, Andhra Pradesh. J.Aqua.Biol. Vol.10 (1 & 2) : 44 – 47.

E.I.A. (1995) A Manual of Analytical Methods for Fish and Fishery product by Export Inspection Agency (EIA), Govt.of India Publication.

Hawkers, H.A. (1978) River bed animals tell tales of pollution. In : Huges J.G. and Hawkers, H.A. (Collators). Biosurvellence of river water quality. PP : 55 – 77. Proceedings of Section K of the British Association of the Adavancement of Science, Aston, 1977.

Holdway,P.A., R.A.Watson and B.Moss (1978) Aspects of ecology of *Prymnesia parvum* (Hypophyta) and water chemistry in the Norfolk Broads, England. Freshwater Biol., 295 – 311.

Jeppersen,E., M.Sondergaard, O.Sortjaer, E.Mortensen and P.Kristensen (1990) Interactions between phytoplankton, zooplankton and fish in a shallow hypertrophic lake; A study of phytoplankton collapses in lake, Sobigard, Denmark. Hydrobiologia. 191 : 149 – 164.

Kodarkar,M.S., E.V.Muley and Vasant Rao (1991) Toxic algal blooms in the lake Hussainsagar, Hyderabad. J.Aqua.Biol. Vol. 6 (1 & 2) : 13 – 18.

Kodarkar,M.S. (1995) Conservation of lakes. IAAB Publication, Hyderabad.

Manjula Devi (1988) Ecotoxicological studies on freshwater fish with special reference to pollution. Ph.D. Thesis, Osmania University, Hyderabad.

Manson,C.B. (1981) Biology of freshwater pollution. Longman Group Ltd. Publ. PP : 250.

Muley,E.V. (1987) Preliminary report on the fish kills in lake Hussainsagar. Res Project. Municipal Corporation of Hyderabad (MCH) and Anshra Pradesh Pollution Control Board (APPCB), Hyderabad. PP : 42.

Reddy,T. Venkata, K.Ravindranath, P.K.Sreeraman and M.V.Subba Rao (1994) *Aeromonas salmonicida* associated with mass mortality of *Cyprinus carpio* and *Oreochromis mossambicus* in a freshwater reservoir in Andhra Pradesh. Indian J. of Aquaculture in Tropics. 9 (4) : 259 – 268.

Trivedi,R.K., P.K.Goyal (1986) Chemical and Biological Methods for water pollution studies. Enviro Media Publ., Karad, India.