REPORT ON FISH MORTALITY IN ULSOOR LAKE, BENGALURU

1.0. Ulsoor Lake

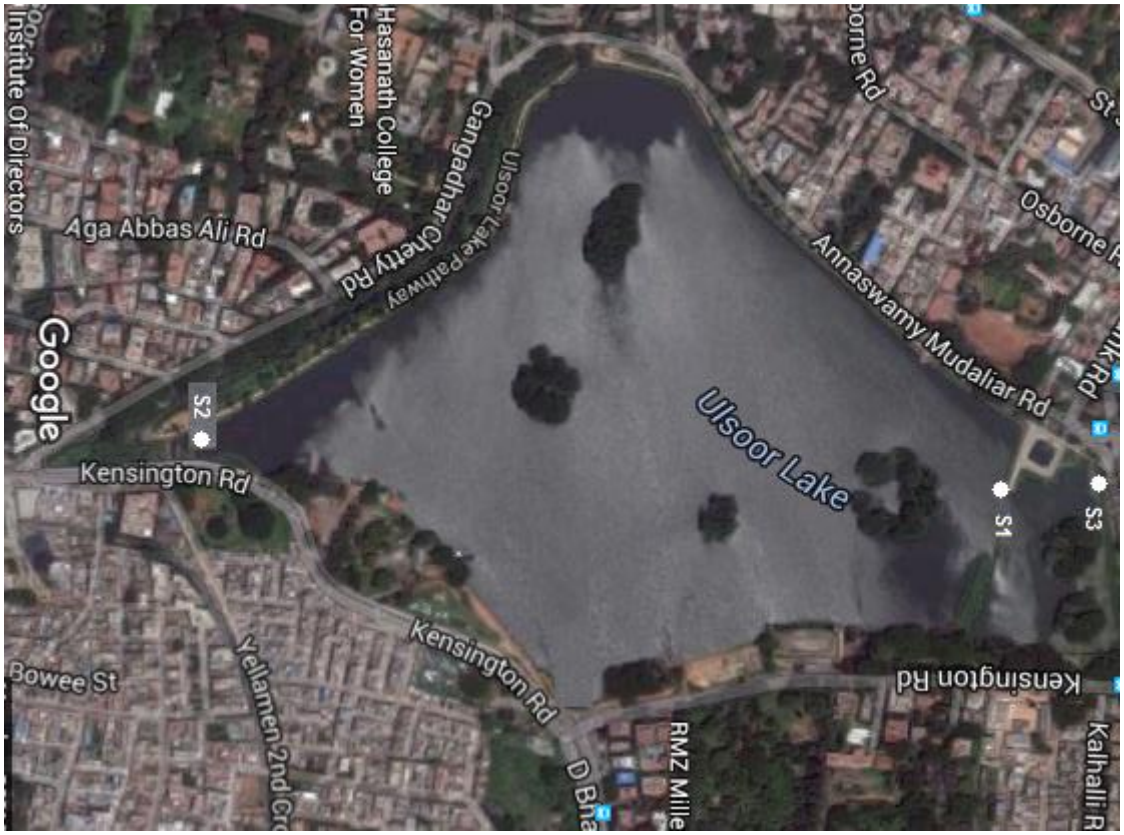
Ulsoor Lake is one of the biggest lakes spread over 123.6 acers, located on the eastern side at Ulsoor, Bangalore city. This lake is developed and maintained by Bruhut Bengaluru Mahanagara Palike (BBMP). This lake was receiving rain water through two storm water drains during rainy season. This Ulsoor lake water quality is monitored every month under the National Water Quality Monitoring Programme (NWMP) by the Karnataka State Pollution Control Board (KSPCB). As per the report of KSPCB, the water quality of Ulsoor lake conforms to designated-best-use classification Class ”D” i.e. Water is fit for propagation of wildlife and fisheries. The fisheries Department has awarded the fishing activity to Bangalore District Fisheries Product Processing Society in Ulsoor Lake.

2.0. Episode Pollution

Thousands of dead fish washed up on the banks of the Ulsoor Lake in Bengaluru on March 07, 2016 and the same was report in the leading local newspapers and media. A team of official from Central Pollution Control Board (CPCB), Zonal Office, Bengaluru inspected the Ulsoor Lake on March 07, 2016 evening and collected the lake water samples to assess the water quality and the possible reasons for the fish death. During the visit to the Ulsoor Lake, the Chairman, Karnataka State Pollution Control Board (KSPCB) and other Senior Officials of the Board were present and the samples were collected by the KSPCB too.

3.0. Water Sampling & Analysis Results

The team collected the lake samples at three different points, the points are S1: Near Kalyani, S2: Ulsoor Kodi (outlet point), and S3: Sewage entry point near the Madras Sappers HQ MEG & Centre. The sampling points are marked as S1, S2 and S3 and shown below:



Map showing the view of Ulsoor Lake and sampling locations (S1, S2 and S3)

The analysis results of water samples collected are as follows:

Water Quality Analysis of Ulsoor Lake as on March 07, 2016 (19.00 Hrs)

Location	S1 : Near Kalyani	S2 : Ulsoor Kodi (outlet)	S3 : Near MEG & Centre (Raw sewage entry point)
Temperature (^oC)	28	26	27
pH at 25 ^oC	7.7	7.1	7.1
EC µs/cm at 25 ^oC	484	501	690
TSS (mg/L) at 25 ^oC	12	12	24
TDS (mg/L) at 180 ^oC	280	308	360
COD (mg/L)	91.6	71.7	107.6
BOD (mg/L) 3 days at 27 ^oC	22	12.3	28.5
DO (mg/L)	4.50	2.1	3.1
Total Hardness (mg/L) as $CaCO_3$	87.6	95.2	137.2
Phosphate (mg/L) as P	0.13	0.1	0.36

The above analysis results revels that the water quality of Ulsoor Lake was not meeting the prescribed limit for Designated – Best - Use for Class "D":

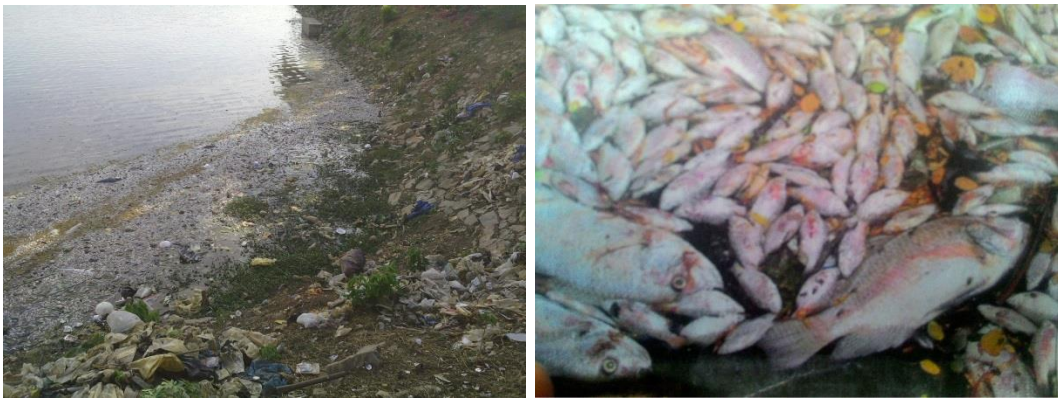
Propagation of Wild Life and Fisheries, with respect to the environmental parameters of Dissolved Oxygen. The BOD of the water was ranging between 12 to 29 mg/L.

4.0. Other Observations

The field observations are as follows:

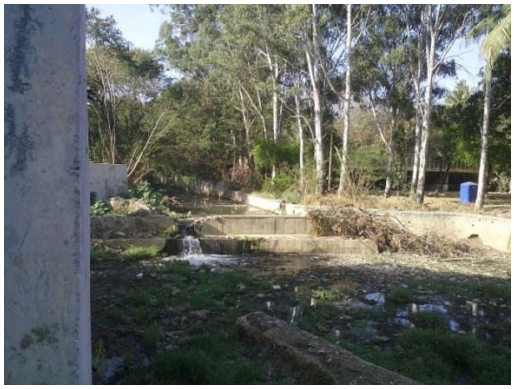
i. There was mortality of fish in the Ulsoor Lake in large quantity and floating on the lake's water. The same was noticed by the morning walkers at Ulsoor Lake on March 07, 2016 and the same was reported by the media.

ii. In the evening during inspection, the floating dead fish were washed on to the lake's shore, causing odour in and around the lake area. It is noticed that Punitius ticto, Katla and common carp were among those dead fish in lake.



Floating dead fish in the Lake

iii. The lake has two storm water inlets and the same is being used for entry of rainwater during rainy season. It is noticed during inspection that there was sewage entry at one of the inlet near the Madras Sappers HQ MEG & Centre. The water sample (sewage) collected at the inlet has DO: 3.15 mg/L, pH : 7.1, and Temperature : 27 ^{o}C. On the other hand, there was no over flow / flow from the lake outlet weir.



Entry of Sewage from MEG & Centre side

iv. After monsoon, other than sewage entry, there was no fresh water or the treated sewage entry to the lake to keep the lake healthy and there was no sewage treatment plant located at the inlet to treat the sewage / drain water before entering to the lake.

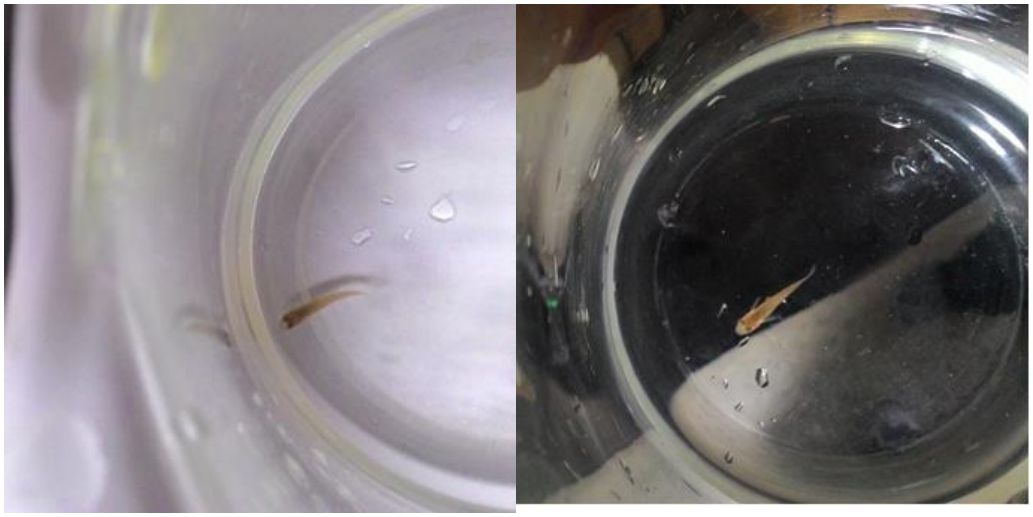
v. The water temperature of the lake measured in the evening around 19.00 Hrs varies between 26 to 28 ^{o}C and the pH ranges 7.1 to 7.7, conductivity ranges 484 to 690 µs/cm and the BOD ranges 12 to 29.

vi. The water level in the lake was about one foot below the outlet weir. Due to decline in water level leads to further increase in temperature of water body leads fast depletion of DO in the water body.

vii. There was growth of algae in the lake water body, which consumes / utilise the DO available in the water during night, leads to further depletion in DO may leads to fish kill. Minimum of 3 mg/L of Dissolved Oxygen is required for the survival of fish. The samples collected have shown the Dissolved Oxygen ranges between 2.06 to 4.50 mg/L at the surface. The DO will further decrease with increase in depth of water. The colour of the water is green which indicate the presence of algae in the water, which is shown below:

Colour of the water

viii. During sampling, it was noticed that there was survival of hatchlings of fishes – Guppy in the sampling bucket at all the three locations. It indicates that the mortality of fish might have caused at some pockets of the lakes, not in the entire area of lakes.



Guppy fish

ix. The dead fishes were removed by the Contractor as per the direction of fisheries department.

5.0. Action taken by KSPCB

The Karnataka State Pollution Control Board (KSPCB) concluded that the fish kill was observed possibly due to sudden depletion of dissolved oxygen. On this issue, the KSPCB held a meeting with concern departments (BBMP, BWSSB,

Fisheries Department, Madras Sappers HQ MEG & Centre, Lake Development Authority, Fisheries Co-Operative Society) and made the following recommendation / decision:

i. The department of fisheries should have had good control over the contractor after leasing the lake for pisci-culture and post monitoring.

ii. BWSSB to examine, if there is any leakage of sewage entry into the lake and arrest/prevent the same within 10 days time from the both the drains.

iii. BWSSB shall establish a Sewage Treatment Plant of 1 to 1.5 MLD on the upstream of Ulsoor Lake and to leave the treated sewage water into the lake to maintain the water level. MEG to spare about ½ Acre land to establish Sewage Treatment Plant.

iv. BBMP should re- construct wetland bund/spill weir before onset of monsoon for this bund a well-designed appropriate screen shall be provided to arrest entry of floating debris into main water body.

v. BBMP to provide defused micro bubblers for the sedimentation tank and also to provide fountains in the main water body either by BBMP or through any agencies under CSR activities.

vi. BBMP to provide online pH and DO meters at appropriate locations in consultation with KSPCB.

vii. Department of Fisheries to take up periodical monitoring of hydro biological and fisheries investigations be undertaken to assess the physio-chemical and biological parameters to facilitate introducing corrective measures and this exercise should be taken up in all the lakes wherever pisciculture either departmentally or through fisheries college.

viii. Department of Fisheries shall establish a nursery within the lake to facilitate pisciculture in Ulsoor Lake.

ix. Before the next renewal of contract for pisciculture, the fisheries department should ensure the proper number is let into the lake to regulate the stockings to ensure balanced density of fishes both local and introduced species.

x. The fisheries co-op society shall maintain the cleanliness of the lake as per procedure laid down by the fisheries department.

xi. MEG shall ensure that the effluent generated from canteen, toilets etc shall be discharged to underground drainage system of BWSSB only.

xii. MEG shall deploy two power boats in the lake a minimum of two hours per day.

On this matter, Additional Chief Secretary, Forests, Ecology and Environment Department submitted factual report on the fish mortality in Ulsoor Lake, Bangalore to the Secretary to Govt of India, MoEF&CC, New Delhi on 09.03.2016. The copy of the same is enclosed.

6.0. Conclusion of CPCB

The water quality of Ulsoor Lake analysis results reveals that the water quality was not meeting the prescribed limit for Designated – Best - Use for Class "D": Propagation of Wild Life and Fisheries, with respect to the environmental parameters of Dissolved Oxygen. The BOD of the water was ranging between 12 to 29 mg/L. The following possible reason might have led to fish kill in high volume:

- Depletion of Dissolved Oxygen level in the lake i.e. <4 mg/L
- Decrease in Water Level in the Ulsoor Lake and increase in temperature of water body.
- Excess i.e. (1.75 Laks) fish lingering of size 30 to 40 mm released in to the lake against the permitted level of 80,000 in 40 Hectare of the lake.
- Entry of Sewage water along with solid wastes, plastics in to the Lake. Due to continuous entry of untreated sewage / organic load to the Ulsoor Lake and presence of algae in the lake water body, increase in temperature of water, might have caused the depletion of available DO leads to fish mortality.
- **Proposed Action**: Appropriate Directions / letter shall be issued to the concern authorities i.e. Lake Development Authority, Bruhut Bengaluru Mahanagara Palike (BBMP), Bangalore Water Supply and Sewerage Board (BWSSB) and Karnataka State Pollution Control Board for taking appropriate measures to improve the water quality and to protect the water bodies and upload relevant data on lakes in their respective websites :

S. No.	Authority	Directed to
1.	The Chairman, Karnataka Pollution Control Board, Parisara Bhawan, 49, Church Street, Bengaluru – 560 001	• Submit action taken report with present status of Ulsoor Lake Pollution and Fish Mortality. • To carryout intensive monitoring of all the lakes of Bangalore including Ulsoor lake on regular basis (Every month) and submit the water quality data to CPCB. To upload the data in their website.
2.	The Chairman, Lake Development Authority, 2nd Floor, Parisara Bhavan, #49, Church Street, Bengaluru – 560 001	• Submit the physical status of lakes in Bengaluru and Karnataka in total. Covering the size, entry of water (storm , sewage, industrial effluent), water quality, issues related to the lakes etc. • ATRs for the protection of lakes in city
3.	The Commissioner, Bruhut Bengaluru Mahanagara Palike	• To erect / install bar screen at the inflow to arrest entry of floating debris into lake, and not to allow / permit raw sewage

	(BBMP), Corporation circle, Hudson Circle, Bengaluru -560002	entry to the water body. • To establish system to maintain required Dissolved Oxygen (i.e. > 4 mg/L), in the Lake and to install online measuring devices for pH, Temperature, D.O, BOD, and Free Ammonia. • To maintain minimum required water level in the Lake during summer to avoid fish kills due to raise of water temperature. • Periodical removal / control of algae growth in the water body to avoid Eutrophication
4	The Chairman Bangalore Water Supply and Sewerage Board (BWSSB), KG Road, Cauvery Bhavan Bengaluru -560009	• To examine and stop the entry of untreated sewage in to any of the lakes located in Bangalore and submit the status report. • To comply all the directions issued under Section 5 of EPA, 1986 vide order No. 1-14011/1/2015-MON, dated 09/10/2015 and communicated vide letter no. Tech/24/STP/ZOB/2015-16/1698 dated 05.01.2016,

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