



## Assessment of Water Quality for Hebbal Lake of Mysore

**Dr. M. K. Mahesh** Department of Botany, Yuvaraja's college, University of Mysore, Mysore, India

**B. R. Sushmitha** Project Fellow, Department of Botany, Yuvaraja's college, University of Mysore, Mysore, India

**H. R. Uma** P.G. Department of Studies in Economics, Manasagangotri, University of Mysore, Mysore, India

### ABSTRACT

A water quality index (WQI) developed by the Canadian Council of Ministers of the Environment (CCME) was applied to Hebbal lake of Mysore, Karnataka State, India, to study its impact on aquatic life, livestock and to know whether it is suitable for recreation, irrigation and drinking. The index of the lake is rated as poor with respect to drinking, recreation and livestock, marginal with respect to Aquatic life and excellent for irrigation purpose. The overall water quality is rated as poor. The water quality is almost always endangered or deteriorated and the conditions often deviate from natural levels. *Anabaena* and *Microcystis aeruginosa* form blooms, *Phacus pleuronectes* is also recorded and the lake water is unsuitable to protect aquatic life. Incidence of Fish kill occurred in 2011 due to contamination of water.

**KEYWORDS:** Water Quality index, Cyanophycean blooms, Poor rating

### Introduction

Water is a prime natural resource and a basic human need. Lake ecology and its biodiversity depends on its natural shoreline and connectivity of lakes. Wetlands, fresh water and its resources are economically important for the healthy survival of living beings on earth and so has become a cause of concern during this era of global warming. Lakes all over the world are drying as they have turned into dumping grounds for sewage, industry effluents and other hazardous wastes. Encroachment of the lakes, pollution of air, agricultural and sewage disposal into the lakes and rapid urbanization has apparently caused undesirable change in the climate and lake structure. More activities in the catchment zones have been a dominant factor causing deterioration of the lake structure and posing a threat to its biodiversity. Better quality of water is described by its physical, chemical and biological characteristics. The physico-chemical methods are used to detect the effects of pollution on the water quality.

The Canadian Council of Ministers of the Environment (CCME) was designed to evaluate surface water quality for the purpose of protecting aquatic life aided with specific guidelines. The number of parameters to be measured can be determined by the water quality monitoring agency. The sampling protocol requires at least four parameters sampled at least four times. The finding must reflect the water quality in a given water area as accurately as possible. Water quality guidelines are numerical values that define physical, chemical or biological characteristics of the water that cannot be exceeded without causing harmful effect (CEQG, 1999). The indices are among the most effective ways to

communicate the information on water quality trends to the general public and in water quality management.

In the present study an attempt has been made to assess the surface water quality of Hebbal lake, a major lake of Mysore city.

### Materials and Methods

#### Study Area

#### Hebbal Lake

Hebbal lake (Infosys) is situated at latitude of 12° 21' 31.32" N, longitude of 76° 36' 42.20" E and elevation of 2463ft. It is located about 6 Km away from Mysore city. The Shape of the lake is irregular. Anthropogenic activities are found and large numbers of industries are situated around the lake. Macrophytes are less abundant.

Surface water samples were collected from the lake during the period from February to November 2012 and analysed for 16 water quality parameters following the standard methods (APHA, 1995). The water chemistry variables analysed are pH, water temperature, Electrical conductivity, total dissolved salts, salinity, turbidity, Dissolved Carbon-di-oxide, Dissolved Oxygen, Total hardness, calcium, Chloride, Total alkalinity, Chemical Oxygen Demand, Nitrate, Phosphate and Biochemical Oxygen Demand. Collection, preservation, identification and enumeration of phytoplankton have been done as per the methods described by Welch, 1948 and Rao, 1955. Blue green algae were identified by referring to the monograph of Desikachary (1959). Three samples per lake, one upstream, middle and down stream were collected and analysed.

**Table 1: Physico- chemical analysis from February 2012 to November 2012**

Hebbal	Feb	March	April	May	June	July	Augu	Sept	Oct	Nov
pH	8.43	8.41	7.99	8.29	9.12	8.01	8.35	8.49	8.44	8.05
WT	23.6	25.2	28.9	26.33	27.73	24.16	28.26	24.96	27.7	25.5
EC	3.06	4.21	5.49	3.51	3.58	4.27	4.88	4.67	1371	2.23
TDS	2.15	2.97	3.84	3.47	2.49	3	3.46	3.3	969.66	1.57
Salinity	1.56	2.21	2.92	2.66	1.63	2.22	2.61	2.49	680	1.13
Turbidity	9.90	40.89	24.56	23.06	19.56	12.80	22.95	1.85	1.49	2.88
Co2	14.6	14.6	21.12	0	0	3.2	0.29	0	0	10.2
DO	0.74	0.74	0.74	0.58	1.6	2.601	0.63	0.96	1.08	0.63
Total Hardness	1084	1614.66	1997.33	1201.3	1194.6	1341.33	1126.6	1544	445.3	736
Calicum	124.51	116.4	137.34	135.73	128.7	104.208	167.26	186.50	81.2	140.54
Chloride	792.36	1455.97	1946.34	1207.94	1316.81	1429.46	1260.96	1609.33	1429.4	648.46
Total alkalinity	320	173.3	186.6	160	146.6	153.3	166.6	146.66	126.6	273.33
COD	88.8	78.2	94.2	81.7	92.4	88.8	87.1	94.22	71.1	90.6
Nitrate	0.07	0.054	0.16	0.04	0.30	0.09	0.073	0.10	0.18	0.22
Phosphate	0.02	0.04	0.016	0.02	0.019	0.048	0.005	0.005	0.07	0.01
BOD	2.6	3.2	3.2	1.86	2.66	1.3	1.3	4.53	6.93	1.3

(EC in ms, TDS and Salinity are in ppt except October month it's in ppm where as EC is in  $\mu\text{s}/\text{cm}$ )

The water Quality Index (WQI) using the above parameters were calculated by feeding the data to CCME-WQI software -1.0. The index involves scope (F1), the number of parameters that are not compliance with water quality guidelines; frequency (F2), number of times that the guidelines are not respected and amplitude (F3), the difference between non compliance measurements and the corresponding guidelines. The square of each term and the square root of the sum are divided by 1.732, which is based on the fact that each of the three factors contributing to the index can reach a value of 100. The final value is subtracted from 100. The index produces values from 0-100 and based on the values the water quality index is characterized as shown in Table 1. Standard values of WHO and ISI are used for calculation of WQI.

**Table 2: Characterization of the water Quality Index (CCME-WQI, 1991).**

Rating	CCME-WQI	Characterization of the water
Excellent	95.0-100	Water quality intact, conditions close to natural levels
Good	80.0-94.9	Water quality is protected with only a minor degree of threat or impairment, conditions rarely depart from natural desirable levels
Fair	65.0-79.9	Water quality usually intact, but occasionally endangered, conditions often deviate from natural levels
Marginal	45.0-64.9	Water quality frequently endangered, conditions very often deviate from natural levels
Poor	0.0-44.9	Water quality almost always endangered, conditions regularly deviate from normal levels.

**Table 3: CWQI for Hebbal Lake of Mysore 2012.**

Data summary	Overall	Drinking	Aquatic	Recreation	Irrigation	Livestock
CWQI	35	39	43	9	100	51
Categorization	poor	poor	poor	poor	Excellent	Marginal
F1 (Scope)	56	43	67	100	0	50
F2 (Frequency)	36	30	44	100	0	22
F3 (Amplitude)	91	93	57	68	0	65
Number of variables tested	9	7	3	1	2	4
Number of variables that failed	5	3	2	1	0	2

### Results and Discussion:

The CCME Water quality index for lakes of Mysore has been studied by Hosmani et al., (2011) The Canadian Water Quality Index for Hebbal lake for various purposes indicates that it is poor for overall purpose, drinking, aquatic and recreation with index values ranging between a minimum of 9 for recreation, 43 for aquatic. The index is 100 for irrigation indicating an excellent quality while it is 51 for livestock rearing and is of marginal quality. The number of variables tested for the overall quality were 9 out of which 5 did not meet the requirements. Similarly 7 were tested for drinking water among which 3 were failures. 3 for aquatic out of which 2 failed. 1 for recreation and there was a failure and no failures among the 2 tested for irrigation and 2 out of 4 failed to meet live stock requirements.

Parameters of failing data were TDS for overall, drinking and livestock, TDS being very low in all cases. Salinity for overall and drinking, Turbidity for overall and aquatic, Carbon di oxide for all except irrigation and livestock and total hardness for overall and livestock rearing. Maximum parameters of failing data were TDS, Salinity and carbon di oxide.

Parameters of passing the test were pH in all cases, turbidity in two instances ie., overall and aquatic, TDS in overall, drinking and livestock, nitrate in overall, irrigation and drinking, Phosphate in overall, drinking, aquatic, irrigation and livestock. Occasional passing data were calcium in overall and drinking water quality.

The Canadian Water Index for Hebbal lake indicated that the water quality for all purposes is poor indicating that the water quality is almost always endangered conditions. It regularly deviates from normal levels. However for certain purposes like live stock rearing the water is marginally good and the quality of water for irrigation appears to be excellent where the water quality is intact and the conditions in it are very close to natural levels. CCME water quality index serves as an important tool in determining the quality of fresh water.

**Acknowledgement:** This work is financially supported by University Grants Commission, New Delhi.

## REFERENCES

1. APHA. (1998). Standard Methods for the Examination of Water and Waste water (20th ed.). American Public Health Association, Washington, DC.
2. CCME. (2001). Canadian Water Quality Guidelines for the protection of aquatic life. CCME water Quality Index 1. Technical Report. Canadian Council of the Ministers of the Environment.
3. Desikachary, T.V. (1959). Cyanophyta, ICAR New Delhi.
4. Hosmani, S.P., Mahesh, M.K. and Alakananda, B. (2011). Water Quality Index (WQI) for protection of aquatic life in lakes of Mysore, Karnataka State, India. International Journal of Lakes and Rivers, 4:91-102.
5. Indian Standard Institution (ISI). (1983). Specification for Drinking Water, New Delhi 15: ISO 5000.
6. Welch, P.S. (1948). Limnological Methods Balkistan Philadelphia USA pp. 18-382.
7. WHO. (1994). Guideline for drinking water quality (Recommendations) World Health Organization, Geneva.