Effect of Topographically Different Strata of Reservoir on Seasonal Composition of Ichthyo-Fauna in Tungabhadra Reservoir

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ABSTRACT
The sustainability of fish diversity and its abundance is based on the quality of water existing in that locality. All the hydrological parameters as well as plankton diversity influences the production of fish species. Stocking of economically viable native species of fishes in the reservoirs may convert the reservoirs more productive and is important measure from aquabiotic conservation point of view. The present investigation carried out at Tungabhadra reservoir from Jun 2017 to May 2018. Physico-chemical characters and fish diversity was estimated at topographically different sites. Results revealed optimum ranges of hydrological parameters showing alkaline pH, high Dissolved Oxygen and nutrient richness in all the three selected stations. There was positive relationship between hydrological parameters and the abundance of fin-fishes. Fish composition was dominated by Cyprinids. The rate of abundance was major carps > minor carps > cat fishes > trash fishes.

Key words: Carps, Conservation, Cyprinids, Topography, Hydrology, Ichthyofauna, Tungabhadra reservoir.

INTRODUCTION
Health of any aquacultural ecosystems depends on the inter-relationships between living and non-living components prevailing in the locality. The present investigation was carried out in Tungabhadra basin at 15°15' 19" N and 76° 21' 10" E from Jun 2017 to May 2018 for estimating Physico-chemical characters and fish diversity. Fisheries sector plays a predominant role not only in terms of food value but also generates income and employment to the public. Inevitably, the country has to depend heavily on the inland capture fisheries resources, among which the reservoirs constitute the mainstay. However the fish yield from the reservoir fishery is frustratingly low (Sinha, 2001). Proper scientific management incorporating traditional knowledge of fishermen and regular yearly documentation would encourage the future enhancement of fishery potentiality as well as the reservoir productivity.

MATERIALS AND METHODS
i) Study Area
Tungabhadra reservoir is tributary of Krishna basin terminating into Bay of Bengal. Three topographically different sampling stations (S1, S2 and S3) were chosen for collection of samples from June 2017 to May 2018 for assessing seasonal fluctuations.

ii) Sampling And Laboratory Procedures
Water samples were collected in one liter plastic bottles and transported to the laboratory for analysis. Air and water temperature were measured at the sampling site itself in the early morning and recorded. The pH of water body was also recorded at the sites using pH meter. Further analysis of water parameters such as free Carbon dioxide, Dissolved Oxygen (DO), Total alkalinity (TA), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Phosphates, Sulphates, Nitrates, Total hardness, Electrical Conductivity, Fluoride, Chloride, Turbidity, Iron, Magnesium, Calcium including BOD and COD were carried out as per the standard methods (APHA, 1992) and average values are presented in the Table.

iii) Fish Sampling
Fish samples were collected from the three fish landing centers located near sampling stations. Fish species were caught using alavi (a giant-seine net) cast net and drag nets. The collected fish were preserved in 4% formaldehyde solution. The sample fishes were identified based on the key characters (Jayram and Talwar, 1991; Jhingran 1999). The data collected was documented and interpreted.

RESULTS AND DISCUSSION
In the hydrobiological investigation relatively high load of suspended solids and fluctuating hardness indicated that the reservoir is prone to pollution. Similar observations were
Effect of Topographically Different Strata of Reservoir on Seasonal Composition of Ichthyo-Fauna in Tungabhadra Reservoir

made by Manjappa (2005) in the Tungabhadra river. High NTU in the water indicated pollution in the water bodies of Bangalore region (Kiran and Ramachandra, 1999). Temperature influences the chemical and biological properties of water (Hosetti and Arvind kumar, 2001). Throughout the year the reservoir showed relatively optimum temperature in all the stations. Due to the natural buffering capacity of water, reservoir seldom shows pH fluctuations (RFI). Alkaline pH was recorded in majority of Indian reservoirs (Reservoir Fisheries of India). Similar alkaline pH was recorded throughout the year in all the stations. Catchment area having agriculture and industrial activities had high pH in the reservoir of Lebanon (Korfali and Juardi, 2003). The dissolved oxygen was sufficiently high in all the stations caused due to turbulence, phytoplankton activity, splashing as well as wind action. The nutrient status of this reservoir is found to be high due to the increased levels of nitrates (1.5 mg/L to 3 mg/L) and phosphates (1 mg/L to 4 mg/L). Ramakrishnahal (1994) reported the similar nutrient status. High turbidity (10–20 NTU) indicated higher rate of siltation and organic load which reduces the primary productivity of the entire reservoir. The Chemical Oxygen Demand (COD) measures the oxygen equivalent of the organic and inorganic matter in a water sample that is susceptible to oxidation. COD as a result of pollution is largely determined by the various organic and inorganic materials (Calcium, Magnesium, Potassium, Sodium etc). The COD values ranged from 40 mg/L to 540 mg/L depicted in the Table 1.

Table 1: Physico-chemical characteristics of water quality of Tungabhadra reservoir Hospet from June 2017 May 2018.

| Time     | Air temp (°C) | Water temp (°C) | Turbidity (NTU) | TDS (mg/L) | TSS (mg/L) | Ele. Cond (µmhos/cm) | Total alkal (mg/L) | COD (mg/L) | BOD (mg/L) | DO (mg/L) | Sulphate (mg/L) | Nitrate (mg/L) | Phosphate (mg/L) | Calcium (mg/L) | Iron (mg/L) | Fluoride (mg/L) | Carbon dioxide (mg/L) | pH | Hardness (mg/L) |
|----------|---------------|-----------------|-----------------|-------------|-------------|----------------------|--------------------|-------------|-------------|------------|-----------------|-----------------|--------------------|----------------|-----------|---------------|----------------------|---|----------------|
| JUN'17   | 29.8          | 30.5            | 1.9             | 20.0        | 1.8          | 1.8                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| JUL'17   | 29.3          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| AUG'17   | 29.5          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| SEP'17   | 29.8          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| OCT'17   | 29.3          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| NOV'17   | 29.5          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| DEC'17   | 29.8          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| JAN'18   | 29.3          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| FEB'18   | 29.5          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
| MAR'18   | 29.8          | 30.4            | 1.5             | 20.0        | 1.8          | 1.5                  | 1.2                | 1.5         | 1.5         | 1.5        | 0.5             | 0.5             | 0.5                | 0.5            | 0.5       | 0.5           | 0.5                   | 12 | 0.5           |
Effect of Topographically Different Strata of Reservoir on Seasonal Composition of Ichthyo-Fauna in Tungabhadra Reservoir

Fig 1: Total fish diversity in three seasons.

Fig 2: Percentage composition of fish families in S1 during pre-monsoon.

Fig 3: Percentage composition of fish families in S2 during pre-monsoon.

Fig 4: Percentage composition of fish families in S3 during pre-monsoon.
Effect of Topographically Different Strata of Reservoir on Seasonal Composition of Ichthyo-Fauna in Tungabhadra Reservoir

Fig 5: Percentage composition of fish families in S1 during monsoon.

Fig 6: Percentage composition of fish families in S2 during monsoon.

Fig 7: Percentage composition of fish families in S3 during monsoon.

Fig 8: Percentage composition of fish families in S1 during post-monsoon.
Mastacebelus armatus, Ambassis nama, Bagarius bagarius, Osteobrama virgosii and Aorichthys seenghala were found in all the landing centres.

CONCLUSION

Tungabhadra Reservoir was found to be having rich fishery potential in its natural hydrological conditions since its impoundment with lesser fluctuations. The topography of the reservoir had not merely affected the diversity of fish fauna, but introduction of Indo-Gangetic major carps could utilize the vacant niches created by trash fishes so as to obtain better yield. Fishing holidays or strict regulation of gill net operations is advisable during June-August months where majority of commercially important fishes breed. Further better management and proper usage of fishing gears would bring good harvest of fin fishes. The present data may serve as baseline information for future studies as it will allow fisheries specialists and administrators to evaluate the impact of future culture enhancements on reservoir fisheries production and its yield.

REFERENCES

David, A., P. Ray, V. B. Govind, K. V. Rajagopal and R. K. Banerjee, (1969). Limnology and fisheries of the Tungabhadra reservoir, Bulletin13. Central Inland Fisheries Research Institute, Barrackpore, pp 188.

Sinha, M. P., (2001). Limnobiotic study on trophic status of polluted freshwater reservoir of coalfield area. Poll. Res.15: 13-17.

APHA, (1992). Standard methods for the examination of water and wastewaters. 19th edition, American Public Health Association, Washington DC, pp. 1193.

Ramakrishniah, M., (1994). Morpho-drainage Index, a fish yield predictor for Indian reservoirs. Paper presented at the 2nd Asian Reservoir Workshop, Hangzhou, P.R. China, 15-19 October, 1990.

Jhingran, V.G. (1991). Fish and Fisheries of India. Hindustan Publication Corporation, New Delhi.

Manjappa, (2005). Water quality index of Tungabhadra river water ecosystem near Harilhar-Karnataka. http://www.wgbis.ces.iisc.in/energy/lake2008/program.

Kiran and Ramachandra. T.V, (1999). Impacts and status of wetlands in Bangalore. Zoos' print J 2003 21(6): 2269-71. Reservoir Fisheries of India.

Hosetti, B.B. and Aravind Kumar, (2001). A text book of Applied aquatic biology, Daya publishing house, New Delhi.

Korfall and Juardi. (2003). ENVIS technical report: 23. Sahyadri conservation series, Environmental information system. I.I.Sc.

Nagabushan C.M and Hosetti B.B. (2010). Diversity of ichthyofauna in relation to physic-chemical characteristics of Tungabhadra reservoir. Hospet., Lake 2010: Wetlands, Biodiversity and Climate Change. T7_Oral_53.

S.B. Huliyal and B.B. Kaliwal. (2005). Water quality assessment of Almatti reservoir of Bijapur-dist. with special reference to zooplankton. Environ. Monit. Asses. (2008), 139:299-306.

Srikant and Ramachandran. (2005). Fish diversity in Linganamakki reservoir. Eco. Envi. and Cons. 11(3-4): pp (337-348).