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Limnological Profile for the Sustained Fish Production in Tungabhadra Reservoir, Hospet.

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ABSTRACT

The status of the aquacultural unit is invariably dependent on various physico-chemical and biological characteristics. Composition of fish production in the tropical impoundments is subject to drastic climatological changes. The sustenance of continuous ichthyofaunal diversity is attributed to the water quality as well as the planktonic abundance. The present study on 21 hydrological parameters with diversity of plankton and qualitative analysis of inland fishes carried out in Tungabhadra Reservoir for two years (Feb 2009 to Jan 2011) showed that the hydro-biological parameters showed direct influence on the ichthyofaunal diversity.

KEYWORDS: Tungabhadra Reservoir, hydrology, plankton, Ichthyofaunal diversity.

INTRODUCTION

Water is an indispensable and most precious natural resource on the planet earth. Hydrobiology is related with the study of physical, chemical, geological and biological aspects of marine water, brackish water & fresh waters. Fresh water habitat occupies a relatively small portion of earth's surface when compared to terrestrial and marine habitats.. The fresh water available in the country is useful as potable, domestic, washing, bathing, agriculture and even for aquaculture. The global fresh water resources are under increasing pressure due to various impacts (GWP technical advisory committee, 2000). Freshwater equity, utility, sustainability is posing a global challenge and there is an all round acceptance of the fact that the world is facing fresh water crisis (Kodarkar, 2003). Both the phytoplankton and zooplankton play a significant role in the aquatic food chain. Phytoplankton forms primary producer of food on which zooplankton feed upon. Some genera of phytoplankton act as biological indicators of water quality (Patrick, 1971). Fisheries sector plays a predominant role not only in terms of food value but also generates income and employment. 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). The present investigation is aimed at studying hydro-biological profile of Tungabhadra reservoir, qualitative analysis of plankton and composition of fin-fishes.

The reservoirs function as *ecotones*, transitions between different habitats and have characteristics of both aquatic and terrestrial ecosystems. These habitats support diverse flora and fauna and are highly productive ecosystems akin to the tropical rainforest in terrestrial ecosystems (Ramachandra et al., 2005).

MATERIALS AND METHODS

Tungabhadra Reservoir is geographically located at 76° 21'10" E latitude and 15° 15'19" N longitude, near Mallapur village, Hospet. Sampling stations had different topographical features. Water samples were collected in the one liter plastic bottles and transported to the laboratory. Altogether 21 hydrological parameters were analyzed as per APHA (1998). The qualitative and qualitative analysis of plankton was done by Sedgewick-Rafter cell counter. Fish species were caught using alavi (a giant-seine net) and drag nets and identified based on the key characters (Jhingran 1999). Statistical methods were applied to study the relationships between different components of the reservoir.

RESULTS AND DISCUSSION

Reservoirs play important role in contributing to the inland fishery. Tungabhadra is the largest tributary of the river Krishna, contributing an annual discharge of 14,700 million m^3 at its confluence point to the main river. Unlike rivers which are under increasing threat of environmental degradation, reservoirs offer ample scope for fish yield optimization through effective management (Vass et al., 2000).

A total of 68 phytoplankton species were identified. It was dominated by Bacillariophyceae members. 66 species of zooplankton were dominated by Rotifers. The seasonal dynamics of phytoplankton were characterized by maximum total density peaks during October and February months whereas zooplankton peak was observed during April and May months. Summer and monsoon seasons were dominated by Copepoda whereas during winter Rotifers were in dominant numbers.

Thirteen phytoplankton species of desmids, 16 species belonging to Chlorophyceae, 18 species belonging to Cyanophyceae and 21 species belonging to Bacillariophyceae were recorded during the study period (Table 1).

Among zooplankton, 12 species belonged to Protozoa, 8 to Cladocera, 25 to Rotifera and 9 to Ostracoda respectively (Table 2).

The endemic fish families form 2.21% of the total bony fish families of the Indian region. 223 endemic fish species are found in India, representing 8.75 % of the total fish species known from the Indian region (Kantaraj *et al*., 2010). Eighty nine species of fin-fishes belonging to 17 families were identified. Amongst them 66 fishes are listed in IUCN (Figure 1). The order of abundance of fishes was major carps > minor carps > cat fishes > trash fishes. Pollution index of water body can be calculated by

$$PI = \frac{Desmidaceae+Bacillariophyceae}{Chlorophyceae+Cyanophyceae}$$

Pollution index (PI) of the water indicated less degree of pollution towards the reservoir gates. Pollution index of the water body (Patrick, 1971) showed low value of 0.96 during 2011, 0.97 during 2010 in upstreams and 0.96 during 2011 in the deep zone which indicated high polluted water.

The water spread area is so vast that lentic water ecosystem is still capable of retention of aquatic nutrients facilitating bloom of phytoplankton in December and February months thereby increase in zooplankton richness thus producing maximum fish yield in the post monsoon season. It is clear from the results that the reservoir is mesotrophic and aging towards eutrophication especially in the upstreams. Hence measures should be taken to minimize the pollution by preventing entry of debris from the anthropocentric activities, controlled disposition from the neighboring farm lands. To monitor the continuous potential fish yield from the reservoir, annual documentation is necessary. Any fluctuation in the plankton biomass and diversity will reflect upon the zooplankton community thereby affecting fish production.

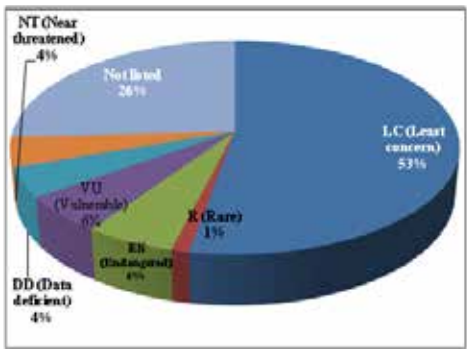


Figure 1. IUCN Conservation status of ichthyofauna.

Table 1. List of phytoplankton recorded from Tungabhadra Reservoir.

Table 51. List of phytoplankton species recorded from TungaBhadra Reservo

	Family: DESMIDACEAE
1	*Closterium lineatum*
2	*Closterium moniliferum*
3	*Cosmarium ochthodes*
4	*Euastrum binale*
5	*Euastrum verrucosum*
6	*Gonatozygon aculeatum*
7	*Micrasterias anomola*
8	*Micrasterias mahabalipurensis*
9	*Micrasterias thomasiana*
10	*Penium sp.*
11	*Pleurotaenium trabecula*
12	*Spondylosium planum*
13	*Staurastrum altermans*

	Family: BACILLARIOPHYCEAE
14	*Achranthes sp.*
15	*Amphora montana*
16	*Asterionella sp.*
17	*Coscinodiscus centralis*
18	*Coscinodiscus lineatus*
19	*Cyclotella meneglicana*
20	*Cymbella sp.*
21	*Diatoma vulgare*
22	*Diploneis sp.*
23	*Fragillaria construens*
24	*Gomphonema constrictum*
25	*Gyrosigma kutzingii*
26	*Melosira varians*
27	*Navicula oblonga*
28	*Nitzschia palae*
29	*Pinnularia viridis*
30	*Pleurosigma angulatum*
31	*Pleurosigma strigosum*
32	*Surirella angusta*
33	*Synedra acicularis*
34	*Synedra ulna*

	Family: CYANOPHYCEAE
35	*Acanthocystis nicholsi*
36	*Anaebena aequalis*
37	*Aphanocapsa biformis*
38	*Aphanocapsa koordersi*
39	*Coelosphaerium kuetzingianum*
40	*Lyngbya martensiana*
41	*Merismopedia minima*
42	*Merismopedia punctata*
43	*Microcystis aeruginosa*
44	*Microcystis marginata*
45	*Microcystis viridis*
46	*Oscillatoria curviceps*
47	*Oscillatoria principes*
48	*Oscillatoria tenuis*
49	*Phormidium acutum*
50	*Spirulina laxissima*
51	*Spirulina platensis*
52	*Stigonema ocellatum*

	Family: CHLOROPHYCEAE
53	*Ankistrodesmus falcatus*
54	*Bumilleria sp.*
55	*Chaetophora incrassata*
56	*Cylindrocystis brebisonii*
57	*Hormidium flaccidum*
58	*Mougeotia calcarea*
59	*Netrium digitus*
60	*Oedogonium sp.*
61	*Pediastrum duplex*
62	*Scenedesmus bijunga*
63	*Scenedesmus obtusus*
64	*Sphaerozosma granulatum*
65	*Spirogyra inflata*
66	*Stigeoclonium helveticum*
67	*Tetraspora sp.*
68	*Zygnema cylindricum*

Table 2. List of zooplankton recorded from Tungabhadra Reservoir.

Table 59. List of zooplankters recorded from Tungabhadra Reservoir.

	Phy: PROTOZOA
1	*Actinophrys spp*
2	*Amoeba spp*
3	*Arcella hemisphaerica*
4	*Centropyxis spp*
5	*Ceratium comutum*
6	*Elphidium spp*
7	*Euglena spp*
8	*Euglypha spp*
9	*Flagellipodium spp*
10	*Gonium pectorale*
11	*Paramoecium spp*
12	*Vorticella spp*

	Phy: ROTIFERA
13	*Ascomorpha saltans*
14	*Brachionus caudatum*
15	*Brachionus forficula*
16	*Brachionus longiseta*
17	*Brachionus quadritentatus*
18	*Brachionus rubens*
19	*Dichranophorus spp*
20	*Embata spp*
21	*Kellicottia longispina*
22	*Keratella quadrata*
23	*Keratella tropica*
24	*Keratella valga*
25	*Lapadella triptera*
26	*Lecane luna*
27	*Monostyla bulla*
28	*Monostyla lunaris*
29	*Notholca caudata*
30	*Notholca labis*
31	*Philodina roseola*
32	*Polyarthra major*
33	*Rotararia spp*
34	*Synchaeta kitina*
35	*Triarthra major*
36	*Trichocerca longiseta*
37	*Trichocerca pocillum*

Phy: ARTHROPODA
Class: Crustacea

	Order: CLADOCERA
38	*Acroperus harpae*
39	*Bosmina longirostris*
40	*Chydorus sphaericus*
41	*Daphnia ambigua*
42	*Daphnia dubia*
43	*Diaphanosoma brachyurum*
44	*Moina macrura*
45	*Streblocerus serricaudatus*

	Sub class: COPEPODA
46	*Copepodites of Diaptomus*
47	*Cyclops scutifer*
48	*Encyclops speratus*
49	*Eudiaptomus gracilis*
50	*Eudiaptomus shihi*
51	*Harpacticoids*
52	*Lepidodiaptomus minutus*
53	*Macrocyclops distinctis*
54	*Megacyclops*
55	*Mesocyclops varicans*
56	*Onychodiaptomus birgei*
57	*Osphranticum labronectum (calanus)*

	Class: OSTRACODA
58	*Cypridopsis angularis*
59	*Cypris latissima*
60	*Cypris protrubera*
61	*Cypris subglobosa*
62	*Potamocypris spp*
63	*Stenocypris spp*
64	*Strandesia elongata*
65	*Strandesia indica*
66	*Strandesia labiata*

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