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COMPARATIVE STUDY ON FISH DIVERSITY IN TWO LENTIC WATER BODIES OF BHADRAVATHI TALUK, KARNATAKA

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Abstract:

The fish diversity of the Nagappanakere tank and Kudligere tank in relation to physico-chemical parameters was studied by monthly samples taken from February 2010 to January 2011. In this study, Nagappanakere tank supported 13 fish species belonging to 04 orders, 06 families and 12 genera. While, Kudligere tank supported 18 fish species belonging to 04 orders, 07 families and 15 genera. Among fish families Cyprinidae was dominant in both the water bodies. In Nagappanakere tank as far as biodiversity status (IUCN-1994) is concerned, 03 species is Not assessed (23.08 %), 06 species as lower risk-near threatened (46.15 %), vulnerable 02 species (15.38%), lower risk least concern is one (7.70%) and 01 species included under the category of Data deficient (7.69%). However, in Kudligere tank 01 species is endangered (5.55 %), 07 species as lower risk-near threatened (38.89 %), vulnerable 02 species (11.11%), lower risk least concern is one (5.55%) , 06 species included under the category of Not assessed (33.33%) and 01 species consider as Data deficient with 5.55%. Physico-chemical characteristics responsible for the occurrence and distribution of fishes in these water bodies are discussed. Hence, proper management and utilization of this fish wealth is necessary to take up the sustainable steps to monitor and conserve fish health.

Key Words: Biodiversity Status, Fish Fauna, Kudligere Tank & Nagappanakere Tank, Bhadravathi Taluk

Introduction:

Biodiversity is also essential for stabilization of ecosystems, protection of overall environmental quality, for understanding intrinsic worth of all species on the earth[1] (Ehrlich and Wilson, 1991). In India, there are 2,500 species of freshwater fishes that have been recognized in the Indian subcontinent out of which 930 are categorized as freshwater species (Jayaram, 1999) and 1570 are marine (Kar, 2003 ; Vijaykumar et al., 2008). Fishes are not only important indicators of ecological health and the abundance, but also maintain a balance in the food chain by consuming plankton and small animals and form food for many animals. This balance in food chain may be affected due to pollution in aquatic system. In addition, there are many threats to fish diversity such as construction of dam, which block the spawning migrations and introduction of exotic species and over fishing. Therefore, knowing the status of fish fauna is indispensible to prevent the loss of particular species (Ramanjaneya and Ganesh, 2016). The Western Ghats is the richest region in India with respect to endemic freshwater fishes. Northeastern India, which has a very high diversity among freshwater fish, does not have many endemic species within India because of its jagged political boundary. There are about 450 families of freshwater fishes globally. Roughly 40 are represented in India (warm freshwater species). About 25 of these families contain commercially important species. Number of endemic species in warm water is about 544. Freshwater fishes are a poorly studied group since information regarding distribution, population dynamics and threats is incomplete, and most of the information available is from a few well-studied locations only (Zooreach organization 2010; Sabuj Kumar Chaudhuri 2010; Thirumala et al., 2011).

The objectives of the present study were to document the fish species in relation to physico-chemical characteristics of water in two lentic water bodies of Bhadravathi taluk, Karnataka and suggest appropriate conservation and management strategies.

Materials and Methods:

Study Area: Nagappanakere tank and Kudligere tanks are located in Kudligere village of Bhadravati taluk in Shivamogga district of Karnataka, India. These water bodies are located 24 Km towards East from district head quarters Shivamogga. 11 KM from Bhadravati town and 262 Km from State capital Bangalore. The area, depth and uses of both the water bodies are depicted in Table 1.

Table 1: Details of the Water Bodies

	Nagappanakere Tank	Kudligere Tank
Area	40 acre	98.18 acre
Depth	8-10 Ft	10-15 Ft
Purpose	Fish culture, Agriculture	Fish culture, Irrigation, Drinking

Fish and Water Sampling: The current study was carried out regularly for a period of one year from February 2010- January 2011 and fishes were collected with the help of fisherman by using gill nets of varying mesh sizes. The fishes were identified as per Jayaram (1999), Talwar and Jhingran (1991) and Dutta Munshi and

Shrivastava (1988). The physico-chemical parameters were recorded at regular intervals and analysis was done by following standard procedures of APHA (1998) and Trivedi et al.(1998).

Results and Discussion:

Table 2 depicts the fish diversity and biodiversity status in two Lentic water bodies of Bhadravathi Taluk, Karnataka. In Nagappanakere tank as far as biodiversity status (IUCN-1994) is concerned, 03 species is Not assessed (23.08 %), 06 species as Lower risk-near threatened (46.15 %), Vulnerable 02 species (15.38%), Lower risk least concern is one (7.70%) and 01 species included under the category of Data deficient (7.69%). However, in Kudligere Tank, out of 18 species, one species is Endangered (5.55 %), 07 species as Lower risk-near threatened (38.89 %), Vulnerable 02 species (11.11%), Lower risk least concern is one (5.55 %) ,06 species included under the category of Not assessed (33.33%) and 01 species considered as Data deficient with 5.55% (Figure 1). Among the fish families Cyprinidae *was* most dominant in both the water bodies (Figure 2). This indicates good correlation with overall species richness across the sites and could be utilized by the biodiversity conservation managers for prioritization of sites of conservation and habitat restoration (Bergerot et al. 2008). The fish species recorded in both the tanks were economically important and having high commercial significance.

The fishes are categorized in to herbivores, carnivores and omnivores. Herbivores fishes include Labeo *rohita*, carnivores fishes include *Notopterus notopterus*, *Mystus cavasius*, *Oreochromis mossambicus*, etc. and omnivores includes *Clarias batracus*, *Cirrhinus mrigala* etc. In Nagappanakere and Kudligere tanks almost all fishes recorded are useful as food fishes and *Salmostoma* , *Puntius* species are used for ornamental purpose. The present study of fish fauna in these two tanks showed that most of the fish species recorded were widely distributed in the lotic water bodies of Western Ghats. In this study cyprinid fishes were dominant. Therefore, the present investigation indicates that cyprinid fishes are found to be the more dominant group than others which is supported by other studies also (Singh et al., 2006). Thirumala and Kiran (2016) worked on the cyprinid fish diversity of three lentic water bodies in relation to physico-chemical parameters in Shivamogga district of Karnataka. They identified 15 cyprinid fish species and as far as biodiversity status (IUCN), is concerned, out of 15species, 5 species are LR-nt (33.33 %), 2 species as LR- Ic (13.33%) and NA and VU each with 26.67 % respectively. It has been shown that physico-chemical variables influence the distribution and abundance of fishes. All fishes are useful as food fishes except Puntius species which are useful as ornamental fishes.

The present fish study has also shown that some of fish species recorded were predatory in nature. Sukumaran and Das (2005) have also made the same observation and stated that majority of the reservoirs of Karnataka state have a large population of predatory fish species. Habitat loss and environmental degradation has adversely affected the fish fauna. Human anthropogenic activities also contribute towards the disruption in the balance on aquatic ecosystem. This work will provide future strategies for development and conservation of fish species. Conservation measures require plantation in catchment area and information on illegal fishing. Rajaram et al.(2004), Mawhoob Noman Alkadasi et al (2010), Shivashankar and Venkataramana (2012) and Thirumala and Kiran (2016) have studied fish diversity in relation to physico-chemical variables. Our studies have shown that water quality parameters including DO are the factors for the distribution of fishes. Our results are in confirmatory with above researchers.

Water Quality:

The physico-chemical variations of the water of the two water bodies is depicted in Table 3. The water temperature ranged between 23 to 31 °C in Nagappanakere tank and 22 to 30 °C in Kudligere tank respectively. These two tanks showed alkaline pH. The increase in pH values was due to increased concentration of bicarbonate alkalinity. The same results were achieved by Mawhoob Noman Alkadas et al.(2010). The results are also in accordance with those of WHO (1984a& b). The calcium content ranged 14-42 mg/l and 12-35 mg/l in Nagappanakere tank and Kudligere tank respectively. But magnesium content was less than the calcium and it fluctuated 10-34 mg/l in Nagappanakere tank and 9-28 mg/l in Kudligere tank. The low values of BOD (1.4 to 2.6 mg/l) show the less quantity of biodegradable materials. Dissolved Oxygen (DO) is an important indicator of water quality. DO affect the solubility and availability of many nutrients and therefore productivity of aquatic ecosystems (Wetzel, 1983). Significant fluctuations in DO ranged 3.8-6.4 mg/l in Nagappanakere tank and 4.8- 7.6 mg/l in Kudligere tank, thus supporting the concept that lentic water bodies under natural conditions contains a high quantity of DO ending with saturation point (Welch, 1952). The total alkalinity values observed in the range of 88 to 210 mg/l in Nagappanakere tank and 80-190 mg/l in Kudligere tank. The present investigation show the total hardness varied between 52 and 84 mg/l in Nagappanakere tank and 40-72 mg/l in Kudligere tank respectively and showed soft to moderately hard category. The optimum values of hardness ranges between 75 to 150 mg/l which supports the total fish productivity (Das, 1996). Hence, the water of the both the tanks are suitable for fish culture.

Conclusion:

The investigation of the physico-chemical parameters of these two tanks of Bhadravathi taluk, Karnataka revealed that most of the water quality parameters are under tolerable limits. Both the water bodies

contains economically important and cultivable fishes as well as some ornamental fishes. However, in recent days the water holding capacities of these tanks are decreasing, which might affect the survival of fish fauna. In addition, human anthropogenic activity and surface run off might also influence the fish diversity in the water bodies. Nevertheless, it is suggested to monitor the water regularly in these tanks and appropriate control measures are required to conserve the fish diversity.

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Table 2: Fish diversity and Biodiversity status in two Lentic water bodies of Bhadravathi Taluk, Karnataka

S.No	Scientific Name	Nagappanakere Tank	Kudligere Tank	Abundance	Biodiversity status
	Order: Cypriniformes Family: Cyprinidae				
1	*Salmostoma untrahi (Day)*	+	+	A-2	NA
2	*Ctenopharyngodon idella*	+	+	A-1	DD
3	*Cirrhinus mrigala* (Ham)	+	+	A-2	LR-nt
4	*Labeo rohita* (Ham-Buch)	+	+	A-2	LR-nt
5	*Osteobrama cotio peninsularis* (Silas)	-	+	A-2	NA
6	*Puntius* sp.	+	+	A-(3-4)	LR-nt
7	*Cyprinus carpio cummunis* (Linnaeus)	+	+	A-2	LR-lc
8	*Catla catla* (Ham-Buch)	+	+	A-2	VU
	Order: Siluriformes Family: Bagridae				
9	*Mystus cavasius* (Ham-Buch)	-	+	A-(3-4)	LR-nt
10	*Mystus armatus* (Ham-Buch)	-	+	A-2	NA
11	*Sperata seenghala*	+	+	A-(3-4)	NA
	Family: Siluridae				
12	*Ompok pabo* (Ham-Buch)	-	+	A-2	NA
13	*Ompok bimaculatus* (Bloch)	-	+	A-2	EN
	Family: Claridae				
14	*Clarias batrachus* (Linn)	+	+	**A-2**	VU
	Family: Channidae				
15	*Channa marulius* (Ham-Buch)	+	+	**A-2**	LR-nt
16	*Channa punctatus*	+	+	**A-2**	LR-nt
	Order: Osteoglossiformes Family: Notopteridae				
17	*Notopterus notopterus* (Ham)	+	+	A-(3-4)	LR-nt
	Order: Perciformes Family: Cichlidae				
18	*Oreochromis mossambica (Peters)*	+	+	A-(3-4)	NA

LR-nt= Lower risk Near threatened; NA-Not assessed, VU- Vulnerable, EN- Endangered ; DD- Data Deficient ; LR-lc- Lower risk least concern.

Table 3: Water quality of two lentic water bodies of Bhadravathi taluk, Karnataka

S.No	Parameters	Nagappanakere Tank	Kudligere tank
1	Water Temperature (^{O}C)	23-31	22-30
2	pH	7.2-8.2	7.4-8.1
3	Calcium (mg/l)	14 - 42	12-35
4	Magnesium (mg/l)	10-34	9-28
5	Dissolved Oxygen (mg/l)	3.8-6.4	4.8-7.6
6	Biochemical Oxygen Demand (mg/l)	2.4-4.6	1.4-2.6
7	Total Hardness (mg/l)	52- 84	40-72
8	Total alkalinity (mg/l)	88-210	80-190

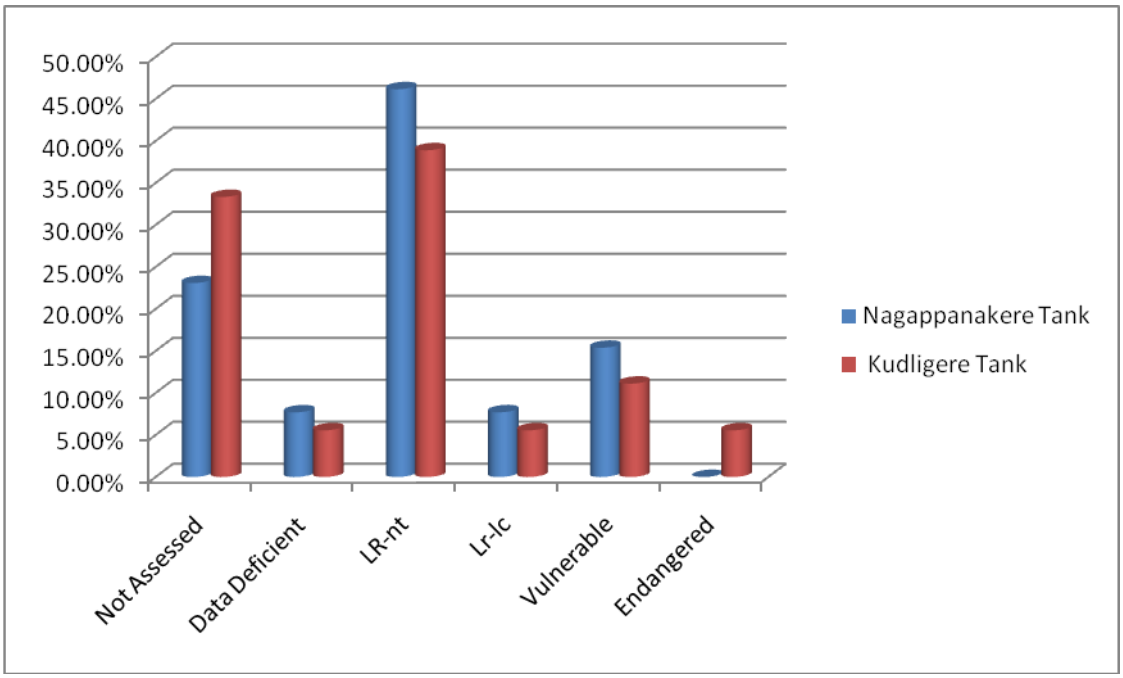

Figure 1: Biodiversity status (IUCN 1994) of fishes in Two lentic water bodies of Bhadravathi taluk, Karnataka

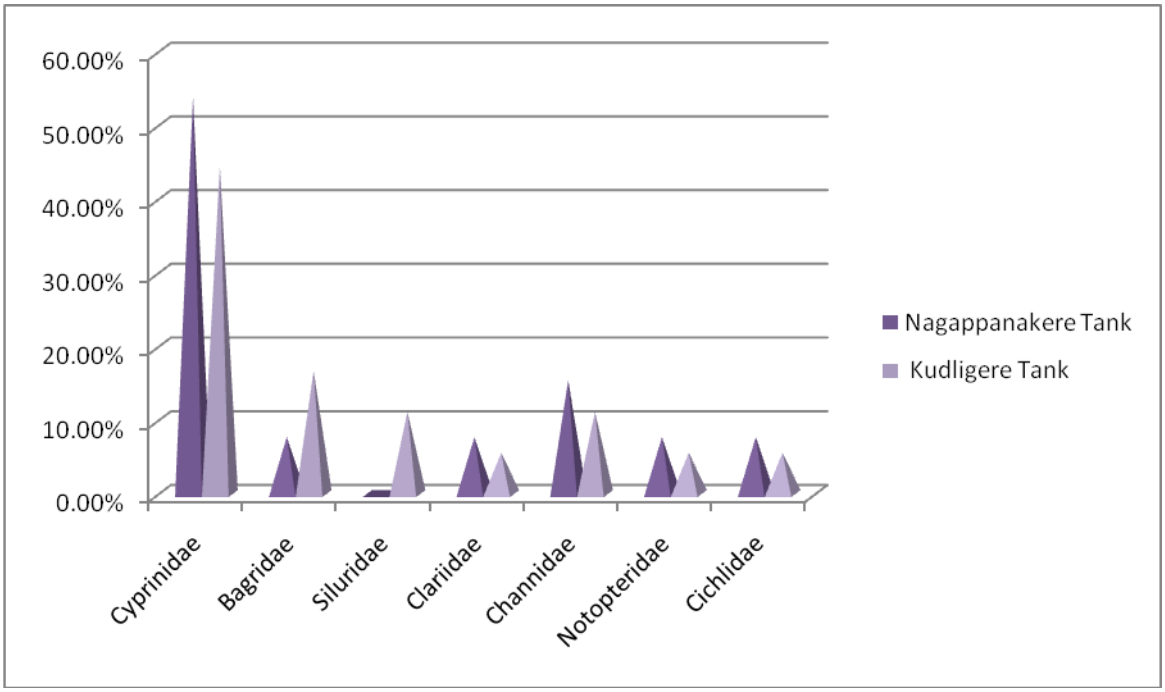

Figure 2: Percentage occurrence of Fish families of Two water bodies of Bhadravathi taluk, Karnataka