



ORIGINAL RESEARCH PAPER

Zoology

A CHECKLIST OF FRESHWATER ICHTHYOFAUNA OF NAKANA LAKE, DISTRICT- DHULE (M.S.) INDIA.

KEY WORDS: Cyprinidae, Conservation, Aquaculture, Shannon-wiener Diversity Index.

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ABSTRACT

Fishes are aquatic creatures, perfectly adopted for aquatic life. Freshwater bodies comprise variety of fishes and maintain the balanced ecosystem. Present study reveals total 20 species belonging to 5 orders, 12 families and 18 genera. The family Cyprinidae was found to be dominant form major bulk (30%). Followed by Siluridae, Bagridae and Ambassidae each with (10%). Whereas family Clupiedae, Mastacembalidae, Channidae, Ciclidae, Gobidae, Claridae, Heteropneustidae and Cobitidae including single species of each contribute (5%). Authors documented the record of fish diversity by calculating the various diversity indices such as Shannon-Wiener diversity index (H), Simpson's Dominance index (D), Simpson's index of diversity (I-D), Simpson's Reciprocal index (1/D), Margalef's Richness index (MD) and Pielou's Evenness index (J).

Introduction

Water is life, It is utmost important for survival. The freshwater bodies i.e. lakes, ponds and reservoirs etc. are vital resources for developing countries, although the amount of water in them constitutes only a minute fraction i.e. less than 1% of the total freshwater recourses on the earth. In India these are mostly manmade, having great economic importance. Indian history is full of events prompting construction of water bodies for power generation, irrigation, drinking and flood control etc but now a day these are also utilized for fisheries. These are important from socio-economic point of view, as it has potential of providing employment (Khan *et al.*, 1991).

Fishes constitutes half of the total number of vertebrates in the world and lives in all types of aquatic habitats. Around the world approximately 22,000 fish species have been recorded out of which 2500 (11%) are found in India among these 930 species are freshwater and 1,570 are marine (Umbarhande *et al.*, 2011). Fish is valuable source of protein, in addition to being an important palatable food item, for human consumption. They are part of aquatic food chain, nutrient cycling and ecosystem services. Fish also used as a genetic library for possible future use in medicine and aquaculture, stimulate human interest in nature (Rao *et al.*, 2013). Nakana Lake is a manmade lake, selected as freshwater reservoir for the present study. The aim of this study was to reveal the faunastic diversity of freshwater fish species from Nakana Lake, during June 2013 to May 2014. Many edible fish species are occur and fishing is done regularly. It is also used for aquaculture.

Material and Methods

Study area

The present study was conducted at Nakana Lake. It was built over the Panzara River, near Morane Village, Tah. and Dist. - Dhule (MS) India. The geographical location of the lake has (20° 52' 56.27" N and 74° 43' 31.82" E). This is earthen lake having catchment area is of 945 m, maximum height is 18.41 m. Main purpose behind construction of the lake is for drinking water supply, irrigation and aquaculture.

Collection, identification and preservation of fish

To study the ichthyofaunal diversity, relative species and abundance of Nakana Lake was selected as a case study. The fresh fish specimens were purchased from fisherman at the sight of fishing, brought them to laboratory and wash them with tap water. For identification and taxonomic study the photographs were snapped. For advanced study morphological characters, fin and scale formula were noted. Small specimens were directly placed in 4 % formalin where as large fishes were given an incision in their abdomen and preserved. The fishes were identified by using different literature viz., Day (1994); Talwar and Jhingran (1991) and Jayaram (2002). Those which are not properly identified were sent to the Western Regional Station (WRS, ZSI), Akurdi, Pune (MS).

For quantitative way of water assessment, species diversity indices of diverse water bodies were computed in recent years (Kawade and Pandhakar, 2016). With help of following formulae, we determine the diversity indices to assess how diverse the lake about fish species.

Data analysis

1. Shannon – Weiner Index, (1963): (H): $H = -\sum P_i (\ln P_i)$
2. Simpson's Dominance Index, (1949): (D): $D = \sum n(n-1)/N(N-1)$
3. Simpson's Index of Diversity = 1-D,
4. Simpson's reciprocal Index = 1/D,
5. Margalef's Index, (1958): (MD): $MD = R = S-1/Ln(n)$
6. Pielou's evenness Index, (1966): (J): $J = H/Ln^*S$

Results and Discussion

During the entire study different fish variety had been observed, total 20 species were collected from Nakana Lake, during study period. The scientific name, local name of the fish species along with Order, Family and status were illustrated in Tabel-1.

The study findings showed that recorded species belonging to 5 Orders, 12 Families, 18 genera and 20 species. Our findings are corroborated with earlier researchers viz; Sarwade and Khillare (2010) reported the 60 species of fishes belonging to 15 families and 36 genera during their study on Ujani wetland (M.S.). Kharat *et al* (2012) had reported 51 species of fishes belonging to the 14 families and 35genera during their study on Krishna River at Wai (M.S.). Jayabhaye and Lahane (2013) were observed 21 species of fishes belonging to 6 families and 13 genera during their study period on Pimpaldari tank, Dist. Hingoli (M.S.). Recently Sharma *et al* (2017) recorded 143 fish species including 4 orders, 22 families and 45 genera from River Yamuna.

Due to more fecundity of major carp; density of Cypriniformes was evident in the Lake and suitable environmental condition relatively higher population. Dominance of fish species belonging to order Cypriniformes, those were also reported by other authors from different freshwater reservoirs. Sakhre and Joshi (2002) reported the ichthyofauna of Palas-Nilegaon reservoir in Osmanabad District, Maharashtra. They revealed 21 species of fishes belonging to 14 genera falling under 4 Orders (Cypriniformes, Perciformes, Siluriformes and Osteoglossiformes). Patole and Patil (2009) recorded 22 fish species from Panzara River, Tahsil Sakri, Dist. - Dhule. These belong to 5 orders, 12 families and 22 genera. The member of order Cyprinoformes were dominated from major bulk (60%) Patole (2014) again recorded 32 fish species from Tapi River with 6 stations through Dhule and Nandurbar district in Maharashtra. These belong to 6 orders, 12 families and 23 genera. Recently, Dwivedi *et al* (2017) revealed that 58 fish species belonging to 5 orders, 18 families and 43 genera from the Paisuni River. Cypriniformes order was shared 27 species (46.55%). Sonawane and Patole (2017) reported 20 fish species belonging to 16 genera, 11 families and 6 orders from Nakane, Sulwade and

Dedorgaon dams of Dhule District. Very recently Bharman *et al* (2018) recorded 49 fish species from 4 orders, 11 families and 28 genera from Kaladan River and its four major tributaries of Kaladan River, Indo-Myanmar biodiversity hotspot, Mizoram state of India.

In present investigation family wise percentage of fishes is shown in fig-2, in which Family Cyprinidae is dominant with 6 species (30%) over all the reported families. Ambassidae, Bagridae and Siluridae were having 2 species (10%). Family Clupiedae, Mastacembalidae, Channidae, Ciclidae, Gobidae, Claridae, Heteropneustidae and Cobitidae including single species of each contribute (5%).

Every natural ecosystem doesn't have equal abundance, it shows variety of species which differ in their relative abundance and richness. During tenure of this research work total 252 catches of 20 fish species represented by 12 families.

- Family Cyprinidae found to be dominant group with 6 species in the assemblage composition in which *Cirrhinus reba* was less abundant, *Puntius sophore*, *Rasbora doniconius* and *Labeo boggut* were found to be abundant as well as *Cyprinus carpio* and *Labeo rohita* were moderately abundant.
- Family Siluridae shown 2 species *Ompok bimaculatus* was found to be less abundant and *Wallago attu* was rear.
- Family Bagridae represents 2 species *Mystus bleekeri* and *Mystus vittatus* were less abundant and moderately abundant respectively.
- Family Ambassidae shown 2 species *Chanda nama* and *Parambasis ranga* was abundant and less abundant respectively.
- Family Heteropneustidae had shown *Heteropneustes fossilis* species was rare.
- Claridae family includes *Clarius batrachus* was moderately abundant.
- Ciclidae family represents exotic species *Oreochromis mossambicus* was found to be abundant.
- Family Gobidae includes *Glossogobius guiris* was rare.
- Channidae family conveys *Channa punctata* was less abundant.
- Family Mastacembalidae includes *Mastacembelus armatus* was found to be rare
- Family Clupeidae represents species *Tenulosa ilisha* was abundant.

Rao, *et al* (2013) recorded 63 fish species from river Champavathi (Vizianagaram, A.P., India). They showed 13 species were abundant, 15 moderate, 23 species common and 12 were rare. In the Present Investigation *Chanda nama* and *Oreochromis mossambicus* species were found to be abundant and *Heteropneustes fossilis* showed least count. Thirumala, *et al* (2011) reported the exotic fish species *Oreochromis mossambicus* established rapidly and widely. As per local fisherman's information catching of tilapia is increasing over the years. During post monsoon season it dominates the indigenous fish species. There is no demand hence fishermen treat this unwanted fish.

Biological Indices

Biological diversity can be measured by many different ways i.e. Richness and Evenness. Different kinds of organisms are present in a particular area is called richness while evenness compares the similarity of population of each species. Diversity depends on those, both things are increases, diversity automatically increases. Shannon and Wiener index is also an important tool for quantifying diversity of particular habitat. By using different formulas we calculated values of same indices given in table - 2.

Table-2, Fish species richness, abundance, dominance and diversity indices of Nakana Lake, Dhule.

Sr. No.	Index	Value
1	Species Richness (S)	20
2	Species abundance (N)	252
3	Shannon-Weiner Index (H) (Shannon and Wiener, 1963)	1.7550

4	Simpson's Dominance Index (D) (Simpson, 1949)	0.0713
5	Simpson's Index of Diversity (1-D)	0.9291
6	Simpson's Reciprocal Index (1/D)	14.0469
7	Margalef's Index (MD) (Marglef, 1958)	7.1315
8	Pielou's Evenness Index (J) (Pielou, 1966)	0.6073

The present investigation focused richness, abundance and different diversity indices of freshwater body Nakana Lake. The lake represents richer value about fish species i.e. 20 and abundance is 252. The value of the Shannon-Weiner index was (1.7550) shows greater diversity. The index of dominance is useful for determining particular fish species dominating by that habitat. In Simpson's Dominance Index quantify the probability that two individuals randomly selected from a sample will belongs to the same species. The value of this index was (0.0713), which ranges between 0 and 1. If a value of this index was 0 stands for infinite diversity and 1 indicates no diversity. When value of lake is low, the implication is that "Dominance is shared by all the species of that community" Cummins (2002). To get over this problem 'D' is subtracted from 1 to give the Simpson's index of diversity (1-D) which was (0.9291) and Simpson's reciprocal Index (1/D) was (14.0469). These three are the closely related indices shows the same diversity. The species richness is calculated by Margalef's Index (MD) was (7.1315) and evenness is by Pielou's index (J) was (0.6073). Our findings are supported by earlier studies like Mandal, *et al* (2010); Shukla and Sing (2013) are calculated the values of diversity of two floodplain lakes Gopalnagar and Damur of West Bengal and Ami river respectively.

Conclusion

Freshwater resources are nothing but the life supporting system. If they exploited economic purpose there are not beneficial for human society. Aquatic environment and his biota necessary to save and kept the ecosystem undisturbed. Nakana Lake is manmade water reservoir, it is away from dumping of industrial effluents, and drainage of city and garbage. It is dynamic wetland ecosystem but the ichthyofauna of this lake being disturbed due to some anthropogenic activities including over fishing with fingerlings and juveniles. At the time of religious festivals huge idols of Lord Ganesha and Durga were disposed into the lake. Every year this type of siltation reduced the capacity of water body. On the other hand presence of exotic fish species in the reservoir directly affects on commercially important major carps. The diversity of fish fauna of Nakana Lake is richer hence there is urgent need to create awareness among fishermen and local peoples about the importance of lake. Government fishery department and NGO's has to take lead and conserve them for future generation.

Acknowledgement

Authors are thankful to Director, Western Regional Station, Zoological Survey of India for their keen interest in identification of fishes. We are also thankful to Principal, S. G. Patil College, Sakri Dist- Dhule for providing Central Library facility for fish literature.

Table-1, Ichthyofaunal diversity of Nakana Lake during June, 2013 to May, 2014.

Order	Family	Scientific Name	Local Name	Status
CYPRINIFORMES	Cyrinidae	1. <i>Cirrhinus reba</i> (Hamilton)	Reba	R
		2. <i>Cyprinus carpio</i> (Linnaeus)	Kombda	MA
		3. <i>Puntius sophore</i> (Hamilton)	Dhebri	A
		4. <i>Rasbora doniconius</i> (Hamilton)	Zora	A
		5. <i>Labeo rohita</i> (Hamilton)	Rav	MA
		6. <i>Labeo boggut</i> (Sykes)	Ger	A
SILURIFORMES	Cobitidae	7. <i>Lepidocephalichthys thermalis</i> (Val)	Zirmuti	R
	Siluridae	8. <i>Ompok bimaculatus</i> (Bloch)	Raigdi	LA

		9. <i>Wallago attu</i> (Schneider)	Papada	R
	Bagridae	10. <i>Mystus Bleekeri</i> (Day)	Chichva	LA
		11. <i>Mystus vittatus</i> (Hamilton)	Chichva	MA
	Heteropneustidae	12. <i>Heteropneustes fossilis</i> (Bloch)	Tochya	R
		13. <i>Clarius batrachus</i> (Linn.)	Mangur	M
	PERCIFORMES	14. <i>Chanda nama</i> (Ham- Buch)	Kach masa	A
		15. <i>Parambassis ranga</i> (Hamilton)	Zanzara	LA
	Ciclididae	16. <i>Oreochromis mossambicus</i> (Peters)	Shilpi	R
	Gobiidae	17. <i>Glossogobius guiris</i> (Hamilton)	Khavlya	R
	Channidae	18. <i>Channa punctata</i> (Bloch)	Dok	LA
SYNBRANCHI FORMES	Mastacembalidae	19. <i>Mastacembelus armatus</i> (Lacepede)	Eel	R
CIUPEIFORMES	Clupeidae	20. <i>Tenulosa ilisha</i> (Hamilton)	Bhat masa	A

A-Abundant, LA=Less Abundant, MA- Moderately Abundant, R-Rare

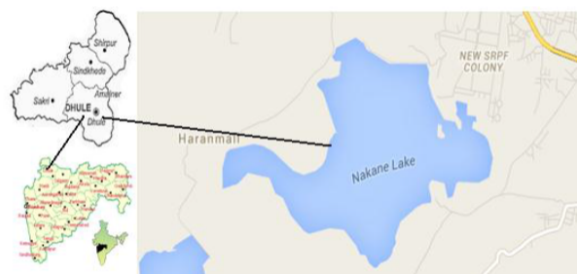


Fig.-1, Map Showing Study area, Nakana Lake, Dhule (MS) India.

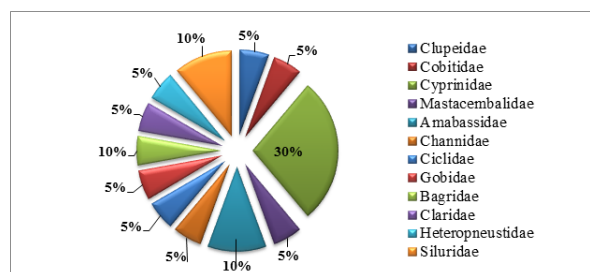


Fig.-2, Percentage occurrence of fish families of Nakana Lake, Dhule (MS), India

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