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STATUS OF FISH BIODIVERSITY IN THE SINDPHANA RIVER DAM NEAR SHIRUR KASAR, DISTRICT BEED, MAHARASHTRA, INDIA

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ABSTRACT: Fish biodiversity studies were undertaken from January 2012 to December 2012 to census commercially important fishes in the Sindphana Dam. The present paper deals with the variety and abundance of freshwater fishes in the Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India. The results of the present investigation reveal the occurrence of 44 fish species belonging to 7 orders, 15 families, and 26 genera. Among the collected species order Cypriniformes was most dominant constituting 50% followed by order Siluriformes constituting 18%, order Perciformesconstituting 18 %, orders Osteoglossiformesand Synbranchiformes constituting 5% and orders Mugiliformesand Beloniformes constituting 2 %of the total fish species. Fish biodiversity indices species richness 44 in the total number of species (N_0), 3.73 in Margalef's index (R_1), and 0.97 in the Menhinick index (R_2). Species diversity was 0.47 in the Simpson index (λ), 1.16 in the Shannon-Weiner index (H'), 2.98 in abundant species (N_1), and 2.80 in very abundant species (N_2). Species evenness was 0.42 in (E_1), 0.21 in (E_2), 0.17 in (E_3), 0.95 in (E_4), and 0.97 in (E_5).

Key Words: Fish biodiversity, Economic value, biodiversity indices, Sindphana dam.

INTRODUCTION

Water is the basic element in fish culture and its specific properties as a cultural medium are of great significance in the productivity of a pond or eservoir. Pure water is unable to support living organisms but it contains nitrogen, phosphorus, potassium, and calcium salts, dissolved organic matter and gases like oxygen, nitrogen, and carbon dioxide determine to a large extent the productivity. In the water of lakes and reservoirs, fish are reared more as a part of a general fishery improvement program than as pure fish culture. Only 61.3 % of the readily cultivable water area in the country is presently utilized for inland fish culture. The culture of Indian major carp and exotic species has been very popular in recent times. The study of fishes technically known as Ichthyology' is one of the least popular branches of Natural History. Fishes form one of the most important groups of vertebrates, influencing the aquatic

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ecosystem & life in various ways. Millions of human beings suffer from hunger and malnutrition. The fishes form a rich source of food and provide a meal to tide over the nutritional difficulties of man in addition to serving as an important item of the human diet from time immemorial and are primarily caught for this purpose. Fish diet provides proteins, fat, and vitamins A & D. A large amount of phosphorus and other elements are also present in it. They have good taste and are easily digestible (Pawar, 2014).

Biodiversity is essential for the stabilization of ecosystem protection of overall environmental quality for understanding the intrinsic worth of all species on the earth. Fish biodiversity of rivers essentially represents the fish faunal diversity and their abundance. River conserves a rich variety of fish species which supports commercial fisheries (Ehrlich *et al,* 1991).

Fish is economically a very important group of animals, besides being used as food. Fish liver is an important source of oil containing vitamins A and D. Several minerals especially if the bones can be eaten. Fish is also a source of Vitamin B. Unsaturated fat in fish also reduces the risk of the formation of high blood cholesterol. Body oil from fish is extensively used in soap industries and tanning. Fish also yield fish meals. Fish manure and several other products of commerce. For successful fish farming in dams and reservoirs, it is essential to make a detailed hydrological study of the water body. Suitable species that are stocked in dams are the major carp. These are capable of adjusting successfully to the ecological condition of the reservoir. The exotic carp also Thrive in man-made lakes and are suitable species for culture.

The present investigation was undertaken to study the fish biodiversity of Sindphana Dam near ShirurKasar Dist. Beed [M.S] India. The objective of the present study was to give recent data regarding fish diversity of the East Coast river system, aiming to contribute to a better knowledge of the fish diversity of Sindphana Dam and a tool for conservation planning of aquatic environments in this region. It is the first effort in this direction, various indigenous, commercially important, and economically valuable fishes were found in this area.

MATERIAL AND METHODS

Fishes were collected from Sindphana Dam from January - December 2012 with the help of local fishermen using different types of nets namely gill nets, cast nets, dragnets, and Bhorjal. Immediately photographs were taken with the help of the digital camera. Fishes were brought to the laboratory and preserved in 10% formalin solution in separate specimen jars according to the size of the species. Small fishes were directly placed in the 10% formalin solution. While large fishes were given an incision in their abdomen and preserved. The Meristic and morphometric characters were measured and identified up to the species

level, with the help of standard keys and books (Jayaram**,** 1999 and Talwar *et al***,** 1991).

Community structure analysis:

Three indices were used to obtain the estimation of species diversity, species richness, and species evenness.

1. Shannon and Weaver, (1949) and Simpson, (1949) diversity index value was obtained by using the following equation:

$$H' = -\sum_{i=I}^{S} (Pi \ In \ Pi)$$ **(Shannon's index)**

$$\lambda = -\sum_{i=I}^{S} n_i(n_i-1) / n(n-1)$$ **(Simpson index)**

Where,

Pi = Proportion of the first species.

The proportions are given Pi=ni/N

2. Species richness (R1 and R2) was obtained using the equation.

$R1 = (S - 1) / In (n)$ **(Margalef, 1958)**

$R2 = S / \sqrt{n}$ **(Menhinick, 1964)**

Where,

R = Index of species richness

S = Total number of species

N = Total number of individuals

3. Species equitability or evenness was determined by using the following expression.

1) Evenness index 1 (E_1). **(Pielou, 1977)**

$E_1 = In (N_1)/ In (N_0)$

2) Evenness index 2 (E_2). **(Sheldon, 1969)**

$E_2 = N_1 / N_0$

3) Evenness index 3 (E_3). **(Heip, 1974)**

$E_3 = N_1 - 1 / N_0 - 1$

4) Evenness index 4 (E_4). **(Hill, 1973)**

$E_2 = N_2 / N_1$

5) Evenness index 5 (E_5). **(Alatalo, 1981)**

$E_2 = N_2 - 1 / N_1 - 1$

Where,

N0 = Number of species on the sample

N1 = Number of abundant species in the sample

RESULTS AND DISCUSSION

During the study period, different fish varieties were observed in the Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India. The results of the area was rich in fish biodiversity. About seven orders and fourteen families of fish species were collected during the study period. Many collected fishes were having economic importance and were sold after collection in the local fish market. In the present fish biodiversity study about 44 species of 26 different genera and 15 families were recorded from the Sindphana Dam and number of catches carried out from January 2012- December 2012. The members of Order Cypriniformes were dominated by 22 species followed by Siluriformes and Perciformes with 08 species, Osteoglossiforms and Synbranchiformes with 02 species each, and Mugiliformes, and Beloniformes with 01 species each.

About 15 fish families representing 41 fish species, Family Cyprinidae was the dominant group with 19 species in the assemblage composition in which *Discognathuslamta* (Ham.), *Rasbora daniconius* (Ham.), and *Puntius ticto* (Ham.) were found most abundant. *Catla-caltla* (Ham.), *Ctenopharyngodonidella* (Valeneiennes), *Puntius amphibious* (Valeneiennes), *Puntiusjerdoni* (Ham.), *Puntiussarana* (Ham.), *Puntiussophore* (Ham.), *Lebeorohita* (Ham.), *cyprinuscarpio* (Linn.), *Hypothalmichthysmolitrix* (Valeneiennes), *Chela sladoni* (Day), *cirrhinusmrigala* (Ham.), and *Thynnichthyssandkhol* (Sky) were found abundant form. *Chela phulo* (Ham.), *Cirrhinusreba* (Day), *Labeo calbasu* (Ham.), *Osteobramacotio* (Ham.) and *Ambylpharyngodon microlepis* (Bleeker) were found comperatively less abundant. Followed by Family Bagridae in which *Mystustengara* (Ham.) was found abundant form.*Mystus aor (Aorichthys)* (Ham.), *Mystus bleekeri* (Day), *Mystus cavasius* (Ham.) and *Mystus seenghala* (Sykes) were found less abundant. Followed by Family Channidae in which *Channa striatus* (Bloch)was found most abundant form. *Channa punctatus* (Bloch), *Channa gaucha* (Ham.) and *Channa marulius* (Ham.) were found abundant form. Followed by Family Notopteridae in which *Notopterus notopterus* (Pallas) was found abundant form. *Notopterus chitala* (Ham.) was found rare form. Family Siluridae in which *Wallago attu* (Bloch and Schneider) was found abundant form. Family*Ompok bimaculatus* (Bloch) was found rare form. Family Mastacembelidae in which *Mastacembelus armatus* (Lacepede) and *Mastacembelus pancalus* (Ham.) were found less abundant forms. Followed by Family Balitoridae in which *Nemacheilus botio* (Ham.) was found rare form. Family Cobitidae in which *Lepidocephalus guntea* (Ham.) was found rare form. Family Claridae in which *Claris batrachus* (Linnaeus) found abundant form. Family Mugilidae in which *Mugilcephalus* (Linnaeus) was found rare form.Family Belonidae in which *Xenentodon cancila* (Ham.) was found rare form. Family Cichlidae in which *Tilapia mossambica* (Ham.) were found abundant form.

Family Anabantidae in which *Anabas testudineus* (Bloch) were found abundant form.Family Gobiidae in which *Glassogobius giuris* (Ham.) was found rare form. FamilyGobiidae in which *Angullia bengealnesis (Gray)* were found rare form and also given a common name and economic value (Table 1).

About 44 species were recorded and identified on the Sindphana Dam. Among the order,Cypriniformeswas most dominant constituting 50% followed by order Siluriformesconstituting 19%, order Perciformesconstituting 14.28%, orders Osteoglossiformes and Synbranchiformes constituting 4.76% and orders Mugiliformes and Beloniformes constituting 2.38%of the total fish species show in the (Fig. 1).

Annual variation in fish biodiversity indices at Sindphana Dam near Shirur Kasar Dist. Beed [M.S] India during January 2012- December 2012 indices species richness 44 in the total number of species (N_0), 3.73 in Margalef's index (R_1) and 0.97 in Menhinick index (R_2). Species diversity was 0.47 in the Simpson index (λ), 1.16 in the Shannon-Weiner index (H'**)**, 2.98 in abundant species (N_1) and 2.80 in very abundant species (N_2). Species evenness was 0.42 in (E_1), 0.21 in (E_2), 0.17 in (E_3), 0.95 in (E_4) and 0.97 in (E_5) (Table 2).

Mahapatra, (2003) recorded an abundance of catfish in the Hirakund reservoir. A total of 43 species were present of which 18 were commercially important. Sakhare and Joshi, (2003) reported 34 species of fish in reservoirs of the Parbhani Dist. of Maharashtra. Shinde*et al.*, (2009) reported the Ichthyofauna of Harsool-Savangi Dam Aurangabad (M.S) India. Total 15 fish species belongto 3 orders, 4 families, and 12 genera. The order Cypriniformeswasfound dominant with 11 species, followed by Perciformes with 3 species and Siluriformes with 1 species.Shakhare, (2001) recorded 23 fish species belonging to 7 orders in Jawalgaon reservoir in Solapur district and Pawar, *et al.*, (2003)observed that about 11 species belonging to 5-orders from Sirur Dam near MukhedNanded District (M.S.). Hiware and Pawar (2006) recorded 43 fish species from NathSagar Dam; Paithan reservoir in Aurangabad Dist. suggesting that the fish diversity from the reservoir under study is rich as compared to NathSagar Dam. Simpson's index (λ), which variesfrom 0 to 1, gives the probability that two individuals drawn at random from a population belong to the same species. Simply stated, if the probability was high that both individuals belong to the same species, then the diversity of the community sample was low. Shannon's Index (H'), combines species richness and species evenness components as one overall index of diversity.The higher value of Shannon's Index (H'), that indicated was the greater species diversity. The greater species diversity means a larger food chain and more cases of inter-specific interactions and greater possibilities for negative feedback control which reduces oscillations and hence increases the stability of the community.

Table 1. The fish biodiversity and Economic value of fish in Sindphana Dam during January 2012 - December 2012.

Order	Family	*Scientific name*	Common name	Economic value	Status
Osteoglossiformes	Notopteridae	*Notopterus notopterus* (Pallas)	Notopterus	PF, MD	+
		Notopterus chitala (Ham.)	Moy	MD	_
Cypriniformes	Cyprinidae	*Catla catla* (Ham.)	Catla	FD	++
		Hypothalmichthys molitrix (Valeneiennes)	Silver carp	FD	++
		Ctenopharyngodon idella (Valeneiennes)	Grass carp	FD	++
		Thynnichthys sandkhol (Skyes)	Sandkhol carp	FD	++
		Chela sladoni (Day)	Chela	LV	++
		Chela phulo (Ham.)	Chela	LV	+
		Rasbora daniconius (Ham.)	Black line Rasbora	LV	+++
		Cyprinus carpio (Linn.)	Common carp	FD	++
		Puntius ticto (Ham.)	Ticto	BT, LV,WF	+++
		Puntius amphibious (Valeneiennes)	Khavli	BT, LV,WF	++
		Puntiusjerdoni (Ham.)	Parag	BT, LV,WF	++
		Puntius sarana (Ham.)	Khavli	BT, LV,WF	++
		Puntius sophore (Ham.)	Sophore	BT, LV,WF	++
		Cirrhinus mrigala (Ham.)	Mrigala	FD	++
		Cirrhinus reba (Day)	Reba	FD	+
		Labeo rohita (Ham.)	Rohu	FD	++
		Labeo calbasu (Ham.)	Calbasu	FD	+
		Osteobramacotio (Ham.)	ray-finned fish	FD	+
		*Ambylpharyngodon microlepis (*Bleeker)	Indian Carplet	FD	+
		Discognathus lamta (Ham.)	Garra	FD	+++
	Balitoridae	*Nemacheilus botio* (Ham.)	Botio	FD	_
	Cobitidae	*Lepidocephalus guntea* (Ham.)	_	PF	_
	Bagridae	*Mystus aor* (Ham.)	Aor	PF	+
		Mystus bleekeri (Day)	_	PF	+
		Mystus cavasius (Ham.)	_	PF	+
		Mystus tengara (Ham.)	Tengra	PF	++
		Mystus seenghala (Sykes)	Mystus	PF	+
		Ompok imaculatus (Bloch)	Puffta	PF	_
Siluriformes	Siluridae	*Wallago attu* (Bloch and Schneider)	Fresh water shark	PF	++
	Claridae	*Claris batrachus* (Linnaeus)	Mangur	LV	++
Mugiliformes	Mugilidae	*Mugil cephalus* (Linnaeus)	Grey mullet	LV	_
Beloniformes	Belonidae	*Xenentodon cancila* (Ham.)	Kowa	WF	_
Synbranchiformes	Mastacembelidae	*Mastacembelus armatus* (Lacepede)	Baam	PF	+
		Mastacembelus pancalus	Malga	PF	+

Order	Family	*Scientific name*	Common name	Economic value	Status
		(Ham.)			
	Cichlidae	*Tilapia mossambica* (Ham.)	Tilapia	FD	++
	Anabantidae	*Anabas testudineus* (Bloch)	Koi	LV	+
	Gobiidae	*Glassogobius giuris* (Ham.)	goby	PF	-
	Agullidae	*Angulli abengealnesis (Gray)*	mottled eel	PF	-
Perciformes		*Channa striatus* (Bloch)	Banded snake head	LV, PF	+++
		Channa punctatus (Bloch)	Spotted snake head	LV, PF	++
	Channidae	*Channa gaucha* (Ham.)	Dhok	LV, PF	++
		Channa marulius (Ham.)	Bulls eye snake head	LV, PF	++

+++ Most abundant, ++ Abundant, + Less abundant, - Rare. (I) LV – Larvivous fish (ii) BT – Bait. (iii) PF – Predatory Food Fish (iv) WF – Weed Fish (v) MD – Medicinal Value (vi) FR – Forage Fish (vii) FD-Food Fish.

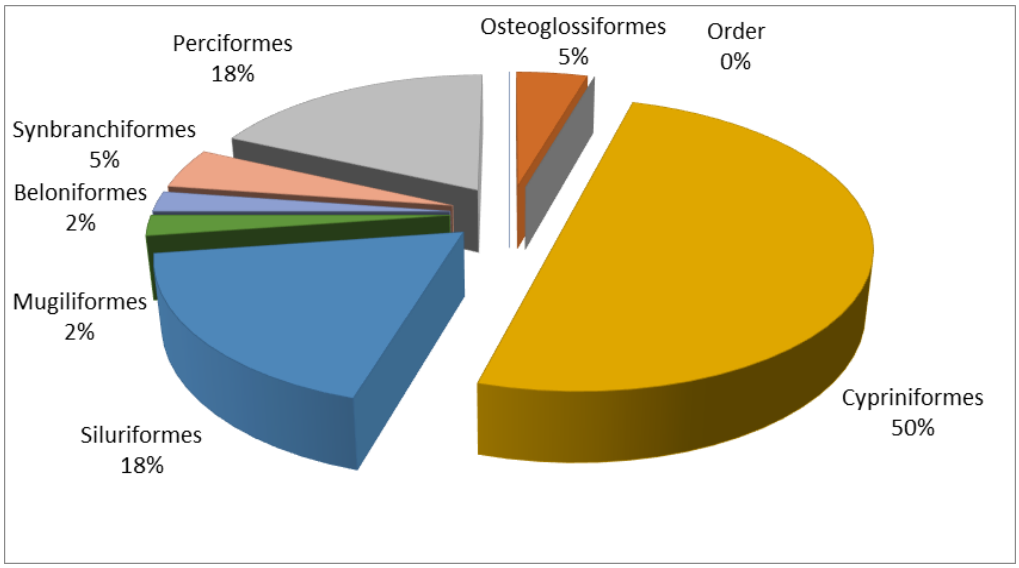

Fig. 1. Order wise fish composition at Sindphana Damnear ShirurKasar Dist. Beed [M.S] Indiaduring January 2012 – December 2012.

According to May, (1975) the Shannon-Weaver diversity index was related to both the total number of species and their relative abundances and can be designated as a positive function of the total number of species. These diversity indices indicated that the ponds under study have a well-balanced fish community that enjoyed an even representation of several species indicating the dynamic nature of this aquatic ecosystem. However, remedial measures should be undertaken to minimize the impact of pollution load as revealed by the

Table 2: Annual variation in fish biodiversity indices at Sindphana Damnear ShirurKasar Dist. Beed [M.S] IndiaduringJanuary 2012 – December 2012.

Indices	Index	Fish biodiversity indices
Species Richness	(N_0)	44
	(R_1)	3.78
	(R_2)	0.97
Species Diversity	(λ)	0.47
	(H')	1.16
	(N_1)	2.98
	(N_2)	2.80
Species Evenness	(E_1)	0.42
	(E_2)	0.21
	(E_3)	0.17
	(E_4)	0.95
	(E_5)	0.97

(R_1), Margalef's indez (R_2), Menhinick index (λ), Simpson's index (H'), Shannon – Weiner index (N_0), No. of all species (N_1), No. of abundant species (N_2), No. of very abundant species (E_1), Evenness index (E_2), Evenness index (E_3), Evenness index (E_4), Evenness index (E_5), Evenness index

ecological indicators. Equitability (evenness) was relatively high during the rainy season (Adesalu and Nwankwo, 2008; Chakraborty and Momi, 2022). Peet, (1974) and Chakraborty et al. (2021) have reported that species diversity implies both richness and evenness in the number of species and equitability for the distribution of individuals among the species. Evenness indices indicate whether all species in a sample are equally abundant. This means that species evenness decreased with the increasing size of the fish population. The indices E_1, E_2, and E_3 are also sensitive to species richness while E_4 and E_5 are relatively unaffected by species richness.

CONCLUSION

The work will conclude future strategies for the development and fish fauna conservation at Sindphana Dam near ShirurKasar Dist. Beed [M.S] India. Recent data regarding fish diversity aims to contribute to a better knowledge of the fish diversity of Sindphana Dam and a tool for conservation planning of aquatic environments in this region. The high value of species richness shows a longer food chain. Simpson index has higher values to show the stable habitat (stability). According to Shannon, index values 0 > 1 show the habitat is under stress pollution; 1 < 3 show not highly polluted.Maintainingfish biodiversity has immense importance as it is not always possible to identify individual species critical to sustaining aquatic ecosystems. Maintaining socioeconomic conditions and management of the reservoir is also necessary to develop more attractiveness in fisheries professionals to culture more fish species in this dam, to produce more diverse groups of fish, and increase food resources and income of local peoples. Dam has high ichthyic diversity with good economic potential.

To conserve and maintain the ichthyic diversity, anthropogenic activities in this dam should be controlled.

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