

Study on correlation matrix of different fish diversity indices at Beehar-Bichhiya River Rewa (M.P.)

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Abstract

The fresh water fishes' correlation matrix of different fish diversity indices at Beehar-Bichhiya River M.P. was studied in the year (2012-13). During the study period correlation matrix of different fish species diversity indices have been recorded. Monthly sampling was carried out in three sites. The result of the study reveals the Shannon Weiner Index was positively correlated With Simpson Diversity Index (0.96), Margalet's Index (0.97) and Pielou's Evenness Index (0.44). While it is negatively correlated with Simpson Dominance Index (- 0.96).

Introduction

Water is nature's most wonderful, abundant and most useful chemical compound gifted with physico-chemical properties, with unique characteristics. It is essential for the survival of all organisms on this planet. According to Kudesia and Kudesia (1998) about 97% of earth's water is found in ocean 2% is frozen as ice in poles and remaining 1% is available to as in the form of fresh water in rivers, streams, lakes and ground water and which is used for human being for their daily needs, irrigation and factories.

Inland water resources play an important role in the life of mankind. Man is dependent for his food supply entirely on the products of land water and plants of the earth. Ever since the turn of 20th century, progress in limnology and fishery science has been rapid and for reaching, as a result of which it has become an integrated and coherent branch of science.

Morphometry of Beehar-Bichhiya Rewa

Beehar river : It is one of the most important river of Rewa district. Beehar river is North-western flowing river of Rewa district and is about 97 kilometers long. The river originates in the Kaimore hills of Kharamkheda village (Satna district) at the elevation of 600 meters above sea level of the Satna district (M.P.). After its origin in Kharamkheda, it flows through the hilly tract of Amarpatan, courses through plateau of Huzur and Sirmour tehsil, reaches the edges of plateau of Chachai village, where with its other tributaries, it forms a water fall, known as "Chachai fall". The river descends about 115 meters below its normal level and flows through a plain, to join the tons rivers, which is one of the important tributaries of Ganga river. Its catchment covers an area about 1685 sq.km. out of which 636 sq.km. is in Satna and rest 1049 sq.km. in Rewa district.

Bichhiya river: It is one of the main tributary of Beehar river. It arises from the village Khaira near Kund of Kaimore rang and flowing 58 km. Its locations in Rewa district is on 24° 10" latitude North and 81° 15" longitude East. The river originates from Khaira village of Gurh tehsil and joins in Beehar river behind the Rewa fort. The confluence place is known as Rajghat. From there, the river jointly flows (with confluence of

Bichhiya and Beehar river) covers several villages of Gurh and Huzur tehsil, which ultimately joins in Chachai fall of Sirmour tehsil of Rewa district.

At the upstream of the Bichhiya river municipal water treatment station is situated after, which it meets with another river called Beehar of Rajghat. Their flows in township, industrial, domestic and municipal discharge merge in to it at different points. The water of the river is used by urban and peripheral rural population directly at many stations for domestic and agriculture uses.

In Beehar-Bichhiya river the study sites are:

1. Station A (Rajghat-upstream).
2. Station B (Jayanti kunj- middle stream).
3. Station C (Ajigarha- downstream).

Observation and Result

Diversity Indices:

Several species diversity indices have been proposed to study freshwater biodiversity, and many are in contemporary use. A diversity index is a mathematical measurement of species diversity in a given community. It has been observed that there are two basic groups' species diversity indices: which are affected most of the occurrence rare species in the community and those that are most sensations to the relative abundance of the species within the community. The first group is highly affected by variations in sample size. Measures in the second group tend to be more accurate for examining the affects of one or more changing parameters on the study community as a whole.

Study of fish community has widely used as ecological indicators to assess and evaluate the status and health of water body. In the present study, lotic water resource was selected to study the abundance and different diversity indices of ichthyofauna. The water body was demarketed into stations to keeping the aims of objectives. For the purpose of study of diversity indices the collected data were computed using standard methods.

Several biodiversity indices were used by the ecologist for their study. For the proper evaluation of fish distribution in the present study following indices were calculated.

1. Shannon-Weiner Index (H)
2. Simpson Dominance Index (D)
3. Simpson's Diversity Index (DI)
4. Margalefs Index (M)
5. Pielous Evenness (P).

Vijaylaxmi *et al.* (2010) studied fresh water fishes' distribution and diversity status of Mullomeri river at Karnatak. During their study the diversity indices were ranged as H (2.5-2.9); D, (0.09-0.1); DI (0.9-0.91); M (1.5-2.3) and P (0.7-0.8), Vyas *et al.* (2012) described the fish biodiversity of Betwa river in Madhya Pradesh. He found the values of Shannon Diversity Index ranged from 2.54 to 3.18, Simpson diversity index 0.08 to 0.11, the values of Margalef index were between 3.71 to 6.70 and Pielous Index vary from 0.50 to 0.64, while assessing the crustaceans community of Wular lake.

In the present study Shannon-wiener Index (H) ranged from 0.29 to 2.49, Simpson Dominance Index 0.08 to 0.86, Simpson's Diversity Index from 0.17 to 0.92,

Margalefs Index vary from 0.19 to 2.55 and Pielous Index from 0.39 to 1.00 (Table 1, 2 and Chart -1).

According to Stub *et al.* (1970) in the biological communities, Shannon-Wiener diversity index varies from 0 to 5. On the basis of this index, values less than 1 characterize heavily polluted condition and values in range of 1 to 2 are characteristics of moderate polluted condition while the value 3 signifies stable environment as condition. Generally, Simpson Index ranges from 0 to 1. In the present study the value of Shannon-Wiener Index showed moderate diversity in the Beehar-Bichhiya river. The only advantage of this index is that can compare the richness of different study sites. In the present study Margalef diversity index were between 0.19 to 2.55 in Beehar-Bichhiya River. Basavarajo *et al.* (2014) reported the fish diversity and abundance in relation to water quality of Anjanapura reservoir. He stated that the Margalef index ranged from 1.48 to 2.4. Vijaylaxmi *et al.* (2010) found higher value 2.3 of Margalef index in the study.

Rumeida *et al.* (2014) studied the different biodiversity indices to evaluate the fish diversity and abundance in Bidong Island. He found that Pielous evenness index ranged from 0.54 to 1. Basavaraja (2014) reported the value of Pielous index from 0.6 to 0.9. In the present study the Peilous evenness index was ranged from 0.39-1.00 in Beehar-Bichhiya river.

On the basis of different diversity indices which were applied during the study. Showed remarkable variations in lotic aquatic environment. The river Beehar-Bichhiya showed better diversity. In Beehar & Bichhiya river the family Cyprinidae was dominant over all the families.

Table- 1: Correlation matrix of different fish diversity indices in Beehar-Bichhiya river from July 2012 – June 2013

	Shannon-Wiener Index	Simpson Dominance Index	Simpson's Diversity Index	Margalef's Index	Pielous Evenness
Shannon-Wiener Index	1.00				
Simpson Dominance Index Simpson's Diversity Index	-0.96	1.00			
Simpson's Diversity Index	0.96	-1.00	1.00		
Margalef's Index	0.97	-0.88	0.88	1.00	
Pielous Evenness	0.44	-0.65	0.65	0.27	1.00

Chart – 1: Shows the different fish diversity indices with positive and negative correlation in Beehar-Bichhiya river Rewa

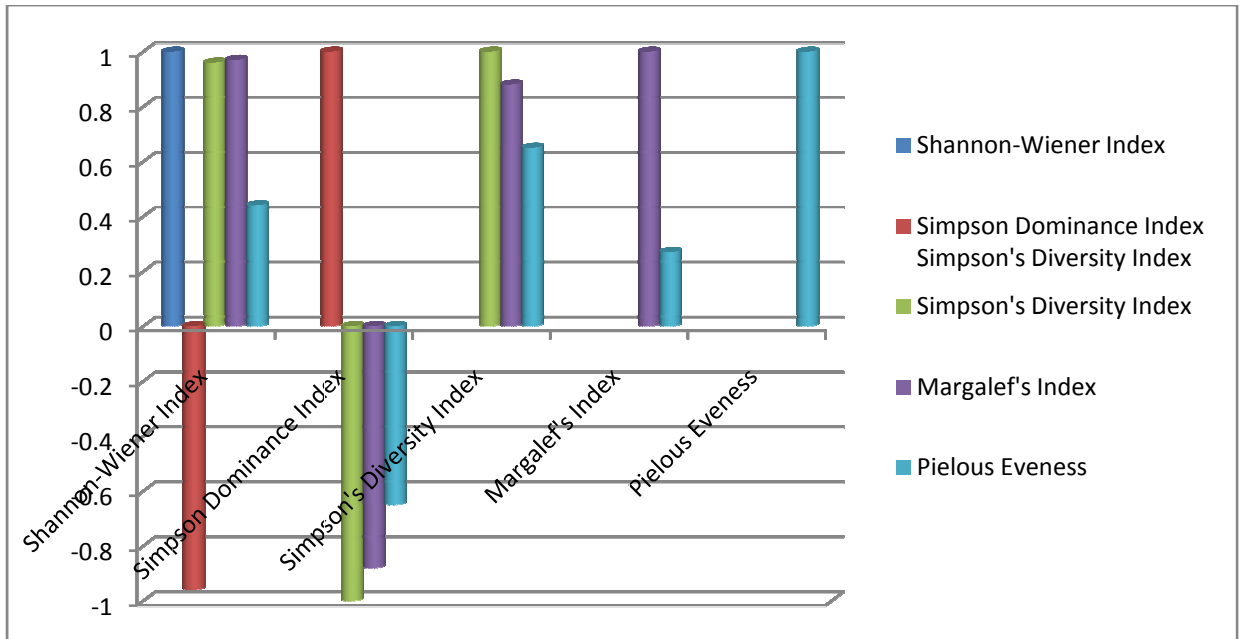


Table – 2: Calculation of different fish diversity indices in Bechar-Bichhiya river from July 2012 – June 2013.

S. No	Family	A					B					C				
		Shannon-Weiner Index (H)	Simpson's Dominance Index (D)	Simpson's Diversity Index (DI)	Margalefs Index (M)	Pielous Evenness (P).	Shannon-Weiner Index (H)	Simpson's Dominance Index (D)	Simpson's Diversity Index (DI)	Margalefs Index (M)	Pielous Evenness (P).	Shannon-Weiner Index (H)	Simpson's Dominance Index (D)	Simpson's Diversity Index (DI)	Margalefs Index (M)	Pielous Evenness (P).
1.	Cyprinidae	2.49	0.08	0.92	2.49	0.88	2.36	0.11	0.89	2.53	0.83	2.35	0.10	0.90	2.55	0.83
2.	Notopetidae	0.29	0.83	0.17	0.32	0.43	0.49	0.68	0.32	0.33	0.70	0.56	0.59	0.41	0.40	0.81
3.	Siluridae	0.81	0.53	0.47	0.42	0.74	0.78	0.56	0.44	0.44	0.71	0.87	0.49	0.51	0.50	0.79
4.	Bagridae	1.18	0.36	0.64	0.71	0.85	0.99	0.48	0.52	0.66	0.71	0.85	0.57	0.43	0.66	0.61
5.	Ophiocephalidae	0.44	0.73	0.27	0.28	0.63	0.27	0.26	0.14	0.25	0.39	0.32	0.82	0.18	0.25	0.46
6.	Mastacembelidae	0.69	0.50	0.50	0.20	1.00	0.69	0.50	0.50	0.19	0.99	0.69	0.50	0.50	0.19	1.00

Bibliography

- Basavaraja. D., Narayana. J., Kiran. B.R. and Puttaiah. E.T. (2014). Fish diversity and abundance in relation to water quality of Anjanapura reservoir, Karnataka, India. ISSN: 2319-7706, Vol 3, Number 3(2014) pp.747-757.
- Kudesia,V.P., Ritu Kudesia., (1998). Water Pollution. Pragati Prakashan, Meerut (India). 728 pp.11.
- Margalef, R. (1972). *Trans.Acad.Sci.*,**44**: 211-235.
- Pielou, E.C. (1966). *Journal of Biology (online)*, **13**:131-144.
- Rumeaida M. Piah, Shariff M.M. Daud and Faez M.I. Badri (2014). Fish diversity and abundance in Bidong Island, South China Sea, Malaysia.Vol. 7, Issue 3.
- Shannon, C.E. and Weiner, W. (1949). The mathematical theory of communication Urbana: University of Illinois press.
- Simpson, E.E. (1949). Measurement of diversity, *Nature*, **163**:688.
- Stub, W. and J.J. Morgan (1970). Aquatic chemistry : An introduction, emphasizing chemical equilibrium in natural water. Wiley, N.Y. 583 pp.
- Vijaylaxmi. C.,Rajshekhar. M. and Vijaykumar. K. (2010). Freshwater fishes distribution and diversity status of Mullameri River, a minor tributary of Bheema River of Gulbarga District, Karnataka.ISSN: 0975-2900, Vol 2, issue 2,pp-01-09.
- Vyas Vipin , Dinesh Damde and Vivek Parashar (2012). Fish Biodiversity of Betwa River in Madhya Pradesh, India with special reference to a sacred ghat. ISSN:2141-243X,Vol. 4(2),pp. 71-77.