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Fish Distribution Pattern and Management in the Tinau River, Palpa

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Abstract

For study direct observation, survey, questionnaire, interviews and discussion method are used to meet the objectives. The main objectives of the study were fish distribution pattern and fish management. The field work was performed between September 2016 to june 2017 of different five stations in Tinau river. Local fishermen were also used for the collection of fishes from sampling sites. Cast net, hook, Bhureli jal and Nets (Jhal) other locally available devices were used for the collection of fish sample. Altogether 5 orders, 9 families, 14 genera and 25 species were found in the study area. Among them 19 fish species from Station I, 16 fish Species from Station II and station III, 10 fish species from Station IV and 7 species from Station V were collected with the help of local fisherman. Fish species such as Channa punctatus, Puntius conchonius and Glyptothorax pectinopterus were found to be clumped in distribution while the rest of the fishes were uniformly distributed. Cyprinids were found to be the most common and dominant among all the species. The human impacts like construction of dam, bridges, riverbed extraction, bank erosion, illegal fishing and use of poisonous chemicals effects on the fish distribution and management directly of the Tinau river. For the management practices like implementation of strict rules and regulations, made ladder for fish passing, construction of fish barrier, plantation, control water pollution and awareness programmes should be done with the help of local people and other institutions. This study helps the local people to pay more attention towards the knowledge about indigenous or locally found fishes and proper management of the Tinau river.

Key words: Anthropogenic; Dominant ;Icthyofauna; Management; Tinau River

Introduction

Major river systems of Nepal are Koshi, Gandaki, Karnali and Mahakali All these rivers have originated from the Himalayas and flow south. The water surface area of Nepal covers 0.1 percent of the total world water systems and fish diversity accounts 0.21 percent of total global fish diversity (Shrestha, 1995).Among the organisms, fishes are the best known species of aquatic organisms and they are the only food source harvested from natural population. Further,

fishes exist at or near the top of the food chain and can serve as a indicator of a balanced aquatic ecosystem (Negi & Mamgain, 2013).The river system is one of the major habitats on earth which plays significant role in establishment and maintenance of rich biodiversity. River provides critical habitats for many species of fauna and flora. Rivers are rich for fauna and flora and they are among the most productive environments of the world. These rivers have provided suitable habitat for a number of fish species and their value is further evidenced by the fact that rivers can produce up to eight times as much plant matter as wheat field (Singh, 1994).These fish species are distributed in various water bodies at different altitudes ranging from a few meters to as high as 4,000 meters from the sea level. Total number of fish species belongs to 98 genera under 35 families and 11 orders (Shrestha, 2008). Among the organism, fishes are the best-known species of aquatic organisms and they are the only food source harvested from natural population. Further, fishes exist at or near the top of the food chin and can serve as an indicator of a balanced aquatic ecosystem (Negi & Mamgain, 2013).

Fresh water ecosystems are strongly affected by anthropogenic change stemming from damming, habitat simplification for navigation, agriculture, hydropower, water extraction, eutrophication, pollution and release of non-native organism (Sharma, 1996) The objectives of the study is to provides the knowledge about the fish management and to study the fish distribution pattern. The Significance of fish has great ecological, economic and nutritional value. (Jha, 2006), studied fish ecology of rivers in Nepal and (Sharma, 1996) studied on the fish biodiversity and fishery resources of the Tinau river. Due to anthropogenic activities there is change in fish habitat and numbers of fish species. This study helps to know about the local fishes and proper management of fishes.

Materials and Methods

Study area

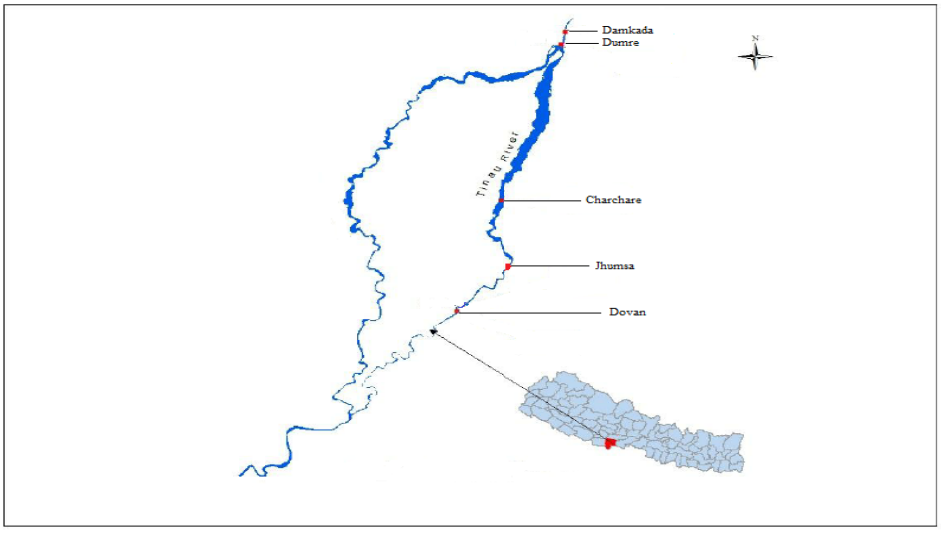

Figure 1: *Map Showing the location of sampling sites in the study area (Tinau river).*

The Tinau River, originating from the Mahabharat range of Palpa district about 20 km east of Tansen. It flows to southern direction joining many feeder streams along its way through a valley called Mariphant. About five kilometer south of Mariphant meets two feeder streams at Charchare, viz., Dumre and Suke. The Tinau River on its way towards south direction meets Sisne Khola and Jhumsa Khola at Jhumsa and after Jhumsa it is also called Jhumsa River. The Tinau River then flows towards west and meets the largest feeder stream Dovan Khola at Dovan . Before entering the Terai region it meets another feeder stream called Chidiya Khola at Siddhababa temple.The Tinau river of Palpa district is taken as the study area. Five sampling stations of the Tinau River are taken for the research work. The selected areas are Station I (Damkada), Station II (Dumre), Station III(Charchare), Station IV(Jhumsa), and Station V(Dhovan) on the basis of junction of river, polluted area &origin of river(Field visits, 2017).

Data collection

The field survey for collection of primary data was done to Tinau River from September 2016 to June 2017. The primary or basic source of data was based onthe survey investigated the fish distribution by using statistical data analysis in Tinau River. Similarly, the information about the fish distribution and its management was collected by questionnaire survey, interview method with local people and fisherman. Five stations were selected as study area. Local fishing techniques were done to know the fish diversity in Tinau River. Some fishes were collected from local fisherman. 60 respondents were asked both subjective as well as objective questions about fish diversity and management of selected stations. Interview was taken from VDC members, old age people and young. Fish diversity of Tinau river from past to the present was discussed. Season in which fishes are mostly found, factor affecting fish diversity and fish management were also discussed. Beside, the study area was collection, direct observation and observation was through photography were done.The secondary data was collected by the review of different journal paper, different published and unpublished literature related to the fish. Fishes were collected from the local fishermen, Local market and self. Local fishermen were also used for the collection of fishes from sampling sites. Cast net, hook, Bhureli jal, Nets and other locally available devices were used for the collection of fish sample. Number of total fish species collected from each sampling site was recorded. Then different species of the collected fish were preserved in 4-8% formaldehyde solution and alcohol. The preserved specimen was taken in laboratory.

Data analysis

All the qualitative and quantitative data gathered during the field visit was analyzed using appropriate statistical tools. The Distribution pattern of Fish was determined by calculating Variance Mean Ratio (V/M) given by Jakson, 1968.

If the Calculated Value = 1 (distribution is random)

If calculated value >1 (distribution is clumped)

If calculated value <1 (distribution is uniformed)

Mean and Variance can be calculated by following formula:

Mean $(\overline{x}) = \frac{\Sigma fx}{N}$

Variance $(\sigma^2) = \frac{\Sigma x^2}{n}$

Results and Discussion

Result

During the study period following observation were made and the results are cited below:

Fish Distribution of the Tinau River:

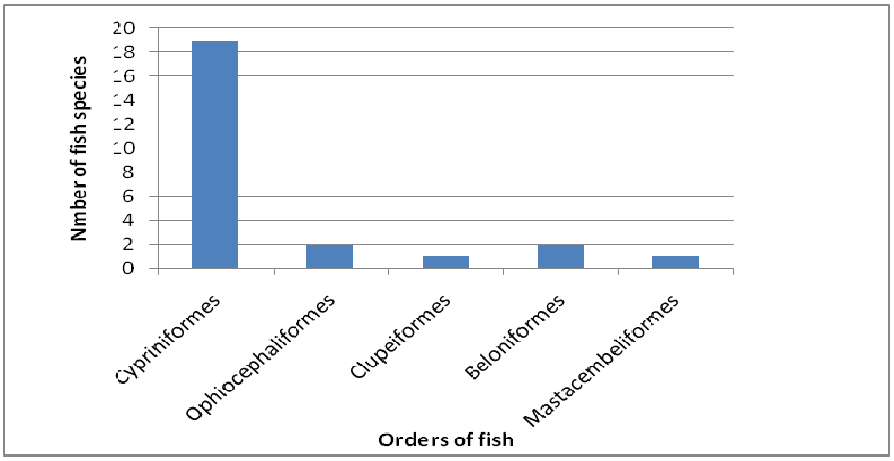

Figure 2: *Order of fish found in Tinau River.*

Cypriniformes was dominant in all sampling stations in which 19 species are found. Species of Cypriniformes were mostly found in Dovan station. Least orders were Clupeiformes and Mastacembeliformes (Figure 2).

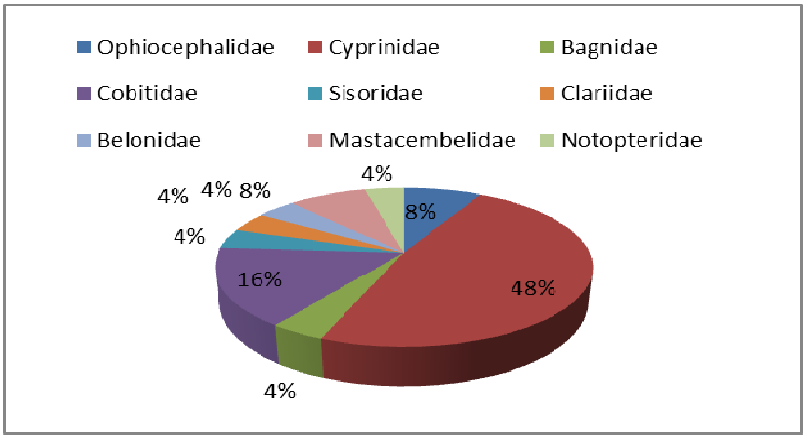

Figure 3: *Family-wise Fish composition (%) of the total fish species in Tinau River.*

Cyprinidae comprised highest percentage of fish species (48%) followed *by Cobitidae, Ophiocephalidae and Mastacembelidae*with 16%, 8% and 8% of total fish species respectively. Remaining 4 families altogether comprised 20% of total fish species. And *Cyprinidae* is the dominant family of all stations.The most common fish species also found in the Tinau River is from *Cyprinidae* family (Figure 3).

Fish Management of the Tinau River:

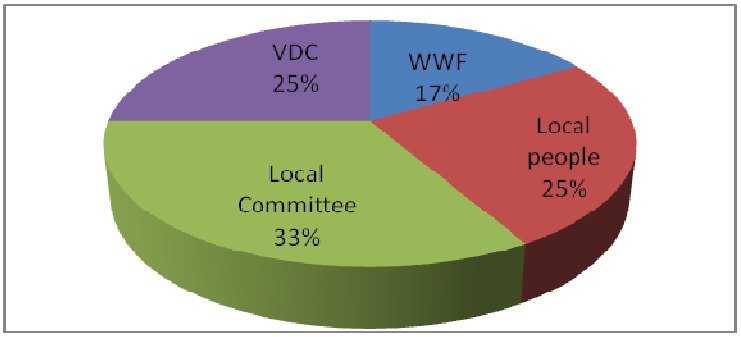

Figure 4: *Perception of local people in percentage.*

Most of the respondents expressed importance of fish for tourism and ecological value, natural beauty. 100% of the respondents said that the fish diversity should be well managed and 33% of the respondent said that fish species should be managed by the local communities themselves with technical assistance from government and NGO/INGO followed by 25% local people, 25% VDC and 17% WWF (Figure 4).

Discussion

Among the five sampling stations, maximum (19) species were recorded from the station V followed by 16, 16, 10 and 7 species from III, IV, I and II respectively. The minimum species from station II might be due to water pollution caused by development construction and floods etc. The distribution pattern of the fish species were of two types i.e. Uniform and Clumped. Most of all stations the distribution patterns of fishes in Tinau River were found to be uniformly but in Stations V distribution patterns of fishes were found to be Clumped. In the study are there are total 25 fish species have been found from Tinau river belonging to the 5 orders, 9 families and 14 genera while (Rijal, 2015) study revealed that total 26 fish species have been collected from the Tinau River, belonging to 4 orders, 9 families and 19 genera. The most commonly observed fish species during the study period were Barillus bendelensis and Puntius sophore and Garra spp. Cypriniformes was dominant in all sampling stations in which 19 species are found. Species of Cypriniformes were mostly found in Dovan station. Least orders were Clupeiformes and Mastacembeliformes (Figure 2). Among them Cyprinidae family was dominant constituting 81.73% of the total followed by Cobitidae constituting 12.24% of total collection. Similarly same family was dominant but constituting 48% followed by Cobitidae constituting 16% of the

total collection (Figure 3). Fishes are not distributed uniformly in the Tinau River which is influenced by the pollution, rod construction and riverbed etc. In the sampling station the fish species are declining so the concerned authorities and stake holders have made various management practices.

Shrestha (1995) described about the various human like power dams, development work, and conservation problems of biologically diverse food and game fishes living in large river bed extraction in Himalayan region which drastically altered fish habitat and communities blocked seasonal movement of pristine migratory fishes. Due to this reason fish species declined day by day and conservation practices like establishment of Fish Park, aquaria and Rivers Park in tail water of dam, development of recreational fishing in the reservoirs of large river are suggested as means to heighten public awareness to preserved river and fishes for future. In the Tinau River Same problems had observed and fish species have been decreased day by day. In this study area to preserved the fish diversity some management practices like illegal fishing, use of poisonous chemicals and materials, extraction of riverbed, have been controlled. Strict rules and regulation are implemented by the VDC. Dahal and Guragain (2013) identified the pressing problems in Tinau River and such ways to overcome the various problems like pollution, riverbed extraction, bank erosion, and the threat to the foundation of bridge. From the recent study we observed that along with the above pressing problems there were various other problems like illegal fishing and use of harmful materials like bomb, electric current and poisonous chemicals. As a result of above mentioned problems the fish species are declining day by day.

Conclusion

In Tinau River we observed different species of fish including 5 orders, 9 family, 15 genera, and 25 species. In the Tinau River on the basis of order Cypriniformes was dominant constituting 72% followed by Ophicephaliformes, Mastacembelliformes and Clupeiformes constituting 8% of total collection. Beloniformes order of total collection was found least constituting percentage. Among five stations 19 species were found in stations V, 16 species in station IV and III, 7 species in station II and 10 species in station I. Dominant order Cypriniformes was observed in all stations and least orders were observed in station I, III and VI .Although, both types, i.e., migratory and resident, of fishes were reported from the Tinau River. Tinau river consists of some of the economically important fishes such as *Schizothorax plagiostomus, Garra gotyla, Channa gachua, Barilius bendelisis, and Noemacheilus rupicola, etc*. Strict rules and regulations have been made by the VDC, illegal fishing, use of poisonous chemicals and materials, extraction of river bed have been strictly prohibited. To preserve the fish diversity along with the VDC, WWF, various clubs, committee and individual people are supporting. Awareness generating programmes related to manage fish diversity should be conducted by the VDC and effective media.

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Appendix I

Fish distribution patterns occurrence at five different stations in Tinau River

S.N.	Scientific name	Sampling Stations				
		I	II	III	IV	V
1	*Channa gachua*	+	+	_	+	+
2	*Channa punctatus*	+	+	+	+	+
3	*Puntius chola*	+	_	_	+	_
4	*Puntius sophore*	_	+	+	+	+
5	*Puntius sarana*	+	_	+	_	_
6	*Puntius conchonius*	_	+	_	_	+
7	*Puntius ticto*	_	+	_	+	+
8	*Danio rerio*	+	_	+	+	+
9	*Danio devario*	+	+	+	-	+
10	*Barilius barila*	_	_	+	+	+
11	*Barilius bendelisis*	+	+	+	_	_
12	*Garra gotyla*	+	_	+	+	+
13	*Schizothorax plagiostomus*	_	_	+	+	+
14	*Schizothoraichthys eocinus*	_	_	+	+	_
15	*Mystus bleekeri*	_	_	_	+	+
16	*Botia lohachata*	+	_	+	_	+
17	*Noemacheilus botia*	_	_	+	_	+
18	*Noemacheilus rupicola*	_	_	+	+	+
19	*Noemacheilus beavani*	_	_	_	+	+
20	*Glyptothorax pectinopterus*	_	_	+	+	+
21	*Clarias batrachus*	_	_	_	_	+
22	*Xenentodon cancila*	+	_	+	+	_
23	*Mastacembelus armatus*	_	_	+	-	+
24	*Mastacembelus pancalus*	_	_	_	_	+
25	*Notopterus notopterus*	_	_	_	_	+

(Note:Present=+, Absent=-)

Distributional pattern of fish species in Tinau River

S.N	Name of Species	Mean	Standard deviation	Variance (V)	Variance mean Ratio (V/M)	Distribution pattern
1	*Channa gachua*	3	0.87	0.75	0.25	Uniformed
2	*Channa punctatus*	3	1.9	3.5	1.2	Clumped
3	*Puntius chola*	6.8	0.95	0.91	0.13	Uniformed
4	*Puntius sarana*	2.6	0.51	0.26	0.1	Uniformed
5	*Puntius sophore*	6.6	1.5	2.31	0.35	Uniformed
6	*Puntius conchonius*	7.5	3.35	11.25	1.5	Clumped
7	*Puntius ticto*	5.55	0.5	0.25	0.05	Uniformed
8	*Danio rerio*	6.02	1.33	1.7	0.3	Uniformed
9	*Danio devario*	5.1	0.71	0.51	0.1	Uniformed
10	*Barilius barilla*	2.76	0.48	0.23	0.08	Uniformed
11	*Barilius bendelisis*	3.21	0.84	0.71	0.2	Uniformed
12	*Garra gotyla*	1.87	0.45	0.205	0.1	Uniformed
13	*Schizothorax plagiostomus*	2.72	1.02	1.04	0.4	Uniformed
14	*Schizothoraichthys eocinus*	1.5	0.5	0.25	0.17	Uniformed
15	*Mystus bleekeri*	1.67	0.5	0.25	0.15	Uniformed
16	*Botia lohachata*	1.5	0.5	0.25	0.17	Uniformed
17	*Nemacheilus rupicola*	2.2	0.7	0.5	0.2	Uniformed
18	*Nemacheilus botia*	2.2	0.7	0.5	0.2	Uniformed
19	*Nemachelius beavani*	1.67	0.5	0.28	0.16	Uniformed
20	*Glyptothorax pectinopterus*	2.33	2.02	4.1	1.8	Clumped
21	*Clarias batrachus*	2.6	0.5	0.26	0.1	Uniformed
22	*Xenentodon cancila*	2	1	1	0.5	Uniformed
23	*Mastacembelus armatus*	1.67	0.5	0.25	0.15	Uniformed
24	*Mastacembelus punctatus*	1.5	0.5	0.25	0.17	Uniformed
25	*Notopterus notopterus*	2.5	1.12	1.25	0.5	Uniformed

Appendix II

-Fish species found in different stations of Tinau River

S.N	Orders	Family	Genus	Species
Station I	Ophiocephaliformes	Ophiocephalidae	*Channa*	*gachua*
			Channa	*punctatus*
	Cypriniformes	Cyprinidae	*Puntius*	*chola*
			Puntius	*sarana*
			Danio	*rerio*
			Danio	*devario*
			Barilius	*bendelisis*
			Garra	*gotyla*
		Cobitidae	*Botia*	*lohachata*
	Beloniformes	Belonidae	*Xenentodon*	*cancila*
Station II	Ophiocephaliformes	Ophiocephalidae	*Channa*	*gachua*
			Channa	*punctatus*
	Cypriniformes	Cyprinidae	*Puntius*	*sophore*
			Puntius	*conchonius*
			Puntius	*ticto*
			Danio	*daevario*
			Barilius	*bendelisis*
Station III	Cypriniformes	Cyprinidae	*Puntius*	*chola*
			Puntius	*sophore*
			Puntius	*sarana*
			Danio	*rerio*
			Danio	*devario*
			Barilius	*barilla*
			Barilius	*bendelisis*
			Garra	*gotyla*
			Schizothorax	*plagiostomus*
			Schizothoraichthys	*eocinus*
		Cobitidae	*Botia*	*lohachata*
			Noemachilius	*botia*
			Noemachilius	*rupicola*
		Sisoridae	*Gyptothorax*	*pectinopteru*

	Benoliformes	Belonidae	*Xenentodon*	*cancila*
	Mastacembeliformes	Mastacembelidae	*Mastacembelus*	*armatus*
Station IV	Cypriniformes	Cyprinidae	*Puntius*	*chilinoids*
			Danio	*rerio*
			Puntius	*sophore*
			Puntius	*chola*
			Barilius	*barilla*
			Schizothorax	*plagiostomus*
			Schizothoraichthys	*eocinus*
			Garra	*gotyla*
	Ophiocephaliformes	Ophiocephalidae	*Channa*	*gochua*
			Channa	*puntatus*
		Cobitidae	*Noemachilus*	*rupicola*
			Noemachilus	*beavani*
		Sioridae	*Glytothorax*	*pectinopteru*
		Bagridae	*Mystus*	*bleekeri*
	Beloniformes	Belonidae	*Xenentodon*	*cancila*
Station V	Ophiocephaliformes	Ophiocephalidae	*Channa*	*gachua*
			Channa	*puntatus*
	Cypriniformes	Cyprinidae	*Puntius*	*sophore*
			Puntius	*conchonius*
			Puntius	*ticto*
			Danio	*rerio*
			Barilius	*barilla*
			Schizothorax	*plagiostomus*
			Schizothoraichthys	*eocinus*
		Cobitidae	*Botia*	*lohachota*
			Noemachilus	*beavani*
			Noemachilus	*botia*
			Noemachilus	*rupicola*
		Sisoridae	*Glyptothorax*	*pectinopterus*
		Bagridae	*Mystus*	*beekeri*
	Mastacembeliformes	Mastacembelidae	*Mastacembelus*	*armatus*
			Mastacembelus	*pancalus*
	Clupeiformes	Notopteridae	*Notopterus*	*notopterus*

*(**Source:** Field Visit, 2017)*