

## Enumeration of Fish and Alimentation of Fisherman at Tezu River in Lohit District of Arunachal Pradesh, India

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### Abstract:

An investigation was conducted on fish diversity and livelihood of fishermen residing in and around of Tezu river at Tezu in Lohit district, Arunachal Pradesh, India during August, 2016 to March, 2017. Altogether, 49 species has been recorded under 33 genera belong to 17 families. Cyprinidae was the dominant family (36.73%) followed by Nemacheilidae and Bagridae (16.33%); Cobitidae and Siluridae (12.25%); Amblyceptidae, Mastacembelidae, Badidae, Belontidae and Chandidae (20.4%); the rest of the families (14.29%). According to IUCN, 35 species listed in Least Concerned (71.4%); 7 in Not Evaluated (14.28%); 3 in Near Threatened (6.12%); 2 in Data Deficient (4.08%); 1 was in Vulnerable (2.04%) and 1 in Endangered (2.04%). A total of thirty five (35) households of fishermen comprised of 97 males and 93 females were surveyed for their socio-economic status. Majority of the household had joint families (100%) comprising more than 5 members and none of the families were nuclear. Only 25 fishermen have been engaged actively in fishing activity from 35 households. The age of the fishermen was 28% for up to 25 years; 60% for up to 60 years and 12% for up to 60 years. As far as educational status, illiteracy rate was 21.05%; 42.10% for primary level; 21.05% for high school level, and 15.80% for higher secondary. Fishing activity was the key source of their income for 25 families (71.42%) and daily wages work for 10 families (28.58%). The main use of waterbodies was bathing/ washing (100%) and drinking at some extent (negligible). The monthly family income was Rs. 6,000 (14.29%); Rs. 10,000 (34.29%) and for Rs. 10,000 (51.42%) of total household. The fishermen (100%) also opined that the present status of the fisheries in the area was declining in trend..

**Keywords:** Fish diversity; Livelihood; Tezu river; Arunachal Pradesh, India

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## Introduction

The state of Arunachal Pradesh is the biggest among the north-eastern states of India in terms of physical area as well as in river basins and refuge of varied fish species. The Indian north-eastern regions are the hot spots of biodiversity in the world (Kottelat and Whitten, 1996). Still, many of them are un-described and numbers of species are under the different category of IUCN red list. Moreover, there are many water bodies which are still unexplored due to dense forests, steep terrains and poor communication. Hence, the discovery of the fish species from these water bodies has not been fully explored till now which might be new to the science. However, the various notable workers partially studied the fish diversity of Arunachal Pradesh, namely Sen (1999) reported 52 fish species from Siang and Subansiri districts; Nath and Dey (2000) listed 131 species; Sen (2006) scanned 143 species; Tamang et al. (2007) listed 47 species; Bagra et al. (2009) recorded 213 fish species from 35 rivers; Bagra and Das (2010) enumerated 44 fish species. Recently, Kumar et al. (2016) cataloged 42 fish species from the sinkin river in Lower Dibang valley of Arunachal Pradesh.

As far as the socio-economic status of fishermen in Arunachal Pradesh is concerned, it was very limited. As per literature, researchers and notable workers have not properly studied or investigated on the livelihood of the fishermen in the state till now. However, more recently Kumar et al. (2016) questioned the socio-economic dependence of the local tribal and fishermen residing in

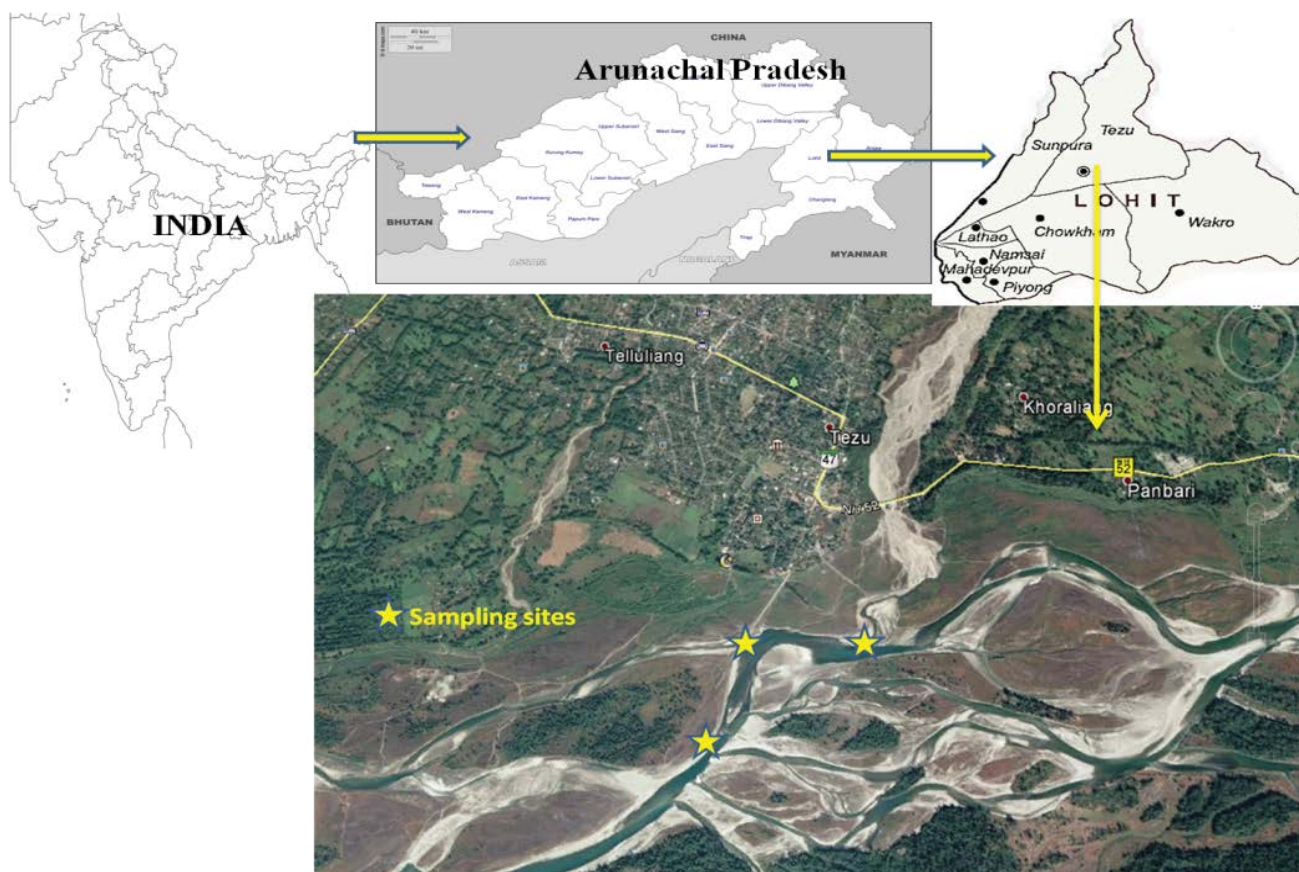
and around of Sinkin River in Lower Dibang Valley district of the state. Therefore, from the above drawbacks, an attempt has been made to explore/investigate on the fish diversity and livelihood of fishermen at the Tezu river in Lohit district, Arunachal Pradesh, India.

## Materials and Methods

### Study area, period and methodology

A contemporary study was executed from the Tezu river (nallah) at Tezu in Lohit district of Arunachal Pradesh, India from August, 2016 to March, 2017 (**Figure 1**). The three sampling sites were selected for this task and marked as site I ( $27^{\circ}54'30.34''$  N and  $96^{\circ}10'16.71''$  E), II ( $27^{\circ}54'31.01''$  N and  $96^{\circ}09'54.65''$  E) and III ( $27^{\circ}54'12.83''$  N and  $96^{\circ}09'47.52''$  E). Seasonal data collection and sampling was done from Tezu river (nallah) and its tributary namely Dus nallah. The river is joined by several small channels after flowing downstream about 10 km and it again joins with the Lohit river, finally drained into the Brahmaputra River. The fish species were fixed using cast net and electro-fishing from the respective sampling sites (**Figure 2**) and further, the specimens were preserved in 5% formalin for identification. The specimens were identified by following the standard keys of Talwar and Jhingran (1991) and Vishwanath et al. (2007). The conservation status of the listed fish species were also assessed through IUCN, 2017-1.

Livelihoods of the fishermen were investigated based on the



**Figure 1:** Satellite imagery of the study area (Tezu River).

written specific questions and through individual (fishermen) interview (**Figure 3**). The information provided by the fishermen were analysed and gathered the availabilities of fish in the river and small streams. The household characteristics such as type of family, size of family, educational status, land use pattern, occupation, annual income, status of fisheries etc., were included in the written questionnaire. Moreover, the propaganda on traditional fisheries management (Fisheries Regulations Act, village regulation, penalty imposed etc.), fishing tools and techniques were also compiled through instant interaction with the village chief and aged person. The respondents were thoroughly assured with the information obtained would not prejudice them in any case.

### Physical characterization of Tezu nallah (River)

The Tezu River is waggling shaped with some pools at an extent. Naturally, the bottom of the river is filled with silt, sand, boulders etc. and the small channels filled with gravel and cobbles. The logs and large woody debris in the river were occasionally found and the organic materials (leaves and twigs) were infrequently occurred in the streams. The approximate depth of the river was



**Figure 2:** A view of fishing activity at a small channel of the Tezu River.



**Figure 3:** A view of interaction and questionnaire with fishermen at the Tezu River.

2-3 ft and 5-6 ft at pool areas whereas, the estimated width of the river was 600-650 ft. Stream velocity of the sampling sites was recorded as 1.1-1.2 m/s. The shape of the river was expanded and deep-seated at some extent. The riverine zone (water's edge and stream bank) of the river was covered by boulder, gravel, bushes, shrubs, tall grasses etc. on both sides. It was noticed that the bank of the upstream was collapsed or eroded on both sides in every rainy season. There is a small barren island in the middle of the river where the sampling was done and the water heads bifurcates at large extent covering the island and again joined together.

## Results and Discussion

### Fish diversity of Tezu River and its drainages

Totally 49 fish species has been listed under 33 genera and 17 families (**Table 1 and Plates 1-3**). It was contemplated among the families, Cyprinidae was the foremost which accommodated 18 species accounting 36.73% (**Figure 4**). Next followed by Nemacheilidae and Bagridae with 4 species each and holding 16.33%; Cobitidae and Siluridae with 3 species each and accounting 12.25%. These are further followed by Amblyciptidae, Mastacembelidae, Badidae, Belontiidae and Chandidae comprising 2 species each accounting 20.4%. Other families like Psilorhynchidae, Balitoridae, Sisoridae, Heteropneustidae, Olyridae, Nandidae and Gobiidae with 1 species each and accounting 14.29%. The present observation was similar with the findings of Bagra et al. (2009); Bagra and Das (2010); Das et al. (2015), Kumar et al. (2016) where the Cyprinidae family was dominated in the different rivers of the state. In fact, the diversity of fish might vary from drainage to drainage due to its topographical variations.

According to IUCN (2017-1), out of the 49 fish species 35 species fall in Least Concerned (LC) category with 71.4%; 7 species in Not Evaluated (NE) with 14.28%; 3 species in Near Threatened (NT) with 6.12%; 2 species in Data Deficient (DD) with 4.08%; 1 species in Vulnerable (VU) with 2.04% and 1 species in endangered (EN) with 2.04%.

### Livelihood (Socio-economic status)

The socio-economic status of fishermen of Tezu nallah (river) at Tezu was investigated and the details given in **Table 2**. For which, a total of 35 households of fishermen were selected and randomly interviewed. The 35 household profiles represent 190 population consisting 93 females and 97 males. The joint families (100%) were in bulk comprising more than 5 members and none of the families were nuclear. Such average joint families needed more or less higher income for their alimentation. Out of the 35 households, only 25 fishermen have been engaged actively in fishing activity. The age of the fishermen was found 28% for up to 25 years; 60% for up to 60 years and 12% for up to 60 years. The literacy rate was noted as 21.05% (as illiterate); 42.10% (as primary level); 21.05% (as high school level); 15.80% (as higher secondary) and there was no record of graduation level. Fishing activity was the main source of income for 71.42% families and daily wages work as 28.58% families. They have no land for agriculture as they have been residing in rented house. The alternative uses of the water

**Table 1:** List of fish species and their IUCN status.

Family	Sl. No.	Scientific name	IUCN Status
Cyprinidae	1	<i>Aspidoparia jaya</i>	NE
	2	<i>Aspidoparia morar</i>	LC
	3	<i>Barilius bendelisis</i>	LC
	4	<i>Barilius barna</i>	LC
	5	<i>Labeo gonius</i>	LC
	6	<i>Raimas bola</i>	LC
	7	<i>Bangana dero</i>	LC
	8	<i>Chagunius chagunio</i>	LC
	9	<i>Crossocheilus latius</i>	LC
	10	<i>Garra annandalei</i>	LC
	11	<i>Garra sp.</i>	NE
	12	<i>Devario aequipinatus</i>	LC
	13	<i>Devario sp.</i>	NE
	14	<i>Rasbora rasbora</i>	LC
	15	<i>Puntius sarana</i>	LC
	16	<i>Puntius sophore</i>	LC
	17	<i>Pethia ticto</i>	LC
	18	<i>Pethia jelius</i>	LC
Psilorhynchidae	19	<i>Psilorhynchus balitora</i>	LC
	20	<i>Botia rostrata</i>	VU
Cobitidae	21	<i>Lepidocephalichthys guntea</i>	LC
	22	<i>Lepidocephalichthys arunachlaensis</i>	EN
Balitoridae	23	<i>Balitora brucei</i>	NT
	24	<i>Schistura sp.1</i>	NE
	25	<i>Schistura sp.2</i>	NE
Nemacheilidae	26	<i>Aborichthys sp.</i>	NE
	27	<i>Acanthocobitis botia</i>	LC
	28	<i>Mystus dibrugarensis</i>	LC
Bagridae	29	<i>Mystus tengra</i>	LC
	30	<i>Mystus bleekeri</i>	LC
	31	<i>Batasio batasio</i>	LC
	32	<i>Ompok pabo</i>	NT
Siluridae	33	<i>Ompok pabda</i>	NT
	34	<i>Kryptopterus indicus</i>	DD
Amblycepsidae	35	<i>Amblyceps apangi</i>	LC
	36	<i>Amblyceps arunachalensis</i>	NE
Sisoridae	37	<i>Gagata cenia</i>	LC
Heteropneustidae	38	<i>Heteropneustes fossilis</i>	LC
Olyridae	39	<i>Olyra longicaudata</i>	LC
Mastacembelidae	40	<i>Macrognathus pancalus</i>	LC
	41	<i>Macrognathus aral</i>	LC
Nandidae	42	<i>Nandus nandus</i>	LC
Badidae	43	<i>Badis assamensis</i>	DD
	44	<i>Badis badis</i>	LC
Gobiidae	45	<i>Glossogobius guiris</i>	LC
Belontiidae	46	<i>Trichogaster chuna</i>	LC
	47	<i>Trichogaster fasciata</i>	LC
Channidae	48	<i>Channa punctata</i>	LC
	49	<i>Channa gachua</i>	LC













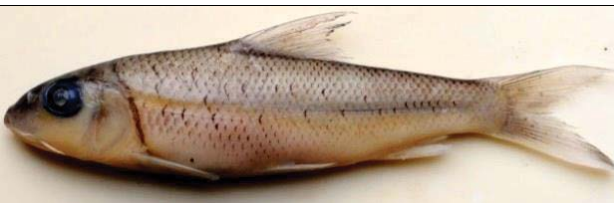

**Legend:** LC=Least Concerned; V=Vulnerable; NT=Near threatened; DD=Data Deficient; NE=Not evaluated

bodies was bathing/washing (100%) and for drinking to an extent. The average monthly income was recorded as Rs. 6,000/- with 14.29%; Rs. 10,000/- with 34.29%; and Rs. 10,000/- with 51.42% families. According to respondents (100%), the present status of the fish availability in the areas was also in declining trend. The livelihood of the fishermen was directly or indirectly dependent on catching fishes and their alternative occupation (daily wages work). Indeed, these waterbodies are one of their main sources of income and somehow they manage to run the family. Generally, from the age of 25 to 60 years of men has been actively engaged in fishing activities and even some members below 15 years were also engaged in fishing activity along with parents using spears, hooks and multiple forks. It might be acknowledged the respondents (100%) admitted there has been prohibited (banned) all kinds of fishing activity from June to August for conservatory measures.

The population of the Tezu area comprised of different indigenous tribes and fishermen including Shahni, Mukhiya and Machuawari community. They are mostly from Bihar and Uttar Pradesh and residing at purana radio centre which is just 0.4 km away from Tezu River (fishing sites). Once, the radio centre was located at the heart of Tezu town which was flown away due to heavy flood and thus the river course direction was also drastically changed. The fishermen have no lands for cultivation and reside in the rented house since two and half decade. In a time, the fishermen use to catch the fish species whole day except fishing banned period (June- August). Now a day, due to decreasing of fish availability they use to catch the fish species only during morning and evening time. Their earning is not enough to run the family hence they earn by doing daily wages work and rickshaw pulling by day time. They also revealed that the availability of diverse fish species is decreasing year by year. Presently, they use to catch the fishes about 3-4 kg/fishermen/day. They also reveal that before 10 years ago, they use to catch the fishes about 10-12 kg/fishermen/day.

Fishing activity is their daily practice in the areas and controlled by these fishermen for not only selling but also for consumption. As fishes are invariably rich in protein food sources for human being and also as a good bio-indicator of the water bodies. They generally use the different gears while catching fishes in the river. Every household possess fishing nets (cast net), basic design of bamboo and other fishing gears (spears, multiple fork, hooks etc.). The indigenous tribes are not involved in the fishing activities. However, during the banned period and winter season, some local tribes occasionally used to catch the fishes by using poisoning, dynamiting and electro fishing methods. Such illegal activities will lead to the declining of the aquatic resources as the period is for breeding, parental care and spawning of the fishes. Usually, the fishermen are paid a minimum amount to the town head (Goanbura) for welfare of the areas. They directly sell the fishes to the Tezu market and to some traders outside the state. The fishermen also reveal that some of the traders from Assam occasionally visited at Tezu and collected live fishes for exporting to Guwahati, Assam and Kolkata, West Bengal. The sustainable management of the aquatic resources is indeed played an important

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<i>Aspidiparia jaya</i>	<i>Aspidoparia morar</i>
	
<i>Barilius bendelisis</i>	<i>Barilius barna</i>
	
<i>Garra annandalei</i>	<i>Garra sp.</i>
	
<i>Channa punctata</i>	<i>Channa gachua</i>
	
<i>Psilorhynchus balitora</i>	<i>Raimas bola</i>
	
<i>Pethia ticto</i>	<i>Puntius jelsius</i>
	
<i>Chagunius chagunio</i>	<i>Rasbora rasbora</i>

**Plate-1:** Some edible and ornamental fish species from Tezu Nallah (River).

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<i>Crossocheilus latius</i>	<i>Acanthocobitis botia</i>
	
<i>Scistura sp. 1</i>	<i>Schistura sp. 2</i>
	
<i>Badis assamensis</i>	<i>Badis badis</i>
	
<i>Schistura devdevi</i>	<i>Aborichthys sp.</i>
	
<i>Lepidocephalichthys guntea</i>	<i>Lepidocephalichthys arunachalensis</i>
	
<i>Devario assamensis</i>	<i>Macrogathus pancalus</i>
	
<i>Trichogaster chuna</i>	<i>Nandus nandus</i>

Plate-2: Some edible and ornamental fish species from Tezu Nallah (River).

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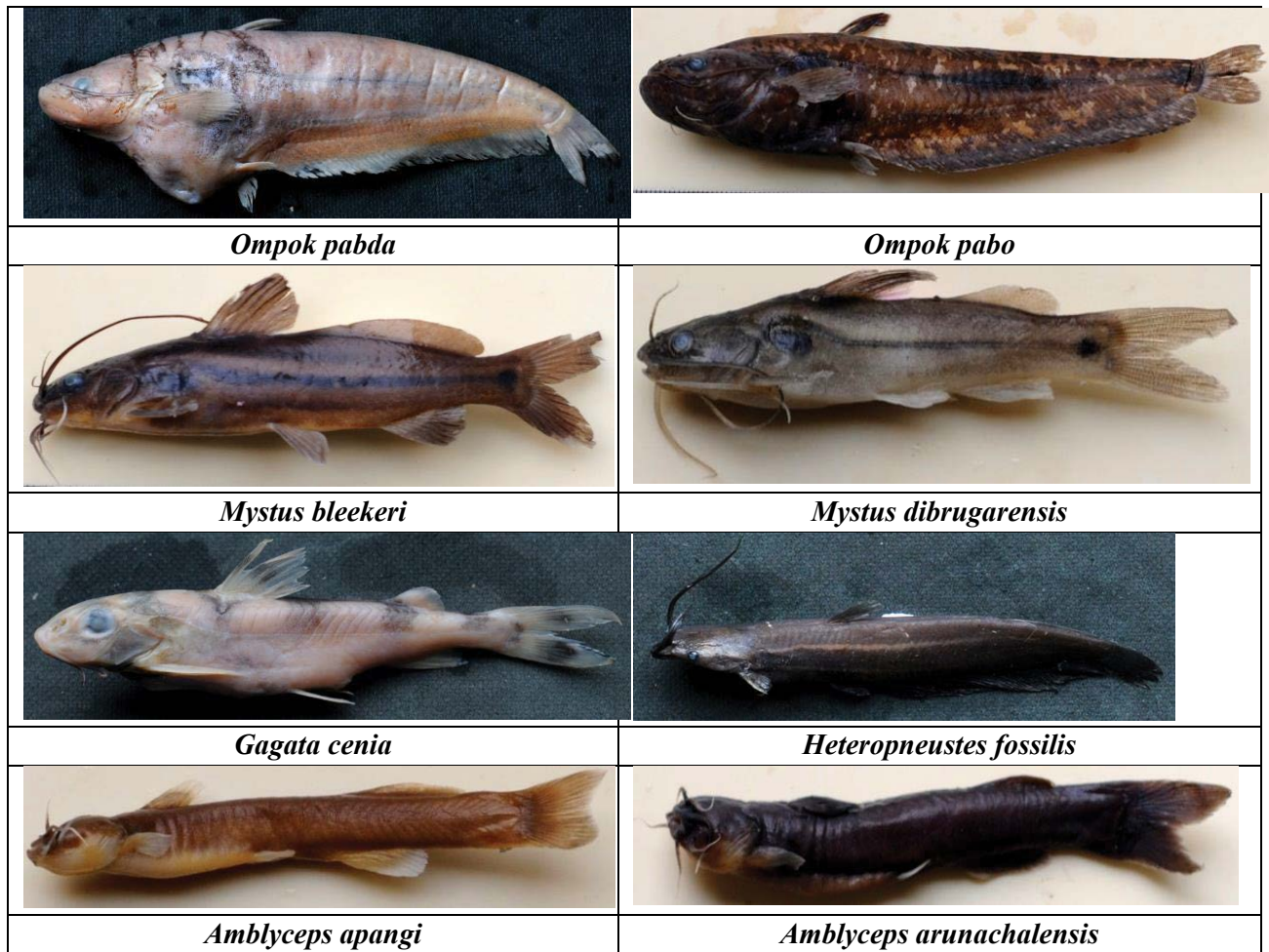


Plate-3: Some edible and ornamental fish species from Tezu Nallah (River).

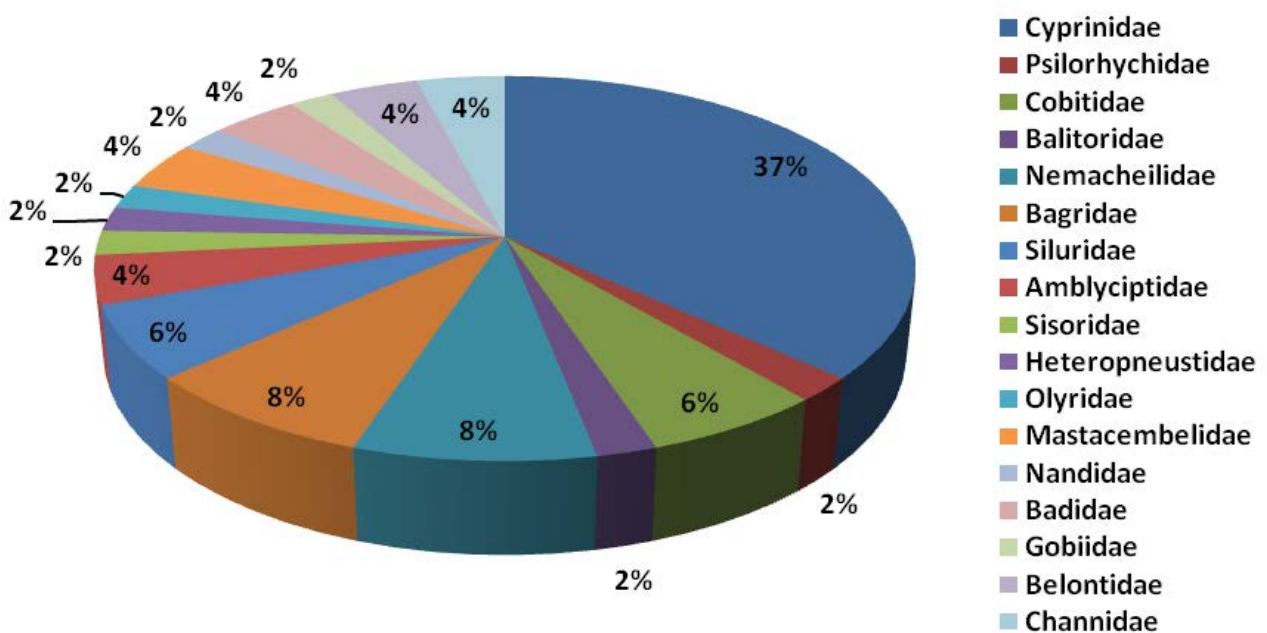


Figure 4: Percentage composition of fish diversity.

**Table 2:** The household profile of fishermen.

Sl.No.	Parameters	No.	%	
1	Household	35		
2	Population		190	
		Male	97	51.05
		Female	93	48.95
3	Size of family	Nuclear	Nil	--
		Joint	100	100
4	No. of fishermen engaged	Man	25	
5	Age of fishermen	25 years	7	28
		50 years	15	60
		60 years	3	12
6	Educational status	Illiterate	40	21.05
		Primary level	80	42.1
		High school level	40	21.05
		Higher secondary level	30	15.8
		Graduate level	Nil	
7	Main occupation of household	Agriculture	Nil	
		Fishing	25	71.42
		Other Daily wages work	10	28.58
8	Main use of waterbodies	Bathing, washing		100
9	Monthly family income (Fishing & Daily wages)			
	1. Upto 6,000/-	5	14.29	
		2. Upto 10,000/-	12	34.29
		3. More than 10,000/-	18	51.42
10	What is present status of the fisheries? Decrease its production year by year as per their observations.			100

role of livelihood not only for the large section of tribal people but also for the fishermen of the areas.

## Conclusion

It is clear from the above discussion, the Lohit River and drainages system has been provided livelihood of the fishermen and also demonstrate a number of ornamental and edible fishes. The indigenous tribal should continue their support to the fishermen and adopt as their alternative source of revenue by exporting trade and supply to other nearby markets in a sustainable way. Proper scientific techniques of fishing would help in the up-gradation of the socio-economic of the fishermen as well as local tribal who are directly or indirectly involved in the fishing activities. A long effective management plan should be adopted for conservation of fishes and illegal fishing should be strictly prohibited. So that the Tezu River may become a commercial hub for ornamental fish trade in future and the Govt. may also organize various programmes for encouraging the formation of fisher's co-operative society.

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