ICHTHYOFAUNAL DIVERSITY OF MELAMCHI RIVER, NEPAL

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Abstract

An attempt was made to study the existing diversity and distribution of fish fauna of Melamchi river, an important tributary of the Indrawati river basin, Sindhupal choke, Nepal. The field survey was undertaken from January 2011 to December 2013. Monthly sampling was carried out at five confluence sites. Diversity, distribution, spatial and temporal abundance were carried out to know the status of fish species in the river. Eleven fish species belonging to two orders and five families were recorded. The order Cypriniformes was dominant with ten fish species followed by the order Salmoniformes with only one species. The most common fish species recorded from the study sites was *Schizothorax plagistomus*. It was recorded from all five sites in all seasons followed by *Neolissochilus hexagonolepis* and *Psilorhynchus psedecheneis*. The highest 87.53% of the total count (4252 individuals) was for *Schizothorax plagistomus* and lowest frequency occurrence was 0.03% for *Oncorhynchus mykiss*. Reduction in the number of fish species from eleven (in 2011) to four (in 2013) was recorded during present study.

Key words: Fish diversity, occurrence percent, spatial and temporal abundance, confluence sites.

INTRODUCTION

Nepal is bestowed with a large number of rivers, considerable number of lakes, reservoirs and irrigated fields. The water resources are utilized for irrigation, electricity and fish culture. Fish is one of the essential resources in the economy of many nations as it is a stable item in the diet of people. It also plays a significant contribution to the livelihood of the rural population. Priority has been given to fisheries in Nepal since last few decades being assisted by international agencies including UNDP, FAO, ADB and JICA. The ichthyofauna of Nepal has been studied by a number of scientists, namely Gunther (1861), Menon (1949), Thapa and Rajbanshi (1968), Rajbansi (1982), Jha and Shrestha (1986), Sapkota (1998), Jayaram (1999) and Shrestha (1995) who reported a total of 182 fish species belonging to 92 genera under 31 families and 11 orders from Nepal. For the first time, Shrestha (1999) made a list of cold water fishes in Nepal, with 59 indigenous and two exotic fish species. Shrestha (2013) reported 228 species of fish species from Nepal.

The Melamchi river is a tributary of larger Indrawati river basin. During its course, it receives around 50 tributaries. Timbu, Gohore, Gyalthum and Talamarang are some of them. The River basin is used for irrigating 289 hectares of land area at Melamchi valley and paddy field, drinking water supply, sanitation, micro-hydropower generation and water mills (MWSDB 2008). Melamchi Water Supply Project (MWSP) work has also been going on in this area since 2003. Under this project, 26.5 km tunnel and a reservoir is under construction to overcome the scarcity of water in Kathmandu valley. Some aspects of the fisheries and fish ecological studies, such as their diversity, spatial and temporal distribution, and abundance in various rivers are necessary in Nepal perspectives, where fish has been epitomized as an important protein resource. This study was undertaken to investigate the fact in Melamchi river.

MATERIAL AND METHODS

Study area

The Melamchi river a tributary of larger Indrawati river basin, originated from the high snowy mountain of the Jugal Himal at an elevation of 5875m. Total length of the river is 41 km and its catchment area is confined between latitudes 27˚58′16″N Latitude 85˚32′28″N. It flows southwards and joins Indrawati river near melamchi pulbazar and the catchment area at the Melamchi Pul Bazaar is 330 km^2. In order to collect fishes, five confluence sites of Melamchi river including Timbu, Gohore, Gyalthum, Talamarang, and Pulbazar were chosen for sample collection (Table 1) between Timbu and Melamchi Pulbazar (Fig. 1) from January 2011 to December 2013.

Table 1. Five confluence sites with selected places and elevation along Melamchi river.

Sampling site	Place	Elevation (Meter)
Site 1	Timbu	1310
Site 2	Kiul (Gohore)	1050
Site 3	Gyalthum	975
Site 4	Talamarang	920
Site 5	Pulbazar	815

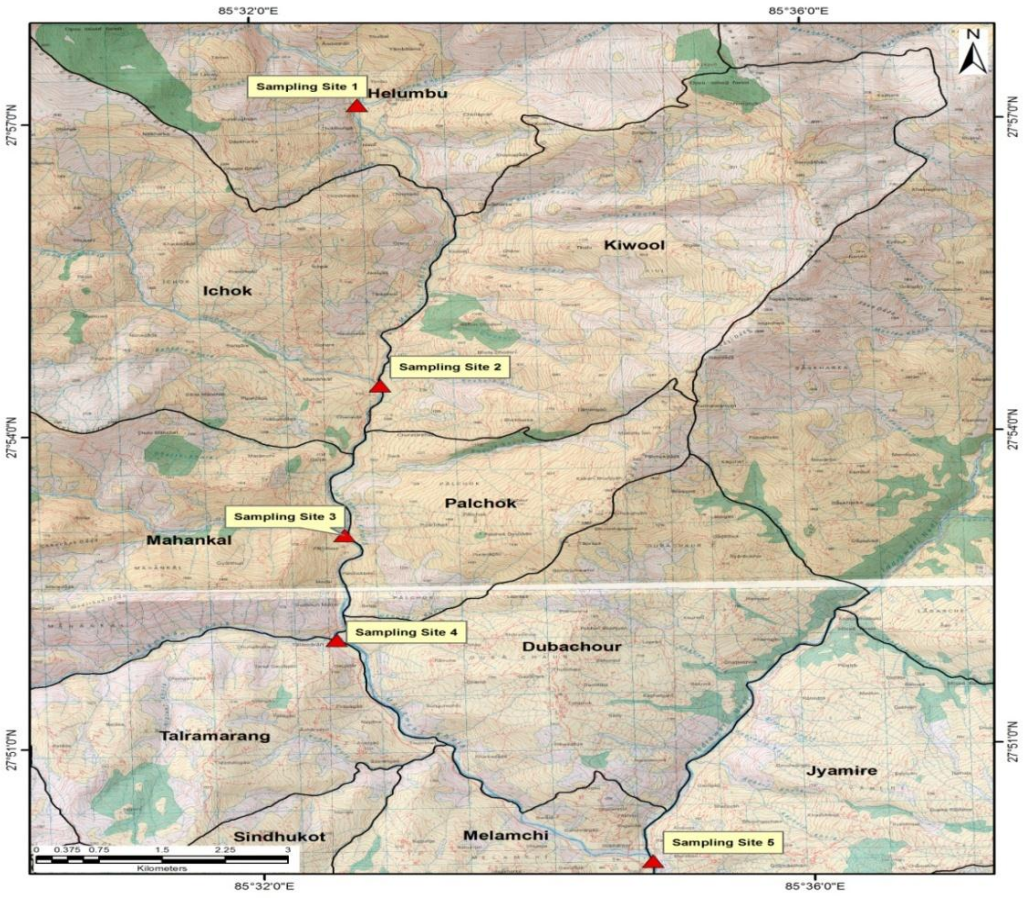

Fig. 1. The study area showing five sampling sites (with red triangle).

Fish collection

Fish samples were collected with the help of local fishermen in the first week of every month from January 2011 to December 2013. Cast net (6mm×6mm size) was used to collect fish samples. The time span for each sampling was between 50 and 60 minutes as it is a factor to calculate catch per unit effort (CPUE) fish species from five sampling sites were recorded to find out spatial, seasonal and yearly average abundance in CPUE (catch per unit effort). The CPUE in this work is defined as the number of fish captured in 10 minutes of hauling. Morphological characteristics of the fishes were recorded for taxonomic identification. The fishes were categorized broadly based on indigenous knowledge, information collected from local Fishermen, and scientifically on the standard methods of taxonomy (Jayaram 1999, Shrestha 1995).

RESULTS AND DISCUSSION

Species diversity and distribution

A total of 11 species belongings to the orders Cypriniformes and Salmoniformes was captured during the entire sampling period at five confluence sites of Melamchi river of Sindhupalchoke District in Nepal. Among the fishes, the family Cyprinidae was the most dominant in the assemblage, followed by the family Cobitidae. The species captured and identified from January 2011 to December 2013 are presented (Table 2).

Table 2. Recorded fish species from Melamchi river from the years 2011 to 2013.

Order	Family	Genus	Species	Total no. of species	Species (%)
Cypriniformes	Cobitidae	*Botia*	*Botia lohachata*	8	0.19
		Lepidocephalus	*Lepidocephalus guntea*	14	0.33
	Cyprinidae	*Barilius*	*Barilius barna*	28	0.66
		Garra	*Garra gotyla*	4	0.09
		Neolissochilus	*Neolissochilus hexagonolepis*	166	3.9
		Puntius	*Puntius conchonius*	6	0.14
		Schizothoraichthys	*Schizothoraichthys progastus*	134	3.15
		Schizothorax	*Schizothorax plagiostomus*	3722	87.53
	Psilorhynchidae	*Psilorhynchus*	*Psilorhynchus pseudecheneis*	164	3.86
	Sisoridae	*Pseudecheneis*	*Pseudecheneis sulcatus*	4	0.09
Salmoniformes	Salmonidae	*Onchorhynchus*	*Oncorhynchus mykiss*	2	0.05

During the investigation, a total of 4252 fishes was captured. *Schizothorax plagiostomus* was the most dominant species at all sites in all the seasons with 87.53% contribution to the total species, followed by *Neolissochilus hexagonolepis* with 3.9%, and *Schizothoraichthys progastus* was 3.15%. *Psilorhynchus pseudecheneis, Barilius barna, Botia lochata, Garra gotyla, Lepidocephalus guntea, Pseudecheneis sulcatus and Puntius conchonius* species were less than 1%. *Oncorhynchus mykiss* was recorded only once with the lowest occurrence of 0.03% (Fig. 2).

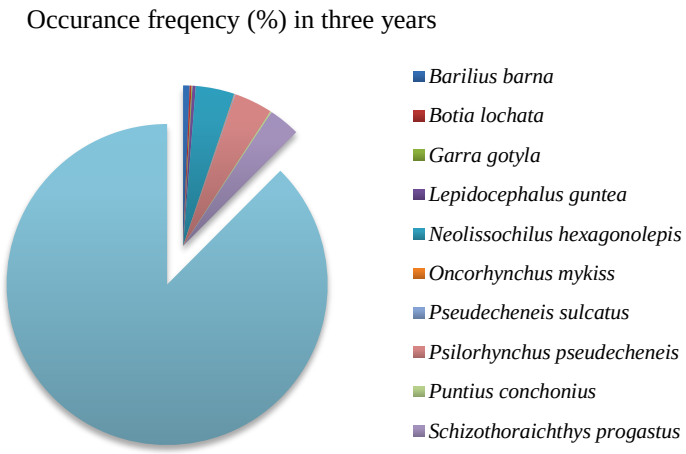

Fig. 2. Occurrence frequency of fish species recorded from Melamchi river during 2011-2013.

Abundance of fish species

Average Abundance

The highest abundance of fishes was recorded 68.97 for *Schizothorax plagiostomus* and the lowest 0.33/10 min for *Oncorhynchus mykiss* at site 3 in the year 2011. The total average abundance (CPUE) of fish species recorded was 63.95, 36.89 and 39.21 in the year 2011, 2012 and 2013, respectively (Fig. 3).

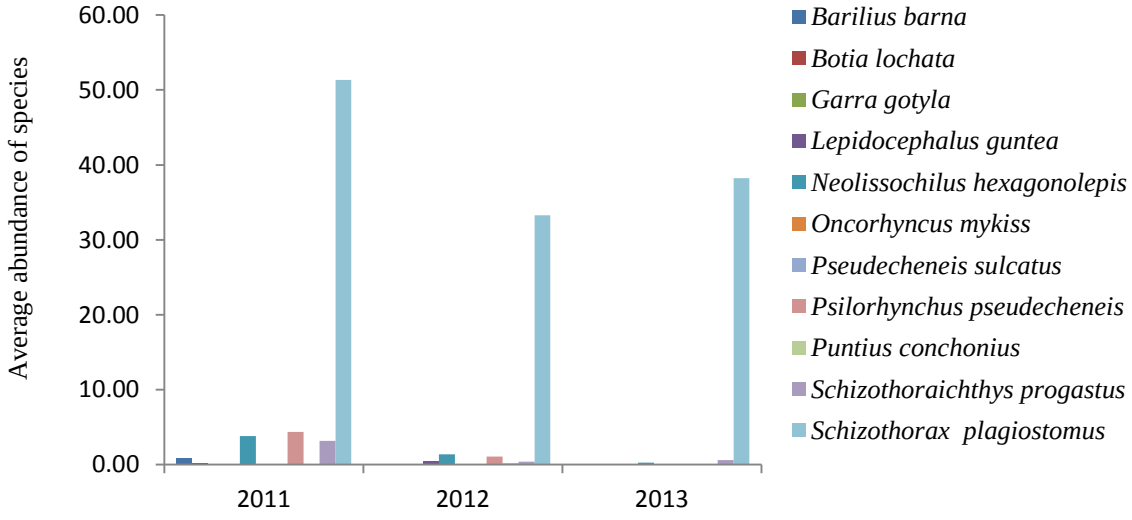

Fig. 3. Average abundance of species Melamchi river in the years from 2011 to 2013.

Spatial distribution of fish species

Four species in the first and second years and only one species in the third year were recorded at site 1 of the river. Out of these, the most common in all seasons was *S. plagiostomus* followed by *P. pseudecheneis. L. guntea* and *P. sulcatus* which were least common. Other common species were *N. hexagonolepis* and *S. progastus* from in the year from 2011 to 2013.

A total of six species in the first year, five species in the second year and two species in the third year was found at the site 2. *S. plagiostomus*, *N. hexagonolepis*, *P. pseudoecheneis* and *S. progastus* were common species in three years. *B. barna and O. mykiss* were recorded only once in first year. *S. plagiostomus* was recorded in all seasons from the years 2011 to 2013. Four species in the first year, three species in the second year and only one species were recorded in the third year at the site 3. *S. plagiostomus*, *N. hexagonolepis*, *P. pseudecheneis* and *S. progastus* were common species in four years. *B. lochata*, *L. guntea*, *G. gotyla*, *P. conchonius*, *P. sulcatus* were less common. *S. plagiostomus* was present in all the seasons from the year 2011 to 2013. Five species in the first year, three species in the second and third years were found at the site 4. S. *plagiostomus*, *N. hexagonolepis* and *P. pseudecheneis* were common. *B. barna* and *N. hexagonolepis* were present in one season; *S. plagiostomus* was present in all the seasons from the year 2011 to 2013. Only two species in the first year and one species of G. *gotyla* was recorded in the second and third years at the site 5.

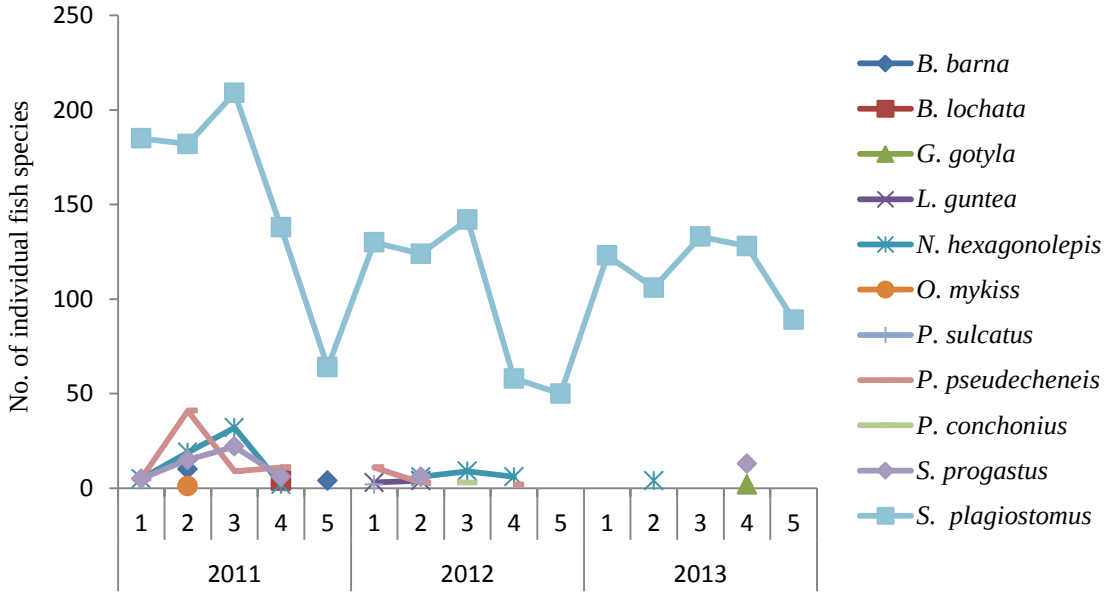

Fig. 4. Spatial abundance of Fish species of Melamchi river.

Temporal abundance of fish species

Temporal abundance of the examined fish species has been categorized under three seasonal durations, viz. pre-monsoon category, per-monsoon category and post-monsoon category.

In the pre-monsoon capture, total five species were recorded during three year (2011-2013) study period. The species were *L. guntea, N. hexagonolepis, P. pseudecheneis, S. progastus*, and *S. plagiostomus*. Among the species recorded, four species were recorded in the 1st year (2011), two in the 2nd year (2012) and two in the 3rd year (2013) of the experiment. Of the recorded species, it was found that *S. plagiostomus, P. pseudecheneis* and *S. progastus* were more abundant in number; and *N. hexagonolepis* and *L. guntea* were less abundant (Fig. 5).

In the per-monsoon capture, total seven species were recorded during the study period. The species were *B. barna*, *L. guntea*, *N. hexagonolepis*, *P. conchonius*, *P. pseudecheneis*, *S. plagiostomus* and *S. progastus*. Among captured species, *S. plagiostomus* and *N. hexagonolepis* were most abundant; and the species *P. conchonius* and *L. guntea* were very rare and were recorded only once in the second year (2012).

In post-monsoon capture, nine species (viz. *B. barna*, *B. lochata*, *G. gotyla*, *N. hexagonolepis*, *O. mykiss*, *P. pseudecheneis*, *P. sulcatus*, *S. plagiostomus* and *S. progastus*) were recorded during the total experimental period. The species *S. plagiostomus* was the most abundant whereas *O. mykiss* was recorded only once in 2011.

It is to be noted that the species contained captured individuals per species less than 1% have been treated as the least common, whereas, the species contained individuals above than 1% were termed as common species.

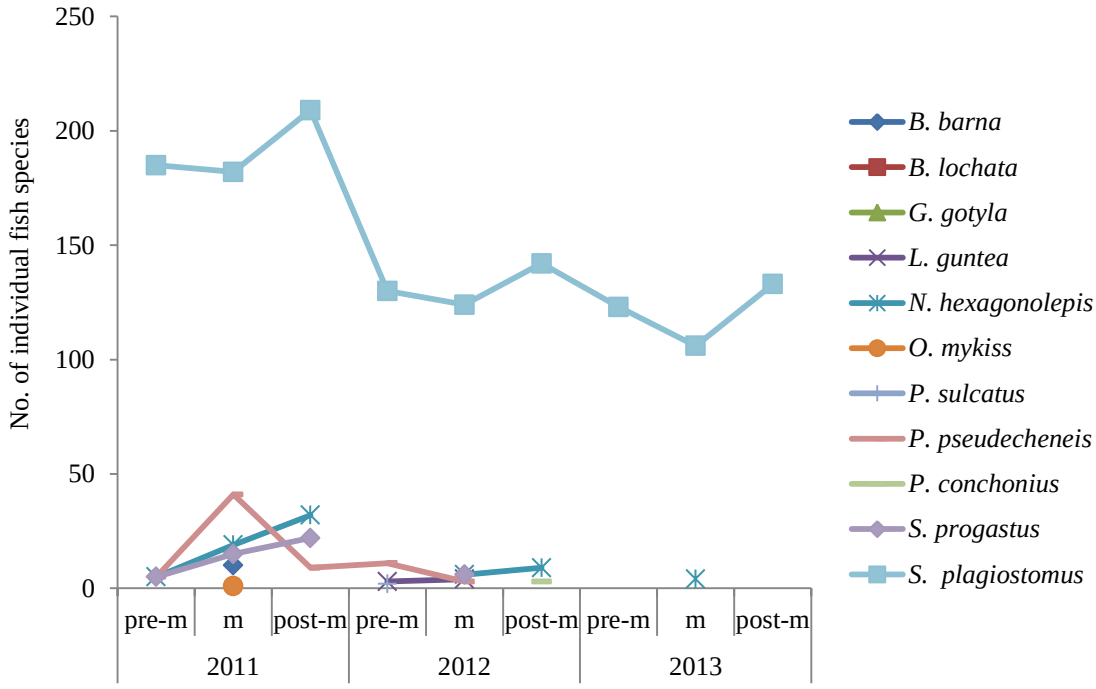

Fig. 5. Temporal abundance of Fish species in Melamchi river

During this study, three species were common in four sites. They were *N. hexagonolepis*, *S. progastus* and *P. Pseudeheneis.* Maximum number of fish species was found at Gyalthum (site 3) while minimum number was recorded at Timbu (site 1). The highest total abundance recorded was 63.95, 36.89 and 39.21 (%), during the study period 2011-2013, respectively. The highest total abundance in Gyalthum is probably an indication of the entry of fishes through Gyalthum stream and suitable habitat. Variation in number and diversity might have occurred due to mixing of other tributaries of Melamchi river. No new record of fish was found in the present study. Average temporal abundance was higher in monsoon; maximum five species were recorded in monsoon in the year 2011 and minimum two in post-

monsoon in 2013. The most common species was *S. plagiostomus* whereas *O. mykiss* appeared to be least in post-monsoon, which might have come possibly with rainwater and not a common species in this River. SMEC (1992) reported 31 species from Melamchi river and its tributaries. BPC (1996) reported 43 species from Melamchi river. Sapkota (1998) reported 43 fish species from Melamchi river, and 23 between Yangri/Melachi confluence downstream and Melamchi/Indrawati confluence. EMP/MWSP (2009) reported 51 species from the water body. The researchers did not point the abundances (as indicated in the present paper) of the species in different seasons of the year; and even not recorded on the consequent for three years. In the present study, the experiment was concluded to evaluate the species (of 11 species) abundance from the three dimensions like, elevation, seasonality and years. The fish species of the river is under threat due to several anthropogenic factors including habitat degradation, pollution and irrational fishing. The lowest species abundance in Talamarang and Pulbazar indicated unfavorable habitat. Illegal fishing, on large scale, was found in this area. High altitude and low temperature might be a cause of less number of fish species in Timbu. Variability in physio-chemical factors, dynamite blast at project sites for construction of tunnel, debris flow and landslide might be other factors in the decrease of abundance and diversity.

It is observed that there was reduction in the number of fish species from 11 species to four species during the years from 2011 to 2013. The most common species was *S. plagiostomus,* recorded at all sites in all seasons. An increase in average abundance of this species was found. Considerable proportion of local people was meeting their own requirement of fish by own catch. Over fishing occurred due to high fish prized species. Fish fauna of this region supports the livelihood of several economic classes. Adequate steps to design, recommend and implement conservation action plans, focusing sustainable management of the fishery sector to boost up the economy of the nation are recommended.

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