



Fish Diversity in the Narayani River

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Abstract

The present study "**Fish diversity in Narayani river**" was conducted to understand the fish diversity of Narayani River in winter season. Altogether 14 species of fishes belonging to Cypriniformes order, 6 families and 10 genera. The fish species was recorded highest in station Narayanghat and low in station Devghat respectively. The study revealed that majority of fish species belonged to the family Cyprinidae.

Most of the fishing appliance and method used were found seasonal, only cast net and hook was noted to be used all throughout the year. According to the fisherman Fish population in Narayani river was declining day by day due to various activities such as stone mining, regular fishing and illegal methods of fishing etc.

Keywords : *Fish, Diversity, Narayani river, species*

INTRODUCTION

1.1 Background

Nepal has rich fresh water sources, which constitute snow-fed rivers, lakes and torrential hill streams and slow moving rivers. There are more than 6000 rivers covering 25000 km in total length (Sharma, 1997; Gubhaju, 2012). The fresh water stretches which cover such an extensive area are of great importance from the point of view of the development of aquaculture, power generation and recreational fisheries (Sharma, 2008). Major river systems of Nepal are Koshi, Gandaki, Kanali and Mahakali which are originated from the Himalayas and flow south. The water surface area of Nepal covers 0.1 percentages of the total world water systems and 0.21 percentage of total global fish diversity (Shrestha, 1995). The river system is one of the major habitats on earth which play the vital role in establishment and maintenance of rich biodiversity (Jha & Bhujel, 2014) Globally, the freshwater fishes belong to 207 families, 2,513 genera and estimated up to 32,500 species, in which 11,952 species are strictly to freshwater environment, and using freshwater 12,457 species (Nelson et al., 2016). Nepal has diverse species of fresh water fishes. As Nepal is about 960 km away from sea, fossils of marine fish are only found in ancient

Tethys and Siwalik zones (Shrestha, 2008). Fresh water of Nepal supports vast array of fish comprising 232 species, many of which have got food, recreational and academic value. Out of the aforementioned figure (232), there are 217 native species and 15 exotic species (Shrestha, 2008). It has been reported that the size of the riverine fishes varies from 280 kg measuring 225cm Gouch or Thend (Sisorid catfish, Bagarius carrellito the smallest (2.5 cm) yellowish-brown fish, Koshi Hara or Datkitari, Haru hara (Shrestha 2008). Other smallest fishes are Pseudambassis lata (3cm). Physoschistura elongate (3.3cm), Brachydaniorerio (4cm) etc (Limbu & Gupta, 2019).

MATERIALS AND METHODS

3.1 Study Area

The present study was done in Narayani River. The main tributaries of Narayani River are Trishuli, Budi Gandaki, Marsyangdi, Seti, Gandaki, Daraudi, Kali Gandaki and Budigandaki river. The present study was confined from Devghat to Golaghat and consists of 4 sampling stations i.e. Devghat, Narayanghat, Shivaghat and Golaghat.

Figure 1: Chitwan district showing different sampling sites of Narayani River

Devghat

It lies at 7km from the city Narayanghat, Devghat is suitable place for sampling and collection of fish species. Devghat is the Kaligandaki junction. The geographical location of Devghat is 27.8002°N and 84.4086°E.

Narayanghat

It is the part of Metropolitan city of Bharatpur in Chitwan district. It lies in the central part of Nepal. The sampling station is suitable for collection of fish species and has high water current. It lies at 27.6989 N and 84.4086E.

Shivaghat

It is the part of the city in Bharatpur which lies 1.4 km away from Narayanghat. The sampling station is suitable for collection of fish species because of high water current. It is located at 27°40'39" N and 84°223.2 E

Golaghat

Golaghat is situated at 26.5239° N and 93.9623° E. It lies in Meghauli village. It is located at the distance of 28.2 km from Narayanghat. It is the last sampling station.

3.2 Study period

The present field studies were conducted from November to January. During this time, the field visit was made for once in thirty days for each sampling station. Sample was collected during this visit.

3.3 Methods

3.3.1 Sources of data collection

Both Primary and secondary data were collected from different study sites during this study. Primary data were collected directly from the field visit, fisherman and interview. The secondary data were collected from different published and unpublished literature.

3.3.2 Fish collection and identification

The fishes were collected from November to January from each sampling sites. The fishes were collected from the fisher man from each sampling sites. Different types of fishing gear such as cast net, gill net and fishing traps were used for the collection of fish specimens from these localities. The large fish were measured and recorded their fin formula and all other information and then photographed.

3.3.3 Measurements of fish for fish identification

- 1) Fin rays: fin rays of each fins (Dorsal, Pelvic, Ventral, Anal and caudal) were counted by the help of forceps for the identification.
 - a. Hard rays (written in roman number as bold)
 - b. Soft rays (written as Arabic number)
- 2) Number of scales:
 - a. Along the lateral line
 - b. From the base of the dorsal fin to downwards anteriorly in the same oblique line up to ventral surface.
- 3) Number of barbels: These were counted with the forceps with pointed tip.

3.3.4 Fish identification

All the collected fishes were preserved at 10% formaldehyde. At first collected fishes were sorted according to their similarities and dissimilarities, First segregation was made by the presence or absence of scales on the body. In the case of those with scales, fishes were separated into different lots according to their body shape, number and length of fins. Likewise, in case of scale less fishes (i.e. catfishes), these were separated according to the total number of barbells in them (like one, two or four pairs). The fish were identified by using standard literature after Shrestha (2008), Shrestha (1995) and Jayaram (2006). The identified specimen was preserved and kept with proper labeling in the laboratory Department of Zoology of Birendra Multiple Campus.

RESULTS

4.1 Fish diversity in Narayani River

Fourteen different species of fishes belonging to Cypriniformes order, 4 families and 9 genera. The study showed highest diversity of fish in Narayanghat station and lowest in Devghat station . The dominant family of fishes in Narayani river belong to Cyprinidae family.

Table 2: Fish species recorded in Devghat to Gholaghat section of Narayani river

SN	Family	Scientific Name	Local Name	Status
1	Cyprinidae	<i>Barilius barila</i>	Chahale	Rare
		<i>Barilius vagra</i>	Faketa	common
		<i>Barilius jalkapoorei</i>	Jalkapoor	rare
		<i>Garra gotyla</i>	Buduna	resident
		<i>Garra annandalei</i>	Lohari	resident
		<i>Labeo dero</i>	Gardi	common
		<i>Tor tor</i>	Sahar	rare
2	Cobitidae	<i>Botia lohachata</i>	Baghi	Rare
		<i>Noemacheilus rupicola</i>	Gadela	rare
3	Sisoridae	<i>Glyptothorax telchitta</i>	Katenga	common
		<i>Glyptothorax cavia</i>	Vedro	common
		<i>Pseudechenesis sulcatus</i>	kabre	common
4	Schilbeidae	<i>Clupisoma garua</i>	Jalkapur	common
		<i>Pseudeutropius murius</i>	Jalkapur	common

4.1.1 Measurement of fishes.

Fishes belonged to different measurement like length and weight.

Table No. 3 Measurement of fishes

SN	Name of fishes	Length	Weight
1	<i>Barilius barila</i>	18cm	24.6gm
2	<i>Barilius vagra</i>	9cm	25gm
3	<i>Barilius jalkapoorei</i>	25cm	48.6gm
4	<i>Garra gotyla</i>	16cm	22.3gm
5	<i>Garra annandalei</i>	10cm	15gm
6	<i>Labeo dero</i>	14cm	30.35gm
7	<i>Tor tor</i>	19cm	48gm
8	<i>Botia lohachata</i>	12cm	17.7gm
9	<i>Noemacheilus rupicola</i>	6.5cm	11.6gm
10	<i>Glyptothorax telchitta</i>	11cm	10.25gm
11	<i>Glyptothorax cavia</i>	10cm	16cm
12	<i>Pseudechenesis sulcatus</i>	12cm	12.4gm
13	<i>Clupisoma garua</i>	27cm	83.8gm
14	<i>Pseudeutropius murius</i>	17.5cm	52gm

4.1.2 Family wise fish composition:

Fishes belonged to different families like, Cyprinidae (50%) , Cobitidae (14.29%) , Sisoridae (21.43%) and Schilbeidae (14.29%) of fish species out of 14 fishes catch.

Table No.4: Families wise fish composition:

Fishes family	Percentage
Cyprinidae	50%
Sisoridae	21.43%
Cobitidae	14.29%
Schilbeidae	14.29%

Fig: 2 Family wise fishes composition

Graph 1: Station and recorded species

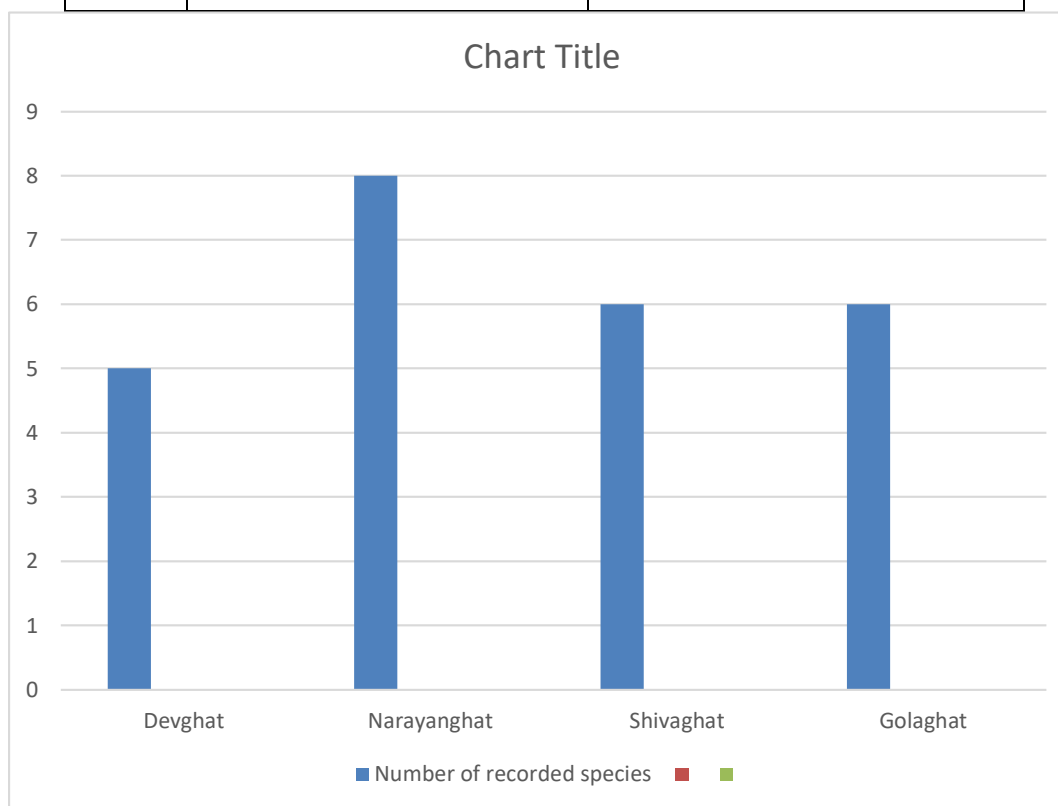
14 fish species were recorded from the four sampling stations. The number of fish species obtained from second sampling station i.e. Narayanghat is highest i.e. 8 species were recorded from here, followed by Shivaghat where 6 species fish were recorded. From Golaghat 6 sample of fishes collected and from Devghat 5 species were collected.

Table No. 5 Station and number of recorded species

SN	Name of fishes	station I			station II			station III			station IV		
		Devghat			Narayanghat			Shivaghat			Golaghat		
		Nov	Dec	Jan	Nov	Dec	Jan	Nov	Dec	Jan	Nov	Dec	Jan
1	<i>Barilius barila</i>	3	1	–	2	1	–	–	–	–	–	2	–
2	<i>Barilius vagra</i>	1	2	1	4	2	2	–	–	–	3	1	–
3	<i>Barilius jalkapoorei</i>	2	1	1	3	5	2	–	–	–	2	3	1
4	<i>Garra gotyla</i>	–	–	–	–	1	–	–	–	–	–	–	–
5	<i>Garra annandelei</i>	–	–	–	–	–	–	–	2	–	–	–	–
6	<i>Labeo dero</i>	–	–	–	3	–	1	–	–	–	1	–	–
7	<i>Botia lohachata</i>	–	–	–	–	–	–	4	4	1	–	–	–
8	<i>Noemacheilus rupicola</i>	–	–	–	–	–	–	2	4	3	–	–	–
9	<i>Glyptothorax telchitta</i>	–	–	–	–	–	–	21	16	25	–	–	–
10	<i>Glyptothorax cavia</i>	–	–	–	–	–	–	–	1	–	–	–	–
11	<i>Pseudecheneis sulcatus</i>	–	–	–	–	–	–	14	8	10	–	–	–
12	<i>Clupisoma garua</i>	2	–	–	3	3	2	–	–	–	4	6	2
13	<i>Pseudeutropius murius</i>	–	–	–	–	1	–	–	–	–	–	–	–
14	<i>Tor tor</i>	4	2	–	–	2	1	–	–	–	–	–	–

Table No 6: Total recorded species in three month at per station.

<i>S.No.</i>	<i>Name of Station</i>	<i>Number of recorded species</i>
<i>1</i>	<i>Devghat</i>	<i>5</i>
<i>2</i>	<i>Narayanghat</i>	<i>8</i>
<i>3</i>	<i>Shivaghat</i>	<i>6</i>
<i>4</i>	<i>Golaghat</i>	<i>6</i>

**Figure No.3 Total recorded fish species in per station.**

4.1.4 Ecology and behavior of some important fishes of Narayani river

Fourteen species of fishes were collected from different sampling station of Narayani river. The important features and behavior of this species are described below :

1. *Barilius barila*:

Barilius barila is commonly known as 'Chahale'. The colour of the body is silvery on sides and belly. The dorsal part of the body is darker. 11-12 vertical darker bands are present in whole length of the body but it is not extended upto lateral line. The maximum size of the this fish species is 125mm. It is found upto the altitudinal range of 1424m.

Fin formula: D9(2/7), P13,V9,A13,C19,L₁43 L.tr.7/5, TL=18cm

2. *Barilius vagra*:

Barilius vagra is commonly known as 'Faketa'. The mouth cleft is extended upto middle of eye . Short 8-13 vertical bands throughout body not reaching upto lateral line . Silvery white in colour. The maximum size of this fish species is 152mm. It is found upto the altitudinal range of 1500m.

Fin formula: $D9(2/7), P16, V9, A13, C19, L_L42, L.tr.8/4 TL=9cm$

3. *Barilius jalkapoorei*:

Barilius jalkapoorei is commonly known as 'Jalkapoor'. The shape of body is slender ,elongated with a pair of small maxillary barbells. Fish have black blotches along the body. The maximum size of this fish species is 305mm. It is found up to the altitudinal range of 1500m.

Fin formula: $D10(3/7), P13, A13(3/10), V9, C19, L_L88, L.tr 15/9 TL=25cm$

4. *Garra gotyla*:

Garra gotyla commonly known as 'Buduna'. The snout with a deep groove and tubercles. In this species of fishes having disc is rounded and large. Generally , body colour is black with greenish tinge. A black dot is behind the gill opening. Dark bands are having in caudal fin. The maximum size of this species of fish is 150mm. It is found upto the altitudinal range of 1372m.

Fin formula: $D11(3/8), P15, V9, A7(2/5), C17, L_L35, L.tr.4/5 TL=16cm$

5. *Garra annandalei*:

Garra annandalei is commonly known as ' Lohari'. It have snout is smooth , groove and tubercles is absent. Ventral disc is small and oval. The colour of the body is black with greenish tinge. The maximum size of this species of fish is 150mm. It is found upto the altitudinal range of 1650m.

Fin formula: $D11(3/7), P15, V8, A7(2/5), C17, L_L33, L.tr.3/3 TL=10cm$

6. *Labeo dero*:

Labeo dero in commonly known as 'Gardi'. It possesses deep groove across snout and covered with pores without any lateral label and with a short maxillary barbell. Generally, the colour of the body is silvery color on sides and belly. Fins are tinged with red. The maximum size of this species of fish is 300mm. It is found upto the altitudinal range of 135- 1424m. It is important food fish.

Fin formula: $D12(3/9), P16, V9, A8, C19, L_L38, L.tr.8/6 TL=14cm$

7. *Botia lohachata*:

Botia lohachata is commonly known as 'Baghi'. It have pointed mouse like head. Broad caudal peduncle and distinct dark 'V' shaped bands on yellow ground of body. Two spots posterior to eye. Fins with black stripes. The maximum size of this species of fish is 100mm. It is found upto the altitudinal range 190m.

Fin formula: D11(2/9),P14,V8,A7(2/5),C19, TL=12cm

8. *Noemacheilus rupicola*:

Noemacheilus rupicola is commonly known as ' Gadela'. It have slender body, broad snout. Body colour is yellowish with dark vertical bands on the whole body length. A black spot in second ray of the dorsal fin. Another dark band present in the middle of the same fin. The maximum size of the this species of fish is 100mm. It is found upto the altitudinal range of 1372m.

Fin formula:D(1/8),P10,A5,V7,TL=6.5cm

9. *Glyptothorax telchitta*:

Glyptothorax telchitta is commonly known as ' Katenga'. It have two yellow patches on either side of origin of dorsal fin. Similar to *Pseudecheneis sulcatus* but differs in structure of Adhesive disc and presence of minute tubercles throughout body. Generally body colour is darkish brown on dorsal and lateral sides, belly is dirty yellow . Fins with dotted bands. Skin is rough with horny tubercles. The maximum size of this species of fish is 125mm. It is found up to the altitudinal range 1650m.

Fin formula: D1/6,P10,V6,A12,C18, TL=11cm

10. *Glyptothorax cavia* :

Glyptothorax cavia is commonly known as ' Vedro'. This species possess smoth head, osseous pectoral spine, fin tip not being produced into long filament. Barbels is four pair. Generally, body colour is muddy on dorsal side with many black dots and patches throughout body and head . Lower surface of head and body is yellowish. Fins are tinged with black dots. The maximum size of this species of fish is 175mm. It is found up to the altitudinal range 1067m.

Finformula:D1/6,P9,V6,A9,C17,TL=10cm

11. *Pseudecheneis sulcatus*:

Pseudecheneis sulcatus commonly known as 'Kabre'. It have conical tapering body. Adhesive apparatus of 16 transverse folds on thorax. Paired fins are large and expanded. Body colour is grayish brown with about four

prominent patches on sides above lateral line. A narrow yellow longitudinal band beginning from posterior end of head to the caudal base. Several other irregular patches scattered on body. Fins with black and yellow patches and tinged with red orange colour is plaited fin ray of ventral fin. The maximum size of this species of fish is 175mm. It is found up to the altitudinal range of 1650m.

Fin formula: D1/6,P12,V6,A11,C17,TL=12cm

12. *Clupisoma garua*:

Clupisoma garua is commonly known as 'Jalkapur'. It have dorsal fin with a slender spine serrated minutely and internally. Dorsal fin is absent in adult but present in young. Caudal fin is deeply forked. Lower lobe is longer. The colour of body is silvery grey above and lighter below. Fins are tinged grey. The maximum size of this species of fish is 609mm. It is found upto the altitudinal range of 570m.

Fin formula: D1/6,A3/28,P11,V5,C17,TL=27cm

13. *Pseudeutropius murius*:

Pseudeutropius murius is commonly known as 'Jalkapur'. It is elongated naked fish. It have four pairs of barbells. Maxillary barbells is reaching up to tip of pectoral fin. Upper jaw is longer than lower jaw. It have snout is pointed and caudal fin is deeply forked. Generally, the colour of body is uniform silvery on sides and below with yellowish tinge. The maximum size of this species of fish is 300mm. It is found upto the altitudinal range 570m.

Fin formula :D1/7,A38,V5,P10,C17,TL=17.5cm

14. *Tor tor*

Tor tor is commonly known as 'Sahar'. It is important food and game fish. The body of this fish is deep and dorsal side is more convex. The body colour is dark grey with greenish tinge along upper half of body. The sides are slightly golden. The lower fins are reddish orange and dorsal fins are slightly dark. The maximum size of this species of fish is 1200mm. It is found up to the altitudinal range of 135-1424m.

Fin formula: D12(3/9),P17,V9,A7,L_L25,L.tr.9/2, TL=19cm

Discussion

In the present study, 14 species of fishes were recorded among which 7 were common. The common species were *Barilius Vagra*, *Labeo dero*, *Glyptothorax telchitta*, *Glyptothorax cavia*, *pseudechenesis sulcatus*, *Clupisoma garva* and *pseudeutropius murius*. 2 of the species were resident i.e. *Garra gotyla* and *Garra anandalei*. And remaining 5 of the species are rare i.e. *Barilius barila*, *Barilius jalkapoorei*, *Tor tor*, *Botia lohachata* and *Noenacheilus rupicola* in Narayani river.

In Narayani river fishes belong to order Cypriniforms and family Cypridae were dominant. Edd(1886) also reported the order cyprinoformes common order of Kaligandaki and Narayani rivers. Shrestha(1996), Karki(2000) and Bajracharya (2001) had also found that Cyprinidae as common family Tinau, Karnali , Sunkoshi and Bhotekoshi rivers repectively.

The number of fish species obtained from second sampling station i.e. Narayanghat is highest i.e. 8 species were recorded from here ,followed by Shivaghat where 6 species fish were recorded. From Golaghat 6 sample of fishes collected and from devghat 5 species were collected.

Different types of fishing methods were used for collection of these species. It was observed by the local fisherman were using cast net, gill net, hook and line to capture the fish. Some people were also found using inappropriate mesh sizes nets. Along with this people were also catching fish during fish breeding season. Result has shown that many of fish habitat has been destroyed because of fishing during inappropriate time. There has directly been over exploitation of fish resources . As a result, Fish species have been decreasing by certain number and the past studies shows that this process is continued to take place. The main reason for observing such small fish numbers was also because of winter season. Because of extreme coldness, it became a difficult task for local fisherman to catch the fish. Past studies on the fish diversity on the Narayani river also shows that the number of fish species collected during winter season was less than the one collected during summer season.

Conclusion and recommendation

The status of fish in Narayani river was studied for the period of three month from November to January covering four different sampling stations. Information was collected on species composition, local names and location of catch different species from all stations. A total of 14 species of fish fauna was collected from the different station of Narayani river belonging to 1 order , 4 families, 14 species and 10 genera. Fish was not uniformly distributed but was influenced by velocity of water, water temperature and PH of water. The fishes of Narayani river were biologically diverse. Different species were found in different stations.

The study of fish diversity has showed that aquatic life style of fish has been highly affected because of landslide, soil erosion and human activities like road detergent, extraction of stone and sand. Government should take necessary actions for planning and control of over and illegal use of fish species before this issue become a threat on a national level.

Fish catches in the Narayani River have been declining because of the use of illegal fishing methods such as poisoning and fishing for brood stocks, controls should be imposed on illegal fishing practices and a fish sanctuary establish. The deep water pools of the Narayani and their feeder streams should be declared fish sanctuaries for the protection of spawners.

The Narayani catchment has been subject to deforestation, resulting in erosion and silting of streams and rivers. There is a need for land rehabilitation measures to be urgently implemented in the watershed. The incidence of water pollutions is increasing in the lower reaches of the river due to the discharges of industrial waste and the illegal use of insecticides, pesticides and pesticides. Control over such activities must be strictly enforced.

Habitat improvement is an essential factor for fishery improvement. To avoid seasonal changes of water level, suitable pools should be created under the management of the local development authority. Such a practice will improve the fish habitat quality and avoid the winter desiccation.

Protection of fish stocks and fishery regulation should be based on periodic assessments of fish stocks. It is high time to enforce the existing fishery law and to restrict the use of nets with less than 2 cm mesh size. In the lower stretches of the Narayani river fish fry is collected for commercial purposes. There is a need for restriction of this practice.

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