



Biology of some Major Freshwater Fishes from Gomti River, Lucknow, U.P

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Abstract

The aim is to analyse the biology of freshwater fishes that are found in gomti riverfront, Lucknow. In fishes, alterations to the natural flow regime are associated with divergence in body shape morphology compared with individuals from unaltered habitats. However, it is unclear whether this morphological divergence is attributable to evolutionary responses to modified flows, or is a result of phenotypic plasticity. Fishes inhabiting arid regions are ideal candidates for studying morphological plasticity as they are frequently exposed to extreme natural hydrological variability. Freshwater fishes are one of the great natural resources of the world, but anthropogenic activities have adversely affected aquatic ecosystems and many species are threatened with extinction. Additionally, fish living in lentic waters tended to have a shorter and fatter body shape compared to those living in lotic waters. This could be attributed to differences in swimming behaviour in these environments.

Keywords: Freshwater fishes, Gomti River, Biology, Aquatic, Swimming behavior.

Introduction

In recent years, it was realized that the fish and freshwaters are one of the most vulnerable resources in nature that have been heavily impacted by human usage and regulation. Uttar Pradesh, one of the largest states in India, has vast potential of aquatic bio resources and offers considerable scope of inland fisheries development and aquaculture. Riverine ecosystem of India have suffered from intense human intervention resulting in habitat loss and

degradation and as a consequence many freshwater fish species have become heavily endangered, particular in Gomti where heavy demand is placed on fresh water. This was coupled with irreversible changes in natural population by introductions of exotic species and diseases (Dudgeon et al.2005; Arthington and Welcomme 1995; Arthington et al. 2004; De Silva and Abery 2007). The fisheries sector in India has third in the world in total fish production and contributes around 1.07 % of the country's GDP and 5.34% of the agricultural GDP. With the

third position in fisheries, the country has high potential in this sector for rural development, nutritional security and employment generation (Prakash, 2021; Singh and Prakash, 2022). Uttar Pradesh, one of the largest states in India, has vast potential of aquatic freshwater resources and offers a considerable scope of culture as well as capture fisheries development. The current assessment of the rivers of Uttar Pradesh reveals about a total biodiversity 124 species 74 genera and 28 families. This diversity has contributed of about 14.11% of the India's freshwater fish diversity. River Gomti showed a total species diversity of 68 species which is higher than the earlier reported 56 species by Sarkar et al., 2010. Uttar Pradesh (UP) is the most populated state and blessed with vast potential of aquatic bio resources that exhibit rich genetic and vivid freshwater fish diversity. UP contributes nearly 14.68% of Indian fish biodiversity and offers considerable scope for inland fisheries development and aquaculture (Lakra 2010). Biodiversity is the core issue of the 21st century (Wilson 2000, Kumar and Khanna 2006) and loss of biodiversity is one of the world's most pressing crises. The estimated current species extinction rate is between 1,000 and 10,000 times higher than it would naturally be (Bowker 2005). India contributes 60–70% of the world's biological resources and is one among 12 biodiversity countries and 25 hotspots of the richest and highly endangered eco regions of the world (Mayers et al. 2000). One of the tributary of the river Ganga is the Gomti, which flows about 12 km through Lucknow city, capital of Uttar Pradesh. The river Gomti is the main source of water for people of Lucknow. The river starts from a natural lake 'Fulhar Jheel' in the forested region near to Pilibhit town in Uttar Pradesh, around 50 km south of the Himalayan foothills. The river moving through the central and eastern segment of Uttar Pradesh navigates an add up to division of around 730 km before finally merging with the Ganga River close to Varanasi. Sai, Reth, Luni, Kalyani, Kathna and Sarayan rivers are the tributaries of the Gomti River. The River receives unprocessed sewage of 26 drains in the Lucknow area. Earlier to Lucknow, Gomti also receives wastes from industries of Sitapur. It is well known

now that Gomti River is highly polluted. As per the report of Uttar Pradesh Pollution Control Board (UPPCB), flow of Gomti has much decreased and because of this biomass on the waterway has increased. Freshwater fishes are the most diverse and also highly threatened of all vertebrate group. Apart from pollution exotic fishes are also supposed to be potential threat for the biodiversity of this river. This is need of the hour to maintain the record of all fish diversity. Moreover, update a record of already identified species is also required.

The fishes that are more found in Gomti River are- *Rohu*, *Catla*, *wallago attu*, *channa punctatus*, *Heteropneustes fossilis*, etc. The different species are taken here to study their biological activities so that we come to know that what environment they required for their survival, their feeding habits, their life cycle etc.

Materials and Methods

Study Area-

Gomti Riverfront, (G.P.S. coordinates of 26° 51' 44.6760" N and 81° 1' 13.2528" E), (image 1) spread over 2 km along the banks of the Gomti River, its major attraction is the musical fountain, which is huge and can be seen from both sides of the river. Surrounded by greenery, and is spread over an area of more than 2 km (Image 2). There are many types of trees in the wetland, in which the chirping of birds fascinates the visitors.

Field methods-

Fishes were caught and collected for the present study from local freshwater bodies by hand-nets, gill nets, cast nets, hooks, drag nets with the help of local people and fisherman mainly during the time of fishing as well as also collected from local fish market. Investigations regarding fish capture and collection were conducted from the month of April to the July, 2023 (Krishna, 2022).

Fishes were identified with the help of its shape, colour, the pattern of scales, fins, mouth pattern and other morphological characters and after

following standard taxonomic keys for fishes (Day, 1889; Datta Munshi and Srivastava, 1988; Menon, 1992; Srivastava, 2002; and Jayaram, 2010).



Image.1 Gomti river front satellite view



Image 2: Gomti River Front

Observation and Results

1. *Labeorohita*- *Labeo rohita* is commonly known as rui, rohit, rohu and it belongs to family Cyprinidae, order Cypriniformes, is a warm-water teleost and column feeder herbivore showing rapid growth in terms of flesh.

It is one of the most important Indian Major carps (IMC) in carp polyculture practice. This IndoGangetic riverine species is distributed throughout South Asia, South-East Asia, Sri Lanka, the former USSR, Japan, China, Philippines, Malaysia, Nepal and some countries of Africa. Information on its culture is available only from the early part of the 20th century.

It can be identified by its fairly depressed snout, thick and fringed lips. Body colour of rohu is black brownish with silvery sides and beneath while caudal peduncle is generally short. The length of rohu fish is 0.4 m and the weight is of 6 Kg. Body of rohu is divisible into head, trunk and tail. Snout is depressed and short (Plate1(1), (Table1). Mouth is sub terminal. At the corners of Mouth thread like small, sensory maxillary barbels are present. Pair of small nostrils are present on the snout dorsally. Eyes on head are without eyelids but they are protected by a transparent protective membrane. Behind the eyes a large bony gill cover or operculum is found in rohu. The scales of *L. rohita* are of typical cycloid type. An over-all depiction of growth increment of *L. rohita* has been estimated by the study of its scales.

According to khan, et. al., body colour of rohu is greying or blackish on the back. Alternate opaque and translucent zones were clearly recorded in the scales (Dwivedi, et. al.). In India, *L. rohita* was introduced into almost all riverine systems and now occupies a central position in polyculture of fish in ponds (Majumder, et. al, 2018). Caudal peduncle is generally short (Sharma, et. al, 2018). Fridmont, 1995 saw the maximum length upto 200 cm and weight of 45 kg. Reported age of 10 years (khan ang Jhingran, 1975).

2. *Catla catla*- *Catla catla* is commonly known as Katla, bhakur and boassa and it belongs to the family Cyprinidae, order Cypriniformes. It is a fresh-water, brackish, benthopelagic and potamodromous.

It is abundantly found in Buriganga, Padma, Meghna and other principal riverals of Bangladesh, Nepal, Pakistan, India and Sri Lanka. It is an important commercial cultured fish species.

It can be identified as short body and deep. It have distinct looks with large and broad head. They have a large protruding lower jaw, and upturned mouth. Scales of these fish are large and they have greyish scales on their dorsal side. The scales are whitish on their belly. Their body is short and deep, somewhat literally compressed. Their eyes are large and visible from underside of the head. Lower lip of the Catla fish is very thick, and the upper lip is absent. Their anal fin is short, dorsal fin inserted slightly in advance of pelvic fins. The caudal fin is forked, and the pectoral fins are long extending to pelvic fins. The Fish is of 2 Kg and length is around 1 m. Its body is slender with a deep belly and a slightly curved body. Its body is silver in colour, with a golden hue on its fins and tail (Plate1(2),(Table1). The fish has a large, scale less head with a prominent forehead. *Catla* fish usually spawns during the monsoon season, when water levels in rivers and lakes are high. The female *Catla* fish can lay up to 5 lakh eggs during each spawning season.

Catla naturally found in rivers, lakes and culture farms and ponds (Jhingran, 1968). This fish has extreme market place demand (Bhuiyan and Islam, 1990). It is the fastest growing species (Nihar Ranjan chattopadhaya, 2017).

3. *Channa punctatus*- It is commonly known as Girohi and girai and it belongs to the family Channidae, order Anabantiformes. It is a freshwater, brackish, benthopelagic and potamodromous. It prefers muddy bottom with thick aquatic vegetation. It is usually carnivorous and eats other small fishes and small aquatic

animals. Fish is notable for migration over-land from one pond to another during rains.

It is distributed throughout the Indian subcontinent and nearby areas, ranging across Afghanistan, Pakistan, India, Sri Lanka, Nepal, Bangladesh, Myanmar and Tibet. It is a food of high food value and has little as aquarium fish.

It can be identified as having elongated and cylindrical body. Eyes comparatively small and located anterior part of head. Lower jaw slightly protruding. No barbels. Scales large. Pectoral just above pelvic, caudal large and rounded. Scales on lateral line. Body colour, generally yellowish to brown on back and lighter below. The length of *Channa punctatus* is 36 cm with the weight of 8.2 gm. A series of about 8-9 vertical bands above lateral line are seen. Mouth is bounded by upper and lower jaws. Jaws are provided with sharp conical teeth. (Plate 1(3), Table 1). The buccal cavity is spacious and leads into a short tubular oesophagus. Stomach is an elongated sac-like structure. The most important feature to note in the digestive system of *C. punctatus* is the presence of only two pyloric caeca. Sexes are separate. Gonads exhibit seasonal variation and attain maximum size during breeding season.

According to Bhuiyan, 1964, head of *C. punctatus* is 3.3-3.9 of TL and 2.7-3.3 of SL and eye diameter 6.2-8.5 of HL. Pelvic is about 75% of pectoral fin length (Talwar and Jhingran, 1991), 40-41 (Rahman, 1989 and 2005), 37-40 (Talwar and Jhingran, 1991; Shafi and Quddus, 2001). Vertical bands alternating with a similar series below it (Rahman 1989 and 2005). In some species numerous black spots on body, dorsal fin, anal fin and caudal fin (Talwar and Jhingran, 1991). Dorsal, anal, and caudal fins are dark grey (Talwar and Jhingran, 1991).

4. *Heteropneustes fossilis*- *H. fossilis* commonly known as Singhi and belongs to family Heteropneustidae, order siluriformes. It is highly regarded for its food value. It is fresh and brackish water. This fish is a seasonal breeder. It has a high protein content, low in fat and has very high iron content.

It is abundantly found in India, Bangladesh, Pakistan, Nepal, and Bhutan. It is having a great demand because of its medicinal value.

Body elongate and compressed. Depressed head covered with osseous plate at top and sides of the head. Barbels four pairs in which maxillary pairs extend to end of pectorals or to commencement to anal and mandibular pairs extend upto base of pelvics but nasal pair considerably shorter than mandibular pairs. A pair of accessory respiratory organ (air sacs) which extends backwards from the gill-chamber on either side of vertebral column. Body colour reddish brown or purplish brown but in mature stage of specimens it shows black in colour (Plate 1(4), Table 1). *H. fossilis* attains gonadal maturity at the end of its first year. The fish found in Gomti river was about 0.3 m of length having the weight of 20 gm.

Caudal rounded (Bloch, 1974). Head 6.0-6.5, ht. 5.8-6.3, eye 6.0-9.5, snout 2.6-3.4 (Rahman, 1989). 226 mg iron is present in 100 gm. of tissue (Anonymous 1982). Length 12 cm (Dutta Munshi & Hughes 1992). Recommended for patients after recovery from malaria (Bhuiyan, 1964). It has very demanded because of its medicinal value (Talwar and Jhingran, 1991). Seeds are only available during spawning season (Tiwari, et al., 1998). Fertilized eggs are green (Bhuiyan, 1964), adhesive, demersal and spherical in form (Talwar and Jhingran, 1991). It can inflict painful wounds with its pectoral spines (Talwar and Jhingran, 1991). Fecundity was measured 2,843 to 44,724 (Shafi and Quddus, 2001).

5. *Mystus tengara*- It is commonly known as tegan and tengara belongs to the family Bagridae, order Siluriformes. It is freshwater and dermal. It is found in flowing and standing waters, canals, hoars etc.

Its distribution extending from north east India to West Bengal, North India, Central India, Northern Peninsular India and Bangladesh.

This fish is omnivorous. They feed on plankton, algae, worms, and other smaller fishes. Body elongated and slightly compressed.

Head depressed. Dorsal spine long upto head keep out the head. Pectoral spine stronger than dorsal spine, used as offence organ. The Upper lobe of caudal fin longer. Body colour yellow or brown with a dark spot-on shoulder. Barbels 4 pairs. Mouth terminal. The length of fish is 0.07 m with the weight of 10 gm. Four pairs of barbels; maxillary pair extending to base of anal fin, nasal anterior end of opercula, outer mandibular base of

pectoral fin and inner pair short. Rayed dorsal fin inserted above half of pectoral fin, spine strong, outer surface smooth, inner surface with 8-10 retrorse teeth. Pelvic fin not reaching anal fin. Anal fin not reaching caudal fin base. Least depth of caudal peduncle 1.5 to 1.8 in its length. Caudal fin forked, upper lobe longer than lower. Light brown on top turning dull yellow on sides and beneath (Plate1(5),Table 1).

Plate1 : Five Major fishes of Gomti River

1-Rohu



Labeo rohita (Hamilton, 1822)

2-Katla



Catla catla (Hamilton, 1822)

3-Girai



Channa punctatus (Bloch, 1793)

4-Singhi



Heteropneustes fossilis (Bloch, 1794)



5-Tegan

Mystus tengara (Hamilton, 1822)

About five parallel longitudinal stripes on either side of body present. Occasionally a dark shoulder spot may also be seen. Oviparous, distinct pairing possibly like other members of the same family. This genus is known to be egg scatterers and may eat the eggs if they are not separated. Cold water changes may start a pair off if they are kept in a species tank on their own. There have been a couple of instances of successful breeding attempts with *Mystus* species. Males have an elongate genital papilla in front of the anal fin. Females will be fuller bodied.

Pectoral spines with 10-30 denticulations (Rahman, 1989). Injured occurred by its dorsal spine is very painful (Bhuiyan, 1964; Talwar and Jhingran, 1991). 4-5 longitudinal bands along sides (Galib, 2008). Head 21.1% SL and 19.4% TL. Height 22.8% SL and 21% TL (Galib, 2008). According to Rahman, 1989, head 3.8-4.5, height 3.3-4.3. eye 4-4.5 in head (Talwar and Jhingran, 1991). Maximum lengths reported: 7 cm (Bhuiyan, 1964) and 6.2 cm (Rahman, 1989).

Table 1: Observation of Five Major Fishes

S.No.	Name of Fishes	Family	Weight	Length	Fin formulae
1.	<i>Labeo rohita</i> (Hamilton, 1822)	Cyprinidae	6 kg	0.4 m	D. 15-16 (3/12-13); P ₁ . 16-17; P ₂ . 9; A.7(2/5). (Rahman, 2005)
2.	<i>Catla catla</i> (Hamilton, 1822)	Cyprinidae	2 kg	1 m	D. 2/15-16, P ₁ . 18-20, P ₂ . 9, A. 3/5 (Rahman, 2005)
3.	<i>Channa punctatus</i> (Bloch, 1793)	Channidae	8.2 gm	0.32 m	D. 29-32; P ₁ . 15-18; P ₂ . 6; A. 20-22. (Rahman, 2005)
4.	<i>Heteropneustes</i> <i>fossilis</i> (Bloch, 1794)	Heteropneustidae	20gm	0.3 m	D. 6-7; P ₁ . 1/6-7; P ₂ . 6; A. 62-70 (Rahman, 1989 and 2005)
5.	<i>Mystus tengara</i> (Hamilton, 1822)	Begridae	10 gm	0.06 m	D. I/7; P ₁ . I/8; P ₂ .6; A. 10-139 (Rahman, 1989)

Conclusion

The study was carried out at Gomti River, Lucknow from April 2023 to July 2023. Analysis of 5 fishes has been done. *Catla* and *Rohu* belong to the family Cyprinidae, *Heteropneustes* to Heteropneustidae, *Mystus* to Begridae and *Channa* to Channidae. By taking the measurement and weight of each species, it is found that the largest one is the *Rohu*, followed by *Catla*, *Heteropneustes*, *Channa* and *Mystus* (Table 1).

This study helps us in understanding the aquatic ecosystem. Fishes serve as indicators of environmental change and pollution. Ultimately a

solid grasp of fish biology allows us to maximize the economic benefits of fisheries while ensuring the long-term health of aquatic ecosystems and livelihoods of those dependent on them.

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