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A CASE STUDY

Current status of fish fauna of river Gomti in Faizabad and Sultanpur districts of U.P., India

PRAMOD KUMAR AND A.P. RAO

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See end of the article for authors' affiliations

Correspondence to :

A.P. RAO
Department of Fisheries
N.D. University of Agriculture and Technology, Kumarganj, FAIZABAD (U.P.) INDIA

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Previously, river Gomti harboured more than 265 species of fishes of various groups of carps, clupeiods, siluriods, live fishes, prawn etc. However, in the present study a total of 64 species of fishes belonging to various families were recorded. Catch of various fishes were decreased. Cyprinidae were the most dominant group contributing 42.5% share. Indian major carps were dominant species throughout the year. Previously, the catch of *Rita rita* was sizable. However, now decreased. The catch of exotic carps *i.e.* silver carp, grass carp and common carp is increasing. The *Labeo calbasu* was among one of the dominant species in river Gomti, however the present share is limited. The catch of *Silondia silondia*, *Bagarius bagarius, Wallago attu,* and *Pangasius pangasius* was significantly decreased.

Uttar Pradesh is most populous state of our country. The agriculture and allied activities forms the backbone of its economy. Being land-locked it is endowed with an abundant supply of inland water resources (11.65 lakh ha) that are ideal for fishery and aquaculture. At present, the state ranks 6th in inland fish production in the country. The availability of 7.20 lakh ha of running water in the form of rivers and canals harbouring icthyofaunal diversity further enrich the state. Till yester years the rivers of the state formed the mainstay of inland fish production which has gradually declined alarmingly.

One aspect of the environment of the water bodies is that they are facing the threat of pollution from an increasing number of new chemicals released into the aquatic environment continuously. It has been reported that almost every river system of India is now polluted to a considerable extent (Martin, 1998; Singh and Aggarwal, 1998). Huge amounts of agricultural pesticides used for crop protection eventually enter into the aquatic system. Similarly, sediments of heavy metals which are released as industrial effluents form a major part of aquatic pollution. The presence of excessive quantities of contamination in water caused death of aquatic organisms in past (Wanganeo *et al.,* 1994).

Gomti river is one of the major tributaries of river Ganga with a stretch of about 940 km from Pilibhit to Jaunpur is one of the major rivers of Uttar Pradesh. The river Gomti has its sources in tarai region of district Pilibhit and comes to Lucknow, passing through Sultanpur and Jaunpur then joins the river Sai at Rajepur and finally joins the river Ganga in Gazipur district of Uttar Pradesh. It contributes 7.39 billion of m^3 per year water to the main stream of river Ganga. The basin drains an area of 28, 375 sq km, and provides drinking water to over 1.39 million peoples.The present study was planned to know the status of fish catch, available species and changing scenario of fishes in the river. Study was also conducted on water quality, phyto and zooplankton to know the complete status of the river.

MATERIALS AND METHODS

For the present study, five sampling stations were made on the river Gomti in a stretch of 20 kms. These stations were named as site G_1, G_2, G_3, G_4 and G_5. Study was conducted for 9 months from July 2006 to March 2007. The monthly sampling of water was done.Various physico-chemical and biological analysis of water was done with suitable and standard techniques. Water colour was judged at

site by close visual observations. Water temperature was recorded at site with graduated thermometer. Turbidity of water was determined by Sacchi disc. pH of water was recorded electrometrically with the help of pH meter. Dissolved oxygen content of river water was determined by Winkler's titrimetric method (APHA, 1980). Free carbondioxide was estimated by standard method using phenolphthalein indicator (APHA, 1980). Alkalinity was determined by the method described by Welch (1948). Plankton were collected using plankton net by filtering 50 liters of water. Collected plankton were counted species wise or group wise by using Sedgewiek Rafter counting cell.For identification of plankton species APHA (1980) was used.

Collection of fishes:

Fishes were collected from various fishermen involved in the fishing business. Enquiries were also made from the nearby fish markets about fish catch from the river Gomti. Majority of the fishes were identified on the spot and rest of the fishes were brought to the laboratory after preserving them at sampling station and then identified with the help of literature of Talwar and Jhingaran (1991), Srivastava (1980) and Jayaram (1981).

RESULTS AND DISCUSSION

Observations on the status of fish catch, available species and changing scenario of fishes in river Gomti:

In the present study a total of 64 fish species belonging to 22 families were recorded from study sites of river Gomti (Table 1). Previously, river Gomti harboured about 265 fish species out of which 40 per cent belonging to Cyprinidae family, which were dominant in comparison to other fish species. However, in the present survey the percentage of Cyprinidae species was decreased drastically.

During past years, the fish fauna of river Ganga was represented by 378 fish species, but stock of most of the economically important fishes including Indian major carps (*Labeo rohita, Catla catla* and *Cirrhinus mrigala*) has dwindled in recent years (Hassan, 1999). Similarly, the fish fauna of river Kharun and Jonk, major tributaries of Mahanadi river system, there were, 43 fish species, reported in past, but most of them were absent in recent study (Om Prakash *et al.*, 2007).

Indian major carps, *Rita rita* and *Mystus cavasius* were the common and in abundance at G_1 and G_2 sites in comparison to G_3, G_4 and G_5 sites of river Gomti in the study. During monsoon months, *Wallago attu* alongwith other live fishes were caught in good numbers, while during rest of the months, their number in catch decreased considerably at all the study sites. The observations regarding fish catch/landing during study period of selected sites indicated that it varied according to season (Table 4). Monsoon months are observed as closed season. It is also evident from present observations that some of the important fishes *viz*. Silundh (*Silonia silondia*), Mahaseer (*Tor tor*), Hilsa (*Hilsa ilisha*) and Payas (*Pangasius pangasius*) were present in abundance during past, however, at present no Mahaseer was found in river Gomti. The share of Silundh (*Silonia silondia*) and Payas (*Pangasius pangasius*) was minimum, while Hilsa (*Hilsa ilisha*) was rarely caught at study sites. Similar observation was also made that the hydraulic structures have destroyed the anadromous fisheries especially *Hilsa ilisha* and *Pangasius pangasius* of the riverine stretch of Ganges (Sinha and Khan, 2001).

A reappraisal of the data on fish catch statistics collected at different sampling stations represent a gradual but steady decline in the total fish catch. Apart from an alarming declining trend in fish catch, there is an awful change in the population structure of many groups of fishes. During the last ten years, the percentage share of these small sized less economically important fishes reached to above 54 per cent, while carps have dwindled to the minimum about 12 per cent.

Industrial effluents load in the Gomti, detected at Lucknow to the extent of 95.670 m^3 per day contains toxic chemicals causing depletion of DO and BOD load, extensive fish mortality is common in Gomti due to industrial wastes (Table 4). In addition to this, untreated sewage discharge causing sharp fall in dissolved oxygen, which in turn puts biotic communities under severe distress. Synthetic detergents along with municipal wastage often cause direct fish kill specially in small streams. This problem gets aggravated due to reduce water flow specially in summer months. The diversion and canalization of stream usually for flood control measure resulted in reduce habitat heterogenicity.

Physico-chemical characteristics of water of river Gomti:

The physico-chemical characteristic of water of study sites were recorded monthly during the study period. The perusal of data as given in Table 2, Table 3 and Table 4, reveals that the colour of water of river Gomti was green during February month while brownish green from January-March. The availability of zooplankton and phytoplankton of various sites were recorded and listed in Table 2 and Table 3. Limited species of plankton were recorded during the study period.

Table 1: Fish species recorded in river Gomti during study period

Sr. No.	Available species	Local name	Sampling station				
			G_1	G_2	G_3	G_4	G_5
1.	*Hilsa ilisha* (Ham.)	Hilsa	±	±	±	±	±
2.	*Setipinna phasa* (Ham.)	Patlukia	+	+	-	-	-
3.	*Notopterus chitala* (Ham.)	Moya	++	++	++	++	++
4.	*Notopterus notopterus* (Pallas)	Patra	++	++	++	++	++
5.	*Amblypharyngodon mola* (Ham.)	Dhawai	+	+	+	+	+
6.	*Aspidoparia morar* (Ham.)	Harduwa	+	+	+	+	+
7.	*Catla catla* (Ham.)	Bhakur	+++	+++	+	++	++
8.	*Chela laubuca* (Ham.)	Dendula	+	+	+	+	+
9.	*Cirrhinus mrigala* (Ham.)	Nain	+++	+++	++	+++	+++
10.	*Cirrhinus reba* (Ham.)	Raia	+++	+++	+++	+++	+++
11.	*Danio devario* (Ham.)	Gurdi	+	+	+	+	+
12.	*Esomus danricus* (Ham.)	Dendua	+	+	+	+	+
13.	*Labeo bata* (Ham.)	Bata	++	++	+	+	+
14.	*Labeo calbasu* (Ham.)	Karaunchha	+++	+++	++	++	++
15.	*Labeo gonius* (Ham.)	Khursa	+	+	+	+	+
16.	*Labeo rohita* (Ham.)	Rohu	+++	+++	++	++	++
17.	*Osteobrama cotio* (Ham.)	Guruda	+	+	-	+	+
18.	*Oxygaster bacaila* (Ham.)	Chelhawa	+	+	+	+	+
19.	*Puntius chola* (Ham.)	Sidhari/Sahari	+	+	+	+	+
20.	*Puntius sarana* (Ham.)	Sidhari/Sahari	+	+	+	+	+
21.	*Puntius sophore* (Ham.)	Sidhari/Sahari	+	+	+	+	+
22.	*Puntius ticto* (Ham.)	Sidhari/Sahari	+	+	+	+	+
23.	*Ctenopharyngodon idella*	Grass carp	+	+	+	+	+
24.	*Hypophthalmichthys molitrix*	Silver carp	+	+	-	-	+
25.	*Cyprinus carpio var. communis*	Common carp	+++	+++	+	+	+
26.	*Botia dario* (Ham.)	Gerra	++	++	+	+	+
27.	*Lepidocephalichthys guntea* (Ham.)	Nakati	++	++	+	+	++
28.	*Nemacheilus aureus* (Day)	Baluari	+	+	+	+	+
29.	*Nemacheilus botia* (Ham.)	Gerri	+	+	+	+	+
30.	*Wallago attu*	Parhin	+	+	+	+	+
31.	*Mystus cavasius* (Ham.)	Tengara	++	++	+	+	+
32.	*Mystus menoda* (Ham.)	Belaunda	+	+	+	+	+
33.	*Mystus tengara* (Ham.)	Tengana	+	+	+	+	+
34	*Mystus vittatus* (Bloch)	Tengara	+	+	-	+	-
35.	*Mystus aor* (Ham.)	Kuthurua	+	+	+	+	+
36	*Mystus seenghala* (Sykes)	Bejahara	+	+	+	+	+
37.	*Rita rita* (Ham.)	Balgagra	+++	+++	++	++	++
38.	*Bagarius bagarius* (Ham.)	Gonch	++	++	+	+	+
39.	*Gagata cenia* (Ham.)	Tinkatia	+	+	-	-	-
40.	*Ailia coila* (Ham.)	Gurdi	+	+	+	+	+
41.	*Clupisoma garua* (Ham.)	Baikari	++	++	+	++	+
42.	*Pangasius pangasius* (Srivastava)	Payas	++	++	+	+	+
43.	*Silonia silondia* (Ham.)	Silundh	++	++	-	-	+
44.	*Heteropneustes fossilis* (Bloch)	Singhi	±	±	±	±	±
45.	*Clarias batrachus* (Linn.)	Mangur	±	±	±	±	±
46.	*Xenentodon cancila* (Ham.)	Kauwa	±	±	-	+	+

Contd….. Table 1

Table 1 Contd...

47.	*Hemiramphus gorakhpurensis* (Srivastava)	Kauwa-ka-Bachcha	+	+	-	++	+
48.	*Rhinomugil corsula* (Ham.)	Anduara	+	+	+	+	+
49.	*Channa gachua* (Ham.)	Chanaga	+	+	+	+	+
50.	*Channa marulius* (Ham.)	Saur	±	±	+	+	+
51.	*Channa punctatus* (Bl.)	Girai	±	±	-	-	-
52.	*Channa striatus* (Bl.)	Saur	±	±	±	+	+
53.	*Amphipnous cuchia* (Ham.)	Anhaya Baam	+	+	+	+	+
54.	*Chanda nama* (Ham.)	Chanari	+	+	+	+	+
55.	*Chanda ranga* (Ham.)	Chanari	+	+	+	+	+
56.	*Sciaena coitor* (Ham.)	Patharchatti	+	+	-	+	+
57.	*Nandus nandus* (Ham.)	Dhebari	+	+	-	+	+
58.	*Anabas testudineus*(Bloch)	Kawai	+	+	+	+	+
59.	*Colisa chuna* (Ham.)	Sephani	++	++	-	+	+
60.	*Colisa fasciatus* (Bloch and Schn.)	Sephani	++	++	++	+	++
61.	*Glossogobius giuris* (Ham.)	Bulla	+	+	-	-	+
62.	*Macrognathus aculeatus* (Bloch)	Bamchor	++	++	+	++	+
63.	*Mastacembelus armatus* (Lacepede)	Baam	++	++	+	++	+
64.	*Tetraodon cutcutia* (Ham.)	Galphulani	+	+	-	+	+

+ — Minimum presence in catch, ++ — Medium presence in catch, +++ — Maximum presence in catch, ± — Rare presence in catch
- — Absent in catch

Table 2 : Zooplankton recorded from various study sites

Sr. No.	Zooplankton	Selected sites				
		G_1	G_2	G_3	G_4	G_5
1.	Cyclops	+++	+++	++	+	+
2.	Diaptomus	+++	+++	Nil	+	+
3.	Nauplea	+	+	+	+	+
4.	Brachionus	+++	+++	++	++	+
5.	Daphnia	+++	+++	++	+	+
6.	Keratella	+++	+++	++	++	+
7.	Alona	+	+	+	+	+
8.	Bosmina	++	+	++	+	Nil
9.	Filinia	++	+	+	+	+
10.	Asplanchna	+	+	Nil	+	+
11.	Polyarthra	+	+	+	Nil	+
12.	Mesocyclops	+	+	+	+	+
13.	Moina	+	+	+	+	+

+ — Minimum availability, ++ — Medium availability,
+++ — Maximum availability

Table 3 : Phytoplankton recorded from various study sites

Sr. No.	Phytoplankton	Selected site				
		G_1	G_2	G_3	G_4	G_5
1.	Eudorina	Nil	+	+	+	+
2.	Oscillatoria	+	+	Nil	++	++
3.	Volvox	+	Nil	+	+	Nil
4.	Closterium	+	+	+	+	+
5.	Anabaena	+	Nil	+	+	Nil
6.	Spirogyra	+	+	+	+	+
7.	Peridinium	+	+	Nil	+	+
8.	Oedogonium	Nil	Nil	+	+	+
9.	Actinastrum	+	+	Nil	+	+
10.	Microcystis spp.	+	+	+	+	+
11.	Ceratium	+	+	+	Nil	Nil
12.	Zygnema	Nil	Nil	+	+	+
13.	Lemanea	Nil	Nil	+	+	+
14.	Cladophora	+	+	Nil	+	+
15.	Euglena spp.	Nil	Nil	+	+	Nil
16.	Synedra ulna	Nil	Nil	+	Nil	+
17.	Spirulina	+	+	Nil	Nil	+
18.	Navicula spp.	+	+	Nil	Nil	Nil

+ — Minimum availability, ++ — Medium availability

Muddy colour of river water was recorded during months of July and August which was due to siltation/ turbidity caused by rain water and surface run-off received from agricultural fields by Gomti river. The light green colour of water during rest of the months was indicative of its being productive in nature (Table 4). Similar observations were also recorded for water colour change of river Purna (Mongal and Desai, 1998) and for a rivulate (Bath and Kaur, 1999).

The average water pH was 8.48, the highest turbidity 456 ppm was recorded during monsoon months. The average alkalinity of river water was 113.2 ppm during the study period. Similar, observations were also recorded by earlier workers for water of other rivers (Upadhayay *et al.*, 2000; Hassan *et al.,* 1999; Prasanthan and Vasudevan Nayer, 2000 and Nath, 2000).

The average dissolved oxygen in river was 5.56mg/

Table 4 : Average water quality parameters at various sites

Sr. No.	Month	Water colour	Temp. (^{0}C)	Turbidity (ppm)	DO (mg/l)	Free Co2	pH	Alkalinity (ppm)	Plankton (ml/50 l)
1.	July, 2006	muddy	28.1	404	5.24	0.80	8.3	110.2	1.04
2.	Aug. 2006	muddy	21.4	456	5.56	Nil	8.48	111.4	1.1
3.	Sept.2006	light muddy	28.1	320	5.38	1.2	8.2	111.8	1.14
4.	Oct. 2006	light muddy	27.7	238	5.28	1.24	8.16	111.0	1.16
5.	Nov. 2006	light green	24.0	226	5.30	1.3	8.04	111.0	1.24
6.	Dec. 2006	light green	20.6	226	5.38	1.32	8.22	112.6	1.16
7.	Jan..2007	greenish	20.7	254	5.20	1.6	8.14	112.0	1.26
8.	Feb.2007	green	20.1	248	5.20	1.52	8.10	112.0	1.3
9.	Mar.2007	brownish green	26.2	232	5.10	Nil	8.22	113.2	1.42

l. The maximum water temperature was 28.1^{0}C in months of July and September2006 and minimum 20.1^{0}C was recorded during February. The similar observations were made by others (Das, 1945; Kumar and Shukla, 2002; Bhatt and Pathank, 1992 and Shallu *et al.,* 1994) in various rivers. The ecological studies conducted by NBFGR, indicated about 20 fish species of the river could threatened due to the high pollution. The industrial effluents containing heavy metals, dyes, cyanides and suspended solids, wastes from agricultural fields containing mostly pesticides and weedicides and domestic sewage containing a wide range of organic compounds are being dumped continuously in the river Gomti from nearby towns of Pilibhit, Lakhimpur, Sitapur, Barabanki, Sultanpur and largely from Lucknow city has posed a serious threat to fish species and other aquatic organisms (Nagpure *et al.*, 2007).

Fishing pattern and loss of fish stock of river Gomti:

The exotic carps *viz.* common carp, grass carp and silver carp were present in good number in the catches from river Gomti in comparison to past years. These non-native species may be disastrous for indigenous fishes in future. Singh and Aggarwal(1998) reported a noticeable decline in total fish out put and an undesirable change in the species spectrum has been the characteristic features of fish yield from Ganga river system during the past three decades. The factors responsible for loss of ichthyo-diversity and fish yield in natural aquatic ecosystems are habitat destruction due to change in quality and quantity of water, alteration in feeding and breeding grounds accompanied by irrational fishing practices and over exploitation of fishes.

It is evident from above that fishery of river Gomti presently has reached a critical phase. The Gomti Action Plan (GAP) was started in the year 2003 for improving the water quality, flora and fauna of the river, however even after 4 years after implementation, no significant improvement is observed. If this plan will be implemented successfully this will not only improve the water quality but will be also helpful in conserving ichthyo-diversity of the river Gomti.

Conclusion:

On the basis of results obtained from present investigation, the river Gomti contains several living aquatic resources. Before two decades, from Gomti river a large quantity of fishes were harvested, however, in present time due to high pollution, habitat destruction and indiscriminate fishing several fish species have been threatened and the fish catch decreased drastically. Phytoplankton population is increasing over zooplankton. Water quality of this river has decreased alarmingly and the pollution load has increased several times and due to these factors, current fish catch has reduced.

For restoration of the lost fishery wealth of this important river, a minimum flow particularly during lean water availability months is essential. Dumping of industrial effluents and domestic sewage should be checked then the water quality should be improved and the fish population can be increased.

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Authors' affiliations

PRAMOD KUMAR, Department of Fisheries, N.D.University of Agriculture and Technology, Kumarganj, FAIZABAD (U.P.) INDIA

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