

Short Communication

Coldwater fish diversity and their conservation status in the Teesta, Jaldhak, Torsa, Kaljani and Sankosh Rivers of the Dooars region, West Bengal, India

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ABSTRACT

A survey was conducted on the coldwater fish diversity in the different rivers of the Dooars region with the help of fisherman. Data was collected on the monthly basis by using different nets. A total of 71 coldwater fishes were reported during the study period. Most dominant family was cyprinidae with 32 species followed by Sisoridae with 12 species; Balitoridae 8 and Bagridae with 4 species etc. 70 coldwater fish species in the river Teesta, 63 in Jaldhaka, 66 in Torsa, 61 in Kaljani and 66 in the river Sankosh were recorded. Ten Endangered and 31 Vulnerable species were reported from all the five rivers. Out of 71 coldwater fishes many have consumption and ornamental value. Many migratory and sport coldwater fishes are also reported. Catch frequency status indicates many fishes found rare and extremely rare during the study.

Keywords: Coldwater fish, Endangered, Vulnerable, Catch frequency status.

INTRODUCTION

Coldwater fishes may be defined as fishes which can't tolerate temperature above the 25 °C for long time. Coldwater fishes are very important bioindicators for climate changes because they are very sensitive to minute changes in water quality. The Himalayas is drained by many major rivers and the eastern Himalaya drained by the Brahmaputra river has a greater diversity of coldwater fish than the western Himalayan drainage (Petr and Swar, 2002). The fish species distribution in the Himalayan streams depends on the water flow rate, nature of substratum, water temperature, and the availability of food. The Coldwater rivers and hill streams are known for their high velocity water fall, rapid cascades, deep pools and substratum comprising bed rock, boulder and sand. Basically two types of fisheries are found in the Indian Himalayan rivers: subsistence fishery and sport fishery (Sehgal, 1999). The Himalaya is blessed with a number of beautiful coldwater fishes (Singh and Akhtar 2015 and Singh and Sarma 2017).

The Dooars region is blessed with many rivers and all the rivers originates from the Himalaya. All the rivers of the Dooars region are rich in tropical as well as coldwater fish species. Many ichthyologist work on fish diversity of the Dooras region such as Shaw and Shebbeare (1937), Hora and Gupta (1941), Jayaram and Singh (1977), Sarkar and Pal (2008, 2015). But no such study on coldwater fish diversity was done in this region.

MATERIALS AND METHODS

Sampling site- Five rivers namely- Teesta , Jaldhak , Torsa , Kaljani and Sankosh were selected for study. Location and longitude of sampling sites are given in the Table 1.

Table 1. Sampling sites along with the location and longitude.

River	Sam-pling site	Location	Longitude
Teesta	Site 1	Seveko	26 ⁰ 88'80.145'' N, 88 ⁰ 48'19.04''E
	Site 2	Gajoldoba	26 ⁰ 74'57''N, 88 ⁰ 59'51.89''E
Jaldhaka	Site 3	Nagrakata	26 ⁰ 85'48.64''N, 89 ⁰ 00'42.71''E
	Site 4	Mathabhanga	26 ⁰ 31'51.79''N, 89 ⁰ 24'88.81''
Torsa	Site 5	Jaiygaon	26 ⁰ 84'67.57''N, 89 ⁰ 36'16.20''E
	Site 6	Cooch Behar	26 ⁰ 30'34.28''N, 89 ⁰ 44'40.50''E
Kaljani	Site 7	Rangamati tea garden	26 ⁰ 81'14.28''N, 89 ⁰ 41'65.19''E
	Site 8	Hamiltongonj	26 ⁰ 68'86.81''N, 89 ⁰ 40'00.04''E,
Sankosh	Site 9	Kumargram	26 ⁰ 61'36.42''N, 89 ⁰ 81'23.88''E
	Site 10	Bakshirhat	26 ⁰ 33'37.23''N, 89 ⁰ 78'93.91''E

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Duration of study

Study on coldwater fish diversity was carried on from January 2016 to December 2017 (two years).

Sampling methods

Sampling was done by casting net (mesh size 5.0-7.0 cm), push net (mesh size 0.5-4.0cm), drag net (mesh size 0.3-0.4 cm) and gill nets (mesh size 2.0-7.0 cm) with the help of fisherman. Coldwater fishes were separated from other fishes and then counted the number. Photographs were taken with the help of canon IS150 digital camera. Collected fishes were then preserved in 4% formalin. Fishes were identified with the standard references- Hora and Gupta, 1941; Jayaram and Singh, 1977 and Shaw and Shebbearae, 1937.

Catch frequency

The catch frequency of each species was calculated on the basis of number of occasions the species collected during the whole samplings process (Tamang *et al.*, 2007). The status was determined with the help of standard catch frequency chart prepared by Tamang *et al.* (2007), catch frequency 91-100 % were common, 81-90% were abundant, 61-80% were frequent, 31-59% were occasional, 15-30% were sporadic, 05-14% were rare and less than 5% were extremely rare.

RESULT AND DISCUSSION

A total of 71 coldwater fishes belonging to 14 families were recorded from the five rivers. Cyprinidae was dominant family with 32 species followed by Sisoridae 12 species, Balitoridae 8 and Bagridae 4 species, Siluridae 1, Psilorhynchidae 2, Nandidae 2, Mastacembelidae 1, Cobitidae 2, Channidae and Amblycepidae 2 species each and Schilbeidae, Anguilidae and Belonidae 1 species each. During the study period 70 coldwater fish species in the river Teesta, 63 in Jaldhaka, 66 in Torsa, 61 in Kaljani and 66 in the river Sankosh were recorded (Table 2 and Fig.-1). More coldwater fishes were recorded in higher altitude of every rivers.

Ali *et al.* (2010) recorded a total coldwater fish species from 218 in Assam, 121 in Manipur, 68 in Nagaland, 167 in Arunachal Pradesh, 134 in Tripura, 165 in

Meghalay and 48 species in Mizoram. Menon (1962) recorded 218 coldwater fish species in the whole Himalayas.

This region is famous for coldwater as well as stenothermic fish species and many coldwater fishes are adapted themselves above the water temperature 25⁰ C. During winter season when water temperature become very low, many coldwater fishes migrate from higher altitude to plains of the Dooars region. Again back to higher altitude during breeding seasons in monsoon. Example of such potadromus fishes are *Labeo pangusia*, *Labeo dyocheilus*, *Neolissocheilus hexagonolepis*, *Schizothoraichthys* Spp. and *Tor* spp. Similar finding was suggested by Singh and Lakra (2011). Damp prevents such type of migration from higher to lower altitude and vice versa. Many damp have been made in the river Teesta, Jaldhaka and Sankosh rivers in Bhutan and India for electricity generation.

Among the 71 coldwater fishes 35 have consumption value and 25 have ornamental value. Many sport fishes such as *Barilius bola*, *Bagarius bagarius*, *Labeo pangusia*, *Labeo dyocheilus*, *Neolissocheilus hexagonolepis*, *Schizothoraichthys* Spp., *Tor* spp. and *Sperata aor* were recorded during the study. This region is also famous for 'Baroli fish' i.e *Aspidoparia morar* and beside this *Barilus* spp. and *Tor* spp are hall mark of the Dooars and Bhutan. Coldwater fishes have high market demand but limited supply and this leads to overfishing. Sing (2019) recorded 47 and 167 coldwater fishes from Sikkim and Arunachal Pradesh respectively.

According to Tamang *et al.* (2007) catch frequency status, 8 fish species are extremely rare, 5 rare, 8 sporadic, 30 Occasional, 16 frequent and 4 are abundant. From the study, it was concluded that moderate number of coldwater fishes found but their catch frequency status under highly concern. Many fish species found very rarely during the study period. Brown trout and rainbow trout were introduced as a sport fish in the river. According to NBFGR (Lakra *et al.*, 2010) out of 71 coldwater fishes 10 are Endangered (EN), 31 are Vulnerable (VU) and 9 under Least concern (Lc) (Table-2). *Amblyceps mangios*, *Anguilla bengalensis*, *Nemachilus devdevi* and *Sisor rhabdophorus* are Endangered species and also reported extremely rare during the survey.

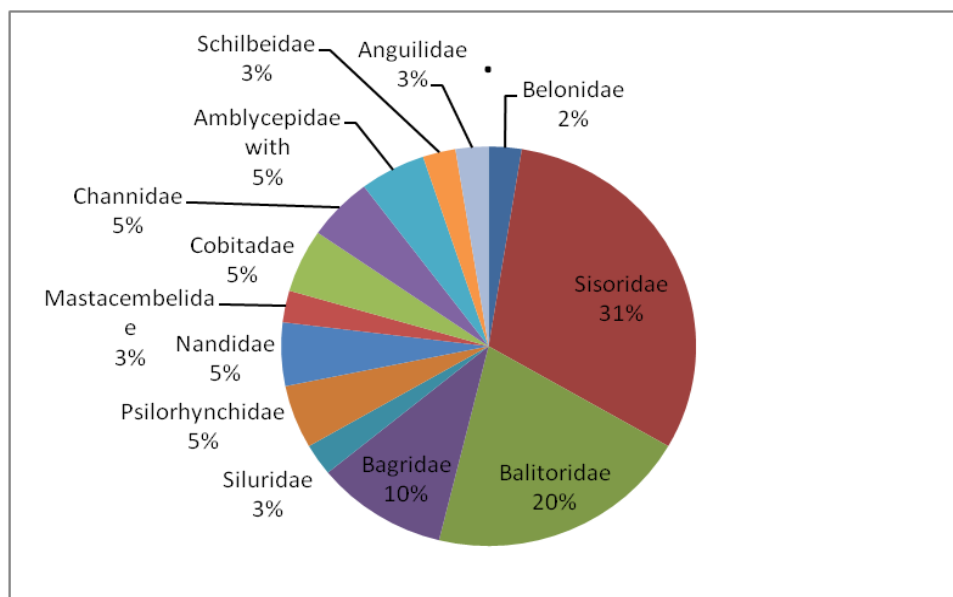


Figure 1. Percent composition of family of coldwater fish in all the rivers of the Dooars region.

Table 2. Checklist of coldwater fishes in the Dooars region.

Family	Fish species found	Recorded in rivers	Catch frequency in %	Catch frequency status	NBFR status
Amblycepidae	<i>Amblyceps mangios</i> (Hamilton)	Ts, Tr, Kj & Sk	3	Extremely rare	EN
	<i>Amblyceps apangi</i> (Nath and Dey)	Ts, Jl, Tr, Kj & Sk	24	Ocassional	VU
Anguillidae	<i>Anguilla bengalensis</i> (Gray & Hardwicke)	Ts, Tr & Sk	2	Extremely rare	EN
Bagridae	<i>Batasio batasio</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	58	Ocassional	
	<i>Mystus vittatus</i> (Bloch)	Ts, Kj & Sk	57	Ocassional	LC
	<i>Mystus bleekeri</i> (Day)	Ts, Jl, Tr, Kj & Sk	61	frequent	VU
	<i>Sperata aor</i> (Hamilton)	Ts, Tr, Kj & Sk	50	Ocassional	
Balitoridae	<i>Aborichthys elongatus</i> (Hora)	Ts, Jl, Tr, Kj & Sk	45	Ocassional	LC
	<i>Balitora brucei</i> (Gray)	Ts, Tr & Sk	30	sporadic	VU
	<i>Acanthocobitis botia</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	27	sporadic	
	<i>Schistura devdevi</i> (Hora)	Ts, Tr, Kj & Sk	2	Extremely rare	EN
	<i>Schistura corica</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	40	Ocassional	LC
	<i>Schistura rupecula</i> (McClelland)	Ts, Jl, Tr & Sk	35	Ocassional	VU
	<i>Schistura savona</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	58	frequent	LC
	<i>Schistura bevani</i> (Gunther)	Ts, Jl, Tr, Kj & Sk	59	frequent	EN
Belonidae	<i>Xenentodon cancila</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	75	frequent	VU
Channidae	<i>Channa striatus</i> (Bloch)	Ts, Jl, Tr, Kj & Sk	78	frequent	
	<i>Channa gachua</i> (Hamilton)	Jl, Tr & Kj	9	rare	EN
Cobitidae	<i>Pangio pangia</i> (Hamilton)	Ts, Jl, Tr & Sk	37	Ocassional	VU
	<i>Botia dario</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	59	Ocassional	VU
Cyprinidae	<i>Aspidoparia morar</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	78	frequent	VU
	<i>Aspidoparia jaya</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	75	frequent	VU
	<i>Barilius barila</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	85	abundant	VU

Table 2 continued in next page

<i>Barilius barna</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	75	frequent	VU
<i>Raiamas bola</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	58	Ocassional	
<i>Barilius shacra</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	55	Ocassional	VU
<i>Barilius vagra</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	52	Ocassional	
<i>Barilius bendalesis</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	50	Ocassional	VU
<i>Barilius tileo</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	58	Ocassional	VU
<i>Chagunius chagunio</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	15	sporadic	EN
<i>Cirrhinus reba</i> (Hamilton)	Ts, Jl, Tr & Sk	36	Ocassional	VU
<i>Crossocheilus latia</i> (Hamilton) END	Ts, Jl, Tr, Kj & Sk	42	Ocassional	VU
<i>Danio rerio</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	45	Ocassional	VU
<i>Devario aequipinnatus</i> (McClelland)	Ts, Jl, Tr, Kj & Sk	47	Ocassional	
<i>Danio dangila</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	42	Ocassional	VU
<i>Garra gotyla</i> (Gray)	Ts, Jl, Tr, Kj & Sk	55	Ocassional	VU
<i>Garra annandalei</i> (Hora)	Ts, Jl, Tr, Kj & Sk	59	Ocassional	LC
<i>Garra lamla</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	60	frequent	VU
<i>Garra maclellanei</i> (Jerdon)	Ts, Jl, Tr & Sk	51	Ocassional	LC
<i>Garra naganensis</i> (Hora)	Ts, Jl, Kj & Sk	36	Ocassional	
<i>Labeo boga</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	70	frequent	LC
<i>Labeo dero</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	71	frequent	
<i>Labeo dyocheilus</i> (McClelland)	Ts, Jl, Tr, Kj & Sk	61	frequent	VU
<i>Labeo pangusia</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	58	Ocassional	VU
<i>Neolissocheilus hexagonolepis</i> (McClelland)	Ts, Kj & Sk	25	sporadic	VU
<i>Puntius sophore</i> (Hamilton)	Ts, Tr, Kj & Sk	87	Abundant	
<i>Puntius ticto</i> (Hamilton)	Ts, Jl, Tr & Sk	84	abundant	
<i>Schizothoracichthys progastus</i> (McClelland)	Ts, Tr, Kj & Sk	12	Rae	VU

Table 2 continued in next page

	<i>Schizothorax richardsonii</i> (Gray)	Ts, Jl, Tr, Kj & Sk	4	Extremely rare	VU
	<i>Semiplotus semiplotus</i> (McClelland)	Ts, Jl, Tr, Kj & Sk	74	frequent	VU
	<i>Tor putitora</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	12	rare	EN
	<i>Tor tor</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	10	rare	EN
Mastacembelidae	<i>Mastacembelus armatus</i> (Lacepede)	Ts, Jl, Tr & Sk	85	abundant	VU
Nandidae	<i>Badis badis</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	82	abundant	
	<i>Nandus nandus</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	57	frequent	
Psilorhynchidae	<i>Psilorhynchus balitora</i> (Hamilton)	Ts, Tr & Kj	17	sporadic	VU
	<i>Psilorhynchus sucatio</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	65	frequent	LC
Siluridae	<i>Ompak pabo</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	65	frequent	VU
Schilbeidae	<i>Clupisoma garua</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	45	Ocassional	
Sisoridae	<i>Bagarius bagarius</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	2	Extremely rare	VU
	<i>Conta conta</i> (Hamilton)	Ts, Jl, Tr, Kj & Sk	25	sporadic	
	<i>Glyptothorax cavia</i> (Hamilton)	Ts, Jl, Tr & Sk	4	Extremely rare	EN
	<i>Glyptothorax horai</i> (Shaw & Shhebeare)	Ts, Jl, Tr, Kj & Sk	52	Ocassional	
	<i>Glyptothorax pectinopterus</i> (McClelland)	Ts, Jl, Kj & Sk	11	rare	VU
	<i>Glyptothorax telchitta</i> (Hamilton)	Ts, Jl, Tr & Kj	20	sporadic	VU
	<i>Hara jerdoni</i> (Day)	Ts, Jl, Tr, Kj & Sk	21	sporadic	
	<i>Nangra punctata</i> (Day)	Ts, Tr, Kj & Sk	35	Ocassional	
	<i>Pseudolaguvia ribeiroi</i> (Hora)	Ts, Jl, Tr, Kj & Sk	57	Ocassional	
	<i>Pseudolaguvia shawi</i> (Hora)	Ts, Jl, Tr, Kj & Sk	55	Ocassional	LC
	<i>Pseudecheneis sulcatus</i> (McClelland)	Ts, Jl & Sk	35	Ocassional	
	<i>Sisor rhabdophorus</i> (Hamilton)	Ts, Tr & Kj	3	Extremely rare	EN

Diversity of coldwater fish decreased day by day due to the following reasons.

Threat to coldwater fishes in the Dooars region-

i) Habitat destruction/loss:

Natural calamities such as flood, flash flood, land slides and man mad activities such as dam, mining of sand, stone and boulder and pollution destroy or modify the habitat of fresh water fishes. Many dams have been made in different rivers of the Dooars region in Bhutan and India for generation of electricity and also for irrigational purpose. These dam change the flow rate of water and also causes sedimentation. Illegal mining of dolomite in Bhutan highly contaminated the rivers of the Dooars region. River bed sometimes used for agriculture purpose and polluted the river water. Soil erosion increased due to deforestation of mountains, has led to heavy siltation of rivers and streams, thus impairing the basic ecological requirements of this fish.

ii) Over fishing or indiscriminate fishing: Over fishing or indiscriminate fishing causes reduction in population size (Sarkar *et al.*, 2008; Singh, 2012). Indiscriminate fishing such as use of mosquito net, dynamite, electrofishing etc. causes mass mortality of fish species and huge reduction in population size. Many migratory coldwater fishes migrate from higher altitude to plain region during winter season and easily caught by the fisherman.

iii) Introduction of exotic fish species: Introduction of exotic fish species causes reduction of indigenous fish species. Exotic fish species competes with indigenous fish species for food and habitat and also introduce new disease and parasites (Singh and Lakra, 2011). Many exotic carps were recorded during the study period which badly affects the coldwater fish diversity in the Dooars region. The introduction of common carp may have adversely affected the endemic schizothoracines and mahseers (Singh and Lakra, 2011).

Plate 1.1. Different coldwater fishes of Dooars region, West Bengal, India

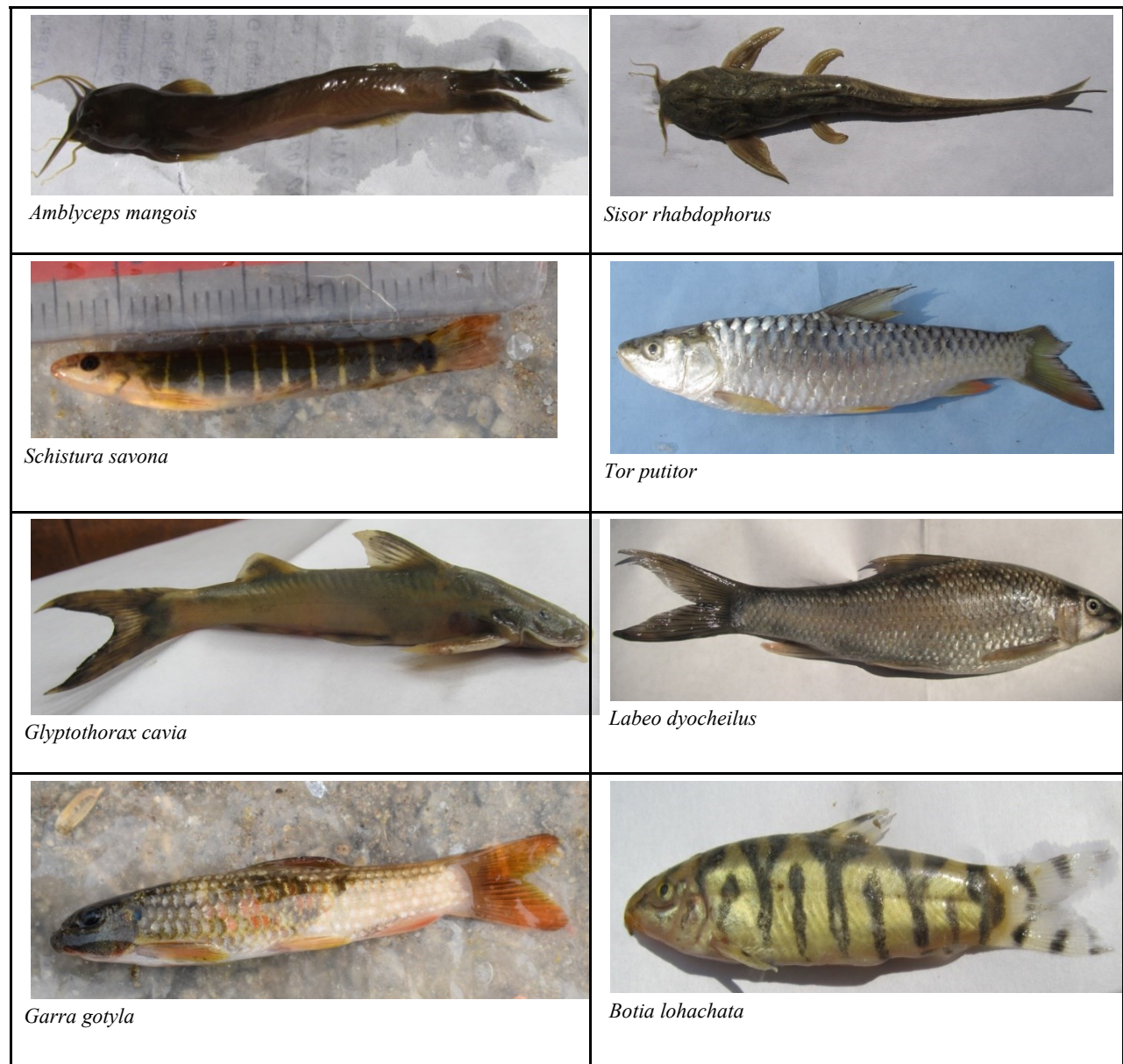
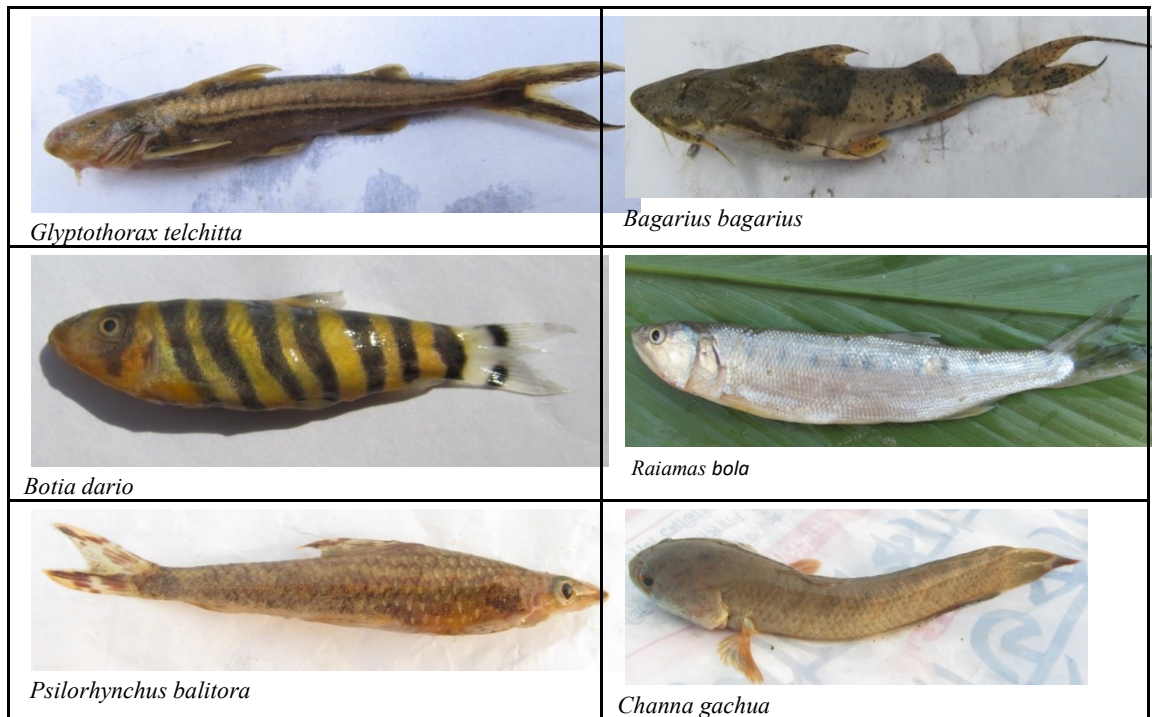


Plate 1.2. Different coldwater fishes of Dooars region, West Bengal, India



CONCLUSION

Moderate numbers of coldwater fishes were found in the five rivers of the Dooars region but their number gradually decreased due to habitat loss, pollution, overfishing and others anthropogenic activities. So if we don't take immediate steps for their conservation in near future many of them will disappear from this region.

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