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New biogeographical distribution of fish *Glyptothorax conirostris, G. telchitta* and *G. cavia* (Siluriformes: Sisoridae) in northern plain tributaries of the Ganges basin, India

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ABSTRACT

Sisorid catfish of the genus *Glyptothorax* are widely distributed, with as many as 40 nominal species reported from India, where they typically inhabit fast-flowing hill streams and faster flowing stretches of larger rivers and streams. We recorded new biogeographical distribution of three species of *Glyptothorax* from the tributaries of northern plains in the Ganges basin. The specimens were collected during experimental fishing for biodiversity studies using cast nets (2010-2012). While *G. conirostris* were collected from the Ganges canal, *G. cavia* and *G. telchitta* were captured from the river Gomti. Previous descriptions were based on preserved specimens; we present diagnostic features and an illustrated redescription based on fresh specimens.

KEY WORDS: new distribution, *Glyptothorax conirostris, G. telchitta, G. cavia,* tributary,Ganges basin, India.

RESUMEN

Los peces bagre del género *Glyptothorax* se distribuyen ampliamente, con nada menos que 40 especies nominales reportadas en India, donde normalmente habitan en arroyos de montaña con corrientes rápidas y tramos que fluyen más rápido en ríos y arroyos mas grandes. Registramos una nueva distribución biogeográfica de tres especies de *Glyptothorax* de las afluentes de las llanuras del norte de la cuenca del Ganges. Los especímenes se recolectaron durante la pesca experimental para estudios de biodiversidad con atarraya (2010-2012). Mientras que *G. conirostris* se capturó en el canal del río Ganges, *G. cavia* y *G. telchitta* fueron capturados en el río Gomti. Descripciones anteriores son basadas en especímenes preservados, presentamos características diagnósticas y redescripción ilustrada basada en especímenes frescos.

PALABRAS CLAVE: nueva distribución**,** *Glyptothorax conirostris, G. telchitta, G. cavia,* cuenca Ganges, India.

Sisorid catfish of the genus *Glyptothorax* are widely distributed and have nearly 40 nominal species reported from India (Jayaram, 2010; Talwar & Jhingaran, 1991; Vishwanath & Linthoingambi, 2007). They typically inhabit foothill rivers and fast flowing mountain streams and are benthic in habitat and maintain themselves attached to rocks, boulders, stones at the bottom of the water bodies where they live by means of a thoracic adhesive apparatus (Jayaram, 2010). This feature formed by a series of roughly parallel integumentary ridges and grooves, the ridges having dense covering of unculi. It is either thoracic or abdominal in location. They are distinguishable by a distinct thoracic adhesive apparatus (de Pinna, 1996). The genus *Glyptothorax* has received attention by many authors and some of the important contributions in India are Hora (1923), Menon (1974) and Vishwanath and Linthoingambi (2007). Li (1986) studied the systematic, distribution and evolution of genus. So far distribution is concerned the species is widely distributed in south Asia from Tigris- Euphrates basin eastward to Vietnam and eastern China while in the Indian region it is distributed in India, Bangladesh, Mayanmar and Pakistan (Jayaram, 2010).

Karmakar (2000) reported the distribution of 16 *Glyptothorax* species in the Himalayan drainage system (Eastern Himalaya, Northeastern Himalaya, Central Himalaya and Northwestern Himalaya). However, in the present study, we collected *Glyptothorax conirostris, G. telchitta* and *G. cavia* while conducting Germplasm exploration in the Ganges basin of Uttar Pradesh plains,

India which is a new distribution record for all these species. In earlier studies *G.conirostris,* was described by Steindachner (1867) from Shimla, Himachal Pradesh Northwestern India. *G. telchitta* was described from Hooghly river, West Bengal (Hamilton, 1822; Jayaram 2010), while *G. cavia* was reported from rivers of Northern Bengal (Hamilton 1822) as per Jayaram (2010).

In a recent publication, Jayaram (2010) distinguished the genus from other members of the subfamily by the presence of greatly depressed head, thick and pappilated lips and ventral surface of thorax with an adhesive apparatus with or without a central pit. de Pinna (1996) diagnosed the genus by the following combination of characters, thorasic adhesive apparatus comprising an elliptical field of folded longitudinal pleats of skin, a detached distal portion of premaxilla, and long and thin lateral arms of the vomer that extend under the entire length of articular process of lateral ethmoid. As there is no previous record of *G. telchitta, G. cavia* and *G. conirostris* from the studied tributaries of Northern plains in Uttar Pradesh, our present report may be considered as the first evidence of a broader distributional range of *Glyptothorax* genus, indicating that the species may be more widely distributed than previously acknowledged.

MATERIALS & METHODS

Study area

The Ganga is a major river of the Indian subcontinent rising in the Himalaya mountain and flowing about 2 510km generally eastward through a vast plain to the Bay of Bengal. The river flows southwest through the Indian state of Uttar Pradesh, Bihar and West Bengal. We collected *G. conirostris* from a canal connected with river Ganges in the northern plains (12˚49.400´N, 076˚03.85´E). River Gomti is a major tributary of the Ganga River basin in Northern India. It originates from a natural reservoir in the forested area near Pilibhit town in Uttar Pradesh, about 50km south of the Himalayan foothills. The river flowing through the central and eastern part of Uttar Pradesh traverses a total distance of about 730km before finally merging in the Ganga River near Varanasi. We collected two individuals of *G. cavia* and one individual of *G. telchitta* from river Gomti at Pilibheet district. The specimen was collected using a castnet during November 2012 (Fig. 1). Digital photographs of the specimen were taken which was then fixed in 10% formaldehyde for further studies. A total of 13 morphometric and meristic characters was taken with a Mutiyoto digital caliper to the nearest 0.01 mm. The specimen was subsequently identified following the taxonomic keys by Talwar and Jhingaran (1991) and Jayaram (2010).

RESULTS

Description

Morphometric and meristic details of *G. conirostris*, *G. cavia* and *G. telchitta* are presented in Table 1. Maximum total length (TL) reported as per Fish base is 14 cm for *G. conirostris,* 10 cm for *G. telchitta* and 28cm for *G. cavia*. In the present study, average total length of *G. conirostris* was 127,4mm with body depth 23,1mm. Body was elongated and strongly compressed. Head was broad and its length measured 2.8 mm. Eyes were minute covered by skin, in middle of head. Dorsal fin was long inserted in posterior half of the body. Predorsal length was measured 45,8 which was shorter than post dorsal length. Rayed dorsal fin higher than body depth. Body depth 22,2% SL. Similarly total length of *G. cavia* was 79,2 and 79,5mm respectively. Its body was also elongated, thin and strongly compressed. Measurement of head length was 1,8-1,6mm. Eyes were minute, thin and surrounded by skin in middle of the head. Least height of caudal peduncle 47% in its length. Least height of caudal peduncle less than 35% in its length. In *G. telchitta* total length recorded was 57,6mm and 45,3mm in standard length. Thorasic adhesive apparatus with narrow folds of skin and incompleted posteriorly. Nostrils separated from the snout by a distance equal to eye diameter. Caudal peduncle height 26,3-33.3% in its length and it was greater than 35% in its length. Due to its smooth and truncated body texture the species often become twisted and easily deformed even in best prepared samples.

Habitat

Water temperature show the collection site as 23,8 to 24,5˚C. Pools with lateral and scour riffles were major habitat characteristics, with substrate such as cobbles, and gravels, and a riparian cover of shrubs and small trees predominating in the collection area. Among other fish species in the river Ganges and Gomti *Puntius sophore, P. sarana, Rasbora daniconius, Labeo rohita*, *Rita rita*, *Notopterus notopterus* and *Salmostoma bacaila* were dominated.

Fig. 1. *Glyptothorax conirostris* (a) lateral view (b) dorsal view (c) ventral view.

TABLE 1
Morphometric details of three *Glyptothorax* species collected from river Ganges basin, India.

S.N.	Morphometric variables(mm)	*G. conirostris*	*G. cavia*		*G. telchitta*
			Sample 1	Sample 2	
	Total length	127,4	79,2	79,5	57,6
	Fork length	114,8	70	71	50,5
	Standard length	109,8	61,5	60	45,3
	Body depth	23,1	67,8	9,5	9,7
	Total body weight(g)	16,4	1,8	1,5	1,6
		Relative characters			
	Standard length/Body depth	4,7	4,6	4,5	4,7
	Standard length/Head length	3,3	3,5	3,4	3
	Head length/Eye diameter	4	4,5	4	4
	Interorbital width/Eye diameter	1,2	1,5	1,8	1,1
	Head length/Head width	1,9	1,8	1,6	1,8
	Head length/ Mouth width	1,8	1,7	1,5	1,7
		Fin formula			
	D/P/V/A/C	7,19, 6/6,4/18	7,9, 6,10,24	7,9,6,10,24	7,10,6,10,24
	Predorsal length/postdorsal length	45,8; 55,8	25,1; 54,1	24,5; 56,1	11,5; 32,6

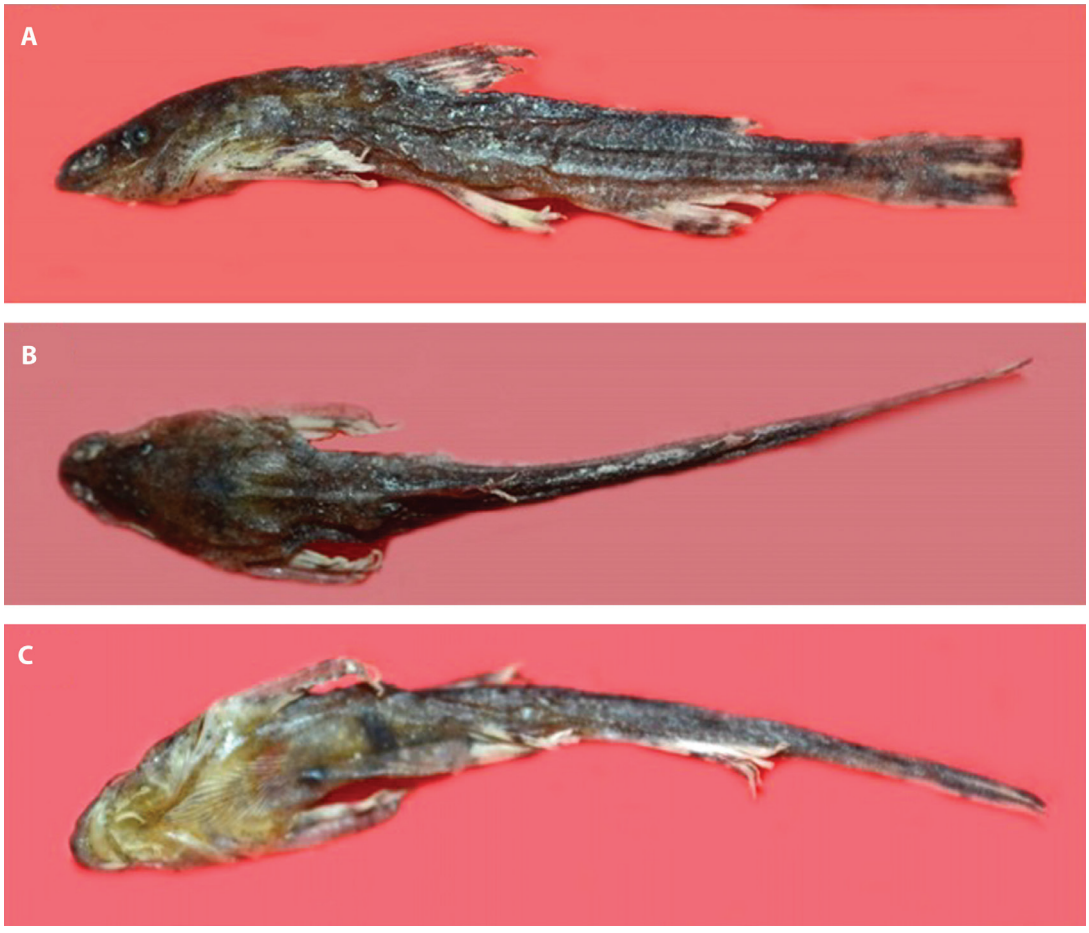

Fig. 2. *Glyptothorax telchitta* (a) lateral view (b) dorsal view (c) ventral view.

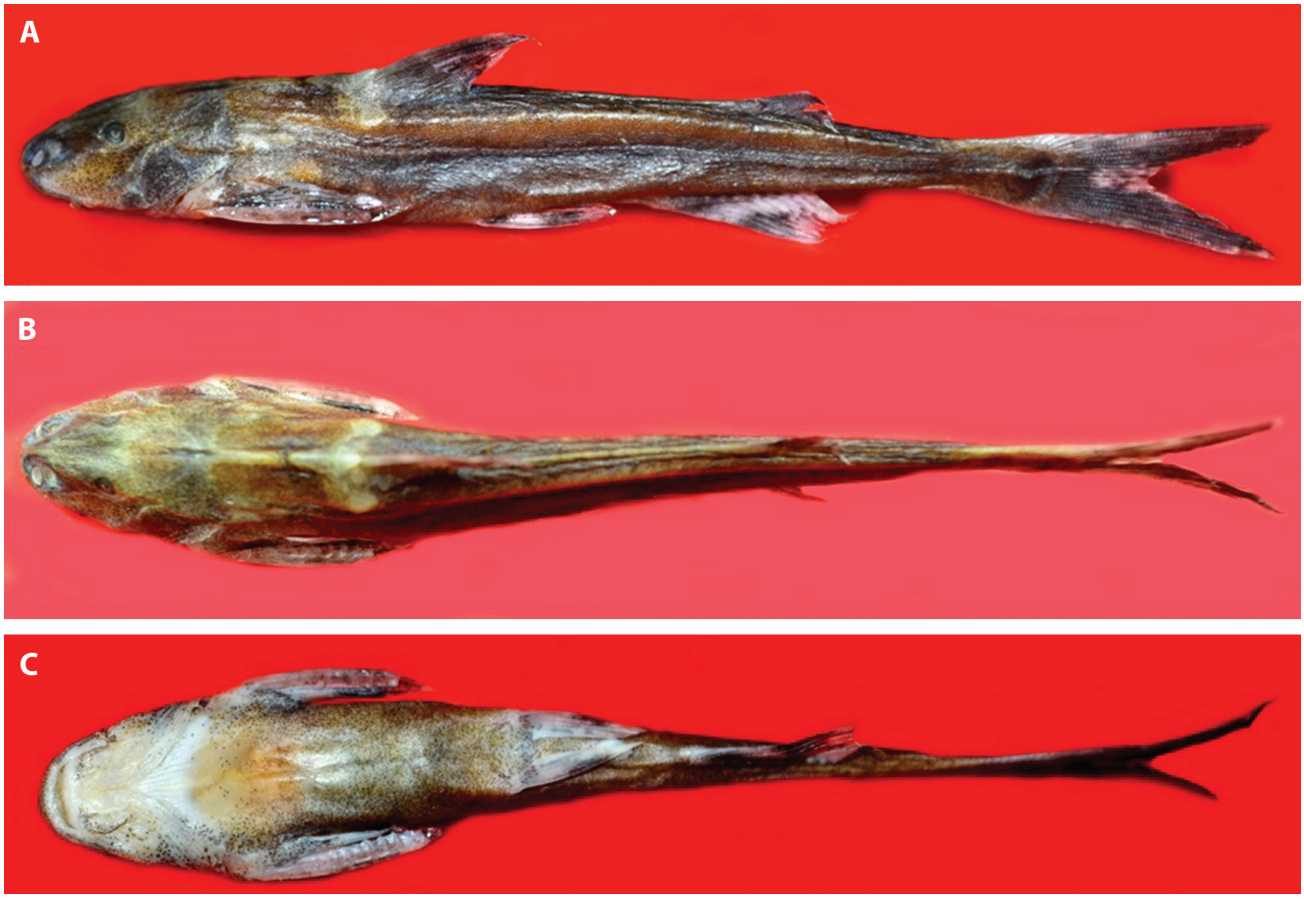

Fig. 3. *Glyptothorax cavia* (a) lateral view (b) dorsal view (c) ventral view.

DISCUSSION

In India, first description of *G. conirostris* was proposed by Steindachner (1867) from Northwestern India and subsequently from Garhwal Himalaya, Mahananda river, North Bengal ,headwaters of Poonchvally Shimla, and Tripura, respectively(Jayaram, 2010). First published record of *G. cavia* was from Northern Bengal and later reported from Assam, Terai region of North Bengal and Bihar, Meghalaya, Manipur, Hooglyriver at Kalna, West Bengal, Uttaranchal, Jammu and Kashmir. *G. telchitta* was recorded from Bihar, Garhwal in Western Himalaya, North Bengal. In Uttar Pradesh the species was reported from Vindhya region and river Rohini , Gorakhpur as cited in Jayaram (2010) and Srivastava (1988).Although the species *G. conirostris,* and *G. telchitta* has been reported earlier (Hora & Menon, 1949; Menon, 1974; Jayaram, 2010) from the state of Uttar Pradesh, however, they were not reported from the tributaries explored under this study. Vishwanath, Lakra and Sarkar (2007) described *G. chindwinica* much similar to *G. cavia* in general appearance but can be easily distinguished in the nature of tooth band, length of thoracic adhesive apparatus, head size, nature of skin and type of band on caudal fin. Hora and Menon (1949) treated *G. burmanicus* a synonym of *G. cavia*.

The genus *Glyptothorax* is very important from a taxonomic point of view as several new species have been described from northeastern India in the past few years (Vishwanath & Linthoingambi, 2007; Rameshori & Vishwanath, 2012). Pandey, Dubey, Kumar, Sarkar and Lakra (2011) described new distribution record of *G. brevipinnis* from a tropical river Ken, Central India. Recently, 9 species of *Glyptothorax* have been described from North Estern Region of India (Viswanath et al., 2007). Dubey (2007) reported seven species (including *G. telchitta*) from Central India. In another study, Badola (2008) reported 8 species of *Glyptothorax* from the drainages of Central Himalayas. An updated list of 40 species of this genus and their distribution in Indian waters has been presented in Table 2. The present distribution records of *G. conirostris*, *G. telchitta* and *G. cavia*in the

TABLE 2
Distribution record of the genus *Glyptothorax* in India.

S.N.	Species	Distribution	Occurrence locations	References
	Glyptothorax alaknandi	Alaknanda river, Shrinagar, district Pauri Garhwal (Uttarakhand)	1	Tilak, 1969
	Glyptothorax anamalaiensis	Streams in Anamalai hills, Western ghats, Tamilnadu	1	Silas, 1952
	Glyptothorax anandalei	Nierolay stream, Bhawani river at the base of Nilgiri hills, Nilgiri district, Tamilnadu	8	Hora, 1923
	Glyptothorax botius	Hooghly river at Kalna, Westbengal & Northeast India	3	Hamilton, 1822
	Glyptothorax brevipinnis	Exact location unknown, River Tonse	15, 1	Hora, 1923; Pandey et al., 2011
	Glyptothorax cavia	Northern Bengal, Eastern Himalayas, Assam, river Gomti	11, 1	Hamilton, 1822; Present study
	Glyptothorax chindwinica	Iril river, Urup, Manipur	1	Vishwanath & Linthiongambi, 2007
	Glyptothorax conirostris	Simla, Himachal Pradesh, Northwestern India, Western Himalaya, Mahananda river, Siliguri, Ganges canal, Roorkie	11, 1	Steindachner, 1867; Menon 1974; present study
	Glyptothorax coheni	Subarnarekha river, Chotanagpur, Jharkhand, India	Not known	Jayaram, 2010
	Glyptothorax dakpathari	Jamuna river, Dehradun, Uttranchal,	1	
	Glyptothorax davissinghi	Karim puzha, Maancheri, Nilambur reserve forest, Kerala	8	Manimekalan & Das, 1998
	Glyptothorax garhwali	Alaknanda, Bhilangana, Mandakini, Srinagar, Pauri garhwal district, Sharda, Tarakpur, Nainital district, Uttranchal, Nepal	8	Jayaram, 2010
	Glyptothorax gracilis	Yamuna river, below barrage, Dakpathar, district Dehradun, Uttar Pradesh, Uttarakhand	3	Gunther, 1864
	Glyptothorax granulus	Iril river, Phungdhar, Ukhurul district, Manipur	1	Vishwanath & Linthiogambi, 2007
	Glyptothorax housei	Mountain stream rapids, Anamalai hills, 4 miles east of valparai poolachi district southern India	2	Herre, 1942
	Glyptothorax indicus	Sone river, Bihar, Moga, East Punjab, streams of Terai, Eastern Himalaya, Kosi, Rihand river, U.P., India, Nepal	6	Jayaram, 2010
	Glyptothorax kasmirensis	Kashmir valley	8	Hora, 1923
	Glyptothorax kudremukhensis	Streams in Thunga river headwaters, Maduba, Kukdremukh national park, Karnataka, Western ghats	3	Gopi, 2007
	Glyptothorax lonah	Deccan, Madhya Pradesh	5	Sykes, 1839
	Glyptothorax madraspatanum	Bowany (Bhawani) river Neilgherries (Nilgiris) Madras state	5	Day, 1878
	Glyptothorax manipurensis	Barak river at Karong, Naga hills at Manipur state, Assam	3	Menon, 1955
	Glyptothorax nelsoni	Subarnarekha river, Chota Nagpur, Jharkhand	2	Jayaram, 2010
	Glyptothorax ngapang	Chindwin basin in Manipur, India	1	Vishwanath & Linthiogambi, 2007
	Glyptothorax pectinopterus	Ganges river drainages	24	McClelland, 1842

TABLE 2 (Continued)
Distribution record of the genus *Glyptothorax* in India.

S.N.	Species	Distribution	Occurrence locations	References
	Glyptothorax poonaensis	Mula mutha river at Poona, Maharashatra, Bombay, Mumbai state	1	Hora, 1938
	Glyptothorax stolickae	Simla, Himachal pradesh	1	Steindachner, 1867
	Glyptothorax striatus	Meghana & Brahamputra drainages India	3	McClelland, 1842
	Glyptothorax telchitta	Hoogly river at Kalna, North Bengal, River Rohini Gorakhpur,Vindhya region of Uttar Pradesh, North Bihar, Madhya Pradesh, river Gomti	9, 1	Hamilton, 1822; Srivastava, 1988; Menon, 1974; Present study
	Glyptothorax trilineatus	Chindwin basin, Manipur, Alaknanda river, Garhwal, Himalaya	11	Blyth, 1860
	Glyptothorax trewavaseae	Yenna valley, Satara district, Maharashtra	3	Hora, 1938
	Glyptothorax ventrolineatus	Iril river, Ukhruk district, Manipur	1	Vishwanath & Linthiongambi, 2007
	Glyptothorax naziri	Punjab	1	Jayaram, 2010
	Glyptothorax ngapang	Manipur, Barak river	2	Vishwanath & Linthiongambi, 2007
	Glyptothorax nelsoni	Subarnarekha river, Chota Nagpur, Jharkhand, India	2	Jayaram, 2010
	Glyptothorax pectinoperus	Nainital, Punjab, Song river Dehradoon, Sutlej, Yamuna, Uttaranchal	7	
	Glyptothorax platypogonides	Manipur	1	
	Glyptothorax saisii	Subarnarekha river, Paresnath hills, Garhwal, Saharanpur, Uttar Pradesh	6	
	Glyptothorax sinensis	Barak river, Kasong, Assam, Manipur India	5	
	Glyptothorax striatus	Cherapunji, Khasi hills, Someswar river, Barapani lake	6	
	Glyptothorax stoliczkae	Headwaters of Jamuna, Shimala, Western Himalaya	2	

explored tributaries of Ganges basin add a new location to the known range of the species in the northern plains of Uttar Pradesh. We believe the population of three *Glyptothorax* species descried here to be in a precarious state due to climatic variations and therefore more studies on biogeography of species in Northern India needs to be encouraged. There is also a need to characterize the population using morphological and molecular tools. As our report is based on low sample size additional catches of the specimens are needed to confirm whether there is an established population of the species in this locality.

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