The Bioscan 10(4): 1659-1663, 2015
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

# FIRST RECORD OF NON-NATIVE LORICARIID CATFISH, *PTERYGOPLICHTHYS DISJUNCTIVUS* (WEBER, 1991) (SILURIFORMES, LORICARIIDAE) IN CAUVERY RIVER OF PENINSULAR INDIA

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**KEYWORDS**
Non-native
Cauvery River
*Pterygoplichthys disjunctivus*

**Received on :**
17.09.2015

**Accepted on :**
02.12.2015

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**ABSTRACT**
Cauvery is an important river of Peninsular India and is home to a number of endemic species. This report provides the first record of the Sucker mouth armoured catfish *Pterygoplichthys disjunctivus,* belonging to the family Loricariidae, from river Cauvery. The fish was collected at Sathegala stretch of river Cauvery (12$^0$15'13"N and 77$^0$09'38"S). Aquarium trade has been responsible for the introduction of many alien species including catfishes of the genus *Pterygoplichthys* to many countries including India. These catfishes have been considered as invaders worldwide. Their occurrence in the wild may be probably due to escape from culture ponds and unintentional releases to the wild. The establishment and uncontrolled spread of *P. disjunctivus* may be a threat to freshwater faunal diversity of river Cauvery, if preventive measures are not immediately put in place.

## INTRODUCTION

Cauvery is a major inter-state river of peninsular India and flows through the states of Karnataka and Tamil Nadu. The river, with its origin at Talakaveri in the Western Ghats of Karnataka State, India, has a length of 765 km and covers a drainage area of nearly 87,000 km$^2$ (Varunprasanth and Nicholas, 2010). The river can be divided into two zones within Karnataka viz. Mountainous- from origin (1341 m) up to Kushalnagar (830 m asl) and Plateau- from Kushalnagar up to Mekedatu. The upper stretch of Cauvery river harbours a good fishery of indigenous carps. Among them, *Gonoproktopterus dubius, Labeo kontius* and *Puntius carnaticus* are indigenous to river Cauvery and *Cirrhinus reba*, *Labeo calbasu, Tor khudree*, *Osteocheilus thomassi, Schismatorhyncus nukta* and *Systomus sarana, among others are* native to river Cauvery. The exotic carps include *Cyprinus carpio, Oreochromis mossambicus, O. niloticus and C. garipienus*.

Many non-native fish are introduced to Indian waters for augmenting fisheries, sport and ornamental fish trade. These fishes enter the river system from culture ponds due to floods or by dumping of unwanted fishes unintentionally by aquarists. The non-native ornamental fishes ranging from tiny guppy (*Poecilia reticulata*) to large red piranha (*Pygocentrus nattereri*) have got established in the peninsular rivers of India (Bijukumar, 2000). The exotic fishes have a varying level of invasiveness on the ecosystem (Khan and Panikkar, 2009). Alien invasive species have been identified as one of the chief threats to the ecosystem and the biodiversity. Invasive alien species can interact with native species by changing habitat structure, competition for food and physical resources, and affects species diversity.

The genus *Pterygoplichthys,* popularly known as "sucker catfish" belonging to the family Loricariidae and native to South and Central America, has been reported from inland waters of India. Table 3 gives the distribution of this fish in India. This is the largest catfish family, with 680 recognized species (Armbruster and Page, 2006). Loricariids with the genus *Pterygoplichthys* is characterised by ten or more dorsal fin rays. The species *Pterygoplichthys pardalis, P. multiradiatus, P. anisisti* and *P. disjunctivus* are closely related and resemble each other with certain similar appearances (Weber, 1991; 1992). Loricariids, being a highly invasive and adaptive species, become threat on entering natural water bodies to native freshwater fish population by establishing themselves (Ravindranath, 2014). Among these, *P. multiradiatus,* has established populations in Vembanad Lake, Kerala, India (Daniels, 2006; Krishnakumar *et al.,* 2009). *P. disjunctivus* and *P. pardalis* have been recorded from wetlands of West Bengal and Assam (Singh and Lakra, 2011). Singh and Lakra (2011) also reported the occurrence of *P. anisisti* in rivers

Ganga near Patna and Gomti near Lucknow, North India. *P. disjunctivs* was found to be well established in the river Gomti (NBFGR, 2009). Murugan *et al*. (2015) reported the extended distribution of the invasive sucker catfish *Pterygoplichthys pardalis* to Cauvery river system of peninsular India. However, there are no reports on the occurrence of *P. disjunctivus* in the Cauvery river system of India. The present report may be considered as the first record of *P. disjunctivus* in River Cauvery.

## MATERIALS AND METHODS

Regular visits at monthly intervals were made to important commercial fish landing centres viz. T. Narasipura, Talakadu and Sathegala located along the upper stretch of river Cauvery to collect samples for studies on biology of selected species of fish during the period June 2014 and June 2015. Samples were also collected by experimental gill netting and cast netting at Sathegala and downstream of Cauvery falls. On one such visit in July, when the water level was low (3-4 feet) and the flow less, ten specimens of *P. disjunctivus* were recorded at Sathegala stretch alone only. Three specimens were taken live to laboratory and observed in aquarium for their behaviour. The rest were fixed in 10% formalin for further studies. Important morphometric and meristic characters were taken with a Vernier calliper to the nearest 0.1mm by examining the left side of the body following the method of Jayaram (2002) and Armbruster (2003). The landmark distances were measured according to Ambruster (2003) and Ozdilek (2007) (Fig. 2). The physico-chemical parameters of water collected at Sathegala site were analysed for dissolved oxygen and alkalinity following standard methods (APHA, 1998) other parameters viz. temperature, Secchi depth, pH and specific conductivity were recorded using standard digital field kit (HQ40d, 582580).

## RESULTS AND DISCUSSION

The Sathegala stretch, located in the plateau stretch of river Cauvery, is characterised by shallowness, moderate current velocity and turbulence. The substrate consists of rocky out-crops with gravel, pebble and cobble-sized particles. The water temperature was 22.5ºC, pH was near neutral (6.8) dissolved Oxygen was in favourable concentration (6.8 mg $l^{-1}$t). The water was soft with total Alkalinity of 40 mg $l^{-1}$ and a moderately high ionic concentration (specific conductivity - 345 $\mu$S $cm^{-1}$. The stretch is not polluted and the habitat is healthy.

The specimens belonging to genus *Pterygoplichthys* ranged

**Table 1: Morphometric measurements (g/cm) of *Pterygoplichthys disjunctivus* specimens (n = 10) collected from Cauvery river, Karnataka (India)**

| Landmarks* | Measurements | Mean (g/cm) | Range (g/cm) |
|---|---|---|---|
| - | Weight of fish (gm) | 250 ± 77.0 | 150 – 325 (g) |
| 1-20 | Total L | 33.05 ± 4.37 | 27.3 – 38.3 |
| 1-19 | Fork L | 30.17 ± 3.83 | 25 – 34.2 |
| 1-17 | Standard L | 23.97 ± 2.43 | 20.5 – 26.5 |
| 1-5 | Head L | 7.92 ± 1.0 | 6.3 – 8.8 |
| 2-4 | Head D | 2.45 ± 0.15 | 2.3 – 2.7 |
| 3-22 | Inter-orbital W | 3.45 ± 0.26 | 3.0 – 3.7 |
| 1-3 | Snout L | 4.1 ± 0.48 | 3.6 – 4.8 |
| 3-21 | Eye diameter | 1.02 ± 0.04 | 1.0 – 1.1 |
| 6-37 | Body D | 4.00 ± 0.29 | 3.6 – 4.4 |
| 32-36 | Body W | 4.27 ± 0.74 | 3.7 – 5.4 |
| 6-12 | Dorsal fin base L | 9.05 ± 0.76 | 7.9 – 9.8 |
| 8-9 | Pectoral fin base L | 1.95 ± 0.25 | 1.7 – 2.2 |
| 10-11 | Pelvic fin base L | 1.62 ± 0.10 | 1.5 – 1.8 |
| 13-14 | Anal fin base L | 1.95 ± 0.82 | 1.2 – 3.3 |
| 16-18 | Caudal peduncle D | 2.15 ± 0.32 | 1.7 – 2.5 |
| 1-6 | Distance between snout and dorsal | 9.5 ± 0.96 | 8.2 – 10.8 |
| 6-16 | Distance between dorsal and caudal | 14.32 ± 0.84 | 13.0 – 15.1 |
| 28-29 | Barbel L | 2.0 ± 0.36 | 1.5 – 2.4 |
| 6-7 | Dorsal spine L | 5.92 ± 0.77 | 5.1 – 6.7 |
| 30-31 | Pectoral spine L | 7.77 ± 0.85 | 6.5 – 8.6 |
| 32-33 | Pelvic spine L | 5.22 ± 1.24 | 3.7 – 6.5 |
| 34-35 | Anal spine L | 3.72 ± 0.72 | 2.6 – 4.5 |
| 15-38 | Adipose spine L | 2.0 ± 0.10 | 1.9 – 2.1 |
| 1-27 | Mouth L | 2.55 ± 0.22 | 2.2 – 2.8 |
| 25-26 | Mouth W | 3.05 ± 0.46 | 2.4 – 3.7 |
| 6-8 | Dorsal-pectoral distance | 6.30 ± 0.76 | 5.2 – 7.2 |
| 6-10 | Dorsal-pelvic distance | 4.85 ± 0.65 | 4.2 – 5.6 |
| 12-13 | Dorsal-anal distance | 3.10 ± 0.55 | 2.2 – 3.6 |
| 12-15 | Dorsal-adipose distance | 3.35 ± 0.47 | 2.6 – 3.8 |
| 15-13 | Adipose-anal distance | 5.77 ± 0.54 | 5.2 – 6.2 |
| 15-16 | Adipose-caudal distance | 1.37 ± 0.14 | 1.2 – 1.6 |
| 23-24 | Internares W | 1.67 ± 0.19 | 1.4 – 1.9 |
| 34-37 | Postanal distance | 9.07 ± 1.5 | 7.1 – 11.3 |
| 1-34 | Pre-anal distance | 17.62 ± 2.10 | 14.6 – 19.6 |

* Landmarks are shown in Figure (L: length, W: width, D: depth)

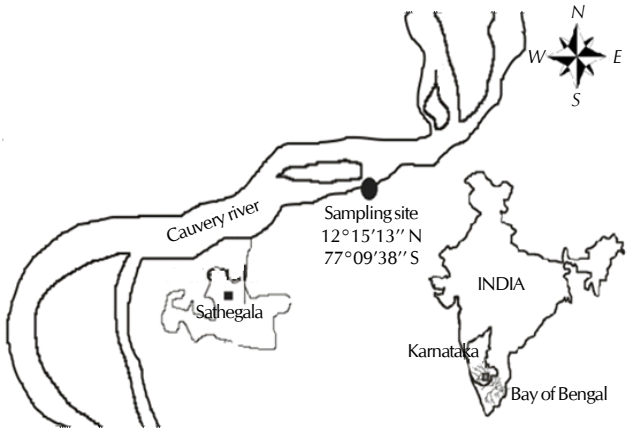


**Figure 1: Map showing the stretch of River Cauvery in Chamarajanagar District of Karnataka, South India where *Pterygoplichthys disjunctivus* specimen were collected**

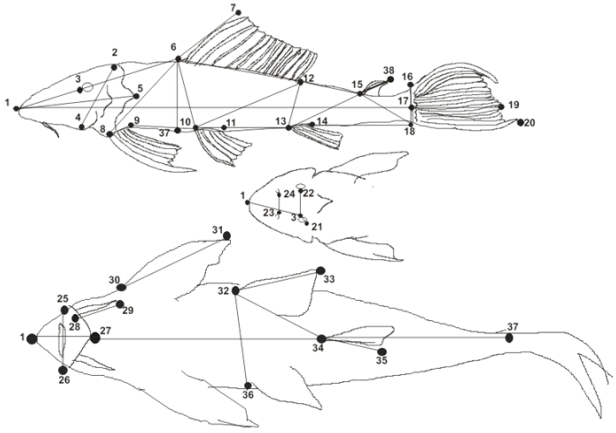

**Figure 2: Landmarks distance and inter landmark distance measurements of *Pterygoplichthys disjunctivus***

**Figure 3: Dorsal view of sucker-mouth armoured catfish**

**Figure 4: Ventral view of sucker-mouth armoured catfish**

in size from 27.3 to 38.3 cm in total length and 150 to 325 g in weight (Table 1). The fishes were identified as *P. disjunctivus* based on the following diagnostic characteristics: large dorsal fin; abdomen colour pattern consisting of light and dark vermiculation resulting from coalescence of spots; dark ventral vermiculation on venter broader or same width as light vermiculation and absence of a prominent supra-occipital process (Fig. 4); body elongated with depressed armoured head; dorsal fin with 12 rays, the first minute, the second massive and the largest; short adipose fin; anal fin with four rays; pectoral fin with five rays, the first biggest; caudal fin emarginated with lower lobe longer and pointed; body covered with 29 rows of lateral line plates (Table. 2). The dorsal surface of head is grey with dark spotting and becoming reticulated from the eye margin to the vertical of 3-4 dorsal rays (Fig. 3). As reported by Armbruster and Page (2006), the adult *P. disjunctivus* do not have geometric patterns on the head. The morphometric and meristic characteristics (Tables 1 and 2) indicate that these specimens are the members of *P. disjunctivus*. The Sathegala stretch of river Cauvery provides a suitable habitat for the successful colonisation of the loricariid *P. disjunctivus*. Successful invasion of loricariids to a variety of ecosystems and their establishment could be attributed to several factors - Occasional migrations across land and low current velocity; (Nico *et al.,* 2012); Distinctiveness in reproduction and development such as prolonged reproductive period, batch spawning, egg development at very low water levels and active parental care (Hoover *et al.* 2004; Liang *et al.,* 2005) Further, the fish is characterised by rapid growth and high fecundity which could result in their abundance within a short period of time (Hoover *et al.,* 2004). Loricariid catfish typically feed low in food chain by grazing or scraping, removing large quantities of periphyton and other attached materials from flat surfaces (Ludlow and Walsh, 1991). A list of seven species of *Pterygoplichthys* along with their distribution area in India is presented in Table 2. *P. disjunctivus* is widely distributed as the species has been recorded from North, East and South Indian freshwaters (NBFGR, 2009; Singh and Lakra, 2011; Present report)

The morphometric and meristic measurements of the collected *P. disjunctivus* specimens are comparable with the measurements of exotic South American sucker mouth armoured catfish reported by Bijukumar *et al.* (2015) at the drainages of Thiruvananthapuram, Kerala.

Alien invasive species are considered as one of the major

**Table 2: Important meristic counts of *Pterygoplichthys disjunctivus* (mean n = 10) collected from Cauvery River, India**

| Meristic data | Numbers |
|---|---|
| Dorsal fin rays | II-12 |
| Pelvic fin rays | I-5 |
| Pectoral fin rays | I-5 |
| Anal fin rays | I-4 |
| Caudal fin rays | I-14-I |
| Lateral line plates | 29 |

**Table 3: Distribution records of the genus *Pterygoplychthys* species in India, with occurrence locations**

| S. no | Species | Distribution | Authors |
|---|---|---|---|
| 1 | *P. multiradiatus* | Vembanad Lake, Kerala | Daniels, 2006 |
| 2 | *P. multiradiatus* | Akkulam Lake, Kerala | Baiju, 2009 |
| 3 | *P. multiradiatus* | Canoli Canal, Central Kerala | Krishnakumar *et al.,* 2009 |
| 4 | *P. disjunctivus* | River Gomti, Lucknow | NBFGR, 2009 |
| 5 | *P. multiradiatus* | Wetlands of Chennai | Knight, J.D.M, 2010 |
| 6 | *P. disjunctivus* and *P. pardalis* | Wetlands of West Bengal and Assam | Singh and Lakra, 2011 |
| 7 | *P. anisisti* | River Ganga near Patna and river Gomti near Lucknow | Singh and Lakra, 2011 |
| 8 | *Pterygoplichthys spp.* | Adyar wetland complex, Chennai, Tamil Nadu | Eric Ramanujam *et al.,* 2014 |
| 9 | *P. disjunctivus* | River Cauvery, Tamil Nadu | Murugan *et al.,* 2015 |
| 10 | *P. pardalis* and *P. disjunctivus* | Drainages of Tiruvananthapuram city, Kerala | Bijukumar *et al.,* 2015 |

**Figure 5: Location of the capture of sucker catfishes**

causes of erosion or devastation of native fish biodiversity in freshwater ecosystems. Alien species are interested mainly as food or ornamental fish. The negative impact of these species became apparent only sometime after their introduction and establishment in the ecosystem. The ecological effects of the highly invasive *Pterygoplichthys* sp. include disruption of food web by overgrazing on the benthic algae and detritus, decline in abundance of native species due to competition and egg destruction, mortality of aquatic birds due to choking by the dorsal and pectoral spines, changes in aquatic plant communities due to substrate ploughing and tail lashing, damages to the fishing gears and bank erosion caused by the nesting burrows (Hoover *et al.,* 2004). It has been reported that *Pterygoplichthys* will become widely established in south-eastern Asia and will have a negative impact on native species (Page and Robbins, 2006). The Cauvery falls is located 2 km downstream of Sathegala. The Cauvery river from below Cauvery falls up to Mekedatu (popularly known as Bheemeshwari stretch), a stretch of around 20 km, flows in a gorge and is characterised by riffles, rapids, cascades, and plunge & trench pools. This stretch supports a number of endemic and native species of commercially important carps viz. *Puntius carnaticus, Systomas sarana, Osteochielus thomassi, Schismatorhyncus nukta, Osteochielichthys brevidorsalis Osteochielichthys sp., Gonoproktopterus dubius, G. micropogon, Labeo kontius, L. calbasu* and *Tor khudree. The spread of P. disjunctivus* further downstream of Sathegala may be rapid and how this would affect the fish biodiversity in Bheemeshwari stretch is a point of concern. Detailed investigations on the biology of the *P. disjunctivus* are necessary to assess its adverse impacts on the native and indigenous fish of river Cauvery. Stringent measures should be taken to identify the pathway of these fishes into the river system. Further, there is need to create awareness regarding ill effects of the *Pterygoplichthys disjunctivus* on the ecosystem, commercial fishery and the livelihood of fishers.

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