



STANDARD MEASUREMENT AND SEXUAL DIMORPHISM OF A COBITID LOACH, *LEPIDOCEPHALICHTHYS GOALPARENSIS* PILLAI AND YAZDANI, 1976

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ABSTRACT

The present study on morphometry and sexual dimorphism is based on 32 fishes (18 males and 14 females) collected from Kamrup and Jorhat district of Assam. Sexual dimorphism was confirmed with Mann Whitney U test and three differences in characters viz. total length, depth of the body and length of pectoral fin were noted. The present data adds to the distributional information of this species in Assam, India.

KEYWORDS: *Lepidocephalichthys goalparensis*, morphometry, Kamrup district, Assam,

INTRODUCTION

Species of the genus *Lepidocephalichthys* is widely distributed throughout India, Bangladesh, Indo-China, Malay Archipelago, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand and Vietnam (Jayaram, 1999). They are small loaches inhabiting a variety of habitats from hill streams to paddy fields (Kottelat and Lim, 1992). They are generally found on the bottom of streams, swamps and flooded fields where they presumably feed primarily on benthic invertebrates (Havird and Page, 2010). Holotype of *Lepidocephalichthys goalparensis* was collected from under a culvert, about 6 kilometers west of Dudhnoi, Inspection Bungalow, Goalpara, Assam (Pillai and Yazdani, 1976). Tilak and Husain (1981) redescribed the holotype (total length, 39mm) of Pillai and Yazdani (1976) and found certain differences. There was no mention whether the specimen was male or female. Bhattacharya et al. (2000) mentioned *L. goalparensis* to be a rare species. The fish is in the critically endangered (CR) category (CAMP, 1998) and LC (least concern) category (IUCN, 2011). Saha and Bordoloi (2009) recorded the fish from the landing site of Sidli and Seksekia beels of Goalpara district, Assam. While revising the genus *Lepidocephalichthys*, Havird and Page (2010) redescribed 15 species and treated *L. goalparensis* to be valid and put *L. caudofurcatus*, as its junior synonym. There is urgent need of verification of distributional record with fresh collection of samples in view of the environmental deterioration and loss of microhabitat throughout the region. The present study reports the occurrence of *Lepidocephalichthys goalparensis* for the first time in two landing sites of the Kamrup district and in a beel (wetland) of the river island Majuli, Jorhat district, of Assam thereby extending the range by 371 km from the type locality. Detailed morphometric description with photographs in fresh condition and sexual dimorphism has been included in this paper.

STUDY SITES

Field studies were carried out for one year (2009-2010) in two landing sites namely Kacharighat and Kukurmara of Kamrup district and Kakarikata beel of Majuli Island, Jorhat District, Assam. Localities of specimens collected are as follows. Kacharighat (N 26°11'586'' and E 91°45'130'') is a major landing site of Guwahati, Kamrup district of Assam in the bank of the river Brahmaputra. Daily catch from Brahmaputra and neighbouring water bodies arrive at this point. From this landing site 3(three) specimens (1 female + 2 males) were collected on 4th May 2009.

Kukurmara (N 26°04'365'' and E 91°25'766'') is another landing site of Kamrup district located at a distance of 30 km from Guwahati. Fish catch from the surrounding beels as well as Kalahi tributary of the river Brahmaputra arrive at this spot. 28(Twenty eight) specimens (15 males and 13 females) were collected from this landing site on 22nd May 2009 and 14th July, 2010. Kakarikata beel (N 26°93'764'' and E 094°10'822'') is a perennial and open beel located in Majuli, a river island of the Brahmaputra river. From this beel 1(one male specimen and a juvenile) were collected. The juvenile sample has not been considered in the present measurements.

MATERIALS AND METHODS

Fishes were collected from two selected landing sites of Kamrup district and a beel of river island Majuli, Assam. Fishes were preserved in 10% formaldehyde solution immediately after collection and stored in 6% formaldehyde solution. Following papers and books were referred for confirmation of identification (Pillai and Yazdani, 1976; Tilak and Husain, 1981; Talwar and Jhingran, 1991; Havird and Page, 2010). Sex was determined by verification of gonads and presence of lamina circularis. Morphometric measurements were made with the dial vernier calliper to the nearest 0.05 mm. Statistical analysis of data were calculated using Microsoft

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Excel 2003. Non-parametric statistics (Mann Whitney U test) was applied to compare males and females. Photographs were taken with a Camera of model Sony Cyber-shot DSC-W-180.

Diagnosis

Lepidocephalichthys goalparensis is distinguished from other members of *Lepidocephalichthys* by the combination of following characters; (i) strongly forked caudal fin with regularly spaced four to five dark V-shaped bars; (ii) Dorsal fin origin anterior to pelvic fin origin; (iii) lamina circularis (Fig-I) composed of fused seventh and eighth pectoral rays; (iv) moderate to large size (39.2 to 53.9 mm SL); (v) sub orbital spine bifid; (vi) a distinct black spot on upper half of caudal fin base; (vii) mouth ventral with 3 pairs of barbels (Fig-II).

Meristic Counts: - D. iii/7; P. i/7; V. i/6; A. iii/6; C. 16

RESULTS



Fig. -I. Pectoral fin with lamina circularis



Fig. II. Ventral part of mouth

Description

Morphometric and meristic characters of *Lepidocephalichthys goalparensis* of the present collection are compared with the data of Pillai and Yazdani (1976) and Tilak and Hussain (1981) (Table -1). Size of the fish moderate to large; body is elongated, laterally compressed and tapering antero posteriorly; caudal fin strongly forked, its length ranges from 21.3 – 22.6mm(22.1% of SL); head length ranges from 21.1-22.3mm(21.7 % of SL); dorsal fin origin anterior to the pelvic fin origin; dorsal fin height

(19.6-20.6mm (20.1 % of SL) is less than the head length; eyes are large, dorsal and placed very close to each other; eye diameter ranges from 19.8-21.4mm(20.6 % of HL); inter orbital space ranges from 13.06-15.5mm(14.2 % of HL); a dark brown streak extends from a little behind tip of snout to the upper part of operculum touching the lower orbital margin; dorsal ridge of body with some irregular saddle shaped dark bands; a distinct black spot on upper half of caudal fin base.

TABLE 1. Comparison of meristic and morphometric characters of *L. Goalparensis*

Sl.No	Characters	Pillai and Yazdani (1976) (n=1)	Tilak and Husain (1981) (n= 1)	Present study (n= 32)		
				Average	Male (n=18)	Female (n=14)
1	Dorsal fin rays	III/6	III/7	III/7	III/7	III/7
2	Pectoral fin rays	7	I/7	I/7	I/7	I/7
3	Caudal fin rays	18	16	16	16	16
4	Depth of body	17.2 % SL	21.3% SL	18.3% SL	18.4% SL	18.2% SL
5	Length of Head	21.9% SL	22.3 % SL	21.4% SL	21.3% SL	21.5% SL
6	Length of caudal peduncle	15.6 % SL	13.1 % SL	15.4% SL	15.3% SL	15.5% SL
7	Height of dorsal fin	17.2% SL	18.0% SL	20.1% SL	19.6% SL	20.6% SL
8	Length of pectoral fin	14.0% SL	16.4% SL	16.1% SL	17.4% SL	14.8% SL
9	Length of caudal fin	21.9% SL	24.6% SL	22.1% SL	22.6% SL	21.3% SL
10	Maximum height of Caudal peduncle	9.4% SL	9.8% SL	9.3% SL	9.7% SL	8.9% SL
11	Length of snout	43.0% HL	36.8% HL	35.9% HL	36.1% HL	35.7% HL
12	Eye diameter	21.4% HL	26.5% HL	20.6% HL	19.8% HL	21.4% HL
13	Inter orbital distance	14.3% HL	14.7% HL	14.2% HL	13.06% HL	15.5% HL

Sexual dimorphism

There is not much variation between male and females of the species. The present study includes detailed measurements based on 32 specimens (18 males and 14 females). Difference between male and female was tested statistically with Mann Whitney U test. The U- test reveals that the male and female differ only in three characters, viz, total length, body depth and length of pectoral fins. Pectoral fin of the male is longer than in females and lamina circularis composed of fused seventh and eighth pectoral rays is present in case of male fish. Table-2 provides statistical comparison of measurements of male and female fishes using Mann Whitney U test.

(a) Males are larger than females: males average 57.4 mm in total length (TL) and reach up to 63 mm whereas females average 56.3mm (TL) and reach up to 61.9 mm (TL).

(b) Body depth of female is more than in males. Body depth of male is 14.3 – 21.9 mm whereas it ranges from 15.5 – 25.0 mm in females.

(c) In case of males, pectoral fin ranges from 13.9 – 19.9mm with an average of 17.4 mm. In case of female, pectoral fin ranges from 7.7 – 17.7mm with an average of 14.7 mm.

TABLE 2. Measurement of male and females (mm). Mean values and standard deviation are given in upper line, minimum and maximum values in lower line. Measurements of males and females are statistically compared using Mann Whitney U Test (at 95% confidence limit),* indicates- **No Difference**; **indicates-**Difference**.

Measurements	Males n=18	Females n=14	U test
Total Length	57.4 ± 6.20 (40.6 – 63.0)	56.3 ± 4.15 (48.7 – 61.9)	U = 391 Z = - 2.401**
Standard Length	48.7 ± 4.10 (41.2 – 53.9)	46.4 ± 3.98 (39.2 – 52.0)	U = 83.5 Z = - 1.409*
Body Depth	18.4 ± 1.93 (14.4 – 21.9)	18.1 ± 2.38 (15.52 – 25.01)	U = 63.5 Z = - 2.203**
Head Depth	10.9 ± 1.92 (7.8 – 13.5)	10.8 ± 1.67 (6.57 – 12.5)	U = 95 Z = - 0.952*
Head Length	21.3 ± 2.56 (16 – 25.1)	21.5 ± 1.68 (19.2 – 24.1)	U = 88.5 Z = - 1.211*
Head Width	7.7 ± 1.29 (4.5 – 9.3)	8.3 ± 1.27 (5.2 – 9.9)	U = 133.5 Z = - 0.575*
Eye diameter	4.5 ± 0.78 (2.6 – 5.3)	4.3 ± 0.32 (4.3 – 5.4)	U = 115 Z = - 0.160*
Snout Length	8.8 ± 1.45 (5.9 – 10.9)	7.8 ± 0.48 (6.9 – 8.8)	U = 138 Z = - 0.754*
Inter orbital space	2.83 ± 0.48 (1.8 – 3.9)	2.9 ± 0.71 (1.9 – 4.1)	U = 123.5 Z = - 0.178*
Pre dorsal length	46.1 ± 5.8 (30.1 – 51.2)	48.1 ± 4.35 (41.2 – 54.3)	U = 102 Z = - 0.674*
Post dorsal Length	48.1 ± 10.5 (27.9 – 57.4)	48.6 ± 8.35 (31.2 – 56.7)	U = 82.5 Z = - 1.448*
Pre pelvic distance	50.5 ± 4.3 (38.5 – 54.9)	50.2 ± 6.99 (29.9 – 57.9)	U = 89 Z = - 1.190*
Length of Dorsal fin	19.6 ± 1.79 (16.9 – 21.5)	20.6 ± 1.41 (17.5 – 22.2)	U = 131.5 Z = 0.496*
Length of base of dorsal fin	11.6 ± 2.56 (7.2 – 13.3)	12.9 ± 1.30 (10.2 – 14.6)	U = 151.5 Z = - 1.290*
Length of base of anal fin	6.8 ± 1.67 (3.4 – 8.8)	6.9 ± 1.17 (4.1 – 7.9)	U = 90.5 Z = - 1.131*
Length of Pectoral fin	17.4 ± 1.88 (13.9 – 19.9)	14.78 ± 2.48 (6.9 – 17.7)	U = 23.5 Z = - 3.790**
Length of Pelvic fin	14.3 ± 1.73 (8.8 – 16.2)	14.72 ± 1.23 (12.7 – 16.4)	U = 90 Z = - 1.151*
Depth of caudal peduncle	8.8 ± 1.45 (5.95 – 10.98)	8.31 ± 1.23 (6.4 – 10.3)	U = 69 Z = - 1.866*
Length of Caudal peduncle	2.84 ± 0.48 (1.8 – 3.9)	2.93 ± 0.71 (1.9 – 4.1)	U = 86.5 Z = - 1.290*

Colour

Colouration of *L.goalparensis* in fresh condition: (Fig III a and Fig.III b)



Fig III a – *L.goalparensis* (Male).



Fig III b - *L.goalparensis* (Female)

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Dorsal surface and abdomen yellow in colour with bluish black spots. 7-8 oval black spots on the lateral side of the body connect to form a lateral line. A large conspicuous dark blue spot is present in the base of the upper caudal region. A black coloured stripe extends from the tip of snout through the orbit and onto the opercle. The caudal fin has four to five anteriorly directed dark blue V-shaped



Fig-IV a - Preserved coloration of *L. goalparensis* (Male)

bars. The pectoral, pelvic and anal fin is yellowish red in colour. The top of the head bears irregular dark blue spots. In the present study also formaldehyde solution (6%) preserved samples show spots (Fig IV a and Fig- IV b) as was described in the holotype of Pillai and Yazdani (1976).



Fig IV b – Preserved coloration of *L. goalparensis* (Female)

DISCUSSION

Lepidocephalichthys goalparensis is in least concern category (IUCN, 2011). Basic data related to the species is lacking as this fish is very rare and could be recorded only in selected water bodies of Goalpara district (type locality, Seksekia and Sidli beel), Kamrup district (Kukurmara and Kachari ghat) and Jorhat district (Majuli island) of Assam. At present the range extension is about 371 km in the Brahmaputra basin. A slight difference in values obtained in morphometric measurements is because earlier description was based on a single specimen (Sex not known) The branched rays of the dorsal fin in the specimens of present collection are seven; branched pectoral fin rays are seven and caudal fin rays are 16 which are similar to the description of Tilak and Husain (1981). Sexual dimorphism in the genus *Lepidocephalichthys* has been reported by various authors. Arunkumar (2000) reported that males are larger than females and pectoral fin of male is longer with fewer rays and ossified than in females. Havird and Page (2010) reported that males have dark stripes and females have dark spots along the sides of the body. Havird et. al (2010) reported sexual dimorphism in a new species *L. zeppelini* (Havird and Tanjitjaroen, 2010) and found that males have significantly larger pectoral than in females and males are also significantly smaller than females.

Sexual dimorphism of male and female fishes has been confirmed with Mann Whitney U test (Table 2). The female differs from male only in four characters viz. absence of lamina circularis, total length, body depth and length of pectoral fin. *L. goalparaensis* was first described from Goalpara district of Assam by Pillai and Yazdani (1976). Tilak and Husain (1981) redescribed *L. goalparensis* by studying the holotype of Pillai and Yazdani (1976) and he found differences in certain characters. Havird and Page (2010) reviewed the genus *Lepidocephalichthys* and confirmed the fish, *Lepidocephalichthys goalparensis* to be a valid species. Menon (1992) synonymised *L. caudofurcatus* and *L. goalparensis* with *L. menoni*. However the characteristics and illustrations presented by Menon (1992) do not

conform to the original description of the species by Pillai and Yazdani (1976). Havird and Page (2010) concluded that *L. menoni* is a junior synonym of *L. annandalei* and *L. caudofurcatus* is a synonym of *L. goalparensis*.

CONCLUSION

The present study assumes significance as basic data related to this fish is lacking. Pillai and Yazdani (1976) and Tilak and Husain (1981) described *L. goalparensis* based on a single specimen from Goalpara district of Assam without any mention of the gender of the fish. The present collection localities are new habitats identified for the fish. The present description of the fish, *L. goalparensis* is based on 32 (thirty two) specimens (18 males + 14 females) collected from two new localities of Kamrup district (Kacharighat and Kukurmara) and from a beel (Kakarikata beel) in the river island Majuli, Assam. Inclusion of colour photograph of freshly collected fish will help future field workers in identification of the fish in field. The present description has confirmed the characteristics as described by Tilak and Husain (1981) and Havird and Page (2010). Sexual dimorphism has been confirmed statistically.

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