



Redescription of *Neoeucirrhichthys maydelli* (Teleostei: Cobitidae) from Brahmaputra drainage, Assam, Northeastern India

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Abstract

A cobitid genus *Neoeucirrhichthys*, a monotypic loach under family cobitidae, was described based on a single specimen of *N. maydelli* from Janali River (Brahmaputra River system) at Raimona, Goalpara district, Assam. Almost after four decades an attempt was made to redescribe *Neoeucirrhichthys maydelli* from Mechi River, Nepal without mentioning presence of minute maxillo-mandibular rudimentary barbel at the corner of mouth. And as the samples were not from the type locality of the original description, thus, need verification and confirmation of its taxonomic status with fresh specimens collected in and around the habitat of its type species. Recent collection of specimens from Khujia River (the vicinity of type locality of type species), the northern tributary of Brahmaputra drainage, Assam have found a population of *Neoeucirrhichthys maydelli* which is redescribed here with additional information on its morphology, anatomy and osteology. The present study reveals the presence of a lateral extension of air bladder capsule on each side which was not seen in the illustration of original description; important osteological features like neurocranium with reduced (almost absent) anterior frontal region, posterior portion of frontal bone triangular shape, no anterior preepiphysial fontanelle, posterior fontanelle triangular shape with wide base towards posterior; total vertebrae 37–38 (18–20 abdominal vertebrae; 18–19 caudal vertebrae), dorsal fin insertion between 14–15 and 16–17 vertebrae, anal fin insertion between 23–24 and 25–26 vertebrae; and caudal complex with 5 hypural and gap between epural and neural arch of first preural centrum (pc-1).

Keywords: Monotypic loach, *Neoeucirrhichthys maydelli*, redescription, Khujia River, osteology, Brahmaputra drainage

Introduction

Bănărescu & Nalbant (1968) described *Neoeucirrhichthys maydelli*, a small monotypic freshwater loach under family Cobitidae, from Janali River (Brahmaputra river system) at Raimona, Goalpara district, Assam. It is characterized by having an elongated and slightly compressed body, absence of rostral, maxillary and mandibular barbels except a minute maxillo-mandibular rudimentary barbel at the corners of mouth, and highly placed eye with very narrow interorbital space. Menon (1992) registered the same characters as mentioned by Bănărescu & Nalbant in their original description. Edds & Ng (2007) attempted to redescribe

Neoeucirrhichthys maydelli from Mechi River, Nepal (far away from its type locality). Some of the information given by Edds & Ng are not aligned with the original description, thus, needs verification and confirmation of its taxonomic status with specimens collected in and around the habitat of its type locality.

On examination of recently collected specimens from Khujia River a northern tributary of Brahmaputra drainage, Assam include a population of *Neoeucirrhichthys maydelli*. It has been reexamined and redescribed here with the additional information on its morphology, anatomy and osteological characters.

Materials and methods

The collected specimens were fixed in 10% buffer formalin. Counts and measurements were made on the left side of the specimens, whenever possible, following Kottelat (1990). Measurements were made point to point with a dial caliper to the nearest 0.1 mm. Measurements of body parts were given as proportions of standard length (SL). Measurements of subunits of heads were given as proportions of dorsal head length (DHL) and lateral head length (LHL). Fin rays were counted under a stereozoom microscope and were confirmed through a cleared and stained specimens following Taylor & Van Dyke (1985). Vertebral counts and description of caudal complex were done from cleared and stained specimens following Sawada (1982). The detail osteological structures were observed and photographed under a Leica Stereozoom microscope using Leica Application Suite version 3.4.0. The specimens were deposited in the Assam Don Bosco University Museum of fish (ADBU-MF). Data from Bănărescu & Nalbant (1968) and Edds & Ng (2007) were used for comparison of the specimens. Gill rakers were counted from the first left side of gill arch.

Neoeucirrhichthys maydelli Bănărescu & Nalbant, 1968

(Figure 1A-D)

Study materials: ADBU-MF 1611/1–8, 8 exs., 27.7–36.6 mm SL, females; ADBU-MF 1611/9, 1 exs., 33.3 mm SL, male; India: Assam: Chirang district: Khujia River at South Kajalgaon (a tributary of Brahmaputra River system), coordinate 26°29'32.2"N 90°29'35.27"E, altitude 72 m above sea level; Bidangshri Basumatary, 20.iii.2021. Two specimens (ADBU-MF 1611/1, 36.6 mm SL, female; ADBU-MF 1611/9, 33.3 mm SL, male) were cleared and stained for osteology.

Diagnosis

Neoeucirrhichthys maydelli is distinguished from other cobitid loaches by the absence of rostral, maxillary and mandibular barbels and presence of a rudimentary maxillo-mandibular barbel at the corner of mouth. It is further diagnosed in having the following characters: 8-9 dark brown saddles on dorsum, a series of 11-12 more or less upside down like triangular bars below mid lateral, short lateral line with 7-8 pores, and a black spot at dorsal half of caudal-fin base, neurocranium with reduced (almost absent) anterior frontal region, posterior portion of frontal bone triangular shape, no anterior preepiphysial fontanelle,

posterior fontanelle triangular shape with wide base towards posterior; total vertebrae 37–38.

Description

Morphometric and meristic data as in Table 1. Body elongate, subcylindrical in cross section, slightly compressed laterally, more or less compressed towards posterior of caudal peduncle. Head compressed, triangular in lateral view with gently convex dorsal and ventral margins. Eyes large, ovoid, horizontal axis longest; highly placed entirely in dorsal half of head, with very narrow interorbital space. Suborbital spine bifid, with a low processus dorso-caudalis branch and a long medial point, extending to vertical through anterior third of eye. Slit of erectile suborbital spine extending from vertical through midway between posterior margin of posterior nares to anterior orbital margin to below vertical through middle of eye. Gills openings restricted, extending from just below posttemporal to just below base of first pectoral fin ray. Snout pointed, flaccid; anterior nostrils prolong forming a prominent tube and posterior nostril at its base (Figure 2a). Mouth small, inferior, horse-shoe shaped (Figure 2b). Very shallow rostral groove along anterior margin of upper lip. Both upper and lower lip moderately thick, slightly papillated; lower jaw with a weak symphyseal knob. Lower lip continuous with upper lip through a narrow flap of skin at corner of mouth. Post-labial groove along posterior margin of lower lip with a medial interruption by narrow frenum between skin of lower jaw and throat. Both rostral or maxillary barbels absent, however a short maxillo-mandibular rudimentary barbel at the corner of mouth (Figure 2c).

Dorsal profile of body rising gently over snout to nape then abruptly elevate at nape often with sharp demarcation, then more or less straight to dorsal-fin origin and sloping gently ventrally from dorsal-fin origin to end of caudal peduncle. Ventral profile convex to anal-fin base, then sloping dorsally to end of caudal peduncle. Body depth highest at dorsal-fin origin.

Dorsal fin with 3 simple and 7½ branched rays; first branched rays longest, last branched rays extending vertically to anal fin origin; distal margin straight; origin posterior to pelvic-fin base, closer to caudal-fin base. Pectoral fin with 1 simple and 8 branched rays, reaching one third to pelvic-fin origin; margin subacuminate. Pelvic fin in advanced to dorsal-fin origin with 1 simple and 6 branched rays, reaching vent when adpressed; distal margin subacuminate; origin

slightly at middle of standard length of body. Anal fin with 2 simple and 5½ branched rays, reaching midway to caudal peduncle when adpressed; distal margin straight. Caudal fin emerginate with 7+7 branched principal rays; procurrent rays in upper and lower lobe of caudal fin with 4-6 and 4 respectively.

Body covered with minute cycloid scales. Lateral line very short with 7-8 lateral pores. Intestine straight.

Osteological features. Neurocranium with reduced (almost absent) anterior frontal region, posterior portion of frontal bone triangular shape; no anterior preepiphysial fontanelle, posterior fontanelle triangular shape with wide base towards posterior end (Figure 3a).

Branchiostegeal rays 3, long well developed, posterior free end (outer side) flattened laterally (Figure 3b). First branchiostegeal ray articulate to ventral side posterior median of ceratohyal (ch); second ray articulate at antero-lateral of epihyal (eh); third ray articulate at median lateral side of epihyal (eh). Interhyal small elongate, articulate from inner wall of posteriormost lateral side of epihyal (eh). Gill rakers 2 in epibranch and 7 in hypobranch (Figure 3c). Ceratobranch triangular dragger shaped with 9 pointed teeth on inner face (Figure 3d). Bony capsule of air bladder rounded with a lateral process directed posterior (Figure 3e).

Total vertebrae 37-38; abdominal 18-20; predorsal 14-16; caudal vertebrae 18-19. Dorsal fin insertion between 14-15 or 16-17 vertebrae. Anal fin insertion between 23-24 or 25-26 vertebrae.

Caudal complex (Figure 3f) with 5 hypural, three in upper lobe (h3-h5) and two in the lower lobe (h1-h2). Gap between eural (e) and neural arch of first preural centrum (pc-1). Hypural-1, 2 attached to parhypural dorsally, hypural-3, 4 and 5 attached to ventral groove of pleurostylar (pls). Principal caudal fin rays lies from pleurostylar to haemal spine (hs) of the second preural centrum (pc-2). Dorsal procurrent rays supported by epeural (e) and neural spine (ns) of second preural centrum (pc-2); ventral procurrent rays supported by haemal spine of second preural centrum (pc-2). Parhypural (ph) and haemal spine (hs) broad and well developed.

Sexual dimorphism. Males are with broad and thickened branched pectoral fin rays (more in 5, 6 & 7) branched rays (Figure 3g). In males, the dorsal surface of pectoral fin rays covered with elongate tubercles arranged in oblique striae (Edds & Ng, 2007).

Coloration. In 10% buffer formalin, body creamy yellow however dark yellow in 70% alcohol. Series of 8-9 dark saddles on dorsal midline, 4 on predorsal and 4-5 on postdorsal region. First saddle closer to nape, slightly faded fourth saddle at the base of dorsal-fin origin, fifth at the posterior end of dorsal-fin base, last eight or ninth slightly posterior to the caudal peduncle end. Dorsolateral surface marked with faint dark melanophores forming irregular reticulated pattern and extending dorsal third of body. Series of 11-12 horizontally elongated more or less inverted triangular shape dark blotches on flanks along horizontal myosepta. Prominent black ovoid spot on dorsal half of caudal-fin base, just above midline of caudal fin. All fin hyaline with dark melanophores forming series of transverse bands. Ventral surface creamy yellow, no pigments. Series of minute dark melanophores arranging in two horizontal rows, one just near orbit and another below former extending from tip of snout to cheek anterior to dorsal corner of operculum. Short faint stripe between tip of snout to base of suborbital spine. Numerous small irregular dark melanophores scattered on dorsum of snout and head. Ventral region of the snout peppered with small dark melanophores.

Distribution. The present *Neoeucirrhichthys maydelli* specimens were collected from Khujia River flowing to the Champabati River (the vicinity of type locality of type species), the northern tributary of Brahmaputra River system. Bănărescu & Nalbant (1968) described it from Janali River (a tributary of Brahmaputra River system) at Raimona, Goalpara district, Assam. Edds & Ng (2007) reported it from Mechi River, Nepal. Rahman (1989) reported *N. maydelli* from Tangan River at Thakurgaon and the Meghna River drainages in Bangladesh viz. Dharla River at Kurigram, Sari River at Jaintapur and Surma River at Lubachara.

Habitat. *Neoeucirrhichthys maydelli* inhabits in cool, shallow and moderately flowing water with gravels bottom, sand, pebbles and riffles. Other species occurring with *Neoeucirrhichthys maydelli* were *Barilius barila*, *B. bendelensis*, *Puntius* sp., *Pethia* sp., *Esomus* sp., *Canthophrys* sp., *Lepidocephalichthys goalparensis*, *L. anandali*, *L. guntea*, *Pangio pangia*, *Psilorhynchus sucatio*, *P. nudithoracicus*, *Acanthocobitis* sp., *Paracanthocobitis* sp., *Schistura* sp., *Chaca chaca*, *Hara* sp., *Amblyceps* sp., *Pseudogobius* sp., *Olyra* sp., *Microphis deocata*, *Pillaia* sp., *Mastacembelus* sp., *Macrogathus* sp.; *Parambassis* sp., *Badis* sp., *Glossogobius* sp.; *Channa* sp. and different types of shrimps, snails and crabs.

Table 1. Biometric data of *Neoeucirrhichthys maydelli* showing the comparative account with previous description.

	ADBU-MF1611/1-9			Bănărescu & Nalbant, 1968	Edds & Ng, 2007
	N=9			Holotype	N=4
	range	means	S.D.		range
Standard length(mm)	27.7–36.6			36.0	29.4–36.2
% in Standard Length					
Body depth	11.8–13.3	12.6	0.6	13.3	10.8–12.6
Head length (dorsal)	15.1–17.0	16.5	0.7	--	--
Head length (lateral)	18.4–21.2	19.6	0.9	19.7	18.2–20.4
Head depth at nape	8.5–9.9	9.3	0.5	--	--
Head depth at eye	6.0–7.2	6.7	0.4	--	--
Length of caudal peduncle	14.5–18.4	16.4	1.4	16.9	14.6–19.6
Depth of caudal peduncle	6.3–7.6	6.9	0.5	7.5	5.9–7.1
Pre-dorsal length	52.3–56.9	54.1	1.5	50.0	51.1–54.4
Pre-pelvic length	51.3–52.4	52.0	0.4	47.7	48.6–53.4
Pre-pectoral length	20.9–22.2	21.5	0.5	--	20.2–21.5
Preanus length	68.9–72.6	70.7	1.3	--	--
Preanal length	72.6–76.6	74.2	1.4	71.7	69.6–74.5
Dorsal-fin height	15.9–18.4	17.3	0.9	--	--
Pectoral-fin length	12.9–17.0	14.1	1.5	18.5	12.4–15.1
Anal-fin depth	16.8–19.5	18.2	1.1	13.9	--
Pelvic-fin length	14.5–18.4	16.7	1.4	16.9	12.9–14.7
Caudal-fin length (both upper and lower lobe)	19.5–21.7	20.6	0.9	--	18.2–21.8
Dorsal-fin base length	12.3–14.1	13.1	0.7	11.9	9.7–12.6
Anal-fin base length	8.8–11.0	10.0	0.8	7.9	8.1–10.5
Body width (anal ori)	4.7–6.7	5.7	0.9	--	--
Body width(dorsal ori)	7.5–9.0	8.2	0.5	7.8	--
Pectoral-Pelvic fin distance	29.2–31.3	30.0	0.8	38.6	--
Pelvic-Anal fin distance	19.6–21.7	20.8	0.8	24.4	--
% in lateral head length					

	ADBU-MF1611/1-9			Bănărescu & Nalbant, 1968	Edds & Ng, 2007
	N=9			Holotype	N=4
	range	means	S.D.		range
Snout length	33.9–38.5	35.7	1.7	32.4	28.3–32.3
Eye diameter	19.2–25	21.3	2.0	19.7	15.0–16.1
Interorbital space	3.1–5.8	4.2	0.9	--	8.3–10.0
Mouth gape width	7.5–9.7	9.0	0.9	--	--
Head width max at cheek	17.8–26.2	24.1	2.9	--	--
% in dorsal head length					
Snout length	38.9–47.3	42.6	2.8	--	--
Eye diameter	22.2–28.3	25.3	2.0	--	--
Interorbital space	3.6–6.3	5.0	1.1	--	--
Mouth gape width	9.3–12.7	10.7	1.2	--	--
Head width max	23.6–30.8	28.6	2.5	--	--
Fin counts					
Dorsal-fin rays	iii,7½			iii,7	iii,7
Anal-fin rays	ii,5½			ii,5	ii,5
Pelvic-fin rays	i6			--	i,5
Pectoral-fin rays	i,8			--	i7
Principal caudal-fin rays	i7+7i			--	i,7,8,i
Procurrent rays	iv–vi/iv			--	--

Table 1: Biometric data of *Neoecirrhichthys maydelli* showing the comparative account with previous descriptions.



Figure 1: *Neoeucirrhichthys maydelli*, ADBU-MF 1611/2, 36.5 mm SL, female (A) Lateral, (B) Dorsal, (C) Ventral, (D) Illustrated image (redrawn) from Figure15 of Banareescu & Nalbant (1968).

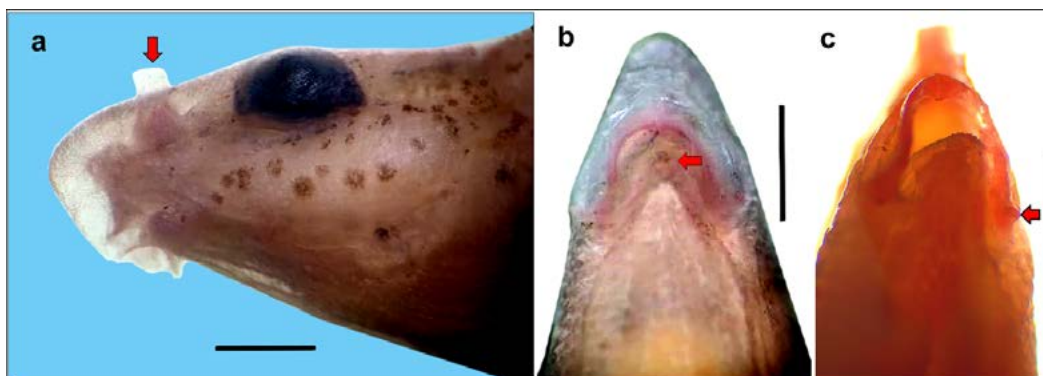


Figure 2: *Neoeucirrhichthys maydelli*, ADBU-MF 1611/2, 36.5 mm SL, female (a) Lateral head showing tube like anterior nostril (marking with red arrowhead), (b) Ventral view of head showing horse-shoe shaped mouth and medial symphyseal knob (marking with red arrowhead), (c) Ventral view of head showing rudimentary maxillo-mandibular barbel (marking with red arrowhead). Scale bar = 1mm.

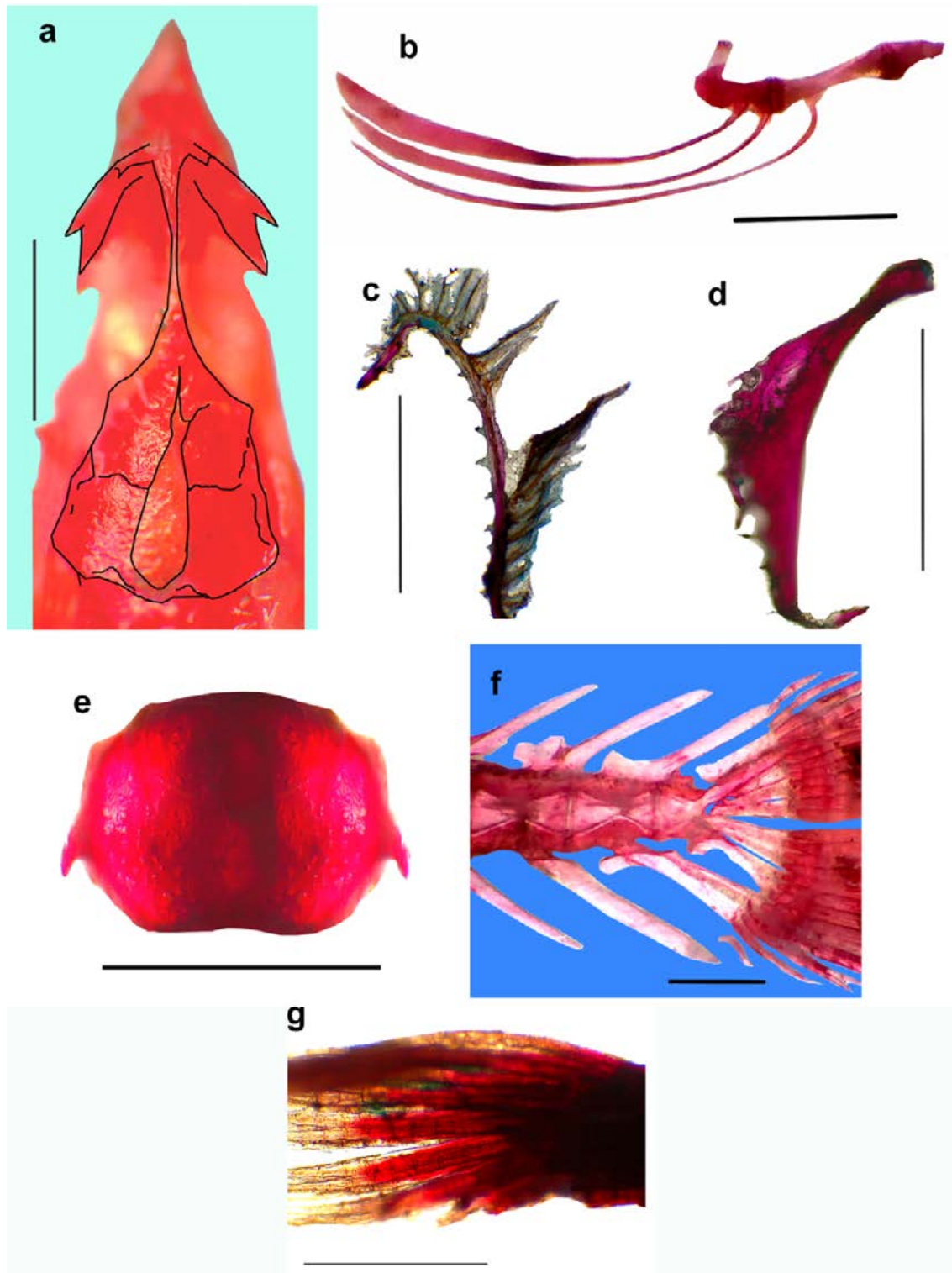


Figure 3: *Neoeucirrhichthys maydelli*, ADBU-MF 1611/9, 33.3 mm SL, male, (a) Dorsal view of neurocranium, (b) Branchiostegal rays, (c) Gill rakers on first left gill arch, (d) A row of pharyngeal teeth on left ceratobranch, (e) Ventral view of air bladder capsule, (f) Caudal complex, (g) Pectoral fin showing thickened branched rays. Scale bar = 1 mm.

Discussion.

During the description of *Neoeucirrhichthys maydelli*, Bănărescu & Nalbant (1968) stated that the lower lip is not connected to the upper lip but to its doublure, no trace of rostral or maxillary barbels, and presence of a minute rudimentary maxillo-mandibular barbel at the corner of the mouth. Edds & Ng (2007) restated the connection of upper and lower lip through its doublure (a flap of skin fringing the upper lip to which the lower lip is ostensibly attached instead of to the upper lip) but did not give any observation of the later. Close examination of the recently collected specimens from the type locality of *Neoeucirrhichthys maydelli* agrees partly with description given by Bănărescu & Nalbant (1968), Menon (1992), and Edds & Ng (2007). We strongly agree with Edds & Ng (2007) on the connection of upper lip and lower lip. Close examination on specimens from the type locality shows the presence of a minute rudimentary maxillo-mandibular barbel at the corner of the mouth as stated by Bănărescu & Nalbant (1968) and Menon (1992). Moreover, Bănărescu & Nalbant (1968) mentioned the thickening and enlargement of the branched rays of the pectoral fin (in males) showing sexual dimorphism. Edds & Ng added the presence of elongate tubercles arranged in oblique striae on thickened branched rays of pectoral fins (in males). However, our specimen resembles with the former

character as mentioned by Bănărescu & Nalbant, not the later. The development of tubercles happens during breeding season in mature males in most of the cyprinid fishes. The study of osteological characters reveals the presence of spike like elongation each on the lateral sides of bony capsule of air bladder, whereas, Bănărescu & Nalbant (1968) didn't show in the diagram.

The comparison of the present specimen from the data published in the original description and the Nepalese specimen shows large similarities with small differences (Table 1). The present specimen collected from the type locality recently, showed slight differences in their fin counts from both Bănărescu & Nalbant (1968) and Edds & Ng (2007). The present specimen have more branched dorsal-fin rays ($7\frac{1}{2}$ vs. 7), more branched anal-fin rays ($5\frac{1}{2}$ vs. 5) from the original description and the Nepalese specimens; more branched pelvic-fin rays (6 vs. 5), more branched pectoral-fin rays (8 vs. 7), less branched caudal fin rays (7+7 vs. 7+8) from the Nepalese specimen. Bănărescu & Nalbant mentioned presence of rows of spots in the dorsal, pectoral and caudal fin, whereas, in the present specimen all the fins are hyaline with dark melanophores forming series of transverse bands. Though there is a very few variations in morphometry and meristic data, they are all conspecific of *Neoeucirrhichthys maydelli*.

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