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The identity of *Pseudecheneis sulcata* (M'Clelland, 1842), with descriptions of two new species of rheophilic catfish (Teleostei: Sisoridae) from Nepal and China

HEOK HEE NG

Fish Division, Museum of Zoology, University of Michigan, 1109 Geddes Avenue, Ann Arbor, Michigan 48109-1079, USA. E-mail: heokheen@umich.edu

Abstract

The identity of *Pseudecheneis sulcata* is clarified in this study, and the species is redescribed. *Pseudecheneis sulcata* (from the Brahmaputra River drainage) can be distinguished from congeners in having a unique combination of the lack of a prominent bony spur on the anterodorsal surface of the first dorsal-fin pterygiophore, presence of a first dorsal-fin element, bifid neural spines on the complex vertebra, the neural spines of the last 2–3 preanal and first 6–7 postanal vertebrae gradually increasing in height, separate pelvic fins, a less convex snout when viewed laterally, presence of pale spots on the body, 36–39 vertebrae, 12–14 transverse laminae on the thoracic adhesive apparatus, pelvic-fin length 21.2–28.7% SL, pectoral-fin length 121.6–156.3 % HL, length of adipose-fin base 17.8–22.7% SL, length of caudal peduncle 25.0–28.3% SL, depth of caudal peduncle 4.0–5.2% SL, and eye diameter 8.8–10.6% HL. *Pseudecheneis eddsi*, new species, is described from tributaries of the Ganges River in Nepal. *Pseudecheneis eddsi* can be distinguished from congeners by a unique combination of the presence of a prominent bony spur on the anterodorsal surface of the first dorsal-fin pterygiophore, presence of a first dorsal-fin element, bifid neural spines on the complex vertebra, the neural spines of the last 2–3 preanal and first 6–7 postanal vertebrae gradually increasing in height, separate pelvic fins, gently rounded snout when viewed dorsally, presence of pale spots on the body, 36–39 vertebrae, pelvic-fin length 18.0–20.9% SL, pectoral-fin length 114.9–156.0% HL, length of adipose-fin base 19.5–24.3% SL, length of caudal peduncle 25.2–27.8% SL, depth of caudal peduncle 3.5–5.3% SL, and eye diameter 9.6–12.8% HL. *Pseudecheneis stenura*, new species, is also described from the Irrawaddy River drainage in southwestern China. *Pseudecheneis stenura* can be distinguished from congeners by a unique combination of the presence of a prominent bony spur on the anterodorsal surface of the first dorsal-fin pterygiophore, presence of a first dorsal-fin element, bifid neural spines on the complex vertebra, the neural spines of the last 2–3 preanal and first 6–7 postanal vertebrae gradually increasing in height, separate pelvic fins, presence of pale spots on the body, 38–40 vertebrae, pelvic-fin length 20.4–24.3% SL, pectoral-fin length 160.4–196.9% HL, length of adipose-fin base 18.8–23.7% SL, length of caudal peduncle 30.3–34.5% SL, depth of caudal peduncle 2.9–3.6% SL, and eye diameter 9.2–12.8% HL. A key to the species of *Pseudecheneis* is provided.

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Key words: Glyptosterninae, Irrawaddy River, Ganges River

Introduction

Sisorid catfishes of the subfamily Glyptosterninae are widely distributed throughout the highlands of southern Asia. Among them, members of the genus *Pseudecheneis* Blyth, 1860 are easily diagnosed in having a thoracic adhesive apparatus consisting of a series of transverse ridges (laminae) separated by grooves (sulcae) (de Pinna, 1996; Roberts, 1998). *Pseudecheneis* species are found in the headwaters of major river drainages throughout the subhimalayan region eastwards to the Ailao Shan range along the upper Red River drainage and the Annam Cordillera. A previous study by Ng & Edds (2005) recognized seven valid species of *Pseudecheneis*, viz. *P. sulcata* (M' Clelland, 1842), *P. paviei* Vaillant, 1904, *P. immaculata* Chu, 1982, *P. sulcatoides* Zhou & Chu, 1992, *P. sympelvica* Roberts, 1998, *P. crassicauda* Ng & Edds, 2005, and *P. serracula* Ng & Edds, 2005.

The identity of *P. sulcata* has been problematic (Ng & Edds, 2005), and the current status of *P. tchangi* (Hora, 1937) is unclear. The study below is based on an examination of material identified as *P. sulcata* from throughout southwestern China, India, and Nepal (including topotypic material of *P. sulcata*) and clarifies the identity of *P. sulcata*, which is redescribed below. Additionally, material from Nepal previously identified as *P. sulcata* by Ng & Edds (2005) is found to belong to an undescribed species; the description of this as *P. eddsi*, new species, appears below. A second new species from southwestern China, *P. stenura*, is also described.

Material and methods

Measurements were made point to point with dial calipers, and data recorded to tenths of a millimeter. Counts and measurements were made on the left side of specimens whenever possible. Subunits of the head are presented as proportions of head length (HL). Head length and measurements of body parts are given as proportions of standard length (SL). Measurements follow those of Ng & Rainboth (2001). An asterisk after a particular meristic count indicates value for the holotype. Osteological data were obtained from both cleared and stained material following the methods of Taylor & Van Dyke (1985) and from radiographs. Statistical analyses were carried out using SYSTAT 10 (SPSS, 2000).

Material examined in this study is deposited in the following institutions: Academia Sinica. Institute of Zoology, Beijing (ASIZB), Natural History Museum, London (BMNH), California Academy of Sciences, San Francisco (CAS), Collection of Maurice Kottelat, Cornol (CMK), Kunming Institute of Zoology, Kunming (KIZ), University of Kansas Natural History Museum, Lawrence (KU), Muséum National d'Histoire Naturelle, Paris (MNHN), Department of Zoology Collection of Vertebrates, Oklahoma State University, Stillwater (OSUS), University of Michigan Museum of Zoology, Ann Arbor (UMMZ), and Zoölogisch Museum Amsterdam (ZMA).

***Pseudecheneis sulcata* (M' Clelland, 1842)**
(Fig. 1)

Glyptosternon sulcatus M'Clelland, 1842: 587, pl. 6 figs. 1–3 (type locality: Kasyah [Khasi] Hills, Meghalaya, India)

Pseudecheneis sulcatus Blyth, 1860: 154; Günther, 1864: 264; Day, 1877: 500, Pl. CXVI Fig. 1; 1889: 107, Fig. 44; Hora, 1923: 44, Pl. IV Fig. 1; Shaw & Shebbeare, 1938: 106, Figs. 109–110, Pl. 3 Fig. 12; Misra, 1976: 310, Pl. XV Fig. 6 (in part); Jayaram, 1979: 57 (in part); 1981: 268 (in part); 1999: 300, Fig. 154 (in part); Wu et al., 1981: 75; Sen, 1985: 167, Fig. 86; 1992: 202, Fig. 74; 1995: 577, Pl. XXXII Fig. 1; Talwar & Jhingran, 1991: 679 (in part); Wu & Wu, 1992: 534, Fig. 147; Zhang et al., 1995: 131, Fig. 58-1; Kundu, 2000: 100; Nath & Dey, 2000: 120, Fig. 107, Pl. 6 - 2.

Material examined

BMNH 1870.11.30.56 (3), 99.8–129.0 mm SL; BMNH 1889.2.1.2718–2719 (2), 60.9–89.8 mm SL; ZMA 121.861 (1), 87.8 mm SL; India: Meghalaya, Khasi Hills (Brahmaputra River drainage). BMNH 1928.9.17.5 (1), 83.8 mm SL; India: Meghalaya, Khasi Hills, Nong Priang stream (Brahmaputra River drainage). UMMZ 243677 (10) 46.6–118.1 mm SL; India: West Bengal, Rishi Khola (River) at Rishi (on W Bengal-Sikkim border) (Brahmaputra River drainage), 27°9'56.0"N 88°38'7.0"E. ZMA 121.862 (1), 55.2 mm SL; India: Meghalaya, Nong Priang stream below Cherrapunji (Brahmaputra River drainage).

Diagnosis

Pseudecheneis sulcata is distinguished from congeners except *P. paviei*, *P. sulcatoides*, and *P. sympelvica* in lacking a prominent bony spur on the anterodorsal surface of the first dorsal-fin pterygiophore (vs. spur present; Fig. 2). *Pseudecheneis sulcata* can be distinguished from *P. paviei* and *P. sympelvica* in having an elongate body with 36–39 vertebrae (vs. short body with 33–35 vertebrae) and 12–14 (vs. 8–12) transverse laminae on the thoracic adhesive apparatus, and further differs from *P. sympelvica* in having separate (vs. fused) pelvic fins. It differs from *P. sulcatoides* in having a longer caudal peduncle (25.0–28.3% SL vs. 22.5–23.7), a first dorsal-fin element (vs. element absent), and bifid (vs. non-bifid) neural spines on the complex vertebra. *Pseudecheneis sulcata* can be further distinguished from *P. crassicauda* in having a more slender caudal peduncle (4.0–5.2% SL vs. 6.0–6.6) and larger eye (8.8–10.6% HL vs. 7.5–8.3), from *P. eddsi* in having a longer pelvic fin (21.2–28.7% SL vs. 18.0–20.9), from *P. immaculata* in having (vs. lacking) pale colored patches on the body and shorter adipose-fin base (17.8–22.7% SL vs. 27.7), and from *P. serracula* in having a shorter adipose-fin base (17.8–22.7% SL vs. 26.8–30.4) and the neural spines of the last 2–3 preanal and first 6–7 postanal vertebrae gradually increasing in height (vs. corresponding neural spines strongly elevated). It further differs from *P. stenura* in having a shorter caudal peduncle (25.0–28.3% SL vs. 30.3–34.5) and pectoral fin (121.6–156.3% HL vs. 160.4–196.9), and from *P. tchangi* in having fewer transverse lamellae (12–14 vs. 21) on the thoracic adhesive apparatus.

Description

Morphometric data as in Table 1. Head and abdominal region narrow and strongly depressed. Dorsal profile rising gently from tip of snout to origin of dorsal fin, then almost horizontal or sloping very gently ventrally to end of caudal peduncle. Ventral profile horizontal to anal-fin base, then sloping very gently dorsally to end of caudal peduncle. Caudal peduncle slender, long, and moderately compressed. Anus and urogenital openings located at posteriormost extent of pelvic fin. Skin smooth, tuberculate in some areas. Lateral line complete and midlateral. Vertebrae 18+18=36 (2), 18+19=37 (7), 19+18=37 (1), 18+20=38 (2), 19+19=38 (3), 19+20=39 (2), or 20+19=39 (1).

Head acutely rounded when viewed from above. Snout gently convex when viewed laterally. Gill openings moderate, extending from posttemporal region to base of first pectoral-fin element. Head covered with thick, tuberculate skin. Ventral surface of head with unculiferous collar on distal margin of branchiostegal membrane immediately anterior to thoracic adhesive apparatus.

Thoracic adhesive apparatus consisting of 12–14 transverse ridges (laminae) separated by grooves (sulcae); ridges frequently not meeting at midline of adhesive apparatus. Adhesive apparatus extending from immediately posterior to collar on distal margin of branchiostegal membrane to level of last pectoral-fin ray.

Barbels flattened, and in four pairs. Maxillary barbel with ventral surface densely covered with papillae, and pointed tip; barbel extending about two-thirds of distance between its base and base of first pectoral-fin element. Distal half of barbel attached to snout via large, thin flap of skin. Nasal barbel with small flap of thin skin fringing posterior margin and extending midway to distance between posterior nares and anterior orbital margin. Inner mandibular-barbel densely covered with papillae; origin close to midline, extending to collar on distal margin of branchiostegal membrane. Outer mandibular barbel originates posterolateral of inner mandibular barbel, extending to level of anterior orbital margin. Eye small and almost rounded, subcutaneous and located on dorsal surface of head.

Mouth inferior, with moderately broad, thin papillate lips. Rictal lobe large and papillate. Premaxillary tooth band not exposed when mouth is closed. Premaxillary teeth short and conical, arranged in irregular rows on a moderately large quadrangular patch. Dentary teeth long, thin, and somewhat rounded at tip; arranged in irregular rows on two separated, roughly triangular patches.

Dorsal-fin origin located at point through anterior third of body. First and second dorsal fin-ray elements not ossified, bearing i,6 (18) rays, and fin margin straight. Adipose fin with short base, approximately 1.5 to 2 times of anal-fin base length; located in middle third of postdorsal region. Adipose fin margin gently convex; posterior end deeply incised. Caudal fin forked, with i,7,8,i (18) principal rays; procurrent rays symmetrical and extend only slightly anterior to fin base. Anal fin with short base extending approximately equal to adipose fin-base length and iii,8 (1), iv,7 (9), or iv,8 (8) rays. Anal fin margin almost straight.

TABLE 1. Biometric data for *Pseudecheneis sulcata* (n=18)

	Range	Mean±SD
% SL		
Predorsal length	32.0–35.8	33.9±1.11
Preanal length	58.0–65.7	60.8±2.05
Prepelvic length	34.7–47.8	37.9±2.96
Prepectoral length	13.9–20.2	16.7±1.82
Length of dorsal-fin base	10.0–13.7	12.1±1.06
Anal-fin length	11.9–14.2	13.1±0.70
Pelvic-fin length	21.2–28.7	23.1±1.80
Pectoral-fin length	19.7–28.5	25.9±2.58
Caudal-fin length	19.0–25.5	22.3±1.61
Length of adipose-fin base	17.8–22.7	21.0±1.24
Dorsal to adipose distance	14.2–21.4	18.6±1.84
Post-adipose distance	16.1–22.2	18.9±1.33
Caudal peduncle length	25.0–28.3	26.8±0.93
Caudal peduncle depth	4.0–5.2	4.5±0.38
Body depth at anus	11.8–16.2	13.9±1.43
Head length	17.5–20.2	18.8±0.90
Head width	13.8–19.6	17.0±1.47
Head depth	10.1–13.9	12.4±1.15
% HL		
Snout length	57.5–69.7	64.3±3.43
Interorbital distance	25.4–37.5	30.9±3.41
Eye diameter	8.8–10.6	9.6±0.49
Nasal barbel length	13.8–28.2	21.4±4.05
Maxillary barbel length	40.4–61.1	50.6±6.66
Inner mandibular barbel length	12.9–20.6	16.9±2.27
Outer mandibular barbel length	20.0–35.4	26.6±3.47

Pelvic-fin origin at vertical through second or third dorsal fin-ray base. Pelvic fin greatly enlarged, extending to base of first anal-fin ray. Anterior fin margin strongly convex, first element broadened and with regular striae on ventral surface; with i,5 (18) rays. Pectoral fin greatly enlarged and with convex anterior margin, reaching to just beyond pelvic-fin base. First element not ossified, broadened and with regular striae on ventral surface; fin with i,12 (9) or i,13 (9) rays.

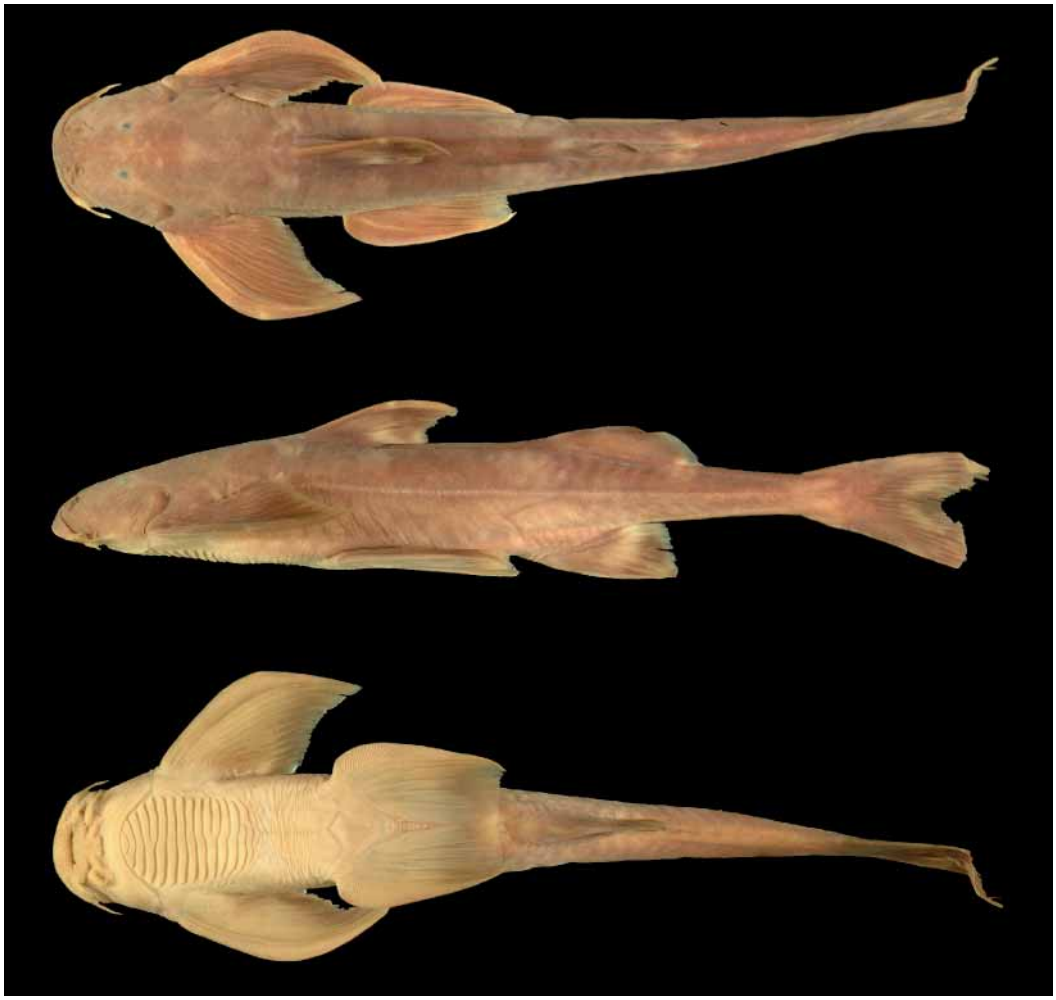

FIGURE 1. *Pseudecheneis sulcata*, BMNH 1928.9.17.5, 83.8 mm SL; India: Nong Priang stream. Dorsal, lateral and ventral views.

Coloration

In 70% ethanol: chestnut brown on dorsal and lateral surfaces of head and body, fading to very light brown on ventral region. Dorsal surface of head and body with distinctive series of small, very light brown spots and bands: one ovate spot on base of first dorsal-fin ray, and another pair on each side of body immediately posterior to last dorsal-fin ray; one band on each side of body at adipose-fin origin, and another on caudal peduncle at base of caudal fin. Dorsal and anal fins hyaline, with brown base and brown subdistal band; brown coloration of base and subdistal band connected to each other at anterior third of fin. Adipose fin light brown, with lighter color around distal edge, especially at posterior end of fin. Caudal fin brown, with hyaline distal margin. Dorsal surfaces of pectoral and pelvic fins brown, ventral surfaces light yellow. Maxillary and nasal barbels brown dorsally and light yellow ventrally.

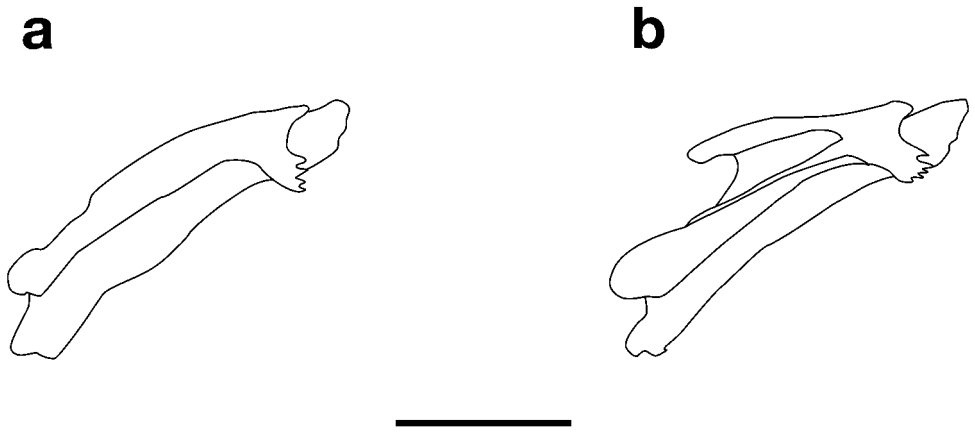

FIGURE 2. Lateral views of first dorsal fin pterygiophore: a. without bony spur on anterodorsal surface; condition seen in *Pseudecheneis paviei*, *P. sulcata*, *P. sulcatoides* and *P. sympelvica* (*P. sulcata*, UMMZ 243677, 83.8 mm SL illustrated), and b. with bony spur on anterodorsal surface; condition seen in all other *Pseudecheneis* species (*P. stenura*, paratype, CAS 219177, 85.1 mm SL illustrated). Scale bar indicates 2.5 mm.

Distribution

Known from the Brahmaputra River drainage (Fig. 3).

Remarks

Although the specific epithet is often listed in the literature as *sulcatus* (see above), the correct epithet should be *sulcata*. This follows the gender of *Pseudecheneis* (feminine), according to Article 31.2 of the International Code for Zoological Nomenclature (*sulcatus* being a participle of the verb *sulco*).

***Pseudecheneis eddsi* sp. nov.**
(Fig. 4)

Pseudecheneis sulcata (non M'Clelland, 1842) Shrestha, 1981: 197, Fig. 91 (in part); 1994: 62, Fig. 97 (in part); Ng & Edds, 2005: 17 (in part).

Type material

Holotype: KU 36872, 84.1 mm SL; Nepal: Tanahun, Khairenitar, Seti River (Ganges River drainage), 28°2'0.0"N 84°4'0.0"E; D. Edds, 15 November 1996.

Paratypes: CAS 44188 (3), 45.5–62.1 mm SL: CAS 50306 (30), 34.7–45.8 mm SL; Nepal: Mahesh Khola, 24–32 km WNW of Kathmandu, on the road to Pokhara (Ganges River drainage); T. R. Roberts, 3 May 1975. KU 29084 (3), 55.8–94.4 mm SL; Nepal: Tanahun, Khairenitar, Seti River (Ganges River drainage), 28°2'0.0"N 84°4'0.0"E; D. Edds, 15 June 1996. KU 29629 (5), 40.5–74.4 mm SL; data as for holotype.

Diagnosis

Pseudecheneis eddsi is distinguished from congeners in having smaller pelvic fins (18.0–20.9% SL vs. 20.4–28.7), and from *P. paviei*, *P. sulcata*, *P. sulcatoides*, and *P. sympelvica* in having a prominent bony spur on the anterodorsal surface of the first dorsal-fin pterygiophore (vs. spur absent; Fig. 2). It further differs from *P. crassicauda* in having a slenderer caudal peduncle (3.5–5.3% SL vs. 6.0–6.6) and larger eye (9.6–12.8% HL vs. 7.5–8.3), and from *P. immaculata* in having (vs. lacking) pale colored patches on the body and a shorter adipose-fin base (19.5–24.3% SL vs. 27.7). *Pseudecheneis eddsi* is further distinguished from *P. paviei* and *P. sympelvica* in having more vertebrae (36–39 vs. 33–35), and further differs from *P. sympelvica* in having the pelvic fins separate (vs. fused at midline). It further differs from *P. serracula* in having a shorter adipose-fin base (19.5–24.3% SL vs. 26.8–30.4) and the neural spines of the last 2–3 preanal and first 6–7 postanal vertebrae gradually increasing in height (vs. corresponding neural spines strongly elevated), from *P. sulcatoides* in having a longer caudal peduncle (25.2–27.8% SL vs. 22.5–23.7), a prominent bony spur on the anterodorsal surface of the first dorsal-fin pterygiophore (vs. spur absent), a first dorsal-fin element (vs. element absent) and bifid (vs. non-bifid) neural spines on the complex vertebra, and from *P. stenura* in having a shorter caudal peduncle (25.2–27.8% SL vs. 30.3–34.5) and pectoral fin (114.9–156.0% HL vs. 160.4–196.9).

Description

Morphometric data as in Table 2. Head and abdominal region narrow and strongly depressed. Dorsal profile rising gently from tip of snout to origin of dorsal fin, then almost horizontal or sloping very gently ventrally to end of caudal peduncle. Ventral profile horizontal to anal-fin base, then sloping very gently dorsally to end of caudal peduncle. Caudal peduncle long and moderately compressed. Anus and urogenital openings located at posteriormost extent of pelvic fin. Skin smooth, tuberculate in some areas. Lateral line complete and midlateral. Vertebrae 18+18=36 (5), 18+19=37 (1), 19+18=37* (8), 20+17=37 (4), 18+20=38 (1), 19+19=38 (11), 20+18=38 (5), 19+20=39 (1), or 20+19=39 (6).

Head acutely rounded when viewed from above. Snout gently convex when viewed laterally. Gill openings moderate, extending from posttemporal region to base of first pectoral-fin element. Head covered with thick, tuberculate skin. Ventral surface of head with unculiferous collar on distal margin of branchiostegal membrane immediately anterior to thoracic adhesive apparatus.

Thoracic adhesive apparatus consisting of 13–18 transverse ridges (laminae) separated by grooves (sulcae); ridges frequently not meeting at midline of adhesive apparatus. Adhesive apparatus extending from immediately posterior to collar on distal margin of branchiostegal membrane to level of last pectoral-fin ray.

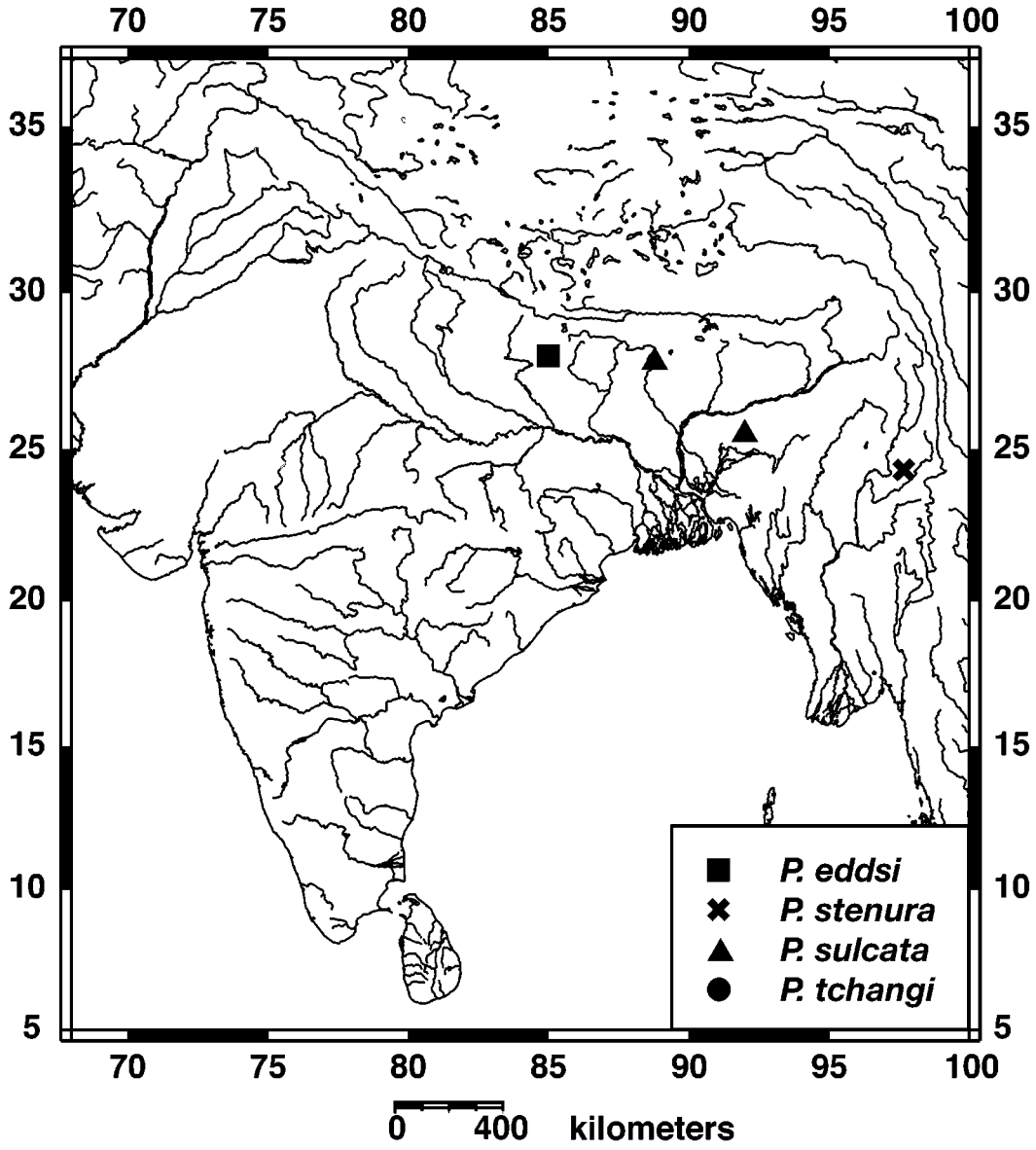

FIGURE 3. Map showing distributions of *Pseudecheneis eddsi*, *P. sulcata*, and *P. stenura*.

Barbels flattened, and in four pairs. Maxillary barbel with ventral surface densely covered with papillae, and pointed tip; barbel extending about two-thirds of distance between its base and base of first pectoral-fin element. Distal half of barbel attached to snout via large, thin flap of skin. Nasal barbel with small flap of thin skin fringing posterior margin and extending midway to distance between posterior nares and anterior orbital margin. Inner mandibular-barbel densely covered with papillae; origin close to midline, extending to collar on distal margin of branchiostegal membrane. Outer mandibular barbel originates posterolateral of inner mandibular barbel, extending to level

of anterior orbital margin. Eye small and almost rounded, subcutaneous and located on dorsal surface of head.

Mouth inferior, with moderately broad, thin papillate lips. Rictal lobe large and papillate. Premaxillary tooth band not exposed when mouth is closed. Premaxillary teeth short and conical, arranged in irregular rows on a moderately large quadrangular patch. Dentary teeth long, thin and somewhat rounded at tip; arranged in irregular rows on two separated, roughly triangular patches.

FIGURE 4. *Pseudecheneis eddsi*, KU 36872, holotype, 84.1 mm SL; Nepal: Seti River. Dorsal, lateral, and ventral views.

TABLE 2. Biometric data for *Pseudecheneis eddsi* (n=42)

	Holotype	Range	Mean±SD
% SL			
Predorsal length	32.1	32.1–35.1	33.8±1.07
Preanal length	62.4	59.5–67.0	62.1±2.06
Prepelvic length	37.3	35.9–40.6	37.6±1.41
Prepectoral length	15.8	15.6–19.0	16.9±1.12
Length of dorsal-fin base	13.3	11.1–13.8	12.5±0.98
Anal-fin length	12.7	10.9–13.3	12.1±0.63
Pelvic-fin length	20.6	18.0–20.9	19.4±0.89
Pectoral-fin length	25.7	22.4–29.2	26.3±1.71
Caudal-fin length	22.0	21.5–25.2	23.3±1.23
Length of adipose-fin base	23.2	19.5–24.3	22.0±1.45
Dorsal to adipose distance	17.6	12.1–20.3	16.3±2.58
Post-adipose distance	18.4	16.3–20.0	18.3±1.05
Caudal peduncle length	26.8	25.2–27.8	26.8±0.73
Caudal peduncle depth	4.6	3.5–5.3	4.7±0.52
Body depth at anus	11.8	11.0–14.5	13.1±1.14
Head length	17.0	17.0–21.0	19.0±1.11
Head width	15.9	15.7–19.3	16.9±1.04
Head depth	12.1	11.3–14.1	12.7±0.88
% HL			
Snout length	62.9	57.7–63.1	60.7±1.82
Interorbital distance	31.5	28.2–35.0	31.7±2.05
Eye diameter	11.2	9.6–12.8	10.8±0.92
Nasal barbel length	20.3	10.3–23.1	17.4±3.29
Maxillary barbel length	53.8	38.3–67.4	52.9±8.61
Inner mandibular barbel length	22.4	13.6–22.4	16.8±2.51
Outer mandibular barbel length	30.1	19.0–31.3	27.0±4.08

Dorsal-fin origin located at point through anterior third of body. First and second dorsal fin-ray elements not ossified, bearing i,6 (42) rays, and fin margin straight. Adipose fin with short base, approximately 1.5 to 2 times of anal-fin base length; located in middle third of postdorsal region. Adipose fin margin gently convex; posterior end deeply incised. Caudal fin forked, with i,7,7,i (4), i,7,8,i* (38) principal rays; procurrent rays symmetrical and extend only slightly anterior to fin base. Anal fin with short base extending less than half of adipose fin-base length and iii,7 (40) or iv,7* (2) rays. Anal fin

margin almost straight.

Pelvic-fin origin at vertical through second or third dorsal fin-ray base. Pelvic fin greatly enlarged, extending to base of first anal-fin ray. Anterior fin margin strongly convex, first element broadened and with regular striae on ventral surface; with i,5 (42) rays. Pectoral fin greatly enlarged and with convex anterior margin, reaching to just beyond pelvic-fin base. First element not ossified, broadened and with regular striae on ventral surface; fin with i,12* (41) or i,13 (1) rays.

Coloration

In 70% ethanol: chestnut brown on dorsal and lateral surfaces of head and body, fading to very light brown on ventral region. Dorsal surfaces of head and body with distinctive series of small very light brown spots and bands: one ovate spot on base of first dorsal-fin ray, and another pair on each side of body immediately posterior to last dorsal-fin ray; one band on each side of body at adipose-fin origin, and another on caudal peduncle at base of caudal fin. Dorsal and anal fins hyaline, with brown base and brown subdistal band; brown coloration of base and subdistal band connected to each other at anterior third of fin. Adipose fin light brown, with lighter color around distal edge, especially at posterior end of fin. Caudal fin brown, with hyaline distal margin. Dorsal surfaces of pectoral and pelvic fins brown, ventral surfaces light yellow. Maxillary and nasal barbels brown dorsally and light yellow ventrally.

Distribution

Presently known only from the Gandaki drainage of central Nepal, in foothills of the Himalayas (Fig. 3). The Seti and Mahesh rivers are tributaries to the Trisuli, which joins the Kali Gandaki to become the Narayani (= Sapta Gandaki) in Nepal. The Narayani (= Gandak in India) is a major tributary of the Ganges River in India.

Habitat and ecology

The type locality of this species (the Seti River) has plenty of cool and swift, rocky riffles, which is presumably where the fish were obtained (they were obtained by fishermen and the exact microhabitat could not be ascertained). Other congeners are known to occur in riffles (Kottelat, 1998; Ng & Edds, 2005; pers. obs.), so it is reasonable to assume that *P. eddsi* inhabits similar habitats.

Other fish species found in the same locality include *Garra annandalei* (Cyprinidae), *G. gotyla* (Cyprinidae), *Neolissochilus hexagonolepis* (Cyprinidae), *Schizothoraichthys progastus* (Cyprinidae), *Schizothorax richardsonii* (Cyprinidae), *Semiplotus semiplotus* (Cyprinidae), *Tor putitora* (Cyprinidae), *Psilorhynchus balitora* (Psilorhynchidae), *Botia almorhae* (Cobitidae), *Acanthocobitis botia* (Balitoridae), *Balitora brucei* (Balitoridae), *Schistura beavani* (Balitoridae), *Glyptothorax cavia,* (Sisoridae), *G. telchitta* (Sisoridae), *Pseudecheneis serracula* (Sisoridae), and *Mastacembelus armatus* (Mastacembelidae).

Etymology

This species is named after David Edds, who collected part of the type series and in honor of his work on Nepalese fishes.

***Pseudecheneis stenura* sp. nov.**
(Fig. 5)

Material examined

Holotype: KIZ 199811999, 132.1 mm SL, China: Yunnan, Baoshan Prefecture, Longchuanjiang at Lianmengjie bridge (Irrawaddy River drainage); C.J. Ferraris, X.-Y. Chen et al., 2–6 Nov.1998.

Paratypes: CAS 219177 (55), 41.3–180.1 mm SL, data as for holotype.

Diagnosis

Pseudecheneis stenura can be distinguished from congeners in having a longer caudal peduncle (30.3–34.5% SL vs. 20.4–29.0) and, except for *P. immaculata*, a longer pectoral fin (160.4–196.9% HL vs. 106.9–164.3). It further differs from *P. immaculata*, *P. paviei*, *P. sulcata*, *P. sulcatoides*, and *P. sympelvica* in having a prominent bony spur on the anterodorsal surface of the first dorsal-fin pterygiophore (vs. spur absent; Fig. 2) and from *P. paviei* and *P. sympelvica* in having more vertebrae (38–40 vs. 33–35) and transverse laminae on the thoracic adhesive apparatus (14–18 vs. 8–12), from *P. sympelvica* in having the pelvic fins separate (vs. fused at midline) and the sulcae on the thoracic adhesive apparatus continuous (vs. interrupted) across the midline, and from *P. sulcata* in having a slenderer caudal peduncle (2.9–3.6% SL vs. 4.0–5.2). *Pseudecheneis stenura* further differs from *P. crassicauda* in having a slenderer caudal peduncle (2.9–3.6% SL vs. 6.0–6.6) and larger eye (9.2–12.8% HL vs. 7.5–8.3), from *P. immaculata* in having (vs. lacking) pale colored patches on the body and a shorter adipose-fin base (18.8–23.7% SL vs. 27.7), and from *P. serracula* in having a shorter adipose-fin base (18.8–23.7% SL vs. 26.8–30.4) and the neural spines of the last 2–3 preanal and first 6–7 postanal vertebrae gradually increasing in height (vs. corresponding neural spines strongly elevated). It can be further distinguished from *P. sulcatoides* in having a shorter distance between the dorsal and adipose fins (11.5–18.0% SL vs. 19.5–23.1), the first dorsal-fin element present (vs. element absent), the complex vertebra with a bifid neural spine (vs. neural spine not bifid) and the first dorsal-fin pterygiophore with (vs. lacking) a prominent bony spur on the anterodorsal surface, and from *P. tchangi* in having a slenderer caudal peduncle (2.9–3.6% SL vs. 4.0).

Description

Morphometric data as in Table 3. Head and abdominal region narrow and strongly depressed. Dorsal profile rising gently from tip of snout to origin of dorsal fin, then almost horizontal or sloping very gently ventrally to end of caudal peduncle. Ventral profile

horizontal to anal-fin base, then sloping very gently dorsally to end of caudal peduncle. Caudal peduncle long, slender and moderately compressed. Anus and urogenital openings located at posteriormost extent of pelvic fin. Skin smooth, tuberculate in some areas. Lateral line complete and midlateral. Vertebrae 19+18=37 (1), 18+20=38 (7), 19+19=38 (9), 18+21=39* (12), 19+20=39 (18), 20+19=39 (2), 18+22=40 (2), 19+21=40 (2) or 20+20=40 (3).

FIGURE 5. *Pseudecheneis stenura*, KIZ 199811999, holotype, 132.1 mm SL, China: Longchuanjiang. Dorsal, lateral and ventral views.

Head acutely triangular when viewed from above. Gill openings moderate, extending from posttemporal region to base of first pectoral-fin element. Head covered with thick, tuberculate skin. Ventral surface of head with unculiferous collar on distal margin of branchiostegal membrane immediately anterior to thoracic adhesive apparatus.

TABLE 3. Biometric data for *Pseudecheneis stenura* (n=56)

	Holotype	Range	Mean±SD
% SL			
Predorsal length	31.6	28.5–35.3	32.3±1.69
Preanal length	53.6	53.6–59.7	55.7±1.80
Prepelvic length	33.2	31.5–36.7	33.9±1.56
Prepectoral length	15.4	10.7–17.0	13.5±1.66
Length of dorsal-fin base	12.4	10.6–12.6	11.8±0.66
Anal-fin length	13.6	12.6–14.9	13.8±0.63
Pelvic-fin length	20.4	20.4–24.3	22.4±1.29
Pectoral-fin length	30.4	26.2–31.7	29.6±1.38
Caudal-fin length	21.3	18.9–26.3	22.0±1.96
Length of adipose-fin base	18.8	18.8–23.7	21.5±1.38
Dorsal to adipose distance	17.8	11.5–18.0	15.1±1.84
Post-adipose distance	25.4	20.6–25.4	23.1±1.36
Caudal peduncle length	33.9	30.3–34.5	32.3±1.36
Caudal peduncle depth	3.6	2.9–3.6	3.3±0.19
Body depth at anus	13.4	11.3–14.2	12.6±0.80
Head length	16	15.3–18.3	16.9±0.91
Head width	13.9	13.9–16.5	14.8±0.74
Head depth	11.4	10.4–12.9	11.4±0.61
% HL			
Snout length	66.8	60.4–68.4	64.0±2.46
Interorbital distance	27	24.2–30.3	27.4±1.80
Eye diameter	10.4	9.2–12.8	11.0±1.05
Nasal barbel length	20.9	9.2–23.2	18.6±3.94
Maxillary barbel length	52.1	46.9–66.0	54.3±5.09
Inner mandibular barbel length	18	13.8–45.6	19.3±7.55
Outer mandibular barbel length	23.7	18.3–34.9	26.6±4.74

Thoracic adhesive apparatus consisting of 14–18 transverse ridges (laminae) separated by grooves (sulcae); ridges frequently not meeting at midline of adhesive apparatus. Adhesive apparatus extending from immediately posterior to collar on distal margin of branchiostegal membrane to level of last pectoral-fin ray.

Barbels flattened, and in four pairs. Maxillary barbel with ventral surface densely covered with papillae, and pointed tip; barbel extending about two thirds of distance between its base and base of first pectoral-fin element. Distal half of barbel attached to snout via large, thin flap of skin. Nasal barbel with small flap of thin skin fringing

posterior margin and extending midway to distance between posterior nares and anterior orbital margin. Inner mandibular-barbel densely covered with papillae; origin close to midline, extending to collar on distal margin of branchiostegal membrane. Outer mandibular barbel originates posterolateral of inner mandibular barbel, extending to level of anterior orbital margin. Eye small and almost rounded, subcutaneous and located on dorsal surface of head.

Mouth inferior, with moderately broad, thin papillate lips. Rictal lobe large and papillate. Premaxillary tooth band not exposed when mouth is closed. Premaxillary teeth short and conical, arranged in irregular rows on a moderately large quadrangular patch. Dentary teeth long, thin and somewhat rounded at tip; arranged in irregular rows on two separated, roughly triangular patches.

Dorsal fin origin located at point through anterior third of body. First and second dorsal fin-ray elements not ossified, bearing i,6 (56) rays, and fin margin straight. Adipose fin with short base approximately equal to anal-fin base length; located in middle third of postdorsal region. Fin margin gently convex; posterior end deeply incised. Caudal fin forked, with i,7,8,i (56) principal rays; procurrent rays symmetrical and extend only slightly anterior to fin base. Anal fin with short base extending approximately equal to adipose fin-base length and iii,7 (2), iv,7 (32), iii,8* (14) or iv,8 (8) rays. Fin margin almost straight.

Pelvic-fin origin at vertical through second or third dorsal fin-ray base. Pelvic fin greatly enlarged and with strongly convex anterior margin, first element broadened and with regular striae on ventral surface; with i,5 (56) rays. Pectoral fin greatly enlarged and with convex anterior margin, reaching to just beyond pelvic-fin base. First element not ossified, broadened and with regular striae on ventral surface; fin with i,13 (7), i,14* (43) or i,15 (6) rays.

Coloration

In 70% ethanol: chestnut brown on dorsal and lateral surfaces of head and body, fading to very light brown on ventral region. Dorsal surfaces of head and body with distinctive series of small very light brown spots and bands: one ovate spot on base of first dorsal-fin ray, and another pair on each side of body immediately posterior to last dorsal-fin ray; one band on each side of body at adipose-fin origin, and another on caudal peduncle at base of caudal fin. Dorsal and anal fins hyaline, with brown base and brown subdistal band; brown coloration of base and subdistal band connected to each other at anterior third of fin. Adipose fin light brown, with lighter color around distal edge, especially at posterior end of fin. Caudal fin brown, with hyaline distal margin. Dorsal surfaces of pectoral and pelvic fins brown, ventral surfaces light yellow. Maxillary and nasal barbels brown dorsally and light yellow ventrally.

Distribution

Known from the Longchuanjiang, a tributary of the Irrawaddy River in southwestern China (Fig. 3).

Etymology

From the Greek stenos, meaning narrow, and oura, meaning tail. In reference to the extremely narrow caudal peduncle. Used as a noun.

Discussion

Until recently, *Pseudecheneis sulcata* was thought to be the most widely distributed glyptosternine catfish, being reported to occur in the Ganges, Brahmaputra, Salween, Irrawaddy and Mekong River drainages (Talwar & Jhingran, 1991; Chu & Mo, 1999). Glyptosternine catfishes have restricted distributions, and many apparently wide-ranging species have been shown to consist of more than one species, each with restricted distributions (e.g. Ng & Rainboth, 2001; Ng, 2004). My examination of material from the Tista River drainage (itself a tributary of the Brahmaputra River) and topotypic (or nearly topotypic) material from the Khasi Hills in Meghalaya, India indicates that they are conspecific (no significant differences in biometrics and meristics could be found to distinguish the two populations) and that *P. sulcata* is restricted to the Brahmaputra River drainage (where it is apparently the only species).

Hora (1937) described a new species and genus, *Propseudecheneis tchangi*, on the basis of the drawing of a specimen from Yunnan, China in Tchang (1936; reproduced here as Fig. 6). The type locality is listed as "Red River drainage" in the original description. However, Tchang (1936) did not indicate the drainage system from which the holotype of *P. tchangi* was collected. Zhou & Chu (1992) subsequently synonymized *P. tchangi* with *P. sulcata* (*Propseudecheneis* having been synonymized with *Pseudecheneis* by Chu, 1982), speculating that the type locality was in the vicinity of Tengchong (which lies within the Irrawaddy River drainage). There are six river drainages flowing through Yunnan province: the Irrawaddy (=Dayingjiang), Mekong (=Lancangjiang), Pearl (=Zhujiang), Red (=Yuanjiang), Salween (=Nujiang), and Yangtze (=Changjiang) river drainages, and *Pseudecheneis* has been reported from all but the Pearl and Yangtze River drainages. Of the remaining four river drainages, *P. tchangi* is unlikely to have come from the Red River drainage (as reported by Hora), since all of the species known from there (*P. intermedius* and *P. paviei*) have considerably shorter, deeper bodies. This leaves the Irrawaddy, Mekong and Salween river drainages as the possible drainages from which the holotype of *P. tchangi* was collected. Tchang's (1936) drawing of the species shows a fish with a uniform dark color, although the species is indicated in the text as having "...some large irregular yellowish blotches...". The situation is compounded by the fact that at least three species of *Pseudecheneis* are reported from these three drainages in China (Zhou & Zhou, 2005).

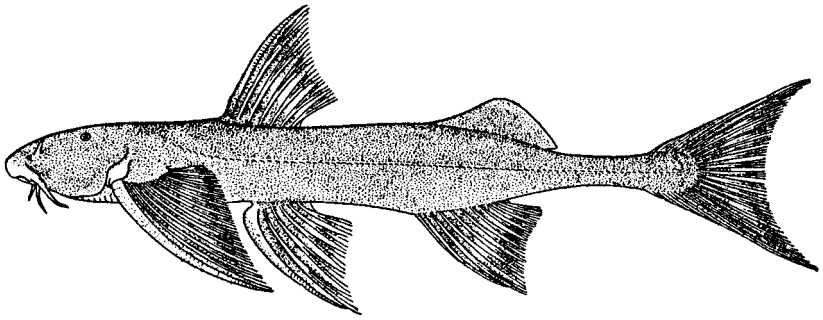

FIGURE 6. *Pseudecheneis tchangi*, illustration from Tchang (1936: Fig. 4).

It is unlikely that *P. tchangi* is conspecific with *P. sulcata*, since like other glyptosternines, *Pseudecheneis* species have very restricted distributions (Ng & Edds, 2005; Zhou & Zhou, 2005). *Pseudecheneis tchangi* was also not collected in the Brahmaputra River drainage (which does not flow through Yunnan province), to which *P. sulcata* is restricted, further emphasizing the unlikelihood of their conspecificity. However, since I was unable to examine the holotype of *P. tchangi* directly, I was unable to ascertain which of the three (or more) species recorded from Yunnan is conspecific with the holotype. Therefore, although *P. tchangi* is tentatively regarded here as a distinct species, comparisons of *P. sulcata*, *P. eddsi* and *P. stenura* with it are restricted to the holotype. As discussed in the diagnoses for each of the three species treated above, *P. tchangi* differs from *P. sulcata*, *P. eddsi* and *P. stenura* in caudal peduncle depth, pectoral- and pelvic-fin length, and in the number of transverse lamellae on the thoracic adhesive apparatus.

A key character used in diagnosing species of *Pseudecheneis* is the shape of the first dorsal fin pterygiophore. Two morphological states exist: the absence (Fig. 2a) or presence (Fig. 2b) of a prominent bony spur on the anterodorsal surface of the first dorsal fin pterygiophore. The dorsal surface of this bony spur is co-ossified with the anterior tip of the anterior nuchal plate (itself part of the first dorsal fin pterygiophore). The shape of this element with regards to the presence/absence of the spur is constant within each species (this was verified by examination of radiographs where cleared and stained material was not available) and had been previously used to diagnose *P. sulcatoides* by Zhou & Chu (1992). It is now found to occur more widely within the genus and its phylogenetic significance is still being investigated.

Externally, *P. eddsi* is very similar to both *P. sulcata*, being distinguished from it solely by the length of the pelvic fin. Ng & Edds (2005) also distinguished both *P. eddsi* and *P. sulcata* (then combined as *P. sulcata*) from both *P. crassicauda* and *P. serracula* by the shorter pelvic fins (not reaching base of the first anal-fin ray vs. reaching). The pelvic fin of *P. eddsi* is even shorter than that of *P. sulcata*: in the latter, the fin almost reaches the base of the first anal-fin ray, while in the former, the tip of the pelvic fin is separated from

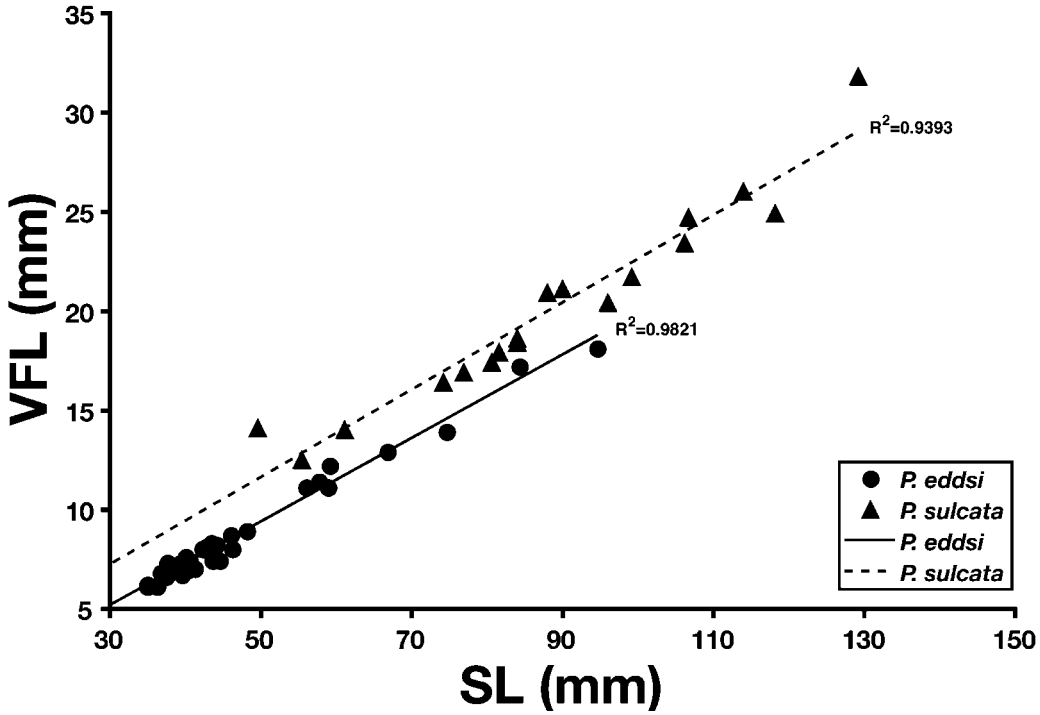

FIGURE 7. Biplot of pelvic-fin length (VFL) against standard length for *Pseudecheneis eddsi* and *P. sulcata*.

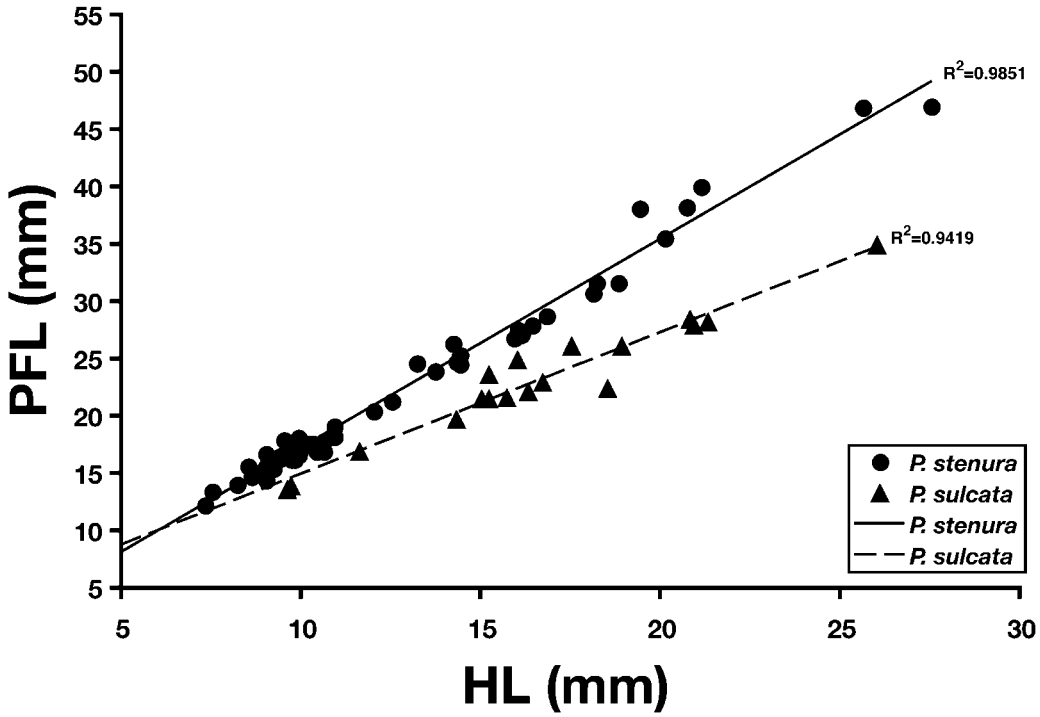

FIGURE 8. Biplot of pectoral-fin length (PFL) against head length for *Pseudecheneis stenura* and *P. sulcata*.

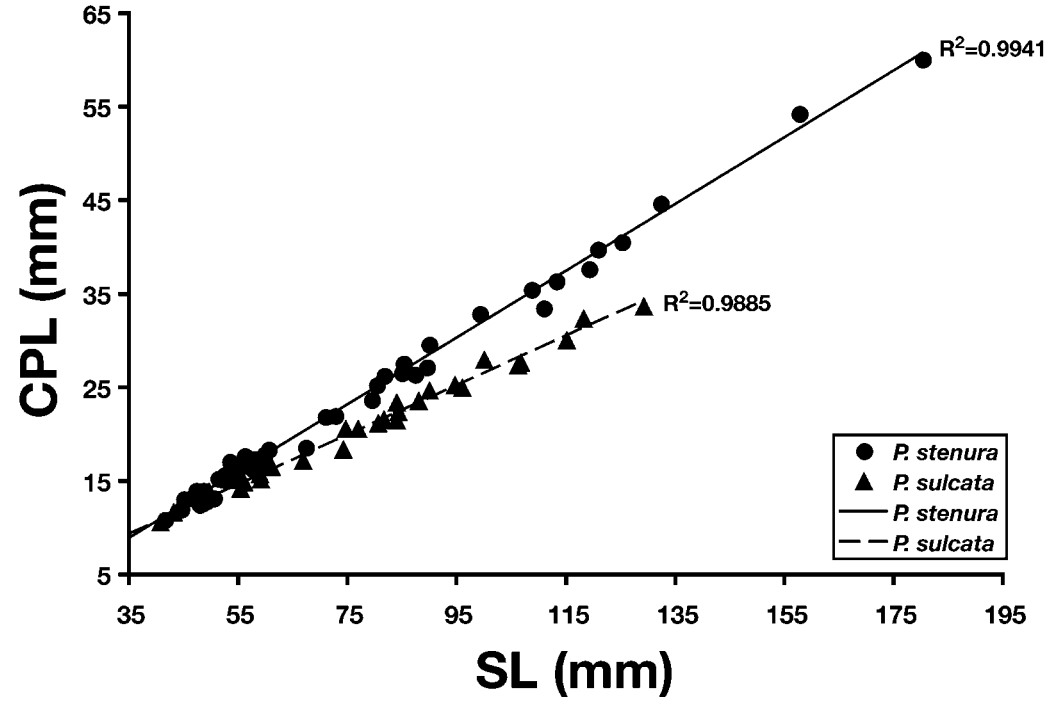

FIGURE 9. Biplot of caudal peduncle length (CPL) against standard length for *Pseudecheneis stenura* and *P. sulcata*.

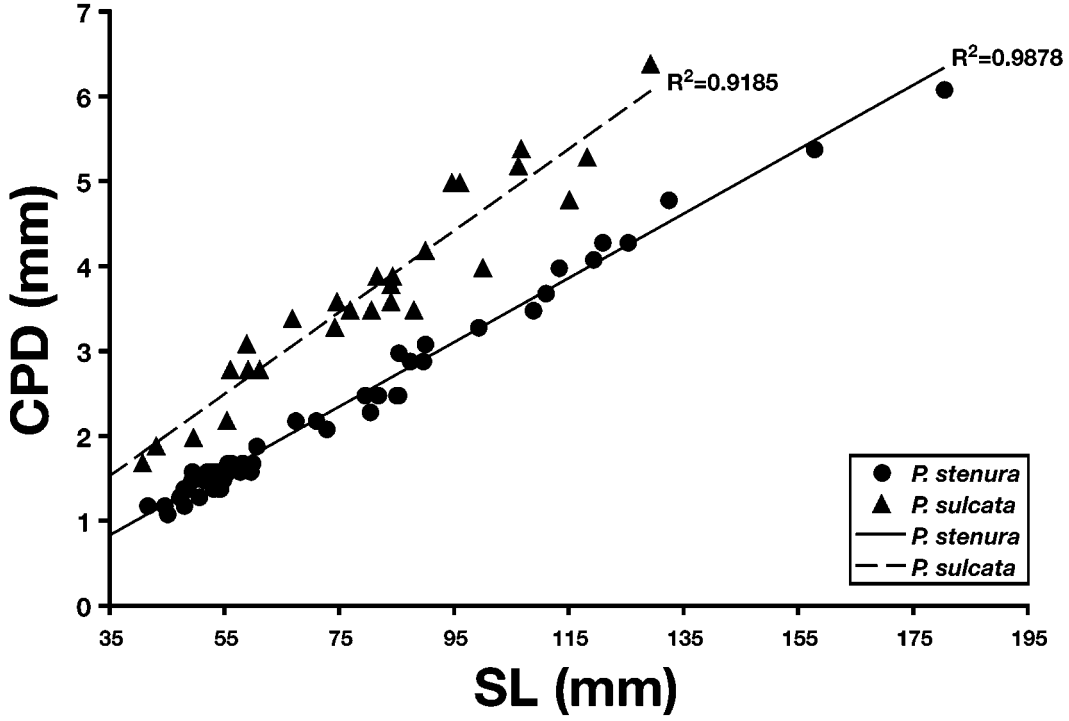

FIGURE 10. Biplot of caudal peduncle depth (CPD) against standard length for *Pseudecheneis stenura* and *P. sulcata*.

the base of the first anal-fin ray by a distance. Furthermore, biplots of the pelvic-fin length against SL for *P. eddsi* and *P. sulcata* (Fig. 7) show that the difference is not due to ontogeny alone, as the regression lines are significantly different (ANCOVA, $p<0.001$). Similarly, biplots of pectoral-fin length against HL (Fig. 8), caudal peduncle length (Fig. 9) and caudal peduncle depth (Fig. 10) against SL for *P. stenura* vs. *P. sulcatus* show that the regression lines are all significantly different (ANCOVA; $P<0.001$ in all cases).

Artificial key to the species of *Pseudecheneis*

1. Vertebrae 33–35; typically 8–12 transverse lamellae on thoracic adhesive apparatus . 2
   Vertebrae 36-39; typically 12 or more transverse lamellae on thoracic adhesive apparatus 3
2. Pelvic fins separate (Red River drainage in northern Vietnam and southern China)..... ..... *P. paviei*
   Pelvic fins fused (Mekong River drainage in northern Laos) ..... *P. sympelvica*
3. Prominent bony spur on anterodorsal surface of first dorsal-fin pterygiophore absent 4
   Prominent bony spur on anterodorsal surface of first dorsal-fin pterygiophore present. 5
4. First dorsal element present; complex vertebra with bifid neural spines; length of caudal peduncle 25.0-28.3% SL (Brahmaputra River drainage in India and China) ....*P. sulcata*
   First dorsal element absent; complex vertebra without bifid neural spine; length of caudal peduncle 22.5–23.7% SL (Mekong River drainage in southern China)..... ..... *P. sulcatoides*
5. Body uniform color, without pale patches (Mekong River drainage in southern China) ..... *P. immaculata*
   Body contrasting color, with pale patches..... 6
6. Neural spines of last 2–3 preanal and first 6–7 postanal vertebrae strongly elevated; adipose-fin base more than 2.0 times length of anal-fin base (Ganges River drainage in Nepal).....*P. serracula*
   Neural spines of last 2–3 preanal and first 6–7 postanal vertebrae gradually increasing in height; adipose-fin base 1.5–2.0 times length of anal-fin base 7
7. Caudal peduncle depth 6.0–6.6% SL; eye diameter 7.5–8.3% HL (Ganges River drainage in Nepal) .....*P. crassicauda*
   Caudal peduncle depth 2.9–5.3% SL; eye diameter 8.3–12.8% HL..... 8
8. Pelvic-fin length 18.0–20.9% SL (Ganges River drainage in Nepal) .....*P. eddsi*
   Pelvic-fin length 20.4–24.5% SL 9
9. Caudal peduncle depth 2.9–3.6% SL; pectoral-fin length 160.4–196.9% HL (Irrawaddy River drainage in China) ..... *P. stenura*

Caudal peduncle depth 4.0% SL; pectoral-fin length 144.2% HL (Yunnan, China) .... *P. tchangi*

Comparative material

Pseudecheneis crassicauda: BMNH 1958.9.1.8 (holotype), 103.7 mm SL; BMNH 1958.9.1.9 (1 paratype), 56.8 mm SL; Nepal: Mewa Khola (River), Dhankuta District, 27°0'N 87°20'E. BMNH 1970.12.14.230 (1 paratype), 136.8 mm SL; Nepal: Mewa Khola (River), Sanghu

P. immaculata: BMNH 1987.9.17.5 (1 paratype), 80.9 mm SL; China: Yunnan, Deqin County, Liudongjiang.

P. paviei: BMNH 1987.9.17.24 (1 paratype of *P. intermedius*), 55.5 mm SL; China: Yunnan, Jingdong County, Dongbao. BMNH 2003.2.9.2–3 (2), 51.1–51.2 mm SL; China: Yunnan, Jingdong County, Yuanjiang drainage. MNHN 1935-0042 (1), 47.0 mm SL; Vietnam: Nghia Lo.

P. serracula: KU 29554 (holotype), 153.2 mm SL; Nepal: Mugu/Bajura, Jhugala, Karnali River, purchased at Jhugala, 29°31'18.0"N 81°46'48.0"E. BMNH 1985.9.16.50–51 (2 paratypes), 48.0–48.2 mm SL; Nepal: Narayani River, Chitawan National Park. KU 28669 (5 paratypes), 41.5–56.5 mm SL; Nepal: Kanchanpur, Brahamadev, Mahakali River at Brahamadev, 29°4'54.1"N 80°8'30.1"E. KU 29038 (1 paratype), 58.0 mm SL; Nepal: Gulmi/Syangja, Kali Gandaki River at Ridi Bazar; 27°56'6.0"N 83°26'30.1"E. KU 35545 (2 paratypes), 48.0–95.3 mm SL; Nepal: Tanahun, Khairenitar, Seti River at Khairenitar, 28°2'0.0"N 84°4'0.0"E. OSUS 15703 (4 paratypes), 31.6–59.3 mm SL; Nepal: Syangja, Kali Gandaki River at Nimaa. OSUS 15718 (9 paratypes), 34.1–75.5 mm SL; Nepal: Gulmi/Syangja, Kali Gandaki River at Ridi Bazar; 27°56'6.0"N 83°26'30.1"E. OSUS 15729 (3 paratypes), 53.5–59.6 mm SL; Nepal: Baglung, Kali Gandaki River at Sumsaa Ghat (Binamaare). OSUS 15736 (6 paratypes), 19.8–54.4 mm SL; Nepal: Myagdi, Kali Gandaki River at Simaa. OSUS 16340 (1 paratype), 79.5 mm SL; Nepal: Chitawan, Narayani River at Narayanagarh, upstream from irrigation office. OSUS 16609 (1 paratype), 22.2 mm SL; Nepal: Chitawan, Narayani River at Amaltaari Ghat. OSUS 16637 (15 paratypes), 63.0–130.5 mm SL; Nepal: Chitawan, Narayani River at Narayangarh, upstream from irrigation office. OSUS 16695 (1 paratype), 62.3 mm SL; Nepal: Syangja, Kali Gandaki River at Nimaa. OSUS 17179 (1 paratype), 80.0 mm SL; Nepal: Syangja, Kali Gandaki River at Nimaa.

P. sulcatoides: CMK 5611 (3), 19.5–87.5 mm SL; China: Yunnan, Yangbi River from its confluence with Er-Hai River to about 20 km upstream of Yangbi. Additional data from Zhou & Chu (1992).

P. sympelvica: CMK12257 (3), 54.6–55.4 mm SL; Laos: Khammouan Province, Nam Theun, waterfall about 7 km downriver of NT2 dam site, 18°1'40"N 104°58'54"E. CMK

15231 (1), 62.4 mm SL; Laos: Xiangkhouang Province, Nam Ngum, rapids downstream of Ban Latbouak, 19°36’20"N 103°14’28"E. UMMZ 241107 (1), 43.7 mm SL; Laos: Luang Prabang Province, Nam Khan at Keng Noun (rapids), 10 km E of Luang Prabang.

P. tchangi: ASIZB 20010 (holotype), 120 mm SL; China: Yunnan (photographs examined).

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Literature cited

Blyth, E. (1860) Report on some fishes received chiefly from the Sitang River and its tributary streams, Tenasserim Provinces. *Journal of the Asiatic Society of Bengal*, 29, 138–174.

Chu, X.-L. (1982) Phylogeny of the genus *Pseudecheneis* (Siluriformes: Sisoridae), with descriptions of two new species. *Acta Zootaxonomica Sinica*, 7, 428–437. [In Chinese, English summary]

Chu, X.-L. & Mo, T.-P. (1999) Sisoridae. In: Chu, X.-L et al. (Eds) *Fauna Sinica. Osteichthyes. Siluriformes*. Science Press, Beijing. Pp. 114–181. [In Chinese]

Day, F. (1877) *The Fishes of India: Being a Natural History of the Fishes Known to Inhabit the Seas and Freshwaters of India, Burma and Ceylon. Part iii.* William Dawson & Sons, London, pp. 369–552.

Day. F. (1889) *The Fauna of British India, including Ceylon and Burma. Fishes. Vol. 1*. Taylor & Francis, London, 548 pp.

de Pinna, M.C.C. (1996) A phylogenetic analysis of the Asian catfish families Sisoridae, Akysidae, and Amblycipitidae, with a hypothesis on the relationships of the neotropical Aspredinidae (Teleostei, Ostariophysi). *Fieldiana: Zoology (New Series)*, 84, 1–83.

Günther, A. (1864) *Catalogue of Fishes in the British Museum. Vol. 5. Catalogue of the Physostomi, Containing the Families Siluridae, Characinidae, Haplochitonidae, Sternoptychidae, Scopelidae, Stomiatidae in the Collection of the British Museum.* Trustees of the British Museum, London, 455 pp.

Hora, S.L. (1923) Notes on fishes in the Indian Museum. V. On the composite genus *Glyptosternon* McClelland. *Records of the Indian Museum*, 25, 1–44.

Hora, S.L. (1937) Notes on fishes in the Indian Museum. XXXVI. On a new genus of Chinese catfishes allied to *Pseudecheneis* Blyth. *Records of the Indian Museum*, 39, 348–350.

Jayaram, K.C. (1979) Aid to identification of siluroid fishes of India, Burma, Sri Lanka, Pakistan and Bangladesh. 3. Sisoridae. *Records of the Zoological Survey of India, Miscellaneous Publications, Occasional Paper*, 14, 1–62.

Jayaram, K.C. (1981) *The Freshwater Fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka — a Handbook.* Zoological Survey of India, Calcutta, 475 pp.

Jayaram, K.C. (1999) *The Freshwater Fishes of the Indian Region.* Narendra Publishing House, Delhi, 551 pp.

Kottelat, M. (1998) Fishes of the Nam Theun and Xe Bangfai basins, Laos, with diagnoses of twenty-two new species (Teleostei: Cyprinidae, Balitoridae, Cobitidae, Coiidae and Odontobutidae). *Ichthyological E xploration of Freshwaters*, 9, 1–128.

Kundu, D.K. (2000) On a small collection of fishes from Sikkim. *Records of the Zoological Survey of India*, 98, 95–102.

M'Clelland, J. (1842) On the fresh-water fishes collected by William Griffith, Esq., F. L. S. Madras Medical Service, during his travels under the orders of the Supreme Government of India, from 1835 to 1842. *Calcutta Journal of Natural History*, 2, 560–589, Pls. 15, 18, 20, 21.

Misra, K.S. (1976) *The Fauna of India and Adjacent Countries. Pisces. Vol. III. Teleostomi: Cypriniformes; Siluri.* Zoological Survey of India, Calcutta, 367 pp.

Nath, P. & Dey, S.C. (2000) *Fish and Fisheries of North Eastern India (Arunachal Pradesh)*. Narendra Publishing House, Delhi, 217 pp.

Ng, H.H. & Edds, D.R. (2005) Two new species of *Pseudecheneis*, rheophilic catfishes (Teleostei: Sisoridae) from Nepal. *Zootaxa*, 1047, 1–19.

Ng, H.H. & Rainboth, W.J. (2001) A review of the sisorid catfish genus *Oreoglanis* (Siluriformes: Sisoridae) with descriptions of four new species. *Occasional Papers of the Museum of Zoology the University of Michigan*, 732, 1–34.

Roberts, T.R. (1998) *Pseudecheneis sympelvicus*, a new species of rheophilic sisorid catfish from Laos (Mekong basin). *The Raffles Bulletin of Zoology*, 46, 289–292.

Sen, T.K. (1985) The fish fauna of Assam and the neighbouring northeastern states of India. *Records of the Zoological Survey of India, Miscellaneous Publications, Occasional Paper*, 64, 1–216.

Sen, T.K. (1992) Freshwater Fish. *In*: Ghosh, A.K. (Ed.), *State Fauna Series 3. Fauna of West Bengal Part 2 (Reptilia, Amphibia, Fishes, Hemichordata and Archaeozoology)*. Zoological Survey of India, Calcutta. Pp. 101–242.

Sen, T.K. (1995) Pisces. *In*: Alfred, J.R.B. (Ed.), *State Fauna Series 4. Fauna of Meghalaya Part 1 (Vertebrates)*. Zoological Survey of India, Calcutta. Pp. 483–606.

Shaw, G.E. & Shebbeare, E.O. (1938) The fishes of northern Bengal. *Journal of the Royal Asiatic Society of Bengal, Science*, 3, 1–137.

Shrestha, J. (1981) *Fishes of Nepal*. Curriculum Development Centre, Tribhuvan University, Kathmandu, 318 pp.

Shrestha, J. (1994) *Fishes, Fishing Implements and Methods of Nepal*. Gupta, Lashkar, India, 150 pp.

SPSS (2000) SYSTAT 10. SPSS, Chicago.

Talwar, P.K. & Jhingran, A.G. (1991) *Inland Fishes of India and Adjacent Countries*. Oxford and IBH Publishing Company, New Delhi, 2 vols., 1158 pp.

Taylor, W.R. & Van Dyke, G.C. (1985) Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybium*, 9, 107–119.

Tchang, T.-L. (1936) Study on some Chinese catfishes. *Bulletin of the Fan Memorial Institute of Biology. Zoology*, 7, 33–56.

Wu, X.-W., He, M.-J. & Chu, S.-L. (1981) On the fishes of Sisoridae from the region of Xizang. *Oceanologia et Limnologia Sinica*, 12, 74–79.

Wu, Y.-F. & Wu, C.-Z. (1992) *The Fishes of the Qinghai-Xizang Plateau*. Sichuan Publishing House of Science & Technology, Chengdu, 599 pp. [In Chinese, English abstract]

Zhang, C.-G., Cai, B. & T.-Q. Xu (1995) *Fishes and Fish Resources in Xizang, China.* China Agricultural Press, Beijing, 162 pp. [In Chinese, English summary]

Zhou, W. & Chu, X.-L. (1992) A new species of *Pseudecheneis* with comments on osteological differentiations at species level (Siluriformes: Sisoridae). *Acta Zootaxonomica Sinica*, 17, 110–115. [In Chinese, E nglish summary]

Zhou, W. & Zhou, Y. -W. (2005) Phylogeny of the genus *Pseudecheneis* (Sisoridae) with explanation of its distribution pattern. *Zoological Studies*, 44, 417–433.

