

**A REVIEW OF THE CATFISH GENUS *PSEUDECHENEIS*  
(SILURIFORMES: SISORIDAE) FROM CHINA, WITH THE DESCRIPTION  
OF FOUR NEW SPECIES FROM YUNNAN**

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**ABSTRACT.** – Presently, six species of *Pseudecheneis* have been recorded in China. They are *Pseudecheneis intermedius* Chu, *P. immaculatus* Chu, *P. paviei* Vaillant, *P. stenura* Ng, *P. sulcata* (McClelland) and *P. sulcatoides* Zhou & Chu. This study suggests that *Pseudecheneis immaculatus*, *P. stenura* and *P. sulcatoides* are valid species. *Pseudecheneis intermedius* is considered a junior synonym of *P. paviei*. *Propseudecheneis tchangii*, formerly treated as a junior synonym of *Pseudecheneis sulcata*, is a valid species belonging in *Pseudecheneis* and in China *Pseudecheneis sulcata* is only found in the Yaluzangbu River (Brahmaputra), Tibet. In addition, four new species from Yunnan are described. They are *Pseudecheneis brachyurus*, *P. gracilis*, *P. longipectoralis* and *P. paucipunctatus*. These four new species can be distinguished from each other by distinct stable morphological characters. They can be distinguished from all recorded species by certain characters. They differ from *P. paviei* in having 14–21 transverse ridges (laminae) of thoracic apparatus (vs. 9–13); differ from *P. sulcatoides* in having a neural spine of complex vertebra bifurcate (vs. single); differ from *P. immaculatus* in having yellow spots and patches at the occipital, post-temporal, origin and base end of the dorsal fin and adipose fin, and caudal fin base (vs. absent); differ from *P. tchangii* in having yellow spots and patches at origin and base end of the dorsal fin, origin and base end of the adipose fin, and the caudal fin base (vs. absent); differ from *P. sulcata* in having longer pelvic fin, reaching base of first anal fin ray (vs. not reaching); differ from *P. crassicauda* in having longer pectoral fin, reaching origin of pelvic fin (vs. not reaching); differ from *P. serracula* in having a shorter base of adipose fin (length of adipose fin base 125–166.7% in length of anal fin base vs. larger than 200%); and differ from *P. sympelvica* in having separate pelvic fins (vs. fused). Except *P. gracilis*, other three new species differ from *P. stenura* in having tubercles at caudal peduncle. *Pseudecheneis gracilis* differs from *P. stenura* in having a saddle patch at origin of dorsal fin (vs. isolated as two ovoid yellow patches on lateral of dorsal fin origin), and further in having shorter head length (head length 14.9–18.6 % SL vs. 20.1–23.7, postorbital head length 4.5–5.9% in head length vs. 8.5–11.4, body depth 73.9–112.2 % in head length vs. 67.1–88.5).

**KEY WORDS.** – *Pseudecheneis*, review, new species, Sisoridae, China.

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## INTRODUCTION

The catfish genus *Pseudecheneis* belongs to the Family Sisoridae in the Order Siluriformes. All species are small freshwater catfish, dwelling at the bottom of fast flowing streams. Their distribution in China includes the Honghe (Red River), Lancangjiang (the upper Mekong River), Nujiang (the upper Salween River), some branches of the Irrawaddy River and the Brahmaputra River. They are also found in adjacent countries, including Vietnam, Laos, Myanmar, India, Nepal and Pakistan (Mai, 1978; Chu, 1982; Zhou & Chu, 1992; Roberts, 1998; Kottelat, 1998, 2001; Rainboth, 1996; Zhou & Zhou, 2005; Ng & Edds, 2005; Ng, 2006a, 2006b; Ng & Tan, 2007; Vishwanath & Darshan, 2007).

Until 2006, six species of *Pseudecheneis* have been recorded in China. They are *Pseudecheneis intermedius* Chu, *P. immaculatus* Chu, *P. paviei* Vaillant, *P. stenura* Ng, *P. sulcata* (McClelland) and *P. sulcatoides* Zhou & Chu (Chu, 1982; Zhou et al., 1992; Zhou & Zhou, 2005; Ng, 2006a).

However, there are distinct problems when identifying specimens from China. External morphological characters are overlapping and characters of muscle and skeleton are identical when identifying specimens between *P. paviei* and *P. intermedius*. There are prominent differences in the external morphological characters and characters of the muscle and skeleton among specimens treated as *Pseudecheneis sulcata* from different localities between the Irrawaddy and Nujiang basins (Zhou & Zhou, 2005). Our

results of DNA sequence of cytochrome *b* show that samples of *P. paviei* and *P. intermedius* are the same and samples of *P. sulcata* from Irrawaddy and Nujiang are obviously different (Zhou et al., 2007).

*Propseudecheneis tchangi* was treated as a junior synonym of *Pseudecheneis sulcatus* (Chu, 1982). When examining holotype's pictures of *Propseudecheneis tchangi*, we found it could be distinguished from specimens of *Pseudecheneis sulcata* collected from Irrawaddy and Nujiang basins in having a longer pectoral fin, extending beyond pelvic fin base (vs. not extending to), and lacking pale colored patches on the body after the dorsal fin origin (vs. with pale colored patches). Ng (2006a) considered that *Pseudecheneis sulcata* was only distributed in Brahmaputra River drainage.

The facts stated above imply that the taxonomy of *Pseudecheneis* species occurring in China is confusing. This study reviews the *Pseudecheneis* species occurring in China. Ten species are recognized as valid, four of which are described as new in this study.

## MATERIAL AND METHODS

Method for obtaining counts and measurements follows Chu (1982), Ng & Kottelat (1998) and Ng & Edds (2005). The description of premaxillary tooth band and tooth shape follows Chu (1979) and He (1996). Description of skin tubercles follows Mo & Chu (1986). Osteological characters were determined from cleared and stained specimens prepared by the methods of Dingerkus & Uhler (1977), but the step of cartilage staining was omitted. Observations, dissections, and drawings were made using a binocular microscope (Motic® D400), equipped with a drawing attachment. Nomenclature of muscles and skeleton follow Mo (1986), Saxena (1961, 1962), and Saxena *et al.* (1966). Anatomical results of muscle and skeleton had been reported in other papers (Zhou & Zhou 2005).

Examined specimens are deposited in the following institutions: Institute of Zoology, Chinese Academy of Sciences, Beijing (IZCAS); Kunming Institute of Zoology, Chinese Academy of Sciences (KIZ); Museum of Zoology, Southwest Forestry College (SWFC). The information of specimens are given as follows total number of examined specimens (ex.), standard length (SL) and total length (TL) with range of specimens in millimeters (mm), collecting locality and river system. Numbers of dissected specimens and stained skeleton specimens (DS) are given in parentheses.

## TAXONOMY

### *Pseudecheneis brachyurus*, new species

(Fig. 1)

*Pseudecheneis sulcatus* – Chu, 1982: 431 (in part specimens from Irrawaddy); Chu, Mo & Kuang, 1990: 196–197, Fig. 196 (in

part specimens from Irrawaddy); Chu & Mo 1999: 153–154, Fig. 98 (in part specimens from Irrawaddy).

**Material examined.** – **Holotype.** SWFC 200103294, 140 mm TL, 122 mm SL; Shudian (25°06.62'N 97°56.21'E) at a branch of Dayinjiang (tributary of Irrawaddy River), Yingjiang County, Yunnan Province; Y.-W. Zhou & X.-F. Pan, 3 Mar.2001.

**Paratypes.** SWFC 200103289–293, 200103295–302, 200103394, 14 ex. (1 DS), 131–156 mm TL, 110–131 mm SL, same date as holotype.

**Other material examined.** Dayinjing (a tributary of Irrawaddy River): SWFC 9904095–099, 5 ex., 80–139 mm SL, Mangyun, Yingjiang County, Yunnan Province; SWFC 200101001–002, 200103303–304, 4 ex., 105–121 mm SL, Tongbiguan, Yingjiang County, Yunnan Province; SWFC 200102155–156, 200102198, 3 ex., 120–131 mm SL, Guyong, Tengchong County, Yunnan Province. Longchuanjiang (a tributary of Irrawaddy River): SWFC 9904035, 9904037–058, 9904060, 24 ex. (1DS), 64.5–155 mm SL, Gudong, Tengchong County, Yunnan Province. Muleijiang (a tributary of Irrawaddy River): SWFC 200103248–251, 4 ex., 56–89 mm SL, Laza, Yingjiang County, Yunnan Province.

**Diagnosis.** – *Pseudecheneis brachyurus* is distinguished from *P. paviei* in having 14–20 transverse ridges (laminae) of thoracic apparatus (vs. 9–13). It differs from *P. paviei* and *P. sulcatoides* in having a furcated neural spine of complex vertebra (vs. single). It is distinguished from *P. immaculatus*, *P. tchangi* and *P. paucipunctatus* in having yellow spots and patches at occipital, post-temporal, origin and base end of the dorsal fin and adipose fin, and caudal fin base (vs. absent or lacking). It differs from *P. gracilis* and *P. stenura* in having a shorter caudal peduncle (19.9–30.0% SL vs. 26.0–35.8). It differs from *P. sulcata* in having

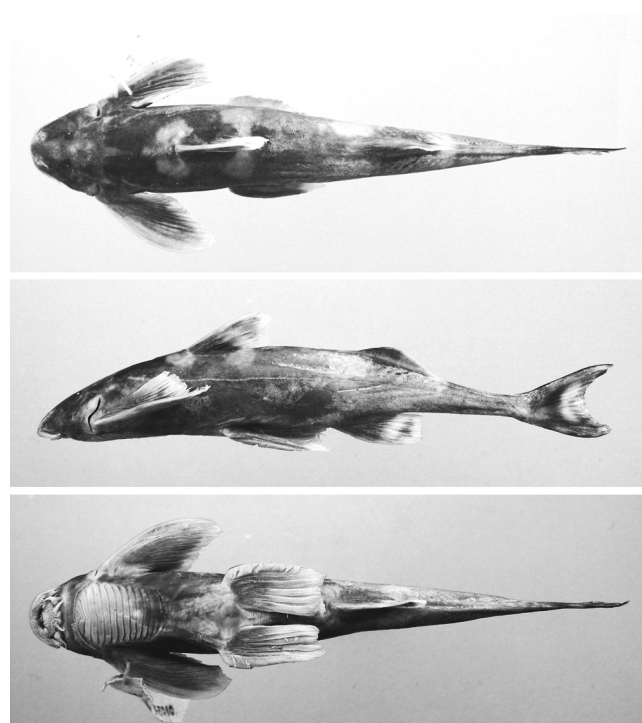


Fig. 1. *Pseudecheneis brachyurus*, SWFC 200103294, holotype, 122 mm SL; China: Dayinjiang (a branch of Irrawaddy River drainage). Dorsal, lateral and ventral views.

a longer pelvic fin, reaching base of first anal fin ray (vs. not reaching), and from *P. crassicauda* in having a longer pectoral fin, reaching origin of pelvic fin (vs. not reaching). *Pseudecheneis brachyurus* is distinguished from *P. serracula* in having a shorter adipose fin base (length of adipose fin base 125–166.7% in length of anal fin base vs. larger than 200%), and from *P. sympelvica* in having separate pelvic fins (vs. fused).

**Description.** – Morphometric data as in Table 1. Body elongate. Dorsal profile rising gradually from tip of snout to origin of dorsal fin, then sloping slowly ventrally to end of caudal peduncle. Head and abdominal region before origin of pelvic fin moderately broad. Body after dorsal fin compressed gradually. Caudal peduncle long and moderately compressed. Thoracic adhesive apparatus oval with 14–20 transverse ridges (laminae).

Head compressed and broadly rounded when viewed from above. Eye small and almost rounded, subcutaneous and located on dorsal surface of head. Distance to tip of snout

longer than to dorsalmost extremity of gill openings. Mouth small, transverse and inferior. Lips with papillae. Premaxillary tooth band semicircular and two or four teeth along its outer edge (Fig. 2A). Mandibular tooth band crescent (Fig. 2B). Outer teeth shovel-shaped (Fig. 3A–C). Inner teeth conical (Fig. 3D–F). Teeth on premaxillary and mandibular tooth bands sparse and embedded in skin. Only tips exposed and arranged in irregular rows. Barbels flattened and in four pairs with papilla except nasal barbel. Nasal barbel short, not extending to orbit. Maxillary barbel not developed, only extending to level of anterior orbit margin and not reaching gill opening. Length of outer mandibular barbel longer than inner mandibular barbel, not reaching or just beyond the front of thoracic apparatus. Gill openings moderate, extending beyond base of first pectoral fin element.

First and second unbranched ray of dorsal fin not ossified. Dorsal fin post-dorsal margin concave slightly. Dorsal fin origin located at point through anterior third of body. Distance of dorsal fin base to origin of adipose fin longer than distance to front of orbit. Adipose fin origin at vertical

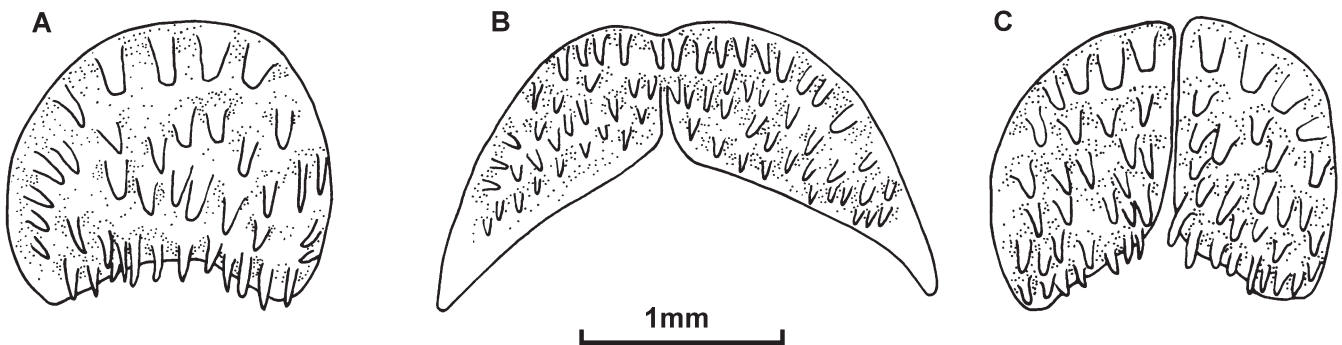


Fig. 2. Premaxillary and mandibular tooth band. A, ventral view of semicircular premaxillary tooth band and four teeth along its outer edge (*Pseudecheneis gracilis*, SWFC 200102148, paratype, 68 mm SL, DS); B, dorsal view of crescent mandibular tooth band (*P. gracilis*, SWFC 200102148, paratype, 68 mm SL, DS); C, ventral view of semicircular premaxillary tooth band and eight teeth along its outer edge (*P. paviei*, SWFC 0005084, 62 mm SL, DS).

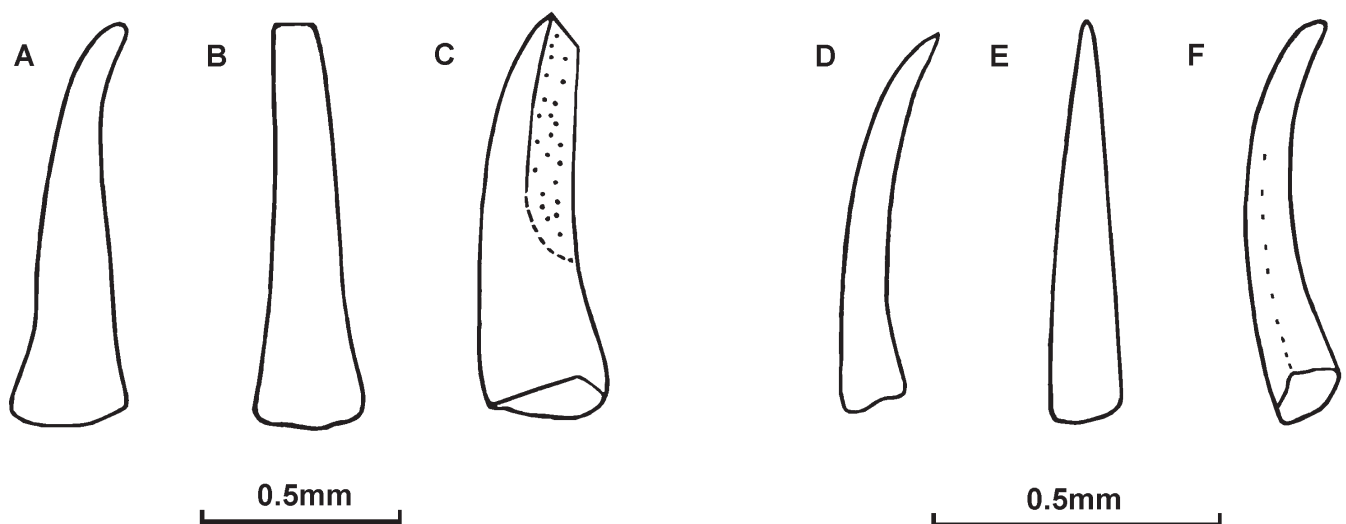


Fig. 3. Tooth shape of premaxillary tooth band (*Pseudecheneis gracilis*, SWFC 200102148, paratype, 68 mm SL, DS): A–C, outer teeth; D–F, inner teeth. A, D, lateral view; B, E, frontal view; D, F, frontal-lateral view.



through anal fin origin. Length of adipose fin base shorter than distance of its origin to end of dorsal fin base. Pectoral fin enlarged with concave posterior margin, extending beyond origin of pelvic fin and not to end of pelvic fin base. Origin of pelvic fin at vertical through preceding end of dorsal-fin base. Pelvic fin extending to anus. First unbranched ray of paired fin broadened with regular striae on ventral surface. Anal fin post-ventral margin emarginate. Distance of anal fin origin to caudal fin base longer than to base of pectoral fin. Anus and urogenital openings located at origin of anal fin. Shortest ray of caudal fin circa 75% of longest ray. Upper lobe shorter than lower lobe.

Body covered with dense, rounded tubercles distributed irregularly, not uniformly (Fig. 4A). Tubercles decreasing in density gradually from occipital to caudal peduncle.

Lateral line complete and midlateral. Vertebrae 17+18=35 (1), 18+18=36 (2).

**Colouration.** – Alive, chestnut brown on dorsal and lateral surfaces of head and body. Light yellow on ventral region. Pink thoracic apparatus and oral region. Occipital having an

obvious, small, yellow, triangular patch. Post-temporal having a small yellow ovate spot. Dorsal fin origin and end of base respectively having a yellow saddle patch (Fig. 5A). Before origin of adipose fin are three yellow patches. Median patch located at origin of adipose fin. Two lateral patches extending vertically to lateral line. Ovate patch on posterior end of adipose fin base. Another on base of caudal fin.

Dorsal fin hyaline, with a thin chestnut brown band near distal margin of fin and a small yellow patch on tip. Adipose fin chestnut brown, with lighter colour around distal edge. Caudal fin base brown. Upper and lower edges with light-yellow lateral stripe near caudal fin base. Two light yellow patches on forked median distal margin of caudal fin. Yellow patch on tip of each lobe. Anal fin hyaline, base dark brown. Middle to distal margin light yellow with a dark strip. Dorsal surfaces of pectoral fins brown. Yellow elliptical patch near base. Yellow patch near distal margin. Pelvic fin base brown. Other part light yellow.

**Distribution.** – This species had been found in the Dayinjing and Longchuanjiang, tributaries of Irrawaddy River (Fig. 6).

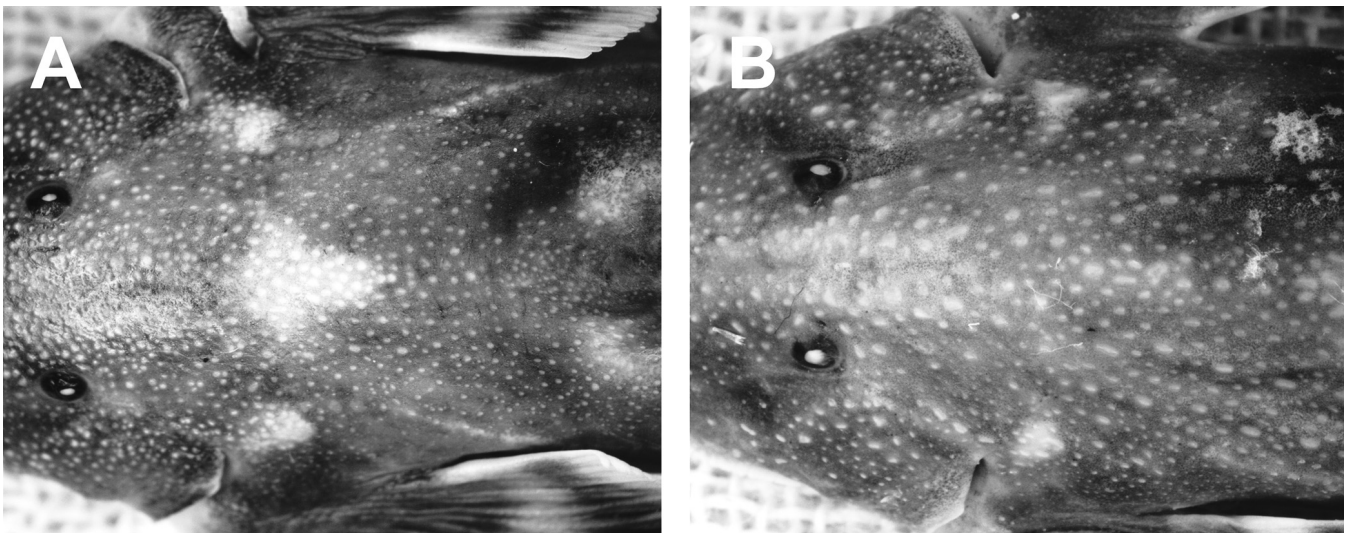


Fig. 4. Tubercles at dorsal of head: A, rounded tubercles (*Pseudecheneis stenura*, SWFC 0502004, 78.6 mm SL); B, some longitudinal tubercles among rounded tubercles (*P. sulcatoides*, SWFC 200005030, 75 mm SL).

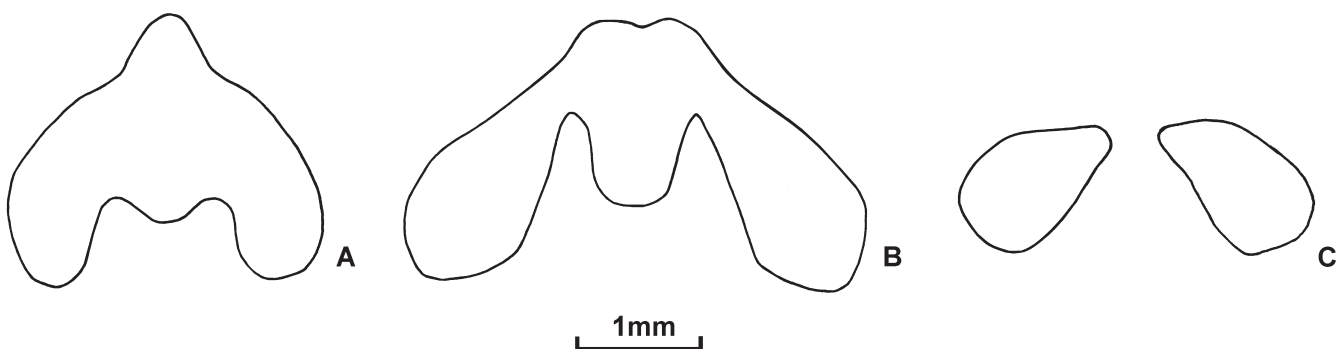


Fig. 5. Patch or spots at dorsal fin origin: A, spots connected as a saddle patch (*Pseudecheneis brachyurus*, SWFC 200103294, holotype, 122 mm SL); B, spots connected as a saddle patch (*P. gracilis*, SWFC 200102125, paratype, 168 mm SL); C, spots isolated as two ovoid spots (*P. stenura*, SWFC 0502001, 90.5 mm SL).

**Etymology.** – From the Latin *brachyurus*, meaning bobtail, in reference to the dumpier caudal peduncle, distinguished from *P. gracilis* and *P. stenura* in the same water system. Used as an adjective.

***Pseudecheneis gracilis*, new species**

(Fig. 7)

*Pseudecheneis sulcatus* – Chu, 1982: 431 (in part specimens from Irrawaddy); Chu, Mo & Kuang, 1990: 196–197, Fig. 196 (in part specimens from Irrawaddy); Chu & Mo 1999: 153–154, Fig. 98 (in part specimens from the Irrawaddy).

**Material examined.** – **Holotype.** SWFC 200102125, 201 mm TL, 168 mm SL; Qushi (25°14'N 98°36.43'E) at the upper of Longchuanjiang (branch of Irrawaddy River), Tengchong County, Yunnan Province; Y.-W. Zhou & X.-F. Pan, 24 Feb.2001.

**Paratypes.** – SWFC 200102127–128, 200102135–138, 200102140, 200102148, 8 ex., 76–226 mm TL, 62–188 mm SL (1 DS), same date as holotype. SWFC 200101665–667, 3 ex., 69–162 mm TL, 56–134 mm SL; Daju (25°06.97'N 98°35.63'E) at a branch of the upper Longchuanjiang, Tengchong County, Yunnan Province; J.-L. Lu, 21 Jan.2001.

**Diagnosis.** – *Pseudecheneis gracilis* is distinguished from *P. sulcata* in having longer pelvic fin, reaching base of first anal fin ray (vs. not reaching), and from *P. crassicauda* in having longer pectoral fin, reaching origin of pelvic fin (vs. not reaching). *Pseudecheneis gracilis* is further distinguished from *P. serracula* in having a shorter adipose fin base (length of adipose fin base 125–166.7% in length of anal fin base vs. larger than 200%), and from *P. sympelvica* in having separate pelvic fins (vs. fused). It can be distinguished from other congeners except *P. immaculatus* in having a long caudal peduncle (27.5–35.8% SL vs. 20.4–28.3), and further differs from other congeners except *P. stenura* in having

deeper forked of caudal fin, the shortest ray of caudal fin circa 50% of longest ray (vs. 75%). *Pseudecheneis gracilis* is distinguished from *P. immaculatus* in having shorter pectoral fin (27.1–30.6% SL vs. 29.4–38.3), and having yellow spots and patches on the body (vs. lacking). *Pseudecheneis gracilis* differs from *P. stenura* in having a saddle patch at dorsal fin origin (vs. two ovoid, isolated yellow patches on lateral of dorsal fin origin) (Fig. 5B, C) and further in having shorter head length (head length 14.9–18.6% SL vs. 20.1–23.7, postorbital head length 4.5–5.9% head length vs. 8.5–11.4, body depth 73.9–112.2% head length vs. 67.1–88.5).

**Description.** – Morphometric data as in Table 1. Body elongate. Dorsal profile rising gradually from tip of snout to origin of dorsal fin, then sloping slowly ventrally to end of caudal peduncle. Head and abdominal region before origin of pelvic fin moderately broad. Body after dorsal fin compressed gradually. Caudal peduncle long and moderately compressed. Thoracic adhesive apparatus oval with 16–20 transverse ridges (laminae).

Head compressed and broadly rounded when viewed from above. Eye small and almost rounded, subcutaneous and located on dorsal surface of head. Distance to tip of snout longer than to dorsalmost extremity of gill openings. Mouth small, transverse and inferior. Lips with papillae. Premaxillary tooth band semicircular and two or four teeth along its outer edge (Fig. 2A). Mandibular tooth band crescent (Fig. 2B). Outer teeth shovel-shaped (Fig. 3A–C). Inner teeth conical (Fig. 3D–F). Teeth on premaxillary and mandibular tooth bands sparse and embedded in skin. Only tips exposed and arranged in irregular rows. Barbels flattened and in four pairs with papilla except nasal barbel. Nasal barbel short, not extending to orbit. Maxillary barbel not

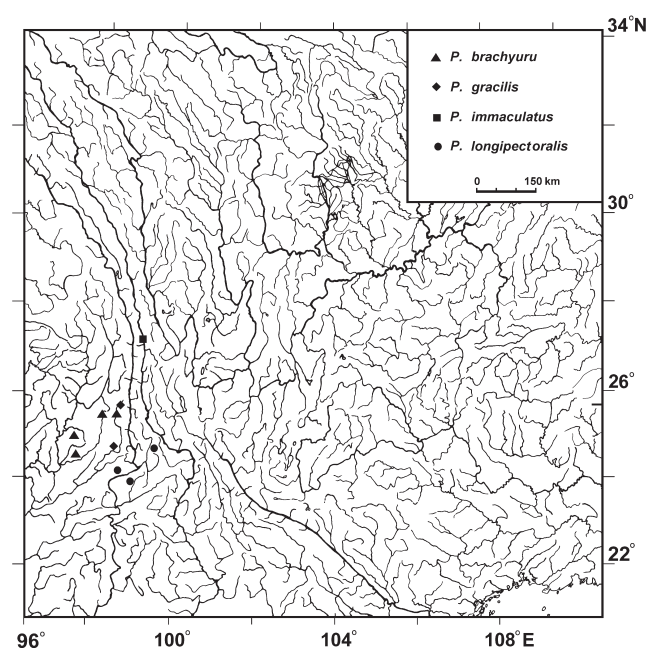


Fig. 6. Map showing distribution of *Pseudecheneis brachyurus*, *P. gracilis*, *P. immaculatus* and *P. longipectoralis*.

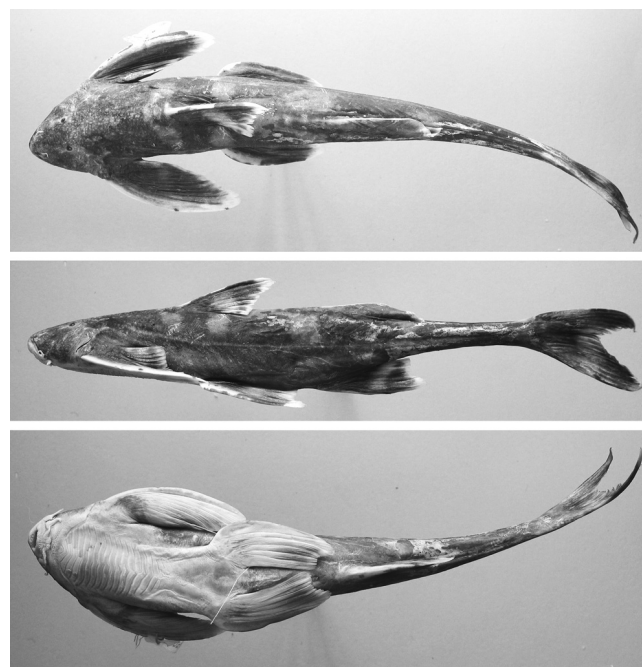


Fig. 7. *Pseudecheneis gracilis*, SWFC 200102125, holotype, 168 mm SL; China: Longchuanjiang (a branch of Irrawaddy River drainage). Dorsal, lateral and ventral views.

Table 1. Counts and proportional measurements of *Pseudecheneis brachyurus* and *P. gracilis* (Roman and Arabic numerals that are in italics and bold show difference of data among species).

Locality	<i>P. brachyurus</i>				<i>P. gracilis</i>			
	Mangyun, Tongbiguan, Lazha, Guyong		Sudian		Gudong		Qushi, Daju	
Number of specimens examined	16	15 (types)	24	12				
Dorsal fin rays	ii, 6	ii, 6	ii, 5-6	ii, 6				
Pectoral fin rays	i, 12-14	i, 12-14	i, 12-13	i, 12-13				
Pelvic fin rays	i, 5	i, 5	i, 5	i, 5				
Anal fin rays	iii, 7	iii, 7	iii, 6-7	iii, 6-7				
Branched caudal rays	7+7	7+7	7+7	7+7 or 7+8				
Transverse folds of thoracic apparatus	14-20	15-18	14-19	16-20				
Gill rakers on outer side of 1st gill arch	7-9	8-9	8-9	7-9				
<b>in % of SL</b>	<b>mean</b>	<b>S.D.</b>	<b>range</b>	<b>S.D.</b>	<b>mean</b>	<b>S.D.</b>	<b>range</b>	<b>S.D.</b>
Body depth	14.9	1.72	12.5-18.6	1.03	16.5	1.41	13.2-17.9	1.48
Predorsal length	32.0	1.96	28.8-35.3	0.93	34.8	1.01	27.3-34.8	2.46
Head length	16.7	0.57	16.0-18.3	0.79	16.9	0.65	14.9-18.6	1.48
Snout length	11.2	0.61	10.3-12.5	1.45	11.6	0.60	9.5-12.9	1.12
Postorbital head length	5.2	0.45	4.6-6.5	0.32	5.1	0.53	4.5-5.9	0.48
Caudal peduncle length	28.1	1.01	26.6-30.0	2.40	26.3	1.00	<b>27.5-35.8</b>	<b>2.74</b>
Caudal peduncle depth	4.2	0.30	3.8-4.8	0.18	4.13	0.23	3.7-5.2	0.42
Length of dorsal base to adipose	16.6	2.03	12.7-20.0	0.98	19.2	2.66	14.0-19.6	1.61
Length of pre-adipose to snout	59.1	3.11	53.6-66.7	1.21	63.2	2.04	54.2-64.3	3.23
Length of pectoral fin	27.9	1.56	25.4-31.3	1.28	27.8	1.54	27.1-30.6	1.00
<b>in % of head length</b>								
Snout length	67.4	2.32	62.9-71.7	7.06	68.8	3.52	64.0-69.6	1.55
Postorbital head length	31.5	3.18	27.3-40.0	1.66	29.9	3.09	28.0-36.0	1.92
Eye diameter	10.3	1.35	8.5-13.9	1.06	8.8	0.97	8.3-17.3	2.80
Interorbital width	27.2	2.17	25.0-33.7	2.23	24.6	2.10	20.8-33.7	4.00
Body depth	89.4	9.93	76.7-110.8	7.01	98.0	9.62	73.9-112.2	10.36
<b>in % P-V length</b>								
Length of pectoral fin	121.9	9.43	108.2-130.8	6.23	119.2	7.81	105.6-129.7	7.31
<b>in % of length of caudal peduncle</b>								
Depth of caudal peduncle	15.1	1.20	12.5-17.0	1.8	15.7	0.95	11.5-18.5	2.39



developed, only extending to level of anterior orbit margin and not reaching gill opening. Length of outer mandibular barbel longer than inner mandibular barbel, not reaching or just beyond the front of thoracic apparatus. Gill openings moderate, extending beyond base of first pectoral fin element.

First and second unbranched ray of dorsal fin not ossified. Dorsal fin post-dorsal margin concave slightly. Dorsal fin origin located at point through anterior third of body, distance of dorsal fin base to origin of adipose fin longer than distance to front of orbit. Adipose fin origin at vertical through anal fin origin. Length of adipose fin base shorter than distance of its origin to end of dorsal fin base. Pectoral fin enlarged with concave posterior margin, extending beyond origin of pelvic fin and not to end of pelvic fin base. Origin of pelvic fin at vertical through preceding end of dorsal-fin base. Pelvic fin extending to anus. First unbranched ray of paired fin broadened with regular striae on ventral surface. Anal fin post-ventral margin emarginate. Distance of anal fin origin to caudal fin base larger than to base of pectoral fin. Anus and urogenital openings located at origin of anal fin. Shortest ray of caudal fin circa 50% of longest ray. Upper lobe shorter than lower lobe.

Body covered with dense, rounded tubercles distributed irregularly, not uniformly (Fig. 4A). Tubercles decreasing in density gradually from occipital to caudal peduncle which almost no tubercles.

Lateral line complete and midlateral. Vertebrae 19+19=38 (1).

**Colouration.** – Alive, chestnut brown on dorsal and lateral surfaces of head and body. Light yellow on ventral region. Pink thoracic apparatus and oral region. Occipital having an obvious, small, yellow, triangular patch. Post-temporal having a small yellow ovate spot. Dorsal fin origin and end of base respectively having a yellow saddle patch (Fig. 5B). Before origin of adipose fin with three yellow patches. Median patch just located at origin of adipose fin. Two lateral patches extending vertically to lateral line. An ovate patch on posterior end of adipose fin base. Another on base of caudal fin.

Dorsal fin hyaline, with a thin chestnut brown band near distal margin of fin and a small yellow patch on tip. Adipose fin chestnut brown, with lighter colour around distal edge. Caudal fin base brown. Upper and lower edges with light-yellow lateral stripe near caudal fin base. Two light-yellow patches on forked median distal margin of caudal fin and yellow patch on tip of each lobe. Anal fin hyaline, base dark brown. Middle to distal margin light yellow with a dark strip. Dorsal surfaces of pectoral fins brown. Yellow elliptical patch near base. Yellow patch near distal margin. Pelvic fin base brown and other part light yellow.

**Distribution.** – This species is found in the upper Longchuanjiang, belonging to Irrawaddy River drainage (Fig. 6).

**Etymology.** – From the Latin *gracil*, meaning long and slender, in reference to head smallish making body elongate and tenuous. Used as an adjective.

***Pseudecheneis immaculatus* Chu, 1982**

(Fig. 8)

*Pseudecheneis immaculatus* Chu, 1982: 428, Fig. 1 (Weixi, Deqin); Chu, Mo & Kuang, 1990: 198–199, Fig. 198 (Weixi, Deqin); Chu & Mo 1999: 154–155, Fig. 99 (Weixi, Deqin); Thomson & Page, 2006: 60 (Mekong drainage, China).

**Material examined.** – Lancangjiang (Mekong River) drainage: KIZ 748742 1 ex., holotype, 96mm SL, KIZ 748650–652, 748735–739, 748741, 9 ex., paratypes, 72.8–104mm SL, Baijixun, Weixi County, Yunnan Province; KIZ 748636–748640, 5 ex., paratypes, 74.5–89.2mm SL, Liutongjiang, Deqin County, Yunnan Province; SWFC 9908007, 0004081–085, 0004095, 7 ex., 76.5–102.5 mm SL (1 DS), Liutongjiang, Deqin County, Yunnan Province. Morphometric data as in Table 2.

**Diagnosis.** – *Pseudecheneis immaculatus* is distinguished from all other congeners in lacking yellow spots or patches on the body (vs. having). Distinguished from all congeners except *P. longipectoralis* in having longer pectoral fin, extending to pelvic fin base (vs. not extending). It differs from *P. longipectoralis* in having a longer caudal peduncle (28.2–32.9% SL vs. 24.9–28.2). Premaxillary tooth band semicircular with two or four teeth along outer edge (Fig. 2A). Body covered with dense, tubercles distributed uniformly, some longitudinal tubercles among rounded tubercles (Fig. 4B). Vertebrae 18+17=35 (1).

**Distribution.** – This species is found in the main river and branches of middle and upper Lancangjiang (Fig. 6).

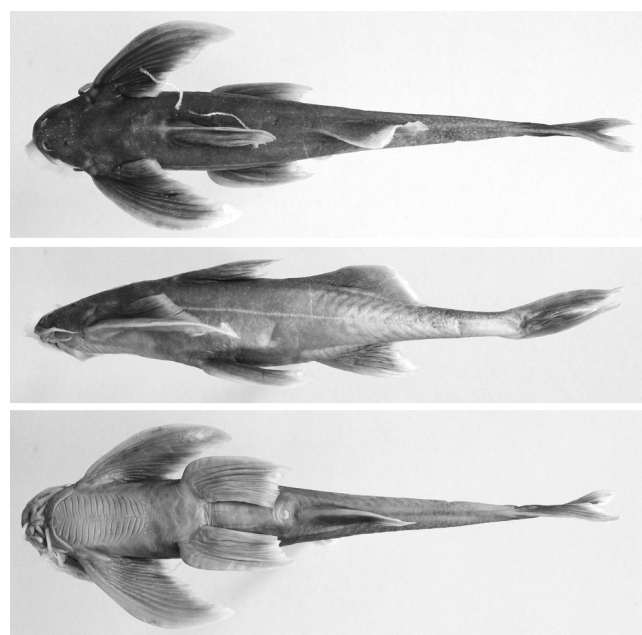


Fig. 8. *Pseudecheneis immaculatus*, KIZ 748742, holotype, 96 mm SL; China: Lancangjiang (the upper Mekong River) drainage. Dorsal, lateral and ventral views.

***Pseudecheneis longipectoralis*, new species**

(Fig. 9)

*Pseudecheneis sulcatus* – Chu, 1982: 431 (in part specimens from Nujiang); Chu, Mo & Kuang, 1990: 196–197, Fig. 196 (in part specimens from Nujiang); Chu & Mo 1999: 153–154, Fig. 98 (in part specimens from Nujiang).

**Material examined.** – **Holotype.** SWFC 0202003, 132 mm TL, 108 mm SL; Kejiehe (24°52'36"N 99°26'03"E) (a tributary of the Salween River), Kejie, Changning County, Yunnan Province; L.-Y. Chen, 15 Feb.2001.

**Paratypes.** SWFC 9904113–9904114, 0202001–002, 0202004–033, 34 ex. (1 DS); 72–132 mm TL, 58.5–108 mm SL; same locality as holotype; W. Zhou & X.-F. Pan, 12 Apr.1999; L.-Y. Chen, 15 Feb.2002.

**Other material examined.** Nujiang (Salween River) drainage: SWFC 9902133–136, 4 ex., 83–133mm SL, Fengweihe, Zhenkang County, Yunnan Province; SWFC 0102063, 1 ex., 122mm SL, Xiangda, Longlin County, Yunnan Province.

**Diagnosis.** – *Pseudecheneis longipectoralis* is distinguished from *P. sulcata* in having longer pelvic fin, reaching base of first anal fin ray (vs. not reaching), and from *P. crassicauda* in having longer pectoral fin, reaching origin of pelvic fin (vs. not reaching). *Pseudecheneis longipectoralis* is further distinguished from *P. serracula* in having a shorter adipose fin base (length of adipose fin base 125–166.7% in length of anal fin base vs. larger than 200%), and from *P. sympelvica* in having separate pelvic fins (vs. fused). Further distinguished from other congeners except *P. immaculatus* in having longer pectoral fin (28.7–38.1% SL vs. 24.5–35.9), extending to pelvic fin (vs. not extending), and differs from *P. immaculatus* in having yellow spots or patches on the body (vs. lacking).

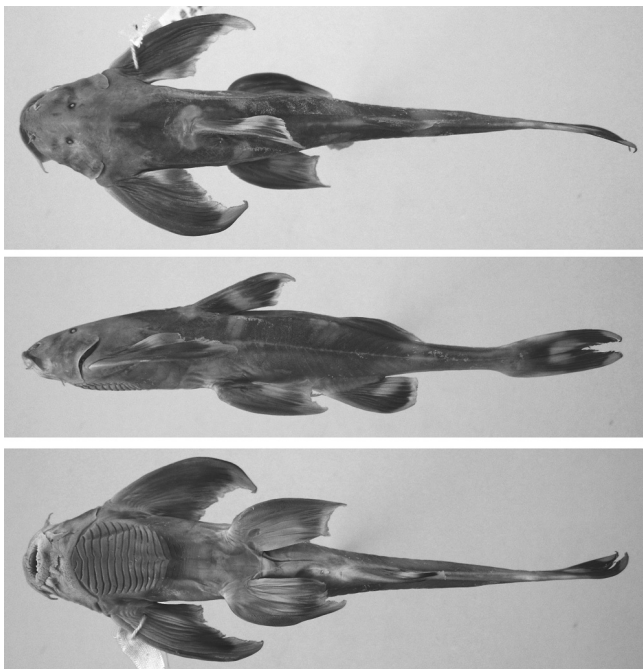


Fig. 9. *Pseudecheneis longipectoralis*, SWFC 0202003, holotype, 108 mm SL; China: Nujiang (the upper Salween River) drainage. Dorsal, lateral and ventral views.

**Description.** – Morphometric data as in Table 2. Body elongate. Dorsal profile rising gradually from tip of snout to origin of dorsal fin, then sloping slowly ventrally to end of caudal peduncle. Head and abdominal region before origin of pelvic fin moderately broad. Body after dorsal fin compressed gradually. Caudal peduncle long and moderately compressed. Thoracic adhesive apparatus oval with 14–21 transverse ridges (laminae).

Head compressed and broadly rounded when viewed from above. Eye small and almost rounded, subcutaneous and located on dorsal surface of head. Distance to tip of snout longer than to dorsalmost extremity of gill openings. Mouth small, transverse and inferior. Lips with papillae. Premaxillary tooth band semicircular and two or four teeth along its outer edge (Fig. 2A). Mandibular tooth band crescent (Fig. 2B). Outer teeth shovel-shaped (Fig. 3A–C). Inner teeth conical (Fig. 3D–F). Teeth on premaxillary and mandibular tooth bands sparse and embedded in skin. Only tips exposed and arranged in irregular rows. Barbels flattened and in four pairs with papilla except nasal barbel. Nasal barbel short, not extending to orbit. Maxillary barbel not developed, only extending to level of anterior orbit margin and not reaching gill opening. Length of outer mandibular barbel longer than inner mandibular barbel, not reaching or just beyond the front of thoracic apparatus. Gill openings moderate, extending beyond base of first pectoral fin element.

First and second unbranched ray of dorsal fin not ossified. Dorsal fin post-dorsal margin concave slightly. Dorsal fin origin located at point through anterior third of body, distance of dorsal fin base to origin of adipose fin longer than distance to front of orbit. Adipose fin origin at vertical through anal fin origin. Length of adipose fin base shorter than distance of its origin to end of dorsal fin base. Pectoral fin enlarged with concave posterior margin, extending beyond end of pelvic fin base. Origin of pelvic fin at vertical through preceding end of dorsal fin base. Pelvic fin extending to anus. First unbranched ray of paired fin broadened with regular striae on ventral surface. Anal fin post-ventral margin emarginate. Distance of anal fin origin to caudal fin base longer than to base of pectoral fin. Anus and urogenital openings located at origin of anal fin. Shortest ray of caudal fin circa 75% of longest ray. Upper lobe shorter than lower lobe.

Body covered with dense, rounded tubercles distributed irregularly, not uniformly (Fig. 4A). Tubercles decreasing in density gradually from occipital to end of anal fin base, then increasing in density gently to caudal peduncle.

Lateral line complete and midlateral. Vertebrae 17+18=35 (1).

**Colouration.** – Alive, chestnut brown on dorsal and lateral surfaces of head and body. Light yellow on ventral region. Pink thoracic apparatus and oral region. Occipital and posttemporal without yellow spot. Dorsal fin origin and end of base respectively having a yellow saddle patch (Fig. 5B). Before origin of adipose fin having three yellow patches.



Table 2. Counts and proportional measurements of *Pseudecheneis immaculatus*, *P. longipectoralis* and *P. paucipunctatus* (Roman and Arabic numerals that are in italics and bold show difference of data among species).

Locality	<i>P. immaculatus</i>			<i>P. longipectoralis</i>			<i>P. paucipunctatus</i>					
	Deqin, Weixi 22 (15 types)	Kejie 35 (types)	Zhenkuang, Longling	Lincang: Nangunhe								
Number of specimens examined	22 (15 types)	35 (types)	5	11								
Dorsal fin rays	ii, 5-6 i, 12-13	ii, 5-6 i, 12-13	ii, 6 i, 12-13	ii, 6 i, 12-14								
Pectoral fin rays	i, 12-13	i, 12-13	i, 12-13	i, 12-14								
Pelvic fin rays	i, 5 iii, 7-8	i, 5 iii, 7-8	i, 5 iii, 7	i, 5 iii, 7								
Anal fin rays	iii, 7-8	iii, 7-8	iii, 7	iii, 7								
Branched caudal rays	7+8	7+7 or 7+8	7+7 or 7+8	7+7 or 7+8								
Transverse folds of thoracic apparatus	14~18	14~21	14~20	14~18								
Gill rakers on outer side of 1st gill arch	8~10	7~9	8~9	7~9								
<b>in % of standard length</b>	<b>mean</b>	<b>range</b>	<b>S.D.</b>	<b>mean</b>	<b>range</b>	<b>S.D.</b>	<b>mean</b>	<b>range</b>	<b>S.D.</b>			
Body depth	16.1	13.1~18.1	1.22	15.6	12.3~20.4	1.63	16.0	15.7~17.7	0.86	17.0	13.7~21.7	2.46
Predorsal length	<b>31.2</b>	<b>28.9~33.4</b>	<b>1.18</b>	34.1	30.7~37.9	1.64	31.9	30.1~33.7	1.36	32.6	30.7~35.8	1.52
Head length	<b>17.5</b>	<b>15.6~19.7</b>	<b>1.03</b>	18.5	17.8~20.5	0.72	17.3	16.9~18.1	0.46	18.7	16.1~22.0	2.10
Snout length	<b>10.6</b>	<b>9.4~11.7</b>	<b>0.69</b>	11.8	11.1~13.6	0.61	11.7	11.1~12.2	0.47	11.4	10.3~12.1	0.55
Postorbital head length	6.0	5.2~6.8	0.51	5.8	5.1~6.8	0.36	5.5	5.3~5.6	0.14	6.6	4.7~9.6	1.48
Caudal peduncle length	<b>30.2</b>	<b>28.2~32.9</b>	<b>1.32</b>	26.0	24.9~28.2	0.83	26.6	25.5~27.1	0.70	27.1	23.9~29.3	1.75
Caudal peduncle depth	4.8	4.0~5.7	0.40	4.1	3.3~4.9	0.32	4.3	4.1~4.5	0.17	4.3	3.9~5.1	0.36
Length of dorsal base to adipose	18.3	15.7~22.6	1.69	21.5	15.0~31.8	4.68	17.1	16.1~18.1	0.93	19.4	16.7~21.6	1.65
Length of pre-adipose to snout	59.2	55.5~62.5	1.82	59.0	56.3~76.0	3.31	58.9	57.9~59.8	0.91	61.6	57.2~66.2	3.10
Length of pectoral fin	<b>32.1</b>	<b>29.4~38.3</b>	<b>2.32</b>	<b>31.4</b>	<b>28.7~38.1</b>	<b>2.19</b>	<b>30.2</b>	<b>29.2~31.2</b>	<b>0.89</b>	27.4	24.9~29.9	1.65
<b>in % of head length</b>												
Snout length	60.5	54.6~65.5	2.7	62.2	59.3~73.0	3.16	67.6	64.3~70.6	2.32	61.1	53.5~72.4	6.16
Postorbital head length	34.2	30.3~40.7	2.29	30.7	27.3~35.7	1.80	31.7	31.0~32.4	0.59	34.8	29.0~44.6	4.41
Eye diameter	6.6	4.4~9.3	1.47	6.9	5.0~9.2	0.98	10.6	9.2~11.8	1.18	9.6	6.2~11.8	1.89
Interorbital width	31.6	20.8~41.4	6.47	37.0	34.3~41.7	1.99	26.8	23.5~28.6	2.08	26.7	19.5~30.7	3.12
Body depth	92.2	75.0~107.6	7.96	82.3	62.5~100.0	8.23	98.1	92.9~102.4	3.54	90.9	82.1~104.0	6.9
<b>in % P-V length</b>												
Length of pectoral fin	<b>140.6</b>	<b>110.0~164.2</b>	<b>7.7</b>	<b>130.2</b>	<b>120.4~156.0</b>	<b>8.00</b>	<b>130.0</b>	<b>123.3~150.6</b>	<b>11.59</b>	116.5	104.6~125.7	7.08
<b>in % of length of caudal peduncle</b>												
Depth of caudal peduncle	16.0	12.6~19.7	1.50	14.9	13.3~18.5	1.14	16.3	15.2~17.5	0.95	16.0	13.6~19.2	1.87

Median patch just located at origin of adipose fin. Two lateral patches extending vertically to lateral line. An ovate patch on posterior end of adipose fin base. Another on base of caudal fin.

Dorsal fin hyaline, with a thin chestnut brown band near distal margin of fin and a small yellow patch on tip. Adipose fin chestnut brown, with lighter colour around distal edge. Caudal fin base brown. Upper and lower edges with light-yellow lateral stripe near caudal fin base. Two light yellow patches on forked median distal margin of caudal fin. Yellow patch on tip of each lobe. Anal fin hyaline, base dark brown. Middle to distal margin light yellow with a dark strip. Dorsal surfaces of pectoral fins brown. Yellow elliptical patch near base. Yellow patch near distal margin. Pelvic fin base brown and other part light yellow.

**Distribution.** – This species is found in the branches of middle Nujiang River drainage (Fig. 6).

**Etymology.** – From the Latin *long*, meaning long, and *pectoralis*, meaning pectoral fin, in reference to pectoral fin longer and extending to pelvic fin base. Used as an adjective.

***Pseudecheneis paucipunctatus*, new species**  
(Fig. 10)

*Pseudecheneis sulcatus* – Chu, 1982: 431 (in part specimens from Nujiang); Chu, Mo & Kuang, 1990: 196–197, Fig. 196 (in part specimens from Nujiang); Chu & Mo 1999: 153–154, Fig. 98 (in part specimens from Nujiang).

**Material examined.** – **Holotype.** SWFC 200203003, 136 mm TL, 109 mm SL; Nangunhe (23°16.49'N 99°04.34'E) (a tributary of Salween River), Cangyuan County, Yunnan Province; L. Zheng, 15 Mar.2002.

**Paratypes.** SWFC 200203001–002, 200203004–005, 4 ex. 89.8–165.1 mm TL, 73.9–135.4 mm SL; same data as holotype. SWFC 9902138–139, 2 ex. (1DS), 108–139 TL, 87–114 mm SL; Nangunhe (23°16.49'N 99°04.34'E), Cangyuan County, Yunnan Province; M.-L. Bao, 2 May 2000. SWFC 200104001–003, 3 ex., 90–91 TL, 73–75.8 mm SL, Dahedi in Nangunhe (23°16.16'N 99°01.41'E), Cangyuan County, Yunnan Province; Z.-S. Wang, 7 Apr.2001.

**Diagnosis.** – *Pseudecheneis paucipunctatus* is distinguished from *P. sulcata* in having longer pelvic fin, reaching base of first anal fin ray (vs. not reaching), and from *P. crassicauda* in having longer pectoral fin, reaching origin of pelvic fin (vs. not reaching). *Pseudecheneis paucipunctatus* is further distinguished from *P. serracula* in having a shorter adipose fin base (length of adipose fin base 125–166.7% in length of anal fin base vs. larger than 200%), and from *P. sympelvica* in having separate pelvic fins (vs. fused). Distinguished from *P. paviei* in having 14–18 transverse ridges (laminae) of thoracic apparatus (vs. 9–13), and further differs from *P. paviei* and *P. sulcatoides* in having a furcated neural spine of complex vertebra (vs. single). And *P. paucipunctatus* is distinguished from *P. immaculatus* in having yellow spots and patches on some parts of the body

except occipital and posttemporal (vs. absent). Differs from *P. tchangi* and *P. brachyurus* in lacking yellow spots and patches on occipital and posttemporal (vs. having). Differs from *P. longipectoralis* in having shorter pectoral fin, not extending to base of pelvic fin (vs. extending). And *P. paucipunctatus* further differs from *P. gracilis* and *P. stenura* in having a shorter caudal peduncle (23.9–29.3% SL vs. 26.0–35.8).

**Description.** – Morphometric data as in Table 2. Body elongate. Dorsal profile rising gradually from tip of snout to origin of dorsal fin, then sloping slowly ventrally to end of caudal peduncle. Head and abdominal region before origin of pelvic fin moderately broad. Body after dorsal fin compressed gradually. Caudal peduncle long and moderately compressed. Thoracic adhesive apparatus oval with 14–18 transverse ridges (laminae).

Head compressed and broadly rounded when viewed from above. Eye small and almost rounded, subcutaneous and located on dorsal surface of head. Distance to tip of snout longer than to dorsalmost extremity of gill openings. Mouth small, transverse and inferior. Lips with papillae. Premaxillary tooth band semicircular and two or four teeth along its outer edge (Fig. 2A), mandibular tooth band crescent (Fig. 2B). Outer teeth shovel-shaped (Fig. 3A–C). Inner teeth conical (Fig. 3D–F). Teeth on premaxillary and mandibular tooth bands sparse and embedded in skin. Only tips exposed and arranged in irregular rows. Barbels flattened and in four pairs with papilla except nasal barbel. Nasal barbel short, not extending to orbit. Maxillary barbel not

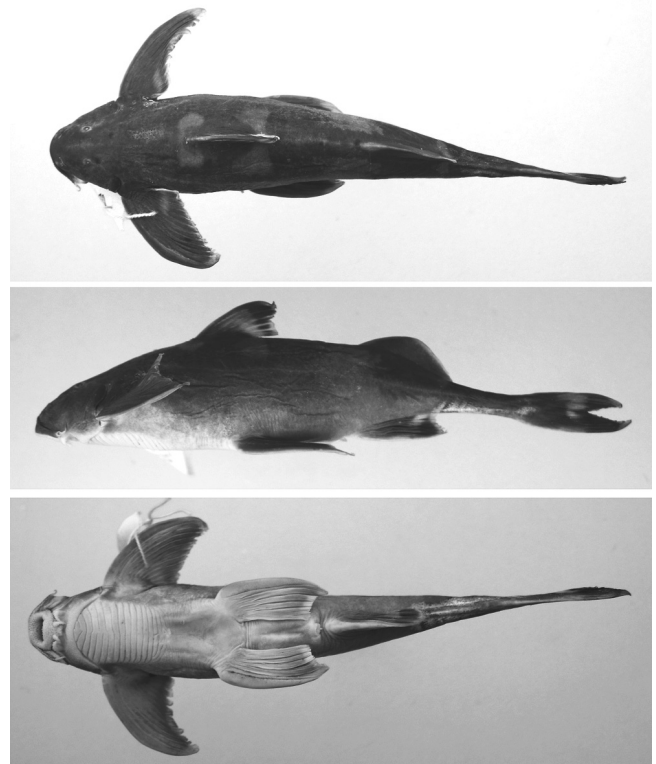


Fig. 10. *Pseudecheneis paucipunctatus*, SWFC 200203003, holotype, 109 mm SL; China: Nujiang (the upper Salween River) drainage. Dorsal, lateral and ventral views.

developed, only extending to level of anterior orbit margin and not reaching gill opening. Length of outer mandibular barbel longer than inner mandibular barbel, not reaching or just beyond the front of thoracic apparatus. Gill openings moderate, extending beyond base of first pectoral fin element.

First and second unbranched ray of dorsal fin not ossified. Dorsal fin post-dorsal margin concave slightly. Dorsal fin origin located at point through anterior third of body. Distance of dorsal fin base to origin of adipose fin longer than distance to front of orbit. Adipose fin origin at vertical through anal fin origin. Length of adipose fin base shorter than distance of its origin to end of dorsal fin base. Pectoral fin enlarged with concave posterior margin, extending beyond origin of pelvic fin and not to end of pelvic fin base. Origin of pelvic fin at vertical through preceding end of dorsal-fin base. Pelvic fin extending to anus. First unbranched ray of paired fin broadened with regular striae on ventral surface. Anal fin post-ventral margin emarginate. Distance of anal fin origin to caudal fin base longer than to base of pectoral fin. Anus and urogenital openings located at origin of anal fin. Shortest ray of caudal fin circa 75% of longest ray. Upper lobe shorter than lower lobe.

Body covered with dense, rounded tubercles distributed irregularly, not uniformly (Fig. 4A). Tubercles decreasing in density gradually from occipital to caudal peduncle.

Lateral line complete and midlateral. Vertebrae 17+18=35 (1).

**Colouration.** – Alive, chestnut brown on dorsal and lateral surfaces of head and body. Light yellow on ventral region. Pink thoracic apparatus and oral region. Occipital and posttemporal without yellow spots. Lateral sides of dorsal fin origin respectively having two yellow ovate spots. End

of dorsal fin base having a yellow saddle patch (Fig. 5C). Before origin of adipose fin having three yellow patches. Median patch located at origin of adipose fin. Two lateral patches respectively extending vertically to lateral line. An ovate patch on posterior adipose fin base. Another on caudal fin base.

Dorsal fin hyaline, with a thin chestnut brown band near distal margin of fin and a small yellow patch on tip. Adipose fin chestnut brown, with lighter colour around distal edge. Caudal fin base brown. Upper and lower edges with light-yellow lateral stripe near caudal fin base. Two light yellow patches on forked median distal margin of caudal fin. Yellow patch on tip of each lobe. Anal fin hyaline, base dark brown. Middle to distal margin light yellow with a dark strip. Dorsal surfaces of pectoral fins brown. Yellow elliptical patch near base. Yellow patch on distal margin. Pelvic fin base brown. Other part light yellow.

**Distribution.** – This species is found in the branches of the upper Nujing (Salween River) drainage (Fig. 11).

**Etymology.** – From the Latin *pauc*, meaning a few, and *punctatus*, meaning spotted, in reference to occipital and posttemporal without yellow spots. Used as an adjective.

***Pseudecheneis paviei* Vaillant, 1892**  
(Fig. 12)

*Pseudecheneis paviei* – Vaillant, 1892: 126 (Lai Chou, Vietnam), 1940: 464; Chu, Mo & Kuang, 1990: 199–200, Fig. 199

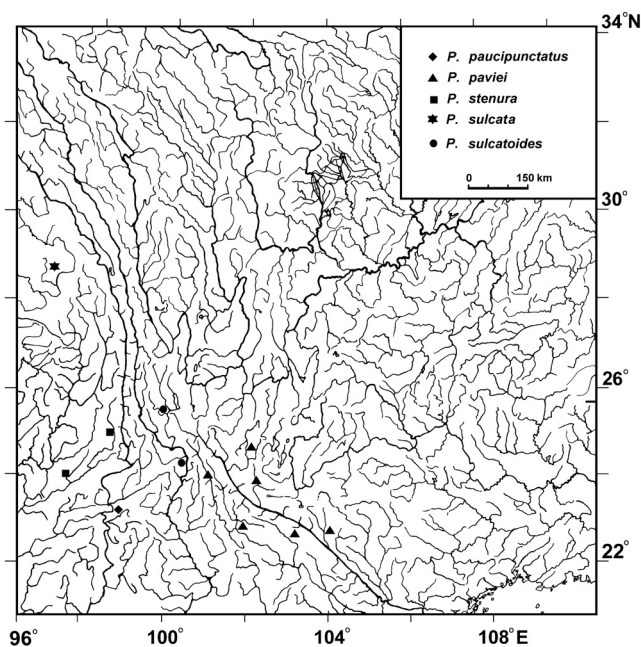


Fig. 11. Map showing distribution of *Pseudecheneis paucipunctatus*, *P. paviei*, *P. stenura*, *P. sulcata* and *P. sulcatoides*.

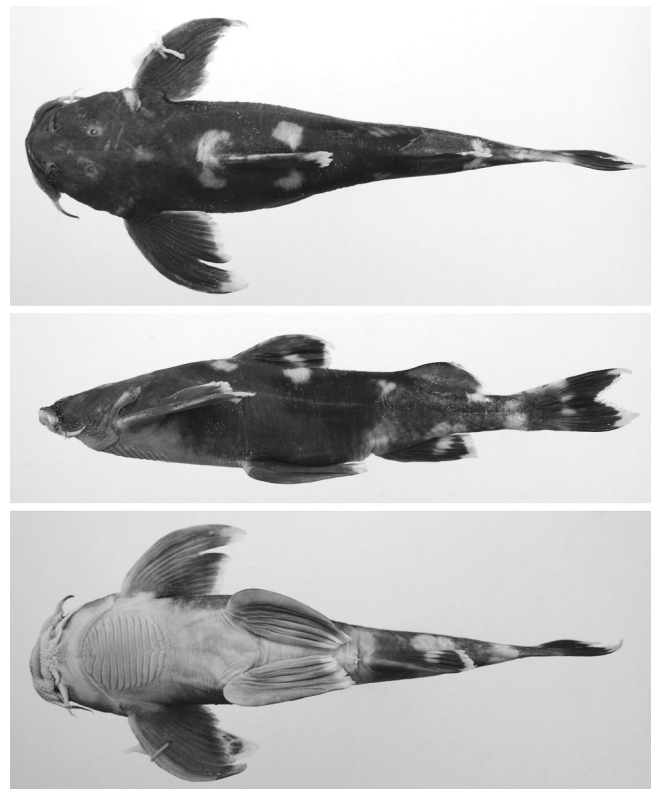


Fig. 12. *Pseudecheneis paviei*, SWFC 9812006, 102 mm SL; China: Yuanjiang (the upper Red River) drainage. Dorsal, lateral and ventral views.



Table 3. Counts and proportional measurements of *Pseudecheneis paviei*, *P. intermedius*, *P. sulcatoides* and *P. stenura* (Roman and Arabic numerals that are in italics and bold show difference of data among species).

Locality	<i>P. paviei</i>			<i>P. intermedius</i>			<i>P. stenura</i>			<i>P. sulcatoides</i>		
	Pingbian, Jinping, Xinping, Yimen	mean	S.D.	Jinghong	mean	S.D.	Tengchong: Longchanjian	mean	S.D.	Yangbi, Simao, Menghai	mean	S.D.
Number of specimens examined	52			21 (7 types, 14 topotypes)			14			76 (10 types)		
Dorsal fin rays	ii, 6			ii, 6			ii, 5			<i>i, 6</i>		
Pectoral fin rays	i, 11~13			i, 11~12			i, 13~14			i, 11~12		
Pelvic fin rays	i, 5			i, 5			i, 4~5			i, 5		
Anal fin rays	ii, 7			ii, 7			iii, 6			ii, 7~8		
Branched caudal rays	7+8			7+8			7+6			7+8		
Transverse folds of thoracic apparatus	9~13			9~12			15~19			14~18		
Gill rakers on outer side of 1st gill arch	7~11			8~11			7~9			10~11		
<b>in % of standard length</b>												
Body depth	18.7	2.97	19.5	11.8~23.4	2.65	16.7	15.1~19.1	1.23	19.4	14.3~22.7	2.03	
Predorsal length	38.9	2.60	40.0	36.0~47.0	3.01	33.7	30.4~35.1	1.32	36.8	33.5~39.6	1.38	
Head length	23.0	1.96	24.3	21.6~29.2	1.74	<b>22.0</b>	<b>20.1~23.7</b>	<b>1.22</b>	19.2	17.3~21.7	0.96	
Snout length	14.8	1.33	15.4	13.2~20.4	1.77	11.4	10.6~12.2	0.58	12.5	10.4~14.2	0.80	
Postorbital head length	8.0	0.62	8.8	7.4~10.6	0.95	10.3	8.5~11.4	0.89	6.7	5.3~12.7	1.18	
Caudal peduncle length	20.6	1.59	20.4	18.0~24.6	1.72	29.4	26.0~32.5	2.01	25.5	23.1~29.5	1.46	
Caudal peduncle depth	<b>7.1</b>	<b>0.63</b>	<b>7.7</b>	<b>6.4~9.3</b>	<b>0.80</b>	4	3.6~4.3	0.22	5.0	3.7~5.7	0.41	
Length of dorsal base to adipose	18.5	2.45	20.3	15.8~24.7	2.58	16.7	13.1~20.0	1.90	19.7	14.3~30.3	3.36	
Length of pre-adipose to snout	68.1	3.24	69.8	63.4~75.8	3.61	59.9	57.1~62.1	1.40	65.2	56.9~71.0	2.78	
Length of pectoral fin	29.2	2.74	31.1	25.9~35.9	2.45	27.6	25.0~29.6	1.38	30.4	27.6~34.1	1.42	
<b>in % of head length</b>												
Snout length	64.5	2.98	63.3	57.1~77.8	4.54	<b>51.7</b>	<b>48.0~56.9</b>	<b>2.23</b>	65.1	60.0~73.3	2.97	
Postorbital head length	34.9	2.51	36.1	32.0~44.7	3.31	<b>46.9</b>	<b>41.5~55.6</b>	<b>3.53</b>	34.6	27.6~63.4	5.59	
Eye diameter	9.82	1.50	10.4	8.0~16.5	2.42	8.2	6.0~10.2	1.15	8.78	5.3~13.9	1.65	
Interorbital width	27.9	4.93	32.8	22.5~44.6	6.57	24.1	21.6~27.8	1.81	27.8	18.4~42.3	6.23	
Body depth	81.5	13.2	80.1	54.4~92.3	9.13	76.3	67.1~88.5	6.64	101.3	73.9~122.2	11.71	
<b>in % P-V length</b>												
Length of pectoral fin	129.6	15.0	133.0	108.0~154.2	13.06	118.3	107.7~129.0	7.54	127.2	112.8~145.3	8.70	
<b>in % of length of caudal peduncle</b>												
Depth of caudal peduncle	<b>34.7</b>	<b>3.55</b>	<b>37.9</b>	<b>32.2~46.7</b>	<b>4.37</b>	<b>13.5</b>	<b>11.5~15.1</b>	<b>1.08</b>	19.5	15.0~24.5	1.78	

(Pinbian, Luchun); Kottelat, 1998: 108, fig. 168 (Laos); Kottelat, 2001: 55; Thomson & Page, 2006: 60 (Red River drainage).

*Parapseudecheneis paviei* – Hora & Chabanaud, 1930: 215; Mai, 1978: 268–269 (Vietnam).

*Pseudecheneis intermedius* – Chu, 1982: 430–431, Fig. 2 (Jingdong); Chu & Mo 1999: 156–157, Fig. 100 (Jingdong).

**Material examined.** – Yuanjiang (main of Red River) drainage: SWFC 97121278–1285, 9801013, 9812001–010, 9903001, 20 ex. (3DS), 69–132 mm SL, Nanxihe, Pinbian County, Yunnan Province; SWFC 9902101, 0005151–154, 0010001–020, 25 ex. (2DS), 42–94 mm, Tengtiaojiang, Jinping County, Yunnan Province; SWFC 0005080–084, 5 ex. (2DS), 59–69 mm SL, Sanjiangkou, Xiping County, Yunnan Province; KIZ 914106–107, 2 ex., 60.5–73 mm SL, Xiaoluzhi, Yimen County, Yunnan Province. Lixianjiang (a tributary of Red River) drainage: KIZ 737173, 1 ex., holotype of *Pseudecheneis intermedius*, 56.5 mm SL, KIZ 737172, 737179, 737183–184, 737188–189, 6 ex., paratypes, 49–56.5 mm SL, Chuanhe, Jingdong County, Yunnan Province; SWFC 9810001–014, 14 ex. (2DS), 36–83.5 mm SL, Chuanhe, Jingdong County, Yunnan Province. SWFC 0412014–030, 15 ex., 37.4–91 mm SL, Niuluohe, Jiangcheng County, Yunnan Province. SWFC 0412031–044, 14 ex., 44.9–95.5 mm SL, Baozang, Jiangcheng County, Yunnan Province.

Morphometric data as in Table 3.

**Diagnosis.** – *Pseudecheneis paviei* is distinguished from other congeners by the combination of following characters. Thoracic adhesive apparatus with 9–14 transverse ridges (laminae) (vs. 14–20). Snout wide and flat, the ratio of snout width at mouth corner to distance between pectoral fin base larger than 0.75 (vs. smaller than 0.75). Caudal peduncle deeper (depth of caudal peduncle 6.1–9.3% SL and 29.4–46.7% in length of caudal peduncle vs. 3.3–5.7, 11.5–24.5). Caudal fin with four yellow spots, isolated each other, not connected (vs. connected each other and forming an entire patch, or only one spot at lower lobe isolated) (Fig. 13). Premaxillary tooth band semicircular and six or eight teeth along its outer edge (vs. two or four) (Fig. 2C). Body covered with dense, rounded tubercles distributed irregularly, not uniformly (Fig. 4A). Tubercles increasing in density gradually from occipital to caudal peduncle. Vertebrae 17+16=33 (1), 17+17=34 (4).

**Distribution.** – This species is found only in the Honghe (Red

River) drainage (Fig. 11).

**Remarks.** – Chu (1982) asked Dr. Greenwood working in the Natural History Museum (London) to examine types of *Pseudecheneis paviei* deposited in Muséum National d'Histoire Naturelle (Paris). Dr. Greenwood could not find types of *P. paviei*. In this study, examined specimens are included some specimens collected from Tengtiaojing of Jinping County in Yunnan, China where is near to the type locality of *P. paviei* in Laichou of Vietnam. Meanwhile, all types of *P. intermedius* deposited in KIZ had been examined.

### *Pseudecheneis stenura* Ng, 2006

(Fig. 14)

*Pseudecheneis sulcatus* – Chu, 1982: 431 (in part specimens from Irrawaddy); Chu, Mo & Kuang, 1990: 196–197, Fig. 196 (in part specimens from Irrawaddy); Chu & Mo 1999: 153–154, Fig. 98 (in part specimens from Irrawaddy).

*Pseudecheneis stenura* Ng, 2006a: 57–61, Fig. 5 (Longchuanjiang); Thomson & Page, 2006: 60 (Irrawaddy drainage, China).

**Material examined.** – KIZ 9811088, 9811023, 2 ex., topotypes collected with the holotype, 85.3–93.9 mm SL, Longchuanjiang at Lianmengjie bridge, Tengchong County, Yunnan Province; SWFC 0502001–012, 12 ex., 73.8–90.5 mm SL, Sanchahe, Lianghe County, Yunnan Province.

Morphometric data as in Table 3.

**Diagnosis.** – *Pseudecheneis stenura* is distinguished from *P. sulcata* in having longer pelvic fin, reaching base of the first anal fin ray (vs. not reaching), and from *P. crassicauda* in having longer pectoral fin, reaching origin of pelvic fin (vs. not reaching). Further distinguished from *P. serracula* in having a shorter adipose fin base (length of adipose fin base 125–166.7% in length of anal fin base vs. larger than 200%), and from *P. sympelvica* in having separate pelvic fins (vs. fused). Further distinguished from other congeners except *P. gracilis* in having a deeper forked caudal fin, shortest ray of caudal fin circa 50% of longest ray (vs. 75%). Differs from *P. gracilis* in having two ovoid yellow patches on dorsal fin origin (vs. a saddle patch) (Fig. 5B, C); length

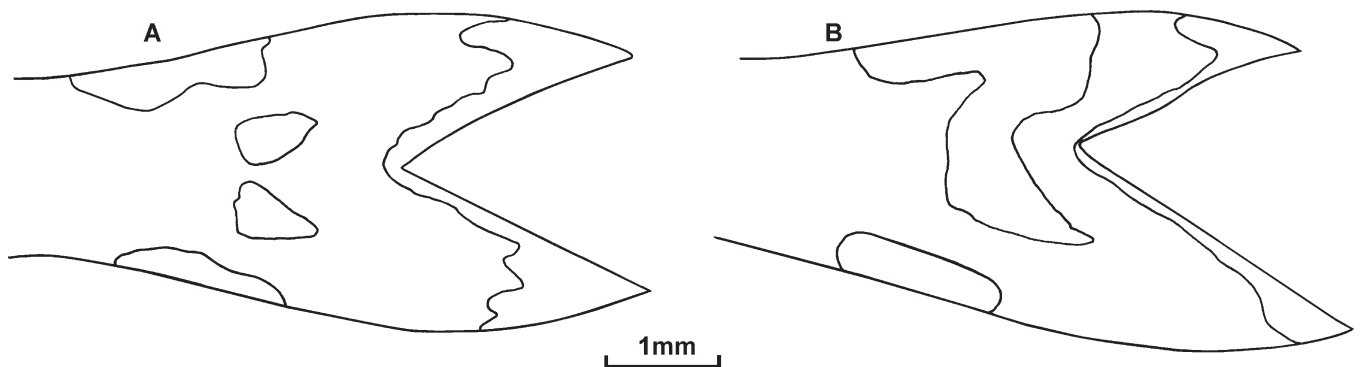


Fig. 13. Spots or patch at caudal fin: A, four spots isolated each other (*Pseudecheneis paviei*, SWFC 9812006, 102 mm SL); B, one spot at lower lobe isolated from the big patch (*P. brachyurus*, SWFC 200103394, paratype, 112 mm SL).

of head longer, head length 20.1–23.7% SL (vs. 14.9–18.6), postorbital head length 8.5–11.4% in head length (vs. 4.5–5.9), body depth 67.1–88.5% in head length (vs. 73.9–112.2%). It differs from *P. paviei* in having 15–19 transverse ridges (laminae) of thoracic apparatus (vs. 9–13). Premaxillary tooth band semicircular and two or four teeth along its outer edge (Fig. 2A). Body covered with dense, rounded tubercles distributed irregularly, not uniformly (Fig. 4A). Tubercles decreasing in density gradually from occipital to caudal peduncle which almost no tubercles. Vertebrae 19+20=39.

**Distribution.** – This species is found in the Longchuanjiang, part of the Irrawaddy River drainage (Fig. 11).

***Pseudecheneis sulcata* (McClelland, 1842)**

*Glyptosternon sulcatus* – McClelland, 1842: 587, Pl. 6 Figs. 1–3 (type locality: Kasyah [Khasi] Hills, Meghalaya, India)

*Pseudecheneis sulcatus* – Blyth, 1860: 154; Wu et al, 1981: 75–76 (Motuo and Chayu of Tibet); Wu & Wu, 1992: 534–536, fig. 147 (Motuo of Tibet); Zhang et al, 1995: 131–132 (Chayu of Tibet).

*Pseudecheneis sulcata* – Ng, 2006a: 47–51, Fig. 1; Thomson & Page, 2006: 61 (Brahmaputra 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. Vertebrae 18+19=37. Diagnosis and data from Ng (2006a).

**Distribution.** – This species is found in the Brahmaputra drainage (Fig. 11).

***Pseudecheneis sulcatoides* Zhou & Chu, 1992**  
(Fig. 15)

*Pseudecheneis sulcatus* – Chu & Chen, 1987: 375 (Xishuanbanna, Yunnan).

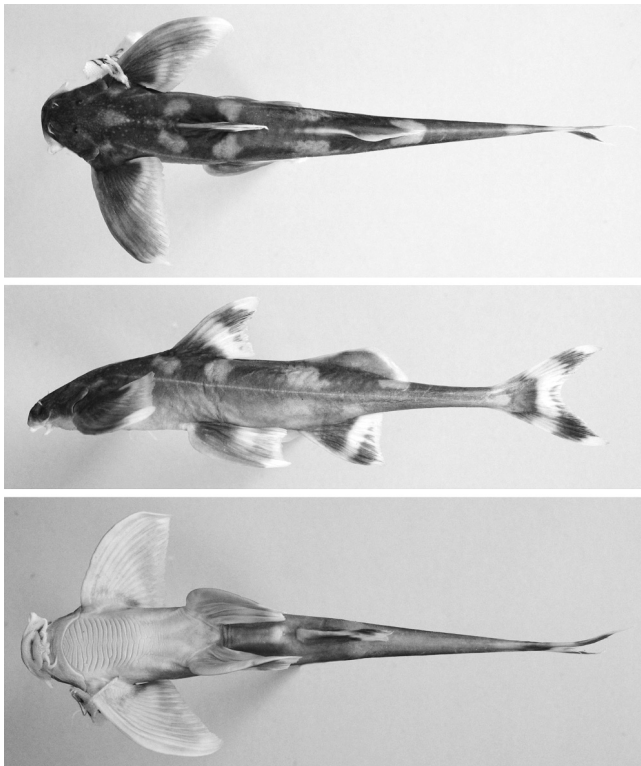


Fig. 14. *Pseudecheneis stenura*, KIZ 9811088, 93.9 mm SL; China: Longchuanjiang (a branch of Irrawaddy River) drainage. Dorsal, lateral and ventral views.

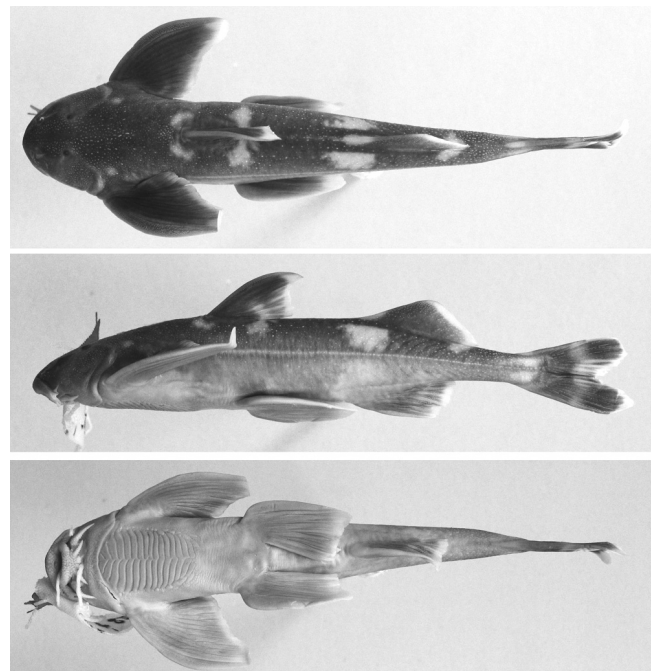


Fig. 15. *Pseudecheneis sulcatoides*, KIZ 839059, holotype, 105 mm SL; China: Lancangjiang (the upper Mekong River) drainage. Dorsal, lateral and ventral views.



*Pseudecheneis sulcatoides* Zhou & Chu, 1992: 111–112, Fig. 1 (Lancangjiang system); Thomson & Page, 2006: 61 (Mekong drainage, China).

**Material examined.** – Lancangjiang (Mekong River) drainage: KIZ 839059, 1 ex., holotype, 105 mm SL, KIZ 839060, 839063, 748792, 749945, 4 ex., paratypes, 88–100mm SL, Yangbi, Yangbi County, Yunnan Province; KIZ 76, 1 ex., paratype, 83mm SL, Xiaoganlanba, Simao County, Yunnan Province; KIZ 764006, 1 ex., paratype, 73mm SL, Xiaohejiang, Simao County, Yunnan Province; KIZ 737016, 863867–868, 863871, 4 ex., paratypes, 74–95mm SL, Menghai, Menghai County, Yunnan Province; SWFC 9910001, 0005015–052, 38 ex. (2 DS), 49–100mm SL, Yangbi, Yangbi County, Yunnan Province.

Morphometric data as in Table 3.

**Diagnosis.** – *Pseudecheneis sulcatoides* is distinguished from *P. sulcata* in having longer pelvic fin, reaching base of the first anal fin ray (vs. not reaching), and from *P. crassicauda* in having longer pectoral fin, reaching origin of pelvic fin (vs. not reaching). *Pseudecheneis sulcatoides* is distinguished from *P. serracula* in having a shorter adipose fin base (length of adipose fin base 125–166.7% in length of anal fin base vs. larger than 200%), and further from *P. sympelvica* in having separate pelvic fins (vs. fused). It differs from *P. paviei* in having 14–21 transverse ridges (laminae) of thoracic apparatus (vs. 9–13). Premaxillary tooth band semicircular and outer teeth two or four (Fig. 2A). Body covered with dense, tubercles distributed uniformly, some longitudinal tubercles among rounded tubercles (Fig. 4B). Vertebrae 17+17=34.

**Distribution.** – This species is found in the main river and branches of low and middle Lancangjiang (Fig. 11).

***Pseudecheneis tchangi* (Hora, 1937)**

(Fig. 16)

*Propseudecheneis tchangi* – Hora, 1937: 348–350, Fig. 11 (Yunnan).

*Pseudecheneis sulcatus* – Chu, 1982: 431 (in part); Chu, Mo & Kuang, 1990: 196–197 (in part); Chu & Mo 1999: 153 (in part).

*Pseudecheneis tchangi* – Thomson & Page, 2006: 61 (Red River drainage, Yunnan of China).

**Material examined.** – IZCAS 20010 (original No 12016 in Zoological Museum of Fan Memorial Institute of Biology), 1 ex., holotype, 120mm SL, Yunnan, China (photograph examined).

**Diagnosis.** – *Pseudecheneis tchangi* is distinguished from all other congeners except *P. immaculatus* in lacking yellow spots or patches on adipose fin base and caudal peduncle (vs. having). And it is distinguished from other congeners except *P. immaculatus* and *P. longipectoralis* in having longer pectoral fin, extending to pelvic fin base (vs. not extending). It differs from *P. immaculatus* and *P. longipectoralis* in having a yellow, triangular patch at occipital (vs. lacking).

**Distribution.** – This species was described from Yunnan, but its exact locality is not known.

**Remarks.** – Hora (1937) described *Propseudecheneis tchangi* based on drawings and simple description of *Pseudecheneis sulcatus* from Yunnan by Tchang (1936), and suggested that this species occurred in Red River system and could not provide evidence to support his idea.

**Key to *Pseudecheneis* from China**

1. Presence of 14–21 transverse ridges (lamellae) on thoracic apparatus; snout rounded and pointed, the ratio of snout width at mouth corner to distance between pectoral fin base smaller than 0.75; caudal peduncle depth 11.5–24.5% in caudal peduncle length, 3.3–5.7% SL; yellow spots of caudal fin connected each other, forming an entire patch, or only one spot at lower lobe isolated from the big patch; body covered with tubercles, and tubercle density at caudal peduncle more exiguous than that of occipital; outer teeth of premaxillary tooth band two or four ..... 2
- Presence of 9–13 transverse ridges (lamellae) on thoracic apparatus; snout wide and flat, the ratio of snout width at mouth corner to distance between pectoral fin base larger than 0.75; caudal peduncle depth 29.4–46.7% in caudal peduncle length, 6.1–9.3% SL; caudal fin with four yellow spots, isolated each other, not connected; body covered with tubercles, and tubercle density at caudal peduncle denser than that of occipital; outer teeth of premaxillary tooth band six or eight (Red River drainage) ..... *P. paviei*
2. Pectoral fin longer, extending beyond pelvic fin origin .... 3
- Pectoral fin shorter, just extending to pelvic fin origin .... 6
3. Body colour uniform, without yellow spots or patches; maxillary barbel long, reaching level of gill opening (middle and upper Lancangjiang) ..... *P. immaculatus*
- Body with yellow spots and patches; maxillary barbel short, not reaching level of anterior orbital margin ..... 4
4. Body without pale colored spots or patches after dorsal fin origin (Yunnan) ..... *P. tchangi*
- Body with pale colored patches at origin and end of dorsal fin, origin and end of adipose fin, base of caudal fin ..... 5



Fig. 16. *Pseudecheneis tchangi*, IZCAS 20010, holotype, 120 mm SL; China: Yunnan. Dorsal and ventral views.

- 5 Pelvic fin not reaching anus (Brahmaputra drainage) ..... *P. sulcata*  
 – Pelvic fin reaching anus (branches of Nujiang River drainage) ..... *P. longipectoralis*
- 6 Length of caudal peduncle bigger than 30% SL; shortest ray of caudal fin about 50% of longest ray; caudal peduncle without tubercles ..... 6  
 – Length of caudal peduncle smaller than 30% SL; shortest ray of caudal fin about 75% of longest ray; caudal peduncle with obvious tubercles ..... 7
- 7 Yellow spots at dorsal fin origin isolated as two ovoid spots; head length 20.1–23.7% SL, postorbital head length 8.5–11.4% in head length, and body depth 67.1–88.5% in head length (middle and lower reaches of Longchuanjiang, Irrawaddy River drainage) ..... *P. stenura*  
 – Yellow spots at dorsal fin origin connected as a saddle patch; head length 14.9–18.6% SL, postorbital head length 4.5–5.9% in head length, and body depth 73.9–112.2% in head length (upper of Longchuanjiang, Irrawaddy River drainage) ..... *P. gracilis*
- 8 Posttemporal with a small yellow ovate spot; yellow spots at dorsal fin origin connected as a saddle patch ..... 8  
 – Post-temporal without a small yellow ovate spot; yellow spots at dorsal fin origin isolated as two ovoid spots (Nujiang River drainage) ..... *P. paucipunctatus*
- 9 Occipital with a small, obvious, yellow triangular patch; body only covered rounded tubercles, which gradually decreasing in density from occipital to caudal peduncle (Irrawaddy River) ..... *P. brachyurus*  
 – Occipital without spot or patch; body covered some longitudinal tubercles among rounded tubercles, which distributed uniformly (lower and middle of Lancangjiang) .. *P. sulcatoides*

## DISCUSSION

### The status of *Pseudecheneis paviei* Vaillant and *Pseudecheneis intermedius* Chu

Types of *Pseudecheneis paviei* deposited in Muséum National d'Histoire Naturelle could not be found (Chu, 1982). In this study, we examined specimens from Tengtiaojing of Jinping County in Yunnan, China (which is near to the type locality of *Pseudecheneis paviei* in Laichou of Vietnam), all type material of *Pseudecheneis intermedius* deposited in KIZ, and fourteen topotypic material of *P. intermedius* deposited in SWFC. According to comparison results, the characteristics of external, muscle and skeleton morphology between *P. paviei* and *P. intermedius* are nearly identical (Zhou & Zhou, 2005). Chu (1982) indicated that the types' standard length of *Pseudecheneis intermedius* is smaller (the largest one is only 56.5mm SL) than that of *P. paviei*, which was as a diagnosis to distinguish *P. intermedius* from *P. paviei*. However, the standard length of the largest topotypic specimen of *P. intermedius* deposited in SWFC is 83.5mm SL and is larger than that of the largest types of *P. intermedius* deposited in KIZ. Meanwhile, the results of DNA sequences analysis showed that there was no difference in partial cytochrome b sequences between *P. paviei* (six specimens from Sanjiangkou of Xinping County, Nanxihe of Pinbian County and Tengtiaojiang of Jinping County) and *P. intermedius* (one specimen from Chuanhe of Jindong

County), and constituted a haplotype (Zhou et al., 2007). The characteristics of external, muscle and skeleton morphology, and the evidence of molecular biology support that *P. intermedius* is the junior synonym of *P. paviei*.

### The status of *Pseudecheneis tchangi* and its collection locality

According to the original account of Tchang (1936), a specimen of rheophilic catfish from Yunnan was recognized as *Pseudecheneis sulcatus*. Tchang described the color of the specimens in alcohol as having a blackish body with several large irregular yellowish blotches; and having yellowish brown fins with black bars. However, his drawing did not depict the large irregular blotches on the body (Tchang, 1936: Fig. 4) and the location of collection was just recorded as Yunnan.

Hora (1937) described a new species and new genus, *Propseudecheneis tchangi*, based on drawings and simple description of *Pseudecheneis sulcatus* from Yunnan by Tchang (1936), and arbitrarily suggested that this species occurred in Red River system and could not provide evidence to support his idea. Chu (1982) examined the types of *Propseudecheneis tchangi* deposited in IZCAS and indicated that its body was flattened (body depth 10.0–13.9% SL). Based on the results of the review of rheophilic catfishes from China, Chu (1982) considered *Propseudecheneis* as the subjective synonym of *Pseudecheneis* and *Propseudecheneis tchangi* was the junior synonym of *Pseudecheneis sulcatus*. Meanwhile, he examined the collection data recorded in field and the type locality of *Propseudecheneis tchangi* was only listed as Yunnan. However, he inferred that the type locality of *Propseudecheneis tchangi* was in the vicinity of Tengchong (which lies within the Irrawaddy River drainage) according to the other specimens with catalogue numbers which was adjacent to *Propseudecheneis tchangi* and whose collection locality and distribution was in west of Yunnan (Irrawaddy River system) (Zhou & Chu, 1992).

In the process of the description of *Pseudecheneis sulcatoides*, Zhou & Chu (1992) examined the radiographs of *Propseudecheneis tchangi*, which showed that the skull had obvious lateral processes of frontal, the parapophysis of complex vertebra and the body axis formed a right angle, neural spine of complex vertebra bifid. The osteological characteristics of *Propseudecheneis tchangi* is consistent with *Pseudecheneis sulcata*. Thus there is further evidence that *Propseudecheneis tchangi* is a synonym of *Pseudecheneis sulcatus*.

Ng (2006) considered *Pseudecheneis sulcata* to be restricted to the Brahmaputra River drainage. His results imply that specimens from Nujiang and Irrawaddy of Yunnan may not be *Pseudecheneis sulcata*. We re-examined the photographs of the holotype of *Propseudecheneis tchangi* (which is deposited in IZCAS) and found that holotype of *P. tchangi* possessed yellow spots on occipital, and post-temporal region without yellow spots. Its colour pattern is nearly identical to

Tchang's drawing (1936: Fig. 4) but is not consistent with the description listed by Tchang (1936: 49). The morphology of *Propseudecheneis tchangi* differs from other recorded congeners in *Pseudecheneis* from China. There are six river systems in Yunnan of China. *Pseudecheneis* occurs in Yuanjiang (Red River), Lancangjiang (the upper Mekong River), Nujiang (the upper of Salween River), Longchuanjiang and Dayinjiang (branches of Irrawaddy River); except in Jinshajiang (the upper of Yangtze River) and Nanpanjiang (the upper of Pearl River). The first author examined many specimens of *Pseudecheneis* deposited in the Museum of Zoology, Yunnan University and had a special interest in *Propseudecheneis tchangi* since 1985. Until now the specimens similar to *Propseudecheneis tchangi* could not be found from Yunnan yet. According to its morphological characteristics, we concur that *Pseudecheneis tchangi* is a valid species, however its exact collection area remains unknown.

#### The study of speciation and taxonomy on *Pseudecheneis*

The results of DNA sequences analysis showed that there was difference in partial cytochrome b sequences between specimens recognized as *Pseudecheneis sulcata* from Nujiang (Kejie of Changning County, Nangunhe of Cangyuan County) and Irrawaddy (Qushi of Tengchong County, Shudian of Yingjiang County). The specimens between the two river basins did not form a monophyletic group and the specimens from different localities in the same river system could not constitute a haplotype (Zhou et al., 2007). The comparison results of muscle and osteological characteristics showed that there were some differences between specimens recognized as *Pseudecheneis sulcata* from Nujiang and Irrawaddy (Zhou & Zhou, 2005). So the descriptions of new species *Pseudecheneis brachyurus*, *P. longipectoralis*, *P. gracilis* and *P. paucipunctatus* in this study are based on the results of morphology and molecular biology comparison.

Catfishes of *Pseudecheneis* are rheophilic and bottom dwelling. The swimming capacity of *Pseudecheneis* is poor and their mobility is limited. The populations of *Pseudecheneis* among river systems and/or in the same river system are easily isolated due to lack of individual migration and gene exchange, which is the main reason resulting in the speciation. Recently, more species of *Pseudecheneis* had been described, indicating the possible presence of more new species of *Pseudecheneis* and highlighting its diversity (Ng & Edds, 2005; Ng, 2006a, 2006b; Ng & Tan, 2007; Vishwanath & Darshan, 2007).

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