

Description of a new dwarf snakehead (Perciformes: Channidae) from western Yunnan

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Abstract

Channa shingon, new species, is described from small mountainous rivulets associated with the Irrawaddy drainage in western Yunnan Province, China. Its maximum SL of about 100 mm makes it the smallest pelvic-fin bearing dwarf snakehead. Further specific characters are lateral head length 27–30 % SL; interorbital width 33–35 % HL; 25–27 anal-fin rays; 44–45 lateral-line scales; 4–5 scale rows between dorsal-fin origin and lateral line; 8–9 scale rows between lateral line and anal-fin origin; 1 mandibular scale; 43–44 vertebrae; inferomesial process of parasphenoid very shallow and straight; dorsal profile conspicuously bulging in front of dorsal fin; juveniles without ocellus-like mark on posterior part of dorsal fin; and a pectoral-fin pattern of 3–4 broad gray to black bands alternating with cream to white interspaces, bands increasingly wide towards distal edge of the fin, interspaces equally wide as bands or narrower.

Key words

Channa; new species; Irrawaddy; Salween; taxonomy.

Introduction

Dwarf snakeheads are a common element of Southeast Asia's freshwater ichthyofauna. They are esteemed food fish for their tasty and firm, muscular flesh, and provide important subsistence fisheries in rural areas. Due to their ability to breathe atmospheric air, dwarf snakeheads are easily transported over short distances and sold alive in village markets. A thin layer of water is sufficient to keep them alive for days. Owing to their accessory respiratory organ, a non-labyrinthic subbranchial chamber, dwarf snakeheads manage to survive in hypoxic water. They are often the only fish species in sewage drainages, where they chiefly feed on aquatic and terrestrial insects, gastropods, all metamorphic stages of anuran frogs, and their own offspring.

Dwarf snakeheads are species allocated within the *Channa gachua* complex sharing alternating dark and light transverse bands on the pectoral fin as defined by

BRITZ (2008). The complex comprises taxa with and without pelvic fins. Dwarf snakeheads are benthic fish inhabiting sluggish water bodies or quiet backwaters of streams with little water movement. A dense network of aquatic vegetation, twigs, and leaf litter provide hideaways to lurk for prey. They usually avoid waters more than about 50 cm deep. Even large specimens up to 20 cm in total length are often encountered in waters shallower than knee-depth.

The sole Chinese species of dwarf snakehead is the pelvic-fin bearing '*Channa gachua*' which is present in all major drainages in Yunnan, Guangxi, Guangdong and Hainan Provinces (ZHANG & ZHAO, 2016). During an excursion to tributaries of the Irrawaddy and Salween in western Yunnan Province, a second species of pelvic-fin bearing snakehead was collected. In the field, it was readily distinguishable from the ubiquitous '*C. gachua*'



Fig. 1. *Channa shingon*; Erganya, Yingjiang; Jieyanghe River: a, KIZ 2014005982, 89.7 mm SL, holotype; b, KIZ 2014005980, 90.2 mm SL, paratype, reversed; c, KIZ 2014005971, 89.4 mm SL; Cangyuan; Nangunhe River.

by its miniature size, ‘humpbacked’ appearance, and the well contrasting black and white bands on the pectoral fin. This species is herein described as new, based on 7 specimens obtained from the ankle-deep waters of small mountainous rivulets running in an Irrawaddy affluent in Dehong, Yunnan, China.

Material and methods

Morphometrics and meristics follow HUBBS & LAGLER (1947), except for: cheek scales are counted from the posterior rim of the orbit to the hindmost preopercular scale, usually contiguous to the first pored lateral-line scale; mandibular scales are the paired cycloid scales on the lower side of the mandible; scales tangential to the first ray of the fin are counted as a full scale in transverse counts; circumpeduncular scales are counted transversely along the series with the lowest number of scales around the peduncle; the lateral head length is measured from the tip of the snout to the rearmost edge of operculum and includes the opercular membrane; eye diameter is measured horizontally; interorbital width is the narrowest bony distance between the orbits, measured with gently applied pressure. Pharyngeal teeth were cleared using Proteinase K. Osteologic features and rays of paired fins were observed on radiographs, those of the paired fins under a binocular microscope.

Abbreviations

EPC, Endruweit personal collection, Qingdao, China; HL, lateral head length; KIZ, Kunming Institute of Zoology, Kunming, China; SL, standard length; TL, total length.

Spellings of Chinese toponyms follow the Mandarin spelling reform of 1958. Median values are given in square brackets; holotype values are included in the batch values. Diagnostic data on *Channa aurantimaculata* and *C. barca* were obtained from VISHWANATH & GEETAKUMARI (2009); on *C. melanostigma* from GEETAKUMARI & VISHWANATH (2011); on *C. orientalis* from COURTENAY & WILLIAMS (2004); on *C. ornatipinnis* and *C. pulchra* from BRITZ (2008); and on *C. pardalis* from KNIGHT (2016). Meristic and morphometric values of *C. harcourtbutleri* used for comparison stem from middle reaches of the Salween as listed under comparative material.

Channa shingon new species

(Figs. 1, 2)

Holotype. KIZ 2014005982, 89.7 mm SL; Erganya village, Tongbiguan town, Yingjiang Cty., Dehong Pref., Yunnan Prov., China; Erganyahe River, Jieyanghe River, Irrawaddy drainage; 24°36.310'N, 97°36.318'E, elevation 1320 m; coll. M. Endruweit, T. Qin & Z.Y. Sha, 19 Aug. 2014.

Paratypes. KIZ 2014005980, 5981, 5983, 3 specimens, 69.5–95.8 mm SL; data as holotype; KIZ 2014005977–5979, 3, 68.6–



Fig. 2. *Channa shingon*, KIZ 2014005983, 69.5 mm SL, paratype; lower side of head and thorax.

99.3 mm SL; location as holotype; coll. M. Endruweit & Z.Y. Sha, 28 Jan. 2014.

Non-typical material. KIZ 2014005984–5987, 4 specimens, 52.6–89.3 mm SL; Shengli village, Xima town, Yingjiang Cty., Dehong Pref., Yunnan Prov., China; Huanglianhe River, Jieyanghe River, Irrawaddy drainage; coll. M. Endruweit, 29 Jan. 2014. KIZ 2014005988–5989, 2, 55.0–77.3 mm SL; 1 km downstream of Houshigou village, Xima town, Yingjiang Cty., Dehong Pref., Yunnan Prov., China; Mengnaihe River, Jieyanghe River, Irrawaddy drainage; coll. M. Endruweit, 30 Jan. 2014. KIZ 2014005971–5976, 6, 57.8–89.4 mm SL; Bangao village, Banlao town, Cangyuan Cty., Lincang Pref., Yunnan Prov., China; trib. to Nangunhe River, Salween drainage; coll. M. Endruweit & T. Qin, 24 Aug. 2014. KIZ 2014005991–6013, 23, 36.9–82.3 mm SL; about 8 km southwest of Mangyun town, Yingjiang Cty., Dehong Pref., Yunnan Prov., China; trib. to Dayingjiang River, Irrawaddy drainage; coll. M. Endruweit, 1 Feb. 2014.

Diagnosis. *Channa shingon* is distinguished from other members of the *C. gachua*-complex (BRITZ, 2008) by having a lateral head length 27–30 % SL; interorbital width 33–35 % HL; 25–27 [26] anal-fin rays; 44–45 [45] lateral-line scales; 4–5 [4] transverse scales to dorsal-fin origin and 8–9 [8] to anal-fin origin; 1 mandibular scale, 43–44 [44] vertebrae; inferomesial process of

parasphenoid very shallow and straight; dorsal profile conspicuously bulging in front of dorsal fin; pelvic fin present; juveniles without ocellus-like mark on posterior part of dorsal fin; a pectoral-fin pattern of 3–4 broad gray to black bands alternating with cream to white interspaces, width of bands increasing towards distal edge of the fin, interspaces equally wide as bands or narrower; and a maximum standard length of about 100 mm.

Description. Body elongate, anteriorly cylindrical, posteriorly compressed, body depth at anal-fin origin 14–16 % SL; proportions given in Table 1, general appearance as in Figure 1. Head short, lateral length 27–29 % SL, strongly depressed, depth at nape 13–14 % SL, wider than deep, widest at about preoperculum. Dorsal profile of head straight to slightly convex, conspicuously bulging in predorsal area, with dorsal-fin origin representing deepest point of body. Eye small, located dorsolaterally well within a horizontal through hindmost edge of maxilla. Interorbital slightly convex.

Mouth terminal, oblique, 35–45° to body axis. Lips fleshy. Lower jaw protruding. Premaxilla with a broad pad of minute conical teeth, teeth larger and somewhat recurved in anteromesial portion (Fig. 3b). Prevomer protruding, with a row of 3–5 large conical teeth. Palatine with 1–3 rows of small, conical teeth. Dentary with a broad pad of many small conical teeth; anteromesial portion of pad notably broader and with larger and recurved teeth (Fig. 3a). Upper pharyngeal pad with large, conical, conspicuously hooked retrorse teeth. Lower pharyngeal teeth arranged in two pads: anteromesial pad with large, conical teeth, directed nearly vertical to body axis; posterolateral pad with short, conical teeth. Tongue narrow, tip free and widely rounded. Isthmus slightly narrower than gape.

Suprabranchial chamber simple; dermal surface without bulging or cavernous structures (Fig. 3a). Inferomesial process of parasphenoid rudimentary, very shallow, horizontally straight (Fig. 5a). Hyomandibular process simple, straight, triangular-shaped; running approximately parallel to parasphenoid process. Epibranchial process slightly curved following shape of branchial arch, thin, flap-like with a rounded edge. First branchial arch with 2–6 tooth plates; epibranchial with many minute conical projections, without plates.

Dorsal-fin rays 35–37 [36]. Anal-fin rays 25–27 [26]. Caudal-fin rays iv–v, 5+5, iv–iii. Pectoral-fin rays 14–16 [15], fin tip reaching anus. Pelvic fin with 6 rays, origin slightly anterior to dorsal-fin origin, length 2.3–2.6 times in pectoral-fin length. Vertebrae 43–44 [44].

Cephalic lateralis system with single pores, without satellite openings. Lateral line with 44–45 [45] scales, dropping one scale row after scale 10–13. Transverse scales to dorsal-fin origin 4–5 [4], to anal-fin origin 8–9 [8]. Predorsal scales 13–15 [14]. Circumpeduncular scales 24–26 [24]. Cheek scales 7. Mandibular scales 1. Gular scales absent. Largest known size 99.3 mm SL, 122 mm TL (KIZ 2014005979).

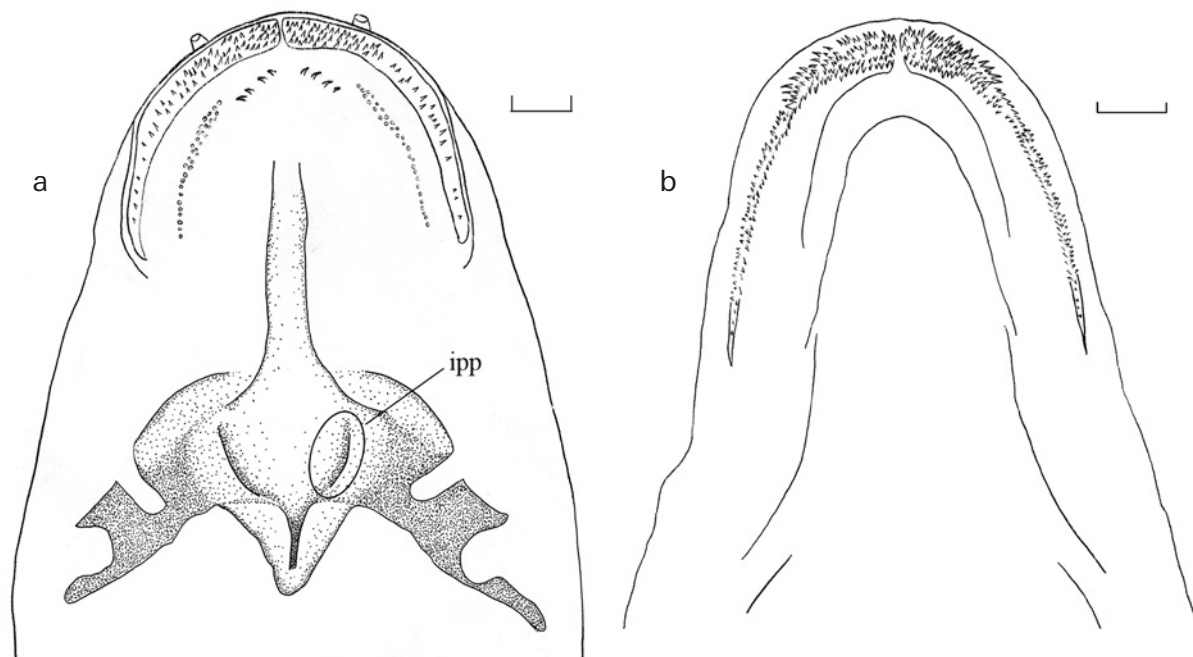


Fig. 3. *Channa shingon*, KIZ 2014005979, 99.3 mm SL, paratype; ipp, inferomesial process of parasphenoid: **a**, upper jaw and supra-branchial chamber; **b**, lower jaw. Scale bar = 2 mm

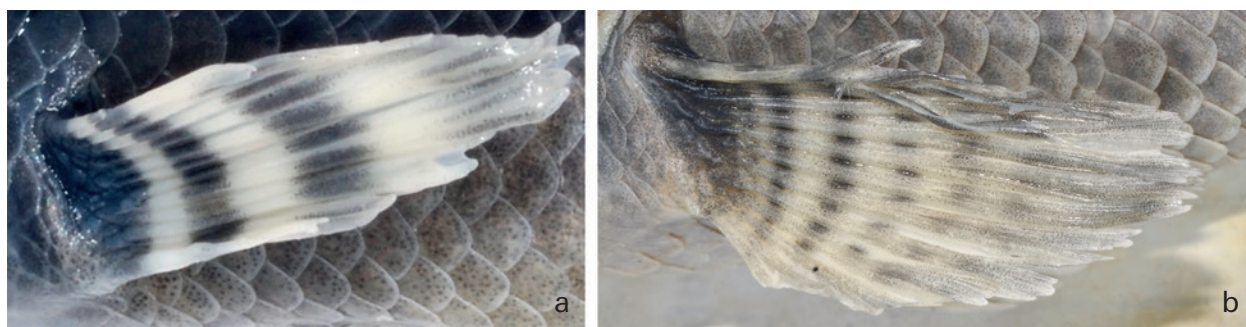


Fig. 4. Pectoral-fin pattern: **a**, *Channa shingon*, KIZ 2014005997, 59.7 mm SL; Yingjiang; Dayingjiang River; **b**, *C. harcourtbutleri*, EPC 4843, 127.0 mm SL; Zhenkang; Nandinghe River.

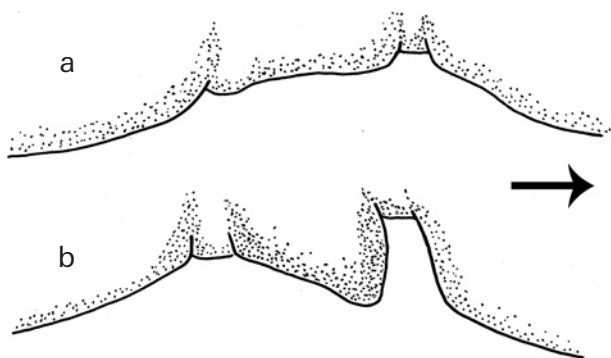


Fig. 5. Inferomesial process of parasphenoid; lateral view, arrow points towards head: **a**, *Channa shingon*, KIZ 2014005979, 99.3 mm SL, paratype; **b**, *C. harcourtbutleri*, EPC 4599, 106.0 mm SL; Cangyuan; Nangunhe River.

Coloration in alcohol. Head and body gray, gradually turning darker on dorsum; lower side of head and abdomen cream. Mandible cream-whitish marbled. Gular

region uniformly gray. Dorsal and anal fin uniformly gray with a cream edge in adults, light gray with irregular dark gray spots in juveniles. Caudal fin gray, with 10–15 irregular rows of faint, dark brown spots, edge cream. Pelvic fin cream turning gray distally, edge cream. Pectoral fin with a broad black basal band followed by 3–4 gray to black transverse bands, bands increasing in width towards distal edge; interspaces cream to white, narrower to equally wide as bands.

Distribution. Known from the Irrawaddy and Salween drainages in Dehong and Lincang prefectures, Yunnan, China; expected to occur in the same drainages in Myanmar.

Ecology. *Channa shingon* prefers weedy, stagnant water sections of small mountainous rivulets. These rivulets are often redirected to irrigate rice paddies. At the type locality, the ankle-deep water was clear, with a pH of 5.9, a conductivity of 20 $\mu\text{S}/\text{cm}$, and a temperature of 12 °C in

the afternoon. The lower reaches of these rivulets, shortly before the influx into a larger stream are usually also inhabited by *Misgurnus anguillicaudatus* and juveniles of *C. harcourtbutleri*. Another habitat of *C. shingon*, the Mengnaihe River upstream of Xima at an elevation of 1730 m, had a water temperature of just 8 °C in the morning (pH 6.7; 20 µS/cm); some backwaters had a thin layer of ice after a chilly night. Vast areas of *C. shingon*'s habitats are ephemeral and desiccate during droughts.

Etymology. The specific epithet is derived from a character in Burmese spiritualism. Shingon, also referred to as Lady Humpback, is one of the 37 officially recognized spirits (nats) in Myanmar; an allusion to the species' humpbacked appearance; a noun in apposition.

Discussion

Channa shingon possesses alternating dark and light transverse bands on the pectoral fin and is therefore assigned to the *C. gachua*-species complex as defined by BRITZ (2008). It may be allocated in a subgroup composed of *C. burmanica* and *C. orientalis* sharing a miniature size of less than 100 mm SL (BLOCH & SCHNEIDER, 1801; CHAUDHURI, 1919). Although elsewhere otherwise stated (Courtenay & Williams, 2004), *C. burmanica* seem to be of very small size not exceeding a TL of about 120 mm. Both, *C. burmanica* and *C. orientalis* lack pelvic fins (vs. present in *C. shingon*). *Channa shingon* differs from both in having 25–27 anal-fin rays (vs. 28 in *C. burmanica*; 20–22 in *C. orientalis*); 44–45 lateral line scales (vs. 48; 36–42). Besides, juveniles and females of *C. orientalis* possess an ocellus on the posterior part of the dorsal fin (vs. absent in *C. shingon*); and radiographs of *C. burmanica* show 47 vertebrae (vs. 43–44 in *C. shingon*).

Channa shingon often coexists with *C. harcourtbutleri*. It is easily distinguishable from the latter by having a pectoral-fin pattern of 3–4 broad gray to black bands, their width gradually increasing distally, with cream to white interspaces, narrower or equally wide as bands (vs. 5–7 faint, thin, gray bands, all approximately equally wide, and gray-brown interspaces, conspicuously wider than bands; Fig. 4); a conspicuously bulging predorsal profile giving the specimen a humpbacked appearance (vs. predorsal profile usually straight in equally sized specimens); and a significantly shorter maximum standard length of about 100 mm (vs. about 200 mm). Further meristic and morphometric differences are 25–27 anal-fin rays in *C. shingon* (vs. 23–25 in *C. harcourtbutleri*); modally 4 transverse scales to dorsal-fin origin and 8 to anal-fin origin (vs. 5 and 9); 1 mandibular scale (vs. 2–3); lateral head length 27–30 % SL (vs. 31–37); and interorbital width 33–35 % HL (vs. 28–31). The suprabranchial chamber is simple in *C. shingon*. Bulging or cavernous structures to increase the chamber's surface and thereby its efficiency are absent, and the parasphe-

Table 1. Morphometrics of *Channa shingon*, n = 7; SD, standard deviation.

	holotype	median	range	SD
SL in mm	89.7		68.6–99.3	
In percent of SL				
Lateral head length	28.5	28.5	27.1–29.7	1.0
Predorsal length	35.9	35.2	33.2–36.4	1.1
Prepelvic length	33.6	33.7	33.1–34.8	0.6
Preanal length	51.7	50.2	49.2–52.0	1.2
Pre-anus length	50.2	48.5	46.6–50.4	1.4
Head depth (at eye)	9.5	9.6	8.8–10.1	0.5
Head depth (at nape)	13.4	13.4	12.5–13.7	0.4
Body depth (at anal-fin origin)	16.1	15.3	14.1–16.1	0.7
Caudal-peduncle depth	9.9	10.3	9.9–11.2	0.4
Caudal-peduncle length	7.1	6.9	5.7–8.6	0.9
Head width (at eyes)	12.7	13.7	12.7–14.2	0.6
Maximum head width	19.5	19.7	18.9–20.4	0.5
Body width (at dorsal-fin origin)	14.9	15.2	14.6–16.0	0.5
Body width (at anal-fin origin)	10.6	12.1	10.6–13.8	1.1
Eye diameter	4.5	4.1	3.7–4.6	0.3
Interorbital width	9.8	9.7	9.3–9.9	0.2
Length of dorsal-fin base	60.8	61.4	59.4–62.8	1.2
Length of anal-fin base	41.2	42.5	40.9–43.6	1.1
Gape width (at rictus)	10.9	11.9	10.9–12.5	0.6
Gape length	11.3	11.5	11.1–12.3	0.4
In percent of HL				
Snout length	23.0	22.8	19.6–25.4	2.4
Postorbital length	65.2	65.7	64.4–66.8	0.8
Eye diameter	15.6	14.5	13.2–16.1	1.1
Interorbital width	34.4	34.0	33.2–35.1	0.7
Head depth (at eye)	33.2	33.5	31.6–36.9	1.7
Head depth (at nape)	46.9	46.9	43.6–50.8	2.3
Ratios				
Pectoral-fin length/pelvic-fin length	2.3	2.4	2.3–2.6	0.1
Gape length/width	1.0	1.0	0.9–1.0	0.1

noidal inferomesial process is very shallow and straight (vs. deep and distinctively pointed in *C. harcourtbutleri*; Fig. 5).

Channa shingon differs noticeably in morphometrics and meristics from *C. gachua* in having 25–27 anal-fin rays (vs. 22–23 in *C. gachua*); lateral head length 27–30 % SL (vs. 32–34); preanal length 49–52 % SL (vs. 53–57); length of anal-fin base 41–44 % SL (vs. 37–40); head depth at nape 13–14 % SL (vs. 14–17 % SL); and postorbital length 18–19 % SL (vs. 22–24). The ocellus in the posterior part of the dorsal fin reported from juvenile *C. gachua* is absent in *C. shingon* (HAMILTON, 1822; NG *et al.*, 1999; VISHWANATH & GEETAKUMARI, 2009).

With a maximum SL of about 100 mm *C. shingon* marks the smallest species among pelvic-fin bearing species of the *C. gachua*-complex. Aside from its miniature size *C. shingon* is easily distinguished from *C. auran- timaculata*, *C. barca* and *C. melanostigma* in having 25–27 anal-fin rays (vs. 28–30 in *C. auran- timaculata*; 33–34 in *C. barca*; 24–25 in *C. melanostigma*); 44–45 lateral-line scales (vs. 51–54; 62–62; 46–47) and 43–

44 vertebrae (vs. 51; 56; 50–51). It is distinct from a group of species within the *C. gachua*-complex sharing black spots along the flanks, namely *C. ornatipinnis*, *C. pardalis*, *C. pulchra* and *C. stewartii*, in lacking these spots and in having modally 4 scale rows between lateral line and dorsal-fin origin (vs. 5 in all species of the comparison group) and 25–27 anal-fin rays (vs. 24–25 in *C. ornatipinnis*; 23–25 in *C. pardalis*; 23–24 in *C. pulchra*). Further meristic differences to *C. stewartii* are 35–37 dorsal-fin rays in *C. shingon* (vs. 39–41); 44–45 lateral line scales (vs. 48–49) and 43–44 vertebrae (vs. 47–48).

Comparative material

Channa burmanica: KIZ 2014005917, 1 specimen, 80.4 mm SL; Putao, Kachin, Myanmar; coll. X.Y. Chen & T. Qin, 24 Nov. 2014. *Channa gachua*: KIZ 2006012617, 622–629, 9, 96.4–191.1 mm SL; Dibrugarh, Assam, India; Brahmaputra, coll. D.X. Feng, 28 Oct. 2006. *Channa harcourtbutleri*: EPC 3757–61, 4321–48; 32, 42.5–148.5 mm SL; Tongbiguan, Yingjiang, Dehong, Yunnan, China; Jieyanghe River, Irrawaddy; coll. M. Endruweit & Z.Y. Sha, 28 Jan. 2014. EPC 4840–54, 15, 39.8–143.5 mm SL; Zhenkang, Lincang, Yunnan, China; Mengduihe River, Salween; coll. M. Endruweit & T. Qin, 21 Aug. 2014. EPC 4562–65, 4599–4601, 7, 52.0–134.0 mm SL; Banlao, Cangyuan, Lincang, Yunnan, China; Nangunhe River, Salween; coll. M. Endruweit & T. Qin, 23 Aug. 2014. EPC 4913–22, 4937–53, 27, 37.2–124.6 mm SL; Tongbiguan, Yingjiang, Dehong, Yunnan, China; Jieyanghe River, Irrawaddy; coll. M. Endruweit, T. Qin & Z.Y. Sha, 19 Aug. 2014. KIZ FDX20070839–844, 6, 80.7–169.0 mm SL; Putao, Kachin, Myanmar; Ziya River, Irrawaddy; coll. D.X. Feng, 18 March 2007. KIZ 1976001139–1140, 2, 116.3–134.2 mm SL; Mangshi, Dehong, Yunnan, China; Longchuanjiang River, Irrawaddy; coll. 1976. KIZ 1983001627–1630, 4, 83.7–106.2 mm SL; Longchuan, Dehong, Yunnan, China; Longchuanjiang River, Irrawaddy; coll. 1983. KIZ 1987005079–5080, 2, 110.4–134.5 mm SL; Ruili, Dehong, Yunnan, China; Longchuanjiang River, Irrawaddy; coll. 1987. KIZ 2002002381–2382, 2, 129.5–138.4 mm SL; Daxue Mt., Yongde, Lincang, Yunnan, China; Nandinghe River, Salween; coll. G.H. Cui & X.Y. Chen, 18 June 2002. KIZ 2002002995–3000, 6, 108.0–148.3 mm SL; Daxue Mt., Yongde, Lincang, Yunnan, China; Ganahe River, Salween; coll. G.H. Cui & X.Y. Chen, 18 June 2002. KIZ 2002003196, 1, 111.0 mm SL; Yongkang, Yongde, Lincang, Yunnan, China; Nanqiaohe River, Salween; coll. G.H. Cui & X.Y. Chen, 20 June 2002. KIZ 2006004293–4295, 3, 80.8–104.2 mm SL; Longdao, Ruili, Dehong, Yunnan, China; Nanwanhe; coll. X.Y. Chen & Y.E. Jiang, 15 Nov. 2006. KIZ 2006012348, 1, 177.0 mm SL; Wuhe, Tengchong, Baoshan, Yunnan, China; Longchuanjiang River, Irrawaddy; coll. X.Y. Chen et al., 18 April 2006. KIZ 2006012351–12352, 2, 54.7–131.0 mm SL; Tengchong, Baoshan, Yunnan, China; Longchuanjiang River, Irrawaddy; coll. X.Y. Chen et al., 23 April 2006. KIZ 2006012356, 1, 90.2 mm SL; Bawan, Baoshan, Yunnan, China; Salween; coll. X.Y. Chen et al., 5 May 2006. KIZ 2007004070–4082, 12, 113.0–194.0 mm SL; Huli, Kunlong, Shan State, Myanmar; Nandinghe River, Salween; coll. D.X. Feng, 28 Nov. 2007. KIZ 2013001298–1299, 2, 79.1–90.6 mm SL; Tongbiguan, Yingjiang, Dehong, Yunnan, China; Jieyanghe River, Irrawaddy; coll. S.W. Liu, 10 June 2013. KIZ 2014000030–32, 3, 80.0–111.3 mm SL; Longchuan, Dehong, Yunnan, China; Longchuanjiang River, Irrawaddy; coll. M. Endruweit, 6 Feb. 2014. *Channa stewartii*: KIZ 2006012613–12616, 12630–12635, 10, 114.3–224 mm SL; Dibrugarh, Assam, India; Brahmaputra, coll. D.X. Feng, 28 Oct. 2006.

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