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Redescription of *Sillago* (*Parasillago*) *indica* McKay, Dutt & Sujatha, 1985 (Perciformes: Sillaginidae), with a reassignment to the subgenus *Sillago*

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Abstract

The Indian sillago, *Sillago indica* McKay, Dutt & Sujatha, 1985, is redescribed on the basis of three paratypes and two newly collected specimens. The presence of two posterior extensions of the swimbladder instead of one suggests that it belongs to the subgenus *Sillago*. Comments on its subgeneric status and comparisons with members of *Sillago* (*Sillago*) are provided. Two specimens collected from Vietnam represent the first record of the species from the South China Sea, western Pacific Ocean.

Key words: Indian sillago, *Sillago* (*Sillago*) *indica*, swimbladder, new record, Vietnam

Introduction

The sand whiting family Sillaginidae currently comprises 33 species in three genera (*Sillaginodes* Gill 1862, *Sillaginopsis* Gill 1861, and *Sillago* Cuvier 1817) and three subgenera (*Sillaginopodys* Fowler 1933, *Sillago* and *Parasillago* McKay 1985) of the genus *Sillago* (McKay 1985, 1992; Kaga *et al*. 2010; Gao *et al*. 2011). Because of the great similarity in shape and coloration of sillaginid species, examination of the shape of the swimbladders is essential to identify the species (McKay 1992).

The Indian sillago, *Sillago indica* McKay, Dutt & Sujatha, 1985, was described under the subgenus *Parasillago* because of its having a single posterior extension and a duct-like process of the swimbladder. We examined the swimbladder of two paratypes (BMNH 1985.8.13.1 and QM I20386); they appeared nearly identical to the illustration of the structure in the original description (McKay *et al*. 1985: fig. 5E) with two anterior extensions, two anterolateral extensions and many lateral processes of the swimbladder. However, our examination also revealed two posterior extensions, not one as shown in the original illustration. One extension can be seen easily via the previous authors' dissection; another extension remained buried in the caudal muscle, thus suggesting that *Sillago indica* does not belong in the subgenus *Parasillago* but instead in the subgenus *Sillago*.

Two specimens (173.4–174.2 mm SL) of *S. indica* were recently collected from the market of Phant Thiet, central Vietnam. As the species had previously been known only from the east and west coasts of India (McKay 1985, 1992), these new specimens represent the first record from Vietnam, as well as the South China Sea, western Pacific Ocean.

Materials and methods

Methods for taking measurements and counts follow Kaga *et al*. (2010). Institutional abbreviations follow Fricke & Eschmeyer (2011). Comparative data are taken from Kaga *et al*. (2010).

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Systematics

Sillago (*Sillago*) *indica* McKay, Dutt & Sujatha, 1985

Figs. 1, 2, 3, Tables 1, 2
[English name: Indian sillago]

Sillago parvisquamis (non Gill 1861): Dutt & Sujatha, 1980: 372.
Sillago (*Parasillago*) *indica* McKay, Dutt & Sujatha *in* McKay 1985: 38 (Holotype: ZSI: uncatalog, India). McKay, 1992: 45 (description).

Material examined. Paratypes: BMNH 1985.8.13.1 (159.4 mm SL), QM I20386 (141.0 mm SL), MNHN 1985–0799 (126.5 mm SL), Visakhapatnam, India, collected by K. Sujatha, June 8, 1979. Additional specimens: NMMB-P13995 (2 specimens, 173.4–174.2 mm SL), Phant Thiet, Vietnam, April 14, 2011.

Diagnosis. A species of subgenus *Sillago* (*Sillago*) with 34 total vertebrae, a dark black band on midline of body, and eight or nine lateral processes spanning entire lateral side of main body of swimbladder.

Description. Counts and measurements are given in Table 1. Description is based on three paratypes and two additional specimens.

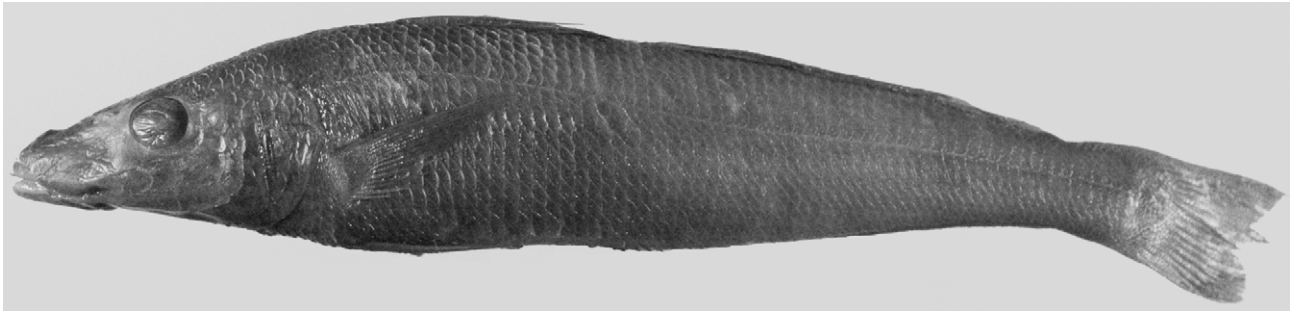

FIGURE 1. *Sillago* (*Parasillago*) *indica*, paratype, BMNH 1985.8.13.1, 159.4 mm SL, from Visakhapatnam, India.

Body fusiform, slightly compressed; depth at the first dorsal-fin origin usually deepest (except a specimen possessing depressed abdomen), deepest depth 5.3–5.5 in SL. Caudal peduncle deep, depth 2.5–3.0 in body depth. Head large, length 3.3–3.5 in SL. Snout very long, length 1.9–2.5 times eye diameter. Eye moderate, its margin covered with adipose eyelid, diameter 4.9–5.9 in HL. Interorbital region flat. Nostrils situated anterior to upper margin of eye; anterior nostril tubular with flap anteriorly, posterior nostril lacking flap. Mouth small, terminal, opening slightly oblique. Upper jaw with small canines forming tooth band, becoming narrower posteriorly. Lower jaw with small canines, forming tooth band anteriorly, width same as upper jaw tooth band, tooth band gradually becoming narrower posteriorly, terminating in one row. Palatine and tongue toothless. Vomer with two to three rows of canine teeth. Two large slit-like sensory pores open onto tip of snout, just above upper lip. Posterior margin of preopercle slightly serrated. Opercle with single weak spine posterodorsally. Body scales deciduous, size moderate, ctenoid except for those on prenasal area, which are cycloid. Cheek scales deciduous, cycloid, arranged in about two rows. Lower part of preoperculomandibular canal covered with cycloid scales, upper part covered with ctenoid scales. Gill rakers on first arch pointed, with small irregular spines; two tooth plates on hypobranchial portion of arch.

First and second dorsal fin short; longest spine 5.3–6.1 in SL. Dorsal fins narrowly separated. Anal-fin origin just below second dorsal-fin origin. Pectoral fin moderate in length 5.9–6.6 in SL; its tip reaching to below sixth to eighth dorsal spine. Pelvic fin shorter than pectoral fin, length 6.2–7.4 in SL; first soft ray elongated. Caudal fin emarginate.

Swimbladder large, with two posterior extensions extending into haemal funnel beyond posterior end of body cavity; two anterior extensions extending forward to basioccipital on both sides above auditory capsule. A single duct-like process originating from ventral surface of swimbladder and reaching urogenital opening. An

anterolateral extension present on each side of swimbladder, branching into anterior and posterior subextensions: anterior one comprising a short, simple blind tubule; posterior one kinky, situated along abdominal wall and reaching just posterior to duct-like process of swimbladder. Eight or nine lateral processes extending from entire lateral surface of main body of swimbladder, anterior three stout and horn-like, posterior five or six rather small and triangular in shape.

Color when fresh (based on two non-type specimens, Fig. 2). Body and head silvery overall, dorsal and abdominal portions separated by dark black band. Upper part of snout blackish and lower part yellowish, parietal blackish, cheek and opercle with fine black dots. Dorsal-fin membranes dusted with black dots. Pectoral fin yellowish, no blotches on base. Anal fin yellowish, interradial membranes dusted with black dots. Caudal fin yellowish, posterior margin blackish and lower lobe densely black.

FIGURE 2. *Sillago* (*Sillago*) *indica*, NMMB-P13995, 174.2 mm SL, from Phant Thiet, Vietnam.

Color in alcohol. In non-types, body and head yellowish brown overall, greenish grey dorsally grading to white ventrally, dorsal and abdominal portions separated by a dark black band. Snout and parietal light brown, lower half of opercle silver with fine black dots, and cheek white with fine black dots. Dorsal-and anal-fin membranes dusted with black dots. Posterior margin of caudal fin blackish and lower lobe densely blackish.

In paratype (Fig. 1), body and head dark brown overall, no dark black band on midline of body. Abdomen with fine black dots. Snout dark gray, lower half of opercle blackish, and cheek with fine black dots. Dorsal-and anal-fin membranes dusted with black dots. Lower lobe of caudal fin dark gray. Over time in preservation coloration may become uniform dark brown, and black band on midline of body disappears.

Distribution. Known from the east and west coasts of India (McKay 1992), and now Vietnam.

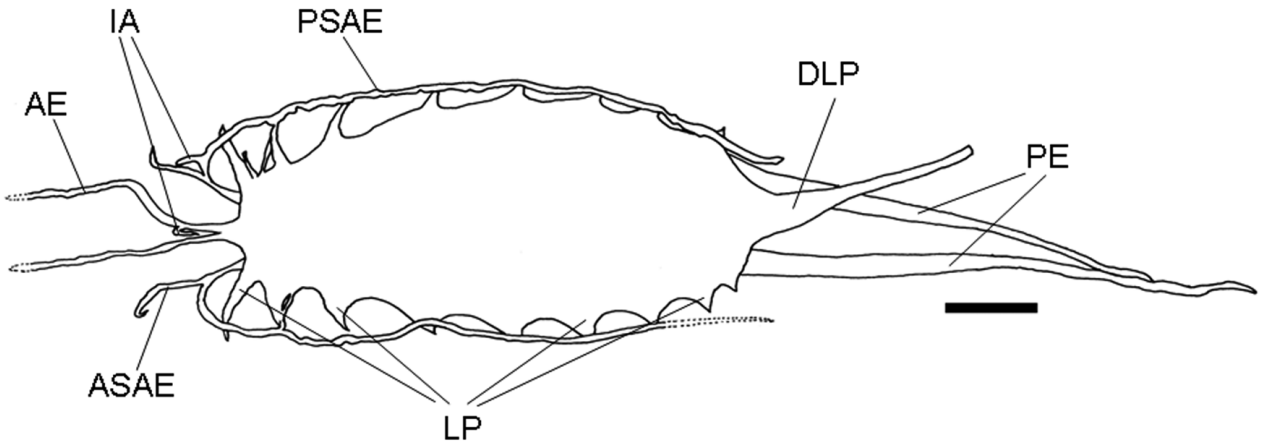

FIGURE 3. Swimbladder in a paratype of *Sillago* (*Parasillago*) *indica*, BMNH 1985.8.13.1, 159.4 mm SL. *ASAE*, anterior subextension of anterolateral extension; *AE*, anterior extension; *DLP*, duct-like process; *IA*, irregular appendage; *PSAE*, posterior subextension of anterolateral extension; *PE*, posterior extension. *Bar* 5 mm

TABLE 1. Counts and proportional measurements of *Sillago* (*Sillago*) *indica.*

	Paratypes n=3	Non-type specimens n=2
Standard length (mm)	126.5–159.4	173.4–174.2
Counts		
Dorsal fin rays	XI–I, 21–22	XI–XII–I, 21–22
Anal fin rays	II, 22–23	II, 21–22
Pectoral fin rays	16–17	16
Pelvic fin rays	I, 5	I, 5
Scales in lateral line	70–71	69
Scales above lat. line	6	5–6
Scales below lat. line	12–13	11–12
Gill rakers first arch	3+8=11	2+8=10
Vertebrae (abdominal+caudal)	13+21=34	13+21=34
Modified vertebrae	4	4
Measurements (% SL)		
Head length	29.4–30.1	28.2–29.0
Head width	13.7–15.8	13.7
Body depth at dorsal fin origin	17.7–19.0	15.7–18.5
Body depth at second dorsal fin origin	16.8–17.7	16.4–17.3
Snout length	12.0–13.2	11.9–12.1
Eye diameter	5.2–6.2	4.9–5.1
Interorbital width	5.4–6.3	5.4–5.9
Upper jaw length	6.3–6.7	6.2–6.9
Snout to dorsal fin	34.9–36.3	35.2–36.3
Snout to second dorsal fin	54.2–57.1	57.1–59.4
Snout to anal fin	55.3–57.7	56.3–57.1
Snout to pelvic fin	30.9–32.6	29.6–30.0
Trunk length	25.9–28.9	29.4–29.5
Longest dorsal spine	16.5–18.8	17.6
First dorsal fin base	17.9–20.0	20.4–21.6
Second dorsal fin base	34.2–36.4	34.1–37.0
Anal fin base	35.1–37.1	34.3–35.9
Pectoral fin length	16.0–17.0	15.1–15.2
Pectoral fin base	4.0–4.5	3.6
Pelvic fin length	15.6–16.0	13.6–14.1
Pelvic fin base	2.6–3.2	2.5–3.0
Anus to caudal fin base	44.9–47.0	45.9–46.2
Caudal peduncle depth	7.1–7.7	6.1–6.8

TABLE 2. Comparison of *Sillago* (*Sillago*) *indica* and five species of the subgenus *Sillago* .

	S. (*S.*) *indica*[a]	*S.* (*S.*) *caudicula*[b]	*S.* (*S.*) *intermedius*[b, c, e]	*S.* (*S.*) *megacephalus*[d, e]	*S.* (*S.*) *parvisquamis*[a, b, e]	*S.* (*S.*) *sihama*[a, b, e]
Number of examined specimens and SL (mm)	5, 126.5–174.2	4, 101.1–148.6	5, 81.0–152.7	–	4, 219.1–258.4	9, 92.2–187.4
Vertebrae (in total)	34	35–36	34	no data	39–40	34
Dorsal fin rays	XI–XII–I, 21–22	XI–I, 22–23	XI–I, 21–22	XI–I, 22	XII–XIII–I, 20–22	XI–I, 20–23
Soft anal fin rays	21–23	23–24	21–22	23	22–24	21–23
HL/SL (%)	28.2–30.1	29.0–30.1	29.1–31.3	33.0	25.9–27.7	27.7–29.9
Black band on midline of body	present	absent	absent	absent	present	present or absent
Lateral process of swimbladder	present	absent	absent	no data	absent	absent

Data sources: a, this study; b, Kaga *et al.*, 2010; c, Wongratana 1977; d, Lin 1933; e, McKay 1992

Discussion

The original description of *Sillago* (*Parasillago*) *indica* McKay *et al*. (1985) was based on mixed data of the holotype and three paratypes. Thus, data of the holotype itself cannot be extracted from the description. We examined only the three paratypes because of difficulties encountered in our attempt to examine the holotype, which is deposited in the Zoological Survey of India, Calcutta (ZSI; catalog number unknown). Based on our observations, the swimbladders of two paratypes (BMNH 1985.8.13.1 and QM I20386) are nearly identical to that reported in the original description of *S. indica* McKay *et al*. (1985; fig. 5E), except for the number of posterior extensions. We determined that the swimbladder of paratype BMNH 1985.8.13.1 (Fig. 3) was used for the illustration in the original description because the irregular appendages on the anterior extension, and on the posterior subextension of the anterolateral extension of the swimbladder, matched completely. Although McKay *et al*. (1985) reported only one posterior extension in the swimbladder of *S. indica*, an additional extension hidden under the caudal musculature was found in paratypes BMNH 1985.8.13.1 and QM I20386, which suggests that *S. indica* is a member of the subgenus *Sillago* (*Sillago*). A third paratype, MNHN 1985–0799, was also examined; however, the swimbladder could not be observed because the internal organs were not removed from the abdominal cavity. Morphometric and meristic data of the three paratypes examined matched the diagnostic characteristics very well except for the number of modified vertebrae (four in this study vs. three in McKay *et al*., 1985). However, the difference in number is a result of whether or not the fourth ambiguous modified vertebra is counted. We judged the fourth caudal vertebra as having a modified L-shaped haemal spine that supports the posteriormost part of the posterior extensions of the swimbladder and is slightly longer than the other three modified vertebrae.

The subgenus *Sillago* (*Sillago*) currently comprises five species: *S.* (*S.*) *caudicula* Kaga *et al*., 2010 from Oman, *S.* (*S.*) *intermedius* Wongratana, 1977 from Thailand and India; *S.* (*S.*) *megacephalus* Lin, 1933 from China; *S.* (*S.*) *parvisquamis* Gill, 1861 from Japan and Taiwan; and *S.* (*S.*) *sihama* (Forsskål 1775) from the Indo-West Pacific, which ranges from Knysna, South Africa, to Japan (McKay 1985, 1992; Kaga *et al*. 2010). Among these five members of the subgenus *Sillago*, *S. indica* is clearly distinguishable from *S. caudicula*, *S. intermedius*, *S. parvisquamis*, and *S. sihama* in possessing eight or nine lateral processes extending from the lateral side of the main body of the swimbladder (vs. lateral processes absent). It can be further separated from *S. caudicula* and *S. parvisquamis* by possession of 34 total vertebrae (vs. 35–36 in *S. caudicula* and 39–40 in *S. parvisquamis*), and from *S. caudicula*, *S. intermedius*, and *S. megacephalus* by having a midlateral black stripe on the body (Fig. 2) (vs. black band absent). The black lateral band on the body is also occasionally present in *S. sihama*. Because of the great similarity of S. *indica* and *S. sihama*, observation of the swimbladder is indispensable to identify these species.

Golani *et al*. (2011) resurrected *Sillago erythrea* Cuvier & Valenciennes, 1829 from the synonyms under *S. sihama* (Forsskål 1755). The characters Golani *et al*. (2011) provided are for the most part not valid or are unreliable. For example, Golani *et al*. (2011: 466) described *S. erythrea*: "differs from *S. sihama* in the absence of scales on the preoperculum and on most of the operculum (completely scaled in *S. sihama*), in the total number of vertebrae (32 in *S. erythraea*, 34 in *S. sihama*)." However, their figure of *S. erythrea* clearly shows scales on the preopercle (Golani *et al*. 2011: fig. 5) and dorsal and anterior portions of the opercle, and their radiographs (Golani *et al*. 2011: figs. 8–9) show the total number of vertebrae for both *S. erythraea* (lectotype MNHN A-3127) and *S. sihama* (paralectotype of *S. erythraea* MNHN A-3137) as 34. McKay (1985: 7) also gave vertebral counts of 14-3-17 for the lectotype of *S. erythrea* (MNHN A-3127) and 14-3-17 for the paralectotype (MNHN A-3137). Hence, the validity of *S. erythrea* remains doubtful. *Sillago* (*Sillago*) *indica* can be distinguished from "*S. erythrea*" of Golani *et al*. (2011) in possessing the lateral processes of the swimbladder versus absence in "*S. erythrea*" (Golani *et al*. 2011: fig. 10).

Recently Gao & Xu in Gao *et al*. (2011) described *Sillago sinica* from the East China Sea without describing the shape of the swimbladder, the most important characteristic for identifying sillaginids. No judgment can be made for its subgeneric status. However, *Sillago* (*Sillago*) *indica* clearly differs from *S. sinica* by the number of total vertebrae (34 vs. 37–39 in *S. sinica*).

Two specimens of *Sillago* (*Sillago*) *indica* newly collected from Vietnam (NMMB-P13995) agree well with the original description by McKay *et al*. (1985), except for swimbladder morphology. Based on our examination, these specimens have a swimbladder nearly identical to that of the two paratypes. The species had previously been known only from the east and west coasts of India (McKay 1985, 1992). Although *S. indica* was reported from Oman by Randall (1995), and also from the Arabian Sea (Manilo & Bogorodsky 2003), by using the data of Randall (1995) (pers. comm. with S. Bogorodsky), Randall's specimens were subsequently described as *S. caudicula* (Kaga *et al*. 2010). The NMBBP specimens represent the first record of *S.* (*S.*) *indica* from Vietnam, as well as from the South China Sea, western Pacific Ocean.

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