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Review of the slender barracudina genera *Dolichosudis* and *Stemonosudis* in Taiwan (Aulopiformes: Paralepididae)

Hsuan-Ching Ho[1,2*], Lorenzo C. Halasan[3] and Song-Yu Tsai[4]

[1]National Museum of Marine Biology & Aquarium, Pingtung, Taiwan

[2]Institute of Marine Biology, National Dong Hwa University, Pingtung, Taiwan

[3]Department of Biology, University of San Carlos, Cebu, Philippines

[4]National Sun Yat-Sen University, Kaohsiung, Taiwan

*Corresponding author. E-mail: ogcoho@gmail.com

Abstract

Slender-bodies barracudinas were collected from Taiwan and examined, and five species spanning two genera, *Dolichosudis* and *Stemonosudis*, were identified. *Stemonosudis siliquiventer*, previously known from the Atlantic Ocean only, was newly recorded in Taiwan, as well as the western Pacific Ocean. Adult *Stemonosudis gracilis* (tentatively identified) and *Stemonosudis miscella* specimens were collected, as well; previously, only juveniles or small individuals had been reported in Taiwan. Detailed descriptions have been provided herein for these species, as well as the final two, *Stemonosidus rothschildi* and *Dolichosudis fuliginosa*. Detailed descriptions are provided for all these species.

Key words: Aulopiformes, Ichthyology, Paralepididae, Taiwan, Taxonomy

Introduction

The barracudina fish family Paralepididae is a group of small to moderately large species with slender bodies who pelvic and dorsal fins are always situated at or behind the middle of the fish. Most species are mesopelagic, though some may be demersal. Ege (1933) established the genus *Macroparalepis* with nine species, and no type species was designated. Ege (1933, 1957) divided the species into two subgroups: groups I (anus clearly behind the dorsal fin origin) and II (anus situated between origins of pelvic and dorsal fins and usually right behind the appressed pelvic fin). Harry (1951)

reviewed the genera of the family Paralepididae and described a new genus, *Stemonosudis*, for Ege's (1933) group II.

According to Rofen (1966:419, 422–423, in key), 10 species were recognized in the genus *Stemonosudis*, and two were described subsequently: *Stemonosudis rothschildi* Richards and *Stemonosudis siliquiventer* Post. Among these species, many were only known from larvae, juveniles, and/or adolescents, with adults never having been observed or characterized.

Ege (1957) provided specimens of *S. macrura* (as *Macroparalepis macrurus*) and *S. miscella* (as *Macroparalepis miscellus*) collected from off eastern Taiwan. The records are followed by Chen and Yu (1986), but no specimens have been reported since then. In the present study, slender-bodied individuals collected from Taiwan were examined, and five species across two genera were uncovered: *Dolichosudis fuliginosa* Post, *Stemonosudis* cf. *gracilis* (Ege), *S. miscella* (Ege), *S. rothschildi*, and *S. siliquiventer*. Herein we provide detailed descriptions of all species based on specimens newly collected from Taiwanese waters.

Materials and methods

All measurements were made with a 30-cm ruler or 15-cm digital calipers, and measurement and count methods followed Ho and Golani (2019) and Ho et al. (2019). Standard length (SL) was measured from tip of snout to posterior margin of the hypural plate. Head length (HL) spanned the tip of the snout to the posterior margin of the gill cover. Predorsal, prepelvic, and preanal lengths were measured from tip of snout to origins of these fins. The distance between pelvic and dorsal fins (V–D) and between pelvic and anal fins (V–A) were calculated directly from predorsal, prepelvic, and preanal fin lengths. Snout length was measured from the tip of the upper jaw to the anterior margin of the orbit. Eye diameter was defined as the greatest distance between the margins of the orbit. Interorbital width was defined as the narrowest distance of the upper margin of the orbits. Pectoral-fin length was measured from base to tip. Body depth was defined as the vertical distance at the pectoral fin base, with body width as the transverse distance at the pectoral-fin base.

Meristic data were counted directly from fish specimens or else from digital X-ray films. Gill rakers were divided into three regions: epibranchial (upper limb of the first gill arch), ceratobranchial (middle region of the first gill arch), and hypobranchial (anterior portion of the first gill arch). The lower-limb gill rakers comprised the sum of the ceratobranchial and hypobranchial portions.

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Vertebrae were sub-divided prepelvic (number before origin of pelvic fin), predorsal (number before origin of dorsal fin), preanal (number before origin of anal fin), prehaemal (number without haemal spines), caudal (number with haemal spines, with the hypural plate considered as one), and total (= prehaemal + caudal). The number of lateral line scales were counted in several areas, as well: prepelvic (PVLL; before origin of pelvic fin); predorsal (PDLL; before origin of dorsal fin); preanal (PALL; before origin of anal fin), and total scales; the latter was a combination of large and regular scales (usually one associated with each myomere/vertebra), plus several much smaller ones in the posterior end of the lateral line.

Dorsal fin origin, pelvic fin origin, and anal fin origin have been abbreviated as DFO, VFO, and AFO, respectively.

Results

Identification of Taiwanese species

In the present study, individuals with slender bodies and heads, as well as pointed snouts, were collected from Taiwan and consequently examined. Among the "naked" paralepidids (e.g., Lestidiinae or Lestidiidae), three genera-*Dolichosudis*, *Macroparalepis*, and *Stemonosudis*, tend to be slender bodied and possess pointed snouts. The anus of all Taiwanese specimens is well in front of the dorsal-fin origin, and they were characterized by having a well-developed ventral adipose fin, and nostrils near the posterior end of the maxilla; such figures signify that they are not members of the genus *Macroparalepis*.

Of the species recognized, *S. rothschildi* was easily recognized as having 10 dorsal blotches (5 before the dorsal fin) and 7 ventral blotches (3 before the pelvic fin); a dorsal fin situated closer to the anal fin than the pelvic fin, and 85 total vertebrae.

The other four species had nearly identical body shapes, fin positions, body proportions, and vertebral formulas, but differed in coloration. The uniformly black color and short lateral line scales separated *D. fuliginosa* from the remaining three species, which were identified as members of the genus *Stemonosudis* based on the upper portions of their bodies being densely covered with powder-like chromatophores; the ventral sides being mostly pale (with dorsal and/or ventral blotches sometimes); lateral line scales being long and ovular, and having nostrils near the posterior end of the maxilla. These three all had 35–38 anal fin rays, 100–103 total vertebrae, 10–11 dorsal fin rays, and could be further distinguished from *S. molesta*, which has 13 dorsal fin rays and 30 anal fin rays; from *S. intermedia*, *S.*

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simile, *S. elongate*, and *S. bullisi*, which all have > 40 anal fin rays; from *S. macrura*, which has 85–95 total vertebrae; from *S. elegans*, which has 3–7 peritoneal sections; and from *S. distans*, which has 17 peritoneal sections.

One Taiwanese species was identified as *S. miscella* based on possessing three blotches in front of the dorsal fin, 10–11 peritoneal sections, and 100–102 total vertebrae. The second species was identified as *S. siliquiventer* based on its dark brown dorsal surface, silvery white abdomen and gill cover, blackish dorsum, and almost identical meristics and proportions as provided in the original description (Post, 1970).

Although the third species has been tentatively identified as *S. gracilis*, some doubts remain. Ege (1957) counted 14–15 peritoneal sections for his specimens, whereas ours have only 10–11. He also provided 37–39 anal fin rays, whereas ours (n=10) have 35–37. Rofen (1966, in key) mentioned that there are consistently 3–4 blotches on the dorsal side and 2–4 on the ventral side behind the dorsal fin, but Ege (1957) suggested that the blotches may fade with preservation. Judging from these differences, we can only determine that our specimens are most similar to *S. gracilis*, but further investigation is required to verify this.

***Dolichosudis* Post, 1969**

Dolichosudis Post, 1969:15 (type species: *Dolichosudis fuliginosa* Post, 1969). Post, 1972:145 (listed).

***Dolichosudis fuliginosa* Post, 1969**

Fig. 1; Table 1

Dolichosudis fuliginosa Post 1969:17 (type locality: off Brazil, 28°34'S, 46°53'W, depth 1200 to 0 m). Post, 1972:145 (listed). Nakabo, 2000:369 (Key). Fukui and Ozawa, 2004:293 (listed).

Specimens examined. NMMB-P23399 (1, 305) Dong-gang, Pingtung, southwestern Taiwan, 26 Apr. 2016. NMMB-P29164 (1, 175), 29 Mar. 2018. NMMB-P30074 (1, damaged), 10 May 2018. NMMB-P30075 (5, 174–192), 27 Mar. 2018. All collected from off Dong-gang fishing port, southwestern Taiwan, in bycatch of bottom trawls.

Description. Morphometric data are provided in Table 1. Dorsal-fin rays 10; pectoral-fin rays 12–14 (mainly 12 or 13); pelvic-fin rays 9; anal-fin rays 35–38. Lateral-line scales: PVLL 41–42; PDLL 49–53; PALL 62–65, and 83–86 in total, including 7–8 scales in the rear portion. Vertebrae: prehaemal 42–45; caudal 57–60;

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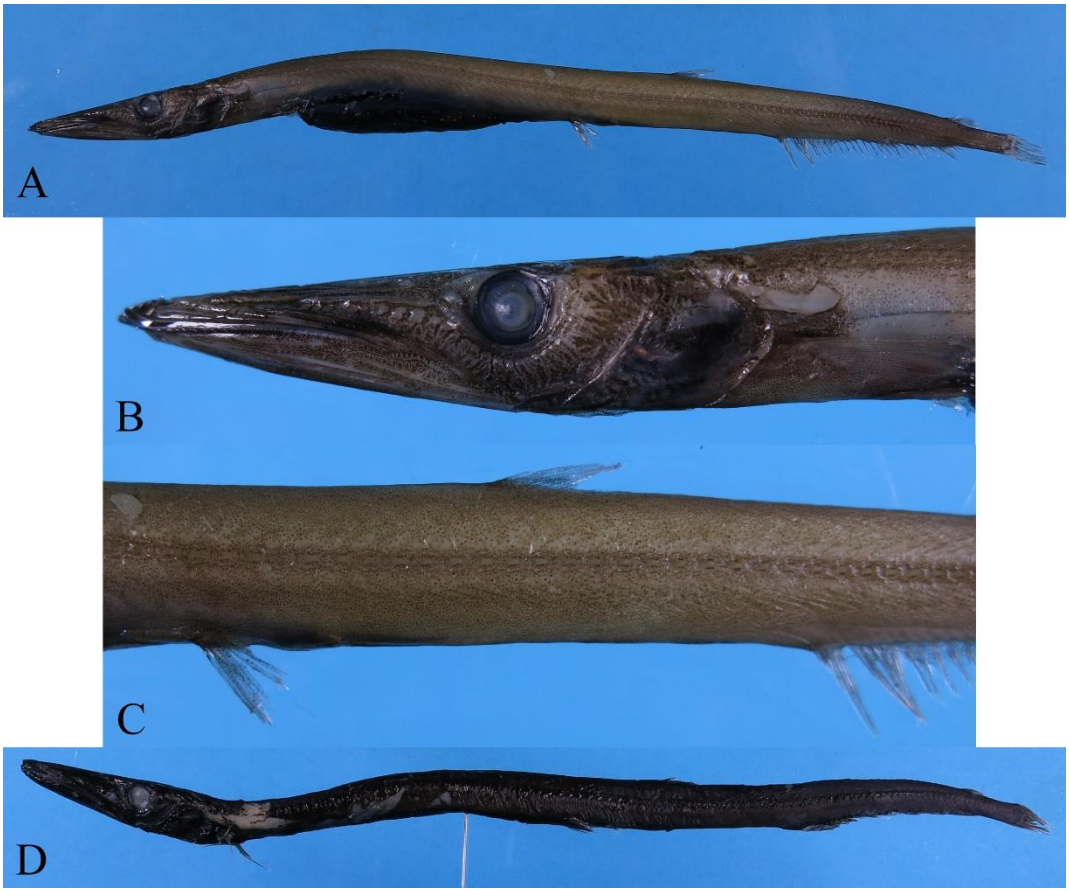

Fig 1. *Dolichosudis fuliginosa* Post 1969, preserved coloration. A–C. NMMB-P29164, 175 mm SL. A. Lateral view. B. Head. C. Trunk region between pelvic and anal fins. D. NMMB-P23399, 305 mm SL, lateral view. Not to scale.

prepelvic 40–41; predorsal 50–52; preanal 61–64; and total 101–103. Gill rakers: 12–15 on upper limb (epibranchial) and 40–48 on lower limb (21–23 on ceratobranchial+19–25 on hypobranchial); total rakers 54–60.

Body very slender, strongly compressed, deepest at middle portion of the fish, body depth 19–22 times in SL. Ventral margin with a narrow fleshy ridge between pectoral and pelvic fins, bearing a very low adipose fin along its margin; ventral adipose fin well-developed between anus and anal fin. Caudal peduncle thin, its length 6.4–7.4 in HL. Anus slightly behind tip of appressed pelvic fin, well in front of DFO.Pectoral fin moderately long, situated at lower half of body, the upper base slightly below vertical through lower margin or eye;

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pelvic fin small, inner rays slightly shorter than outer ones, VFO slightly behind middle of the fish; dorsal fin and with a short base, DFO distinctly behind the appressed pelvic fin and before midline of V–A. Anal fin with long base, AFO situated at posterior fourth of the fish; adipose fin small, above posterior end of anal-fin base.

Head slender, slightly wider than body width, its length 4.8–5.0 in SL. Snout slender, distinctly longer than remainder of head. Two nostrils close together, situated above posterior end of maxilla. Eye moderately large and round. Postorbital length slightly less than half that of HL. Interorbital narrow, slightly concave centrally, with three pairs of longitudinal ridges, the inner ridge extending forward on snout, median ridge terminating at anterior margin of eye and branched posteriorly.

Maxilla terminating less than one eye diameter before a vertical though anterior margin of orbit. Angle of gape at posterior end of maxilla. Front of premaxillary with four close-set, depressible canines, followed by a single row of many small retrose teeth (those in posterior portion gradually smaller). Front of lower jaw with a pair of fixed teeth, followed by two rows of loosely arranged canines, those in inner row slender and depressible, each with a knife-like top, and those on outer row short and fixed. Vomer toothless. Palatine with two rows of canines, arranged in pairs, those in inner row long and depressible and those on outer row short and fixed; those on posterior half small and close-set. Row of small teeth on each side of tongue. Broad fleshy margins surrounded the tongue.

Gil rakers present on all four arches, each with 2 or 3 small teeth and a narrow base. Pharyngeal teeth slender, forming a long, oval patch, in four rows at middle. Fifth ceratobranchial with a single row of similar teeth.

Body naked entirely except for scales present along lateral line; lateral line terminating over posterior third of anal-fin base. Anterior lateral-line scales slightly longer than high, two pores on upper and lower margins; a median pore between two scales present usually.

No light organ around eye, nor was there a luminescent duct in the abdominal cavity.

Coloration. Body uniformly black; all fins darker; anterior portion of tongue with pale margins.

Size. The largest specimen examined was 305 mm SL.

Distribution. Originally described from Brazil and reported from Japan (Nakabo, 2002); collected by bottom trawl at depth more than 400 m around southwestern Taiwan.

Remarks. Post (1969) distinguished

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Dolichosudis from *Macroparalepis* and *Stemonosudis* in having uniformly black bodies and short lateral-line scales. However, the uniformly black body is also present among *Lestidiops mirabilis*, *Macroparalepis affinis*, and adult *Stemonosudis elongate* (Rofen, 1966, Post, 1973, Ho, personal observation), thus it may not be diagnostic at the generic level.Moreover, Post (1969) mentioned that the lateral-line scales are shorter in *Dolichosudis*, being longer in members of the *Stemonosudis*. However, we found the lengths of lateral-line scales of the *Stemonosudis* to be highly variable, and about as high as those of *S. rothschildi* to about twice the length of the other species. Except for the two, aforementioned characters, we could not identify other differences between *Dolichosudis* and *Stemonosudis*, though *D. fuliginosa* was clearly distinct from all species recognized in *Stemonosudis* currently. More investigations are certainly needed to better characterize and quantify these inter-generic differences.

***Stemonosudis* Harry, 1951**

Stemonosudis Harry, 1951:32 (type species: *Macroparalepis intermedius* Ege, 1933). Post, 1972: 157.

Stemonosudis* cf. *gracilis

Fig. 2; Table 1

Stemonosudis ?*gracilis*: Stewart 2015:593.

Specimens examined. NMMB-P9247 (1, 188), 18 Sep. 2008. NMMB-P23828 (1, 193), NMMB-P23829 (1, 205), NMMB-P23830 (1, 199), 4 Feb. 2016. NMMB-P25321 (1, 200), 26 May 2013. NMMB-P25571 (1, 208), 20 Jan. 2017. NMMB-P25574 (1, 197), 07 Sep. 2015. NMMB-P25848 (1, 203), 20 Feb. 2016. NMMB-P29953 (2, 166–187), 25 Jan. 2018. NMMB-P29954 (2, 208–209), 27 Mar. 2018. NMMB-P29955 (1, 199), 16 Jul. 2017. All collected from off Dong-gang fishing port, southwestern Taiwan, in the bycatch of mid-water or bottom trawls.

Diagnosis. A species of *Stemnosudis* with its dorsal surface densely covered with gray chromatophores and the rest of body mostly pale was described; chromatophores densely covering scales in the anterior third of the lateral-line, with gradually fewer chromatophores that were restricted to the upper half of the following scales, and absent in those in the posterior third of the lateral line; no dorsal and ventral saddles; 35–37 anal-fin rays; 44–45 prehaemal, 56–58 caudal, and 101–103 total vertebrae; and 10–11 peritoneal sections.

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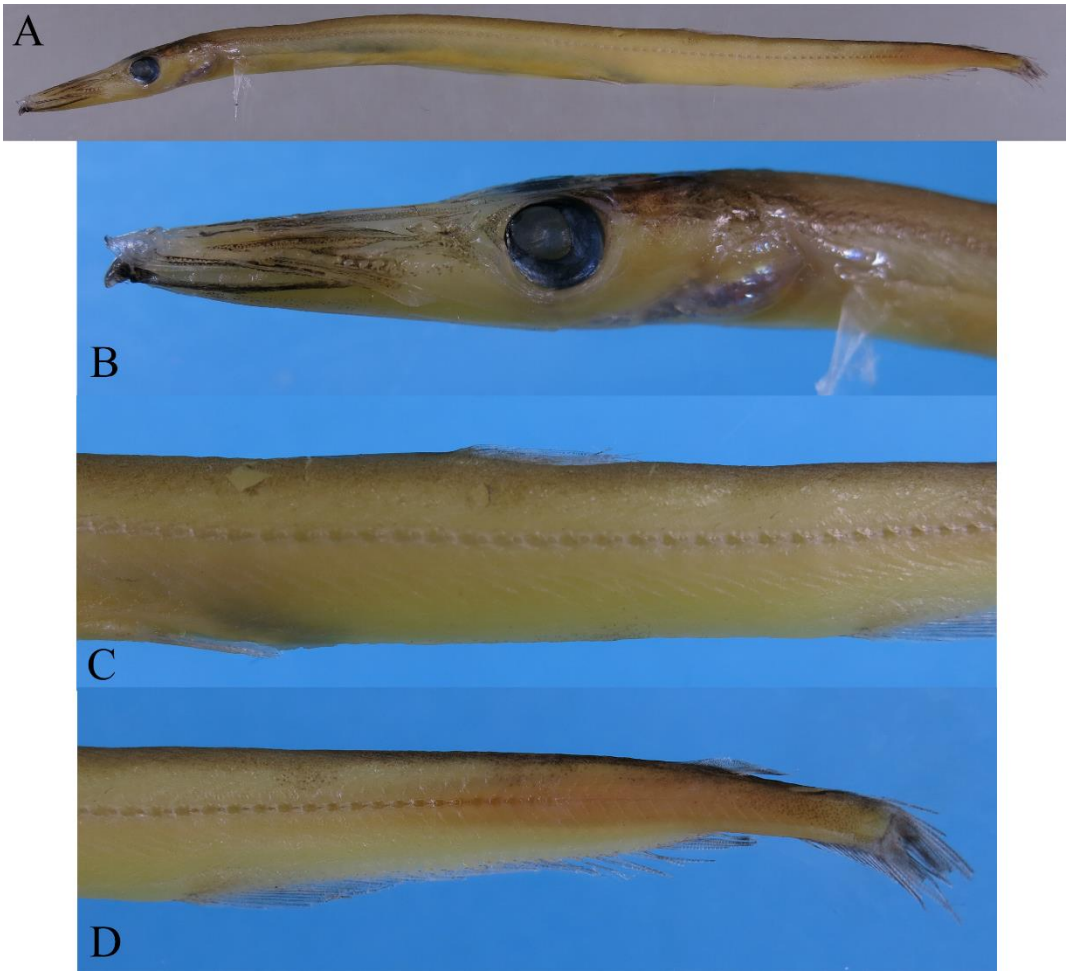

Fig 2. *Stemonosudis* cf. *gracilis*, NMMB-P29954, 1 of 2, 209 mm SL. A. Lateral view. B. Head. C. Trunk region between pelvic and anal fins. D. Tail region. Not to scale.

Description. Morphometric data are provided in Table 1. Dorsal-fin rays 10; pectoral-fin rays 12–13; pelvic-fin rays 9; anal-fin rays 35–37; Lateral-line scales: PVLL 41–44; PDLL 50–52; PALL 63–65, and 82–85 in total, including 7–8 scales in the rear portion. Vertebrae: prehaemal 44–45; caudal 57–56; prepelvic 41–42; predorsal 51–52; preanal 63–64; and total 101–103. Gill rakers: 14–15 on upper limb (epibranchial) and 37–40 on lower limb (22–24 on ceratobranchial+15–16 on hypobranchial); total gill rakers 51–55.

Body extremely slender, strongly compressed, deepest at middle portion of the fish, body depth 19–23 times in SL. Ventral surface with a fleshy ridge between pectoral and pelvic fins, bearing a very low adipose fin along its margin; ventral adipose fin well-developed

between anus and anal fins. Caudal peduncle thin, its length 5.6–10.6 in SL. Anus just behind tip of appressed pelvic fin and well in front of DFO. Pectoral fin moderately long, situated at lower half of body, the upper base slightly below a vertical through lower margin of eye; pelvic fin small, inner rays slightly shorter than outer rays, VFO well behind middle of the fish; dorsal fin small, with a short base, DFO distinctly behind the appressed pelvic fin and before midline of V–A. Anal fin with long base, AFO situated at posterior fourth of the fish; adipose fin small, above posterior end of anal-fin base.

Head slender, slightly wider than body width, its length 4.7–5.0 in SL. Snout elongate, distinctly longer than remainder of the head. Nostrils situated above posterior end of maxilla. Eye moderately large and round. Postorbital length slightly less than half HL. Interorbital narrow, slightly concave centrally, with three pairs of longitudinal ridges, the inner ridge extending forward on the snout; median ridge terminating at anterior margin of eye and branched posteriorly.

Maxilla terminating more than a half-eye diameter before a vertical through the anterior margin of the eye. Angle of gape at posterior end of maxilla. Front of premaxillary with 3–4 close-set, depressible canines, followed by a single row of small retrose teeth. Front of lower jaw with a pair of fixed teeth, followed by two rows of loosely arranged canines (those in the inner row slender and depressible and those on the outer row short and fixed). Vomer toothless. Palatine with two rows of canines, arranged in pairs, those on anterior half distinctly larger and widely-spaced, those on posterior half small, those in inner row long and depressible, and those on outer row short and fixed. Single row of small teeth on each side of tongue, which was surrounded by a broad, fleshy margin.

Gil rakers present on all four arches, each with 1–3 small teeth and a narrow base. Pharyngeal teeth slender, forming an oval patch. Single row of small teeth on fifth ceratobranchial. Body naked entirely except for scales along lateral line; lateral line terminating over middle of anal fin. Anterior lateral line scales about twice as long as high, each with two pores on the upper and lower margins. No light organ around eye, nor was there a luminescent duct in the abdominal cavity.

Coloration. Body pale grayish in general; dorsal fifth of body covered by grayish chromatophores and the rest of body mostly pale; scattered chromatophores below the lateral line and behind the pelvic fin. Dense chromatophores present on scales in anterior third of lateral line, then gradually fewer chromatophores and restricted to upper half of the scales, and

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finally absent in the posterior third of the lateral line. Chromatophores present on dorsal surface of head, snout, lips, and anterior tip of lower jaw. Ventral surface of lower jaw and all fins with scattered chromatophores, which were denser on adipose and caudal fins. Mouth cavity, gill chamber, and gill arches mostly colorless.

Distribution. Originally described from the Straits of Makassar, Indonesia; widely spread in the Indo-west Pacific and western central Atlantic Oceans (Ege, 1957).

Remarks. Our specimens had 35–37 anal-fin rays, 44–45 prehaemal vertebrae, 101–103 total vertebrae, 10–11 peritoneal sections and no blotch on body and are thus identified as *S. gracilis* according to the key provided by Rofen (1966).

However, there were several differences between our specimens and those provided by Ege (1957) and Rofen (1966, key). Ege (1957) described 14–15 (15 in the holotype) peritoneal sections for his specimens and Rofen (1966), who might have examined a larger number, stated 10–15, similar to the 10–11 we observed. Ege (1957) also noted 37–39 (n=55) anal-fin rays, whereas our specimens have 35–37 (n=10). Rofen (1966, in key) mentioned that there are consistently 3–4 blotches on the dorsal side and 2–4 on the ventral side behind the dorsal fin. Ege (1957) suggested that the juveniles have blackish blotches, though these may be lost during preservation. In the drawing of the holotype, such blotches are not featured. Some of our specimens possessed 2–3 indistinct saddles on the dorsal margin of the tail region (Fig. 2D).

Judging from the very broad range of vertebrae (98–106), as well as the geographic range, provided by Ege (1957), it is possible that more than one species may be present among his specimens. Nevertheless, our specimens do not feature blotches on their bodies, and they are similar to the holotype of *S. gracilis*. Adult specimens from the type locality may provide us with a better understanding of the morphological diversity of this species.

Steward (2015) recognized *S. gracilis* but with a question mark. He suggested that his specimens were also similar to *S. elegans* (with 98 total vertebrae). Ege (1957) did not specify the total number of vertebrae of holotype of *S. gracilis*, but mentioned 98–106 for his non-type specimens. Steward's specimens fall within this range and his specimens may represent the same species as ours based on the lack of blotches on the bodies.

***Stemonosudis miscella* (Ege, 1933)**

Fig. 3; Table 1

Macroparalepis miscellus Ege, 1933:233 (type locality: Near Sumatra,

Indonesia, 0°51.5'S, 99°24.5'E, Dana station 3821, depth about 100 m). Ege, 1957:27 (redescription based on 57 specimens).

Stemonsudis miscella (Ege, 1933): Rofen, 1966:419 (in Key). Post, 1972:154 (listed). Nakabo, 2000:370. Fukui and Ozawa, 2004:293 (listed).

Specimens examined. NMMB-P23820 (1, 179), NMMB-P23821 (1, 164), NMMB-P23822 (1, 150), 4 Feb. 2016. NMMB-P24625 (4, 133–149), NMMB-P24631 (1, 125), 27 Jun. 2016. NMMB-P25568 (1, 141), 11 Feb. 2015. NMMB-P25572 (1, 127), 20 Jan. 2017. NMMB-P25573 (2, 119–128), NMMB-P25569 (10, 92–182), 6 Jan. 2017. NMMB-P25847 (1, 149), 25 Jan. 2012. NMMB-P26458 (1, 152), 25 Jun. 2017. NMMB-P29946 (9, 134–179), NMMB-P29947 (10, 122–181), 27 Mar. 2018. NMMB-P29948 (1, 132), 21 Feb. 2017. NMMB-P29949 (1, 119), 25 Jan. 2018. NMMB-P29950 (1, 155), 16 Jul. 2017. All collected from off Dong-gang fishing port, southwestern Taiwan, in the bycatch of mid-water or bottom trawls.

Diagnosis. A species of *Stemnosudis* with dorsal fourth of body covered by grayish chromatophores, seven blotches on dorsum (three before dorsal fin) and twoventral blotches behind pelvic fin; scattered dark chromatophores along upper margin of lateral-line before dorsal fin; 35–37 anal-fin rays; 44–46 prehaemal, 55–58 caudal and 101–103 total vertebrae; 10–11 peritoneal sections.

Description. Dorsal-fin rays 10; pectoral-fin rays 12–14; pelvic-fin rays 9; anal-fin rays 35–37; Lateral-line scales: PVLL 41–43; PDLL 51–55; PALL 64–69, and 81–88 in total, including 6–9 small scales in the rear region. Vertebrae: prehaemal 44–46; caudal 55–58; prepelvic 41–43; predorsal 50–52; preanal 62–65; and total 101–103. Gill rakers: 10–12 on upper limb (epibranchial) and 31–34 on lower limb (21–24 on ceratobranchial+9–11 on hypobranchial); total gill rakers 41–46.

Body slender and strongly compressed, deepest at middle portion of the fish, body depth 19–23 times in SL. Ventral surface with a narrow, fleshy ridge between pectoral and pelvic fins, bearing a very low adipose fin along its margin; ventral adipose fin well-developed between pelvic and anal fins. Caudal peduncle thin, its length 6.9–9.1 in SL. Anus just behind tip of appressed pelvic fin and well before DFO.

Pectoral fin moderately long, situated at lower half of body, the upper base slightly below a vertical through lower margin of eye; pelvic fin small, inner rays slightly shorter than outer rays, VFO behind middle of the fish; dorsal fin with a short base, DFO distinctly behind the appressed pelvic fin and before the

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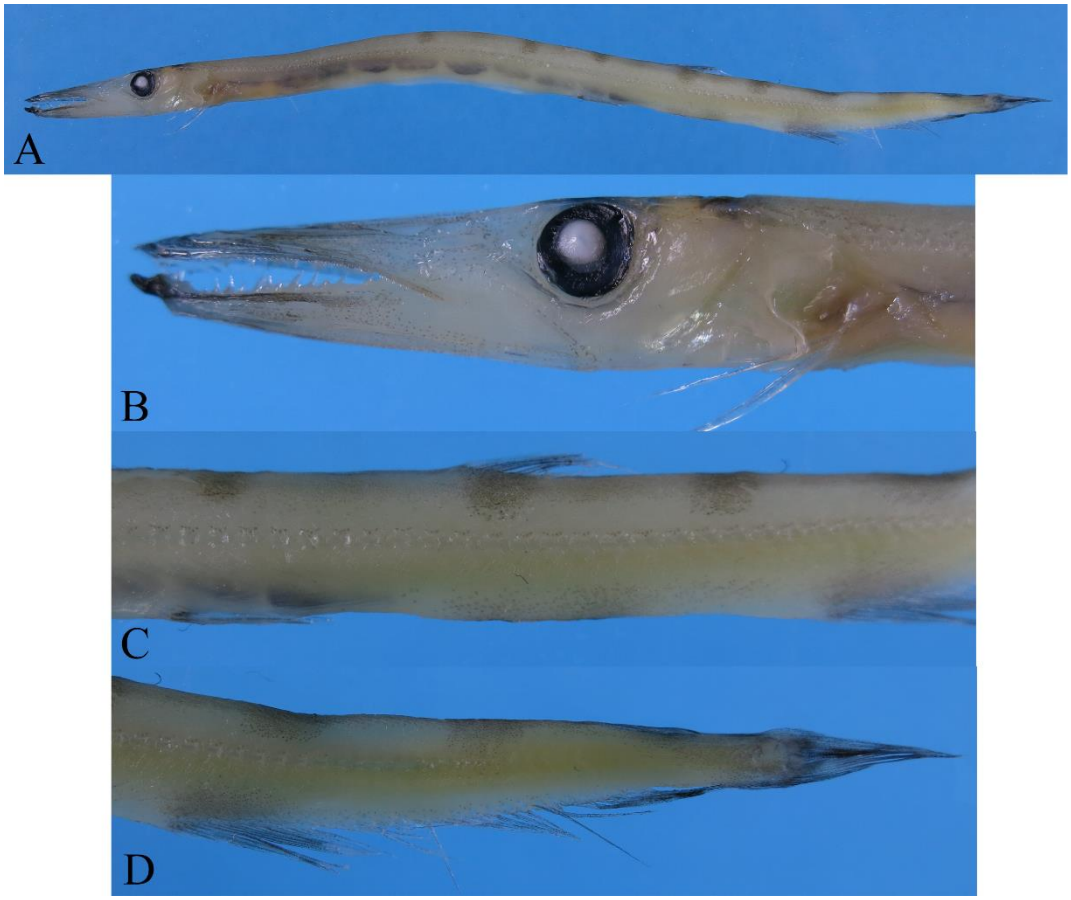

Fig 3. *Stemonsudis miscella* (Ege, 1933), NMMB-P29946, 1 of 9, 178 mm SL. A. Lateral view. B. Head. C. Trunk region between pelvic and anal fins. D. Tail region.

midpoint of V–A. Anal fin with long base, AFO situated at posterior fourth of the fish; dorsal adipose fin small, above posterior end of anal-fin base.

Head slender, slightly wider than body width, its length 4.8–5.2 SL. Snout long and pointed, distinctly longer than remainder of the head. Nostrils situated above posterior end of maxilla. Eyes moderately large and round. Postorbital length slightly less than half HL. Interorbital narrow, slightly concave centrally, with three pairs of longitudinal ridges, the inner ridge extending forward on snout; median ridge terminates at anterior margin of eye and branched posteriorly.

Maxilla terminating more than half eye diameter before a vertical through the anterior margin of the orbit. Posterior end of mouth gape at posterior end of maxilla. Front of premaxillary with four close-set,

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Tab 1. Morphometric data of *Dolichosudis fuliginosa* and *Stemonosudis* cf. *gracilis*. HL=Head length. SD=Standard deviation. SL=Standard length.

	D. fuliginosa		*S.* cf. *gracilis*	
SL (mm)	174–305 (n=7)		166–209 (n=7)	
%SL	Mean (Range)	SD	Mean (Range)	SD
HL	20.6 (20.0–21.0)	0.4	20.7 (20.1–21.2)	0.4
Body depth	5.0 (4.5–5.4)	0.4	4.6 (4.4–5.2)	0.3
Predorsal length	64.8 (64.1–65.7)	0.7	65.5 (64.9–67.6)	0.9
Prepelvic length	54.8 (53.8–56.0)	0.7	56.9 (56.0–57.9)	0.6
Preanal length	75.9 (75.3–77.1)	0.4	77.8 (75.8–79.4)	1.1
V–D	10.1 (9.6–10.4)	0.3	8.7 (8.0–9.8)	0.7
V–A	21.2 (20.6–21.6)	0.5	20.9 (19.3–21.6)	0.9
Head depth	4.5 (4.4–4.7)	0	4.7 (4.5–5.0)	0.2
Snout length	11.5 (11.3–11.9)	0.3	11.6 (11.1–12.2)	0.4
Eye diameter	2.5 (2.2–2.9)	0.1	2.9 (2.8–3.1)	0.1
Interorbital width	1.8 (1.7–2.0)	0.1	1.5 (1.4–1.8)	0.1
Upper jaw	9.2 (8.9–9.3)	0.1	9.4 (8.9–9.7)	0.3
Lower jaw	13.1 (12.7–13.4)	0.3	13.5 (13.0–13.8)	0.3
Pectoral fin	7.0 (4.6–8.3)	1.4	6.7 (5.2–7.8)	1.1
V–D in %V–A	47.5 (44.5–49.8)	2.1	42.5 (39.8–45.5)	2.5
%HL				
Head depth	21.9 (21.5–22.6)	0.5	22.5 (21.9–24.3)	0.8
Snout length	56.0 (54.8–57.1)	1	56.0 (54.6–59.1)	1.5
Eye diameter	11.9 (10.7–13.7)	1	14.2 (13.5–14.9)	0.5
Interorbital width	8.9 (8.2–9.8)	0.6	7.3 (6.8–8.6)	0.6
Upper jaw	44.4 (42.9–45.4)	0.9	45.6 (43.7–47.9)	1.7
Lower jaw	63.7 (62.4–64.4)	0.8	65.1 (63.8–66.2)	0.9

depressible canines, followed by a single row of small retrose teeth. Front of lower jaw with a pair of fixed teeth, followed by two rows of loosely arranged canines, those in inner row slender and depressible and those on outer row short and fixed. Vomer toothless.Palatine with two rows of canines, widely-spaced, arranged in pairs, those on posterior half of jaw small, those in inner row long and depressible, and

those on outer row short and fixed. Single row of small teeth on each side of tongue, which was surrounded by a broad, fleshy margin.

Gil rakers present on all four arches, each with 1–3 small teeth and a narrow base. Pharyngeal teeth slender, forming an oval patch. Single row of small teeth on fifth ceratobranchial. Body naked entirely except for scales along the lateral line; lateral line terminating over middle of anal fin. Anterior lateral-line scales twice as long as high, gradually smaller; each scale with two pores on each upper and lower margin, usually with a median pore between two scales. No light organ around eyes or luminescent ducts in abdominal cavities.

Coloration. Body light grayish in general; dorsal half of body densely covered by light, powder-like chromatophores and the rest of body mostly pale; seven saddles on dorsum, consisting of darker chromatophores, three before dorsal fin, one at base of dorsal fin, and three between dorsal and adipose fins. Two ventral saddles on ventral margin, the first slightly behind the middle of the V–A and the second at the anterior region of the anal fin base. Scattered dark chromatophores along upper margin of lateral-line scales before dorsal fin, absent beyond the point. Chromatophores present on dorsal surface of head, snout, lip, and anterior tip of lower jaw. Ventral surface of lower jaw and all fins covered with scattered chromatophores. Mouth cavity, gill chamber, and gill rakers uniformly pale. Peritoneal membranes divided into 10 or 11 sections.

Distribution. Original described from Indonesia; recorded in the Indo-west Pacific Ocean (Ege, 1957).

Remarks. Ege (1933) described the species *Macroparalepis miscellus* based on a single postlarva (56 mm TL, 54.5 mm SL) collected from near Sumatra, Indonesia. Ege (1957) examined 57 specimens, all smaller than 40 mm SL, except for the holotype. Ege (1957) provided the total number of vertebrae as 98–101 (n=7), of which 42 were prehaemal in two specimens.

Rofen (1966:419) assigned the species to the genus *Stemonosudis* and provided a key for all known species at that time. In the key, he separated *S. miscella* from the highly similar species *S. elegans* in having 9–11 peritoneal sections (vs. 3–7 in the latter), pre-dorsal length 66.1% SL (vs. 62.1%), and preanal length 79.8% SL (vs. 74.5%). Accordingly, our specimens agree well with the diagnostic characters of *S. miscella*. Ege (1957) recorded specimens collected from off Taiwan at two stations (with an unknown number of specimens), which represented the first record in Taiwan. This is the first record of

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adults of this species in Taiwan.

***Stemonosudis rothschildi* Richards, 1967**
Rothschild's barracudina
Fig. 4; Table 2

Stemonosudis rothschildi Richards, 1967:35, (type locality: Central Pacific, 22°47'N, 150°09'W, from stomach content of *Alepesaurus richardsonii*). Post, 1971:738 (validity; additional specimens). Post, 1972: (type catalog). Nakabo, 2000:370. Fukui and Ozawa, 2004:293 (listed).

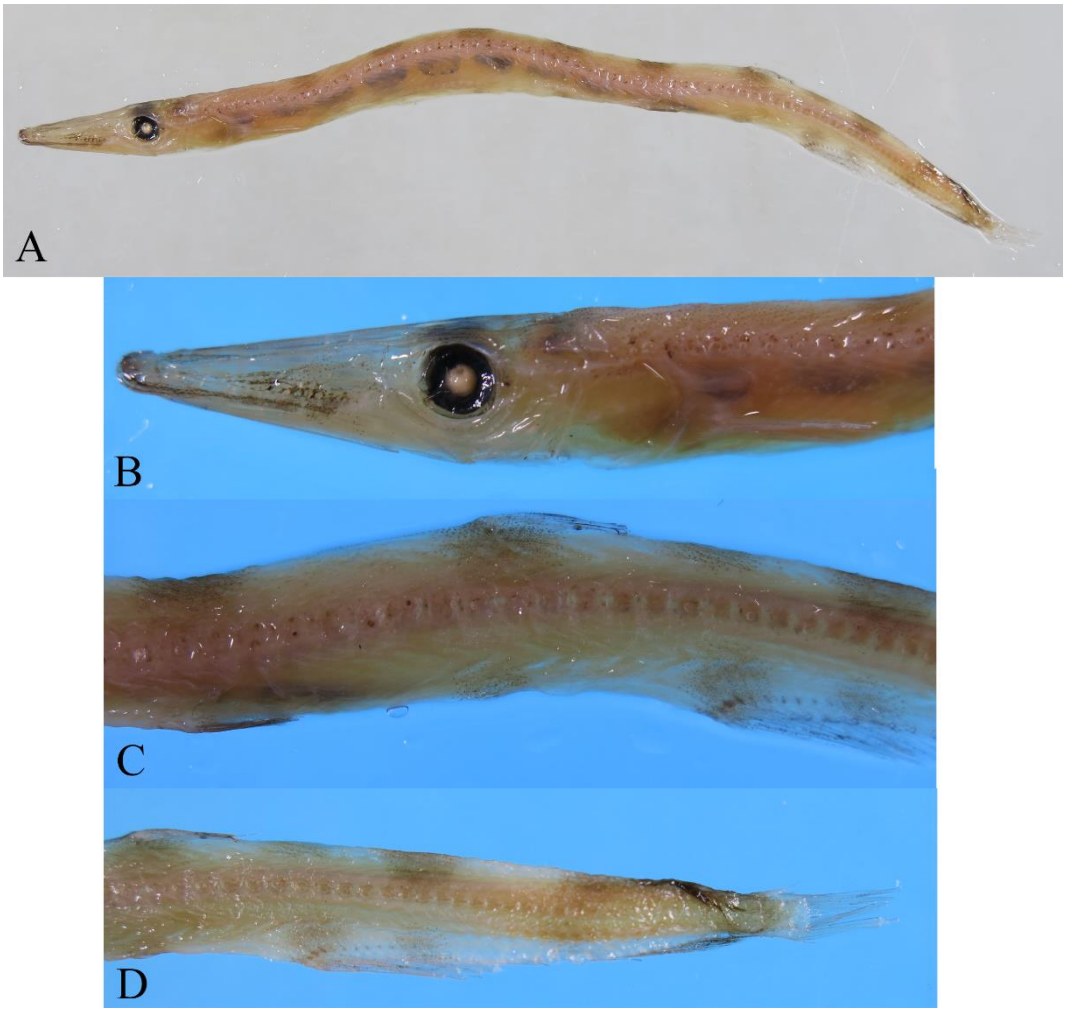

Fig 4. *Stemonosudis rothschildi* Richards, 1967, NMMB-P21780, 147 mm SL. A. Lateral view. B. Head. C. Trunk region between pelvic and anal fins. D. Tail region.

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Specimen examined. NMMB-P21780 (1, 147), Donggang, Pingtung, southwestern Taiwan, 11 Apr. 2014.

Diagnosis. A species of *Stemonosudis* with 10 blotches on dorsum, five before dorsal fin, seven on the ventral side, and three before pelvic fin; dorsal fin origin behind area between origins of pelvic and anal fins; 33 anal-fin rays; 39 prehaemal vertebrae, 46 caudal vertebrae, and 85 total vertebrae; 76 total lateral-line scales.

Description. Dorsal-fin rays 9; pectoral-fin rays 12–13; pelvic-fin rays 9; anal-fin rays 33. Lateral-line scales: PVLL 38; PDLL 46; PALL 53, and 76 in total, including two small scales in the rear region. Vertebrae: prehaemal 39; caudal 46; prepelvic 38; predorsal 46; preanal 53; and total 85. Gill rakers: 7 on upper limb (epibranchial) and 26 on lower limb (17 on ceratobranchial+9 on hypobranchial).

Body slender and strongly compressed, deepest at middle portion of the fish, body depth 18 in SL. Ventral surface with a fleshy ridge between pectoral and pelvic fins, bearing a very low adipose fin along its margin; ventral adipose fin well-developed between anus and anal fin origin. Caudal peduncle thin (length 7.4 in HL). Anus just behind tip of appressed pelvic fin and well before DFO.

Pectoral fin moderately long, situated at lower half of body, the upper base slightly below a vertical through lower margin or eye; pelvic fin small, inner rays slightly shorter than outer rays, VFO behind middle of the fish; dorsal fin with a short base, DFO distinctly behind the appressed pelvic fin and behind midline of space between origins of pelvic and anal fins. Anal fin with long base, AFO situated at posterior fourth of the fish; adipose fin small, above posterior end of anal-fin base.

Head slender, slightly wider than body width, its length 4.7 SL. Snout moderately long, longer than remainder of the head. Nostrils situated slightly before a vertical through posterior end of maxilla. Eyes moderately large and round. Postorbital length slightly less than half HL. Interorbital narrow, slightly concave centrally, with three pairs of longitudinal ridges (the inner ridge extending forward on snout); median ridge terminated at anterior margin of eye and branched posteriorly.

Maxilla terminating at about half eye diameter before a vertical through anterior margin of the eye. Angle of gape at posterior end of maxilla. Front of premaxillary with 3 or 4 close-set, depressible canines, followed by a single row of small retrose teeth. Front of lower jaw with a pair of fixed teeth, followed by two rows of loosely arranged canines, those in inner row slender and depressible and those on outer row short and fixed. Vomer toothless. Palatine with two rows of

canines, widely spaced, arranged in pairs, those on posterior half small, those in inner row long and depressible and those on outer row short and fixed. Single row of small teeth on each side of tongue, which was surrounded by a broad, fleshy margin.

Gil rakers present on all four arches, each with 1–3 small teeth and a short base. Pharyngeal teeth slender, forming an oval patch. Single row of small teeth on fifth ceratobranchial. Body entirely naked except for scales along lateral line; lateral line terminating over middle of anal fin; anterior lateral-line scales as long as height, each with two pores on upper and lower margins.

Coloration. Body light grayish in general; dorsal half of body covered by powder-like chromatophores and ventral half of body mostly pale. Darker chromatophores forming 10 saddles on dorsum; 5 before dorsal fin, 1 at base of dorsal fin, and 4 between dorsal and caudal fins. Seven ventral saddles, three before pelvic fin, one at base of pelvic fin, one slightly behind the area between the pelvic and anal fins, the other two at the posterior region of anal-fin base. Scattered chromatophores present along lateral line and fin bases. Chromatophores present on dorsal surface of head, snout, lip, and anterior tip of lower jaw. Ventral surface of lower jaw with scattered chromatophores. Dorsal and pelvic fins covered by scattered pigments. Anal, adipose, and caudal fins blackish. Mouth cavity, gill chamber, and gill arches colorless. Nine peritoneal sections inside dorsal portion of abdomen cavity.

Distribution. Widespread in the Pacific and Atlantic oceans, but highly variable abundance therein. First record from Taiwan.

Remarks. Several differences were noted between our specimen and previously described ones. Our specimen has slightly anterior dorsal-fin origin, predorsal length 72.3% SL (vs. 74.0–74.5% SL in those of Post, 1971) and distance between V–D 9.5% (vs. 12.7–14.7%); our specimen has smaller V–A, the distance 15.3% SL (vs. 19.0–20.7%). Our specimen has 39 prehaemal vertebrae and 85 total vertebrae (vs. 41–43 and 86–89, respectively, n=5) and was slightly larger than the two types (108.3 and 109.5 mm SL). It is likely that the Pacific population has different body proportions and vertebral formula than fish of the Atlantic population.

***Stemonosudis siliquiventer* Post, 1970**

Silver-belly barracuda

Fig. 5; Table 2

Stemonosudis siliquiventer Post, 1970:205, (type locality: Atlantic, 3°00'S, 26°16'W, depth 2000 meters). Post, 1972:158 (listed). Fukui and Ozawa, 2004:293 (listed).

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Fig 5. *Stemonosudis siliquiventer* Post, 1970, NMMB-P29952, 226 mm SL. A. Lateral view. B. Head. C. Trunk region between pelvic and anal fins. D. Tail region.

Specimens examined. NMMB-P2762 (1, 223), 20 Jul. 2001. NMMB-P12015 (3, 189–218), 18 Feb. 2011. NMMB-P23990 (5, 185–214), 21 Sep. 2015. NMMB-P24398 (1, 217), 24 Aug. 2016. NMMB-P25420 (1, 210), 28 Sep. 2013. NMMB-P25566 (4, 139–217), 4 Feb. 2016. NMMB-P25567 (5, 184–236), 13 Feb. 2015. NMMB-P25570 (2, 185–207), 8 Jan. 2017. NMMB-P26457 (3, 191–212), 25 Jan. 2017. NMMB-P29951 (1, 201), 12 May 2018. NMMB-P29952 (1, 226), 25 Jan. 2018. All collected from off Dong-gang fishing port, southwestern Taiwan, in the bycatch of mid-water or bottom trawls.

Description. Dorsal-fin rays 10–11; pectoral-fin rays 12–13 (mainly 13); pelvic-fin rays 9; anal-fin rays 35–36. Lateral-line scales: PVLL 42–43; PDLL 51–53; PALL 64–66; 82–85 in total, including 6–7 small scales in rear portion. Vertebrae: prehaemal 44–46; caudal 56–57; prepelvic 40–42; predorsal 50–51; preanal 63–64; and total 101–102. Gill rakers: 12–14 on upper limb (epibranchial) and 40–42

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Tab 2. Morphometric data of *Stemonosudis rothschildi*, *Stemonosudis molesta*, and *S. siliquiventer*. HL=head length. SD=standard deviation. SL=standard length.

	S. rothschildi	*S. miscella*		*S. siliquiventer*	
Standard length (mm)	137 (n=1)	119–181 (n=23)		139–235 (n=11)	
%SL		Mean (Range)	SD	Mean (Range)	SD
HL	21.1	20.3 (19.3–21)	0.5	20.4 (19.5–21.0)	0.4
Body depth	5.6	4.2 (3.6–5.0)	0.4	4.4 (3.5–5.0)	0.4
Predorsal length	72.3	65.4 (64.1–66.6)	0.7	65.6 (64.7–66.5)	0.6
Prepelvic length	62.8	56.4 (55.2–57.4)	0.7	56.6 (55.6–57.3)	0.6
Preanal length	78.1	77.6 (76.2–79.1)	0.7	77.8 (76.9–78.9)	0.5
V–D	9.5	9.0 (8.0–10.3)	0.6	9.0 (8.1–10.0)	0.6
V–A	15.3	21.2 (20.1–22.4)	0.6	21.2 (20.2–21.8)	0.5
Head depth	4.9	4.6 (4.3–4.9)	0.2	4.5 (4.4–5.0)	0.2
Snout length	11.5	11.3 (10.8–12)	0.3	11.1 (10.7–11.6)	0.3
Eye diameter	2.9	3.0 (2.4–3.3)	0.2	2.9 (2.5–3.4)	0.2
Interorbital width	2.2	1.6 (1.4–1.8)	0.1	1.5 (1.4–1.6)	0.1
Upper jaw	9.9	9.4 (8.7–9.9)	0.3	9.4 (9.1–9.8)	0.2
Lower jaw	13.8	13.1 (12.6–13.7)	0.3	13.3 (12.9–13.8)	0.3
Pectoral fin	10.5	8.9 (8.3–9.7)	0.6	6.4 (5.6–7.7)	0.9
V–D in %V–A	61.9	43.5 (40.2–46.2)	1.8	42.0 (40.0–44.0)	1.3
%HL					
Head depth	23.2	22.4 (21.6–23.5)	0.6	22.3 (21.6–24.9)	1
Snout length	54.3	55.5 (54.3–57.3)	0.8	54.5 (53.6–55.4)	0.6
Eye diameter	13.5	14.5 (12.6–16.4)	0.9	14.4 (12.6–16.9)	1.2
Interorbital width	10.4	7.6 (6.8–8.9)	0.6	7.3 (6.9–8.0)	0.3
Upper jaw	47.1	46.2 (43.2–47.3)	1	46.1 (45.0–48.0)	0.9
Lower jaw	65.5	64.7 (63.6–67.5)	1	65.4 (64.1–66.4)	0.6

on lower limb (24–25 on ceratobranchial+16–17 on hypobranchial); total gill rakers 52–56.

Body slender and strongly compressed, deepest at middle portion of the fish, body depth 20–28 times less than SL. Ventral surface with a narrow, fleshy ridge between origins of pectoral and pelvic fins, bearing a low, ventral adipose fin along its margin; ventral adipose fin

well-developed between anus and anal-fin origin. Caudal peduncle thin, its length 8–10 in HL. Anus just behind tip of appressed pelvic fin.

Pectoral fin moderately long, situated at lower half of body, the upper base slightly below a vertical through lower margin of eye; pelvic fin small, inner rays slightly shorter than outer rays, fin inserts behind middle of the fish; dorsal fin with a short base, its origin distinctly behind the appressed pelvic fin and before the midline of the distance between the origins of pelvic and anal fins. Anal fin with long base, situated at posterior fourth of the fish; adipose fin small, above posterior end of anal-fin base.

Head slender, slightly wider than body width, its length 4.8–5.1 SL. Snout elongate, distinctly longer than remainder of the head. Nostrils situated above posterior end of maxilla. Eyes moderately large and round. Postorbital length slightly less than half HL. Interorbital narrow, slightly concave centrally, with three pairs of longitudinal ridges, the inner one extending forward on snout; median pair terminated at anterior margin of eye and branched posteriorly.

Maxilla terminating more than half eye diameter before a vertical from the anterior margin of the orbit. Angle of mouth gape at posterior end of maxilla. Front of premaxillary with 3–4 close-set, depressible canines, followed by a single row of small retrose teeth. Front of lower jaw with a pair of fixed teeth, followed by two rows of loosely arranged canines (those in inner row slender and depressible and those on outer row short and fixed). Vomer toothless. Palatine with two rows of canines, widely-spaced, arranged in pairs, those on posterior portion small, those in inner row long and depressible, and those on outer row short and fixed. Single row of small teeth on each side of tongue, which was surrounded by a broad, fleshy margin.

Gil rakers present on all four arches; each raker with 1–3 small teeth and a narrow base. Pharyngeal teeth slender, forming an oval patch. Single row of small teeth on fifth ceratobranchial. Body naked except for scales present on lateral line; lateral line terminating over middle of anal-fin base. Anterior lateral-line scales about twice as long as high, each two on upper and lower margins; usually a median pore between two scales.

Coloration. Body dark grayish in general; dorsal half of body densely covered by dark chromatophores and ventral half of body silvery white before pelvic fin (pale behind the fin); dense chromatophores along ventral margin. Scattered chromatophores below the lateral line originating from the pelvic fin to the posterior region of the body. Peritoneal sections present deeply at the ventral body

wall. Scattered chromatophores present along margin of lateral line. Chromatophores present on dorsal surface of head, snout, lips, and anterior tip of lower jaw. Sparse chromatophores present along eye orbit. Scattered chromatophores in postorbital region and along opening of operculum. Ventral surface of lower jaw with scattered chromatophores. Dorsal fin lightly covered with pigments; pelvic fin and its base with scattered pigments. Anal fin densely covered with chromatophores on anterior and posterior portions, especially at the bases; scattered chromatophores on the remaining areas. Adipose fin, caudal peduncle, and caudal fin blackish. Mouth cavity, gill chamber, and gill arches uniformly pale.

Distribution. Previously only known from the type series collected from the central Atlantic Ocean (3°00'S, 26°16'W). Our specimens represent new record from not only Taiwan, but also the westerm Pacific Ocean.

Remarks. One of the key characters for identifying *S. siliquiventer* is the high number of peritoneal membrane sections (up to 24). However, all specimens possessed fused peritoneal membranes, or their abdominal cavities were damaged to where membrane sections could not be counted.

Many adult paralepidids have fused peritoneal membranes. According to our examination, there are several species in *Stemonosudis* genus with almost identical body proportions and vertebral formula, and *S. siliquiventer* is one of them. More investigations, or even genetic studies, may help to resolve (or synonymize) some of these species.

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