

A New Lizardfish (Aulopiformes: Synodontidae) from Taiwan with Descriptions of Three New Records

Jeng-Ping Chen^{1,2}, Hsuan-Ching Ho^{3,4}, and Kwang-Tsao Shao^{4,*}

¹National Museum of Marine Biology and Aquarium, Pingtung 944, Taiwan

²Institute of Marine Biodiversity and Evolution, National Dong Hwa University, Taichung 974, Taiwan

³Institute of Marine Biology, National Taiwan Ocean University, Keelung 202, Taiwan

⁴Research Center for Biodiversity, Academia Sinica, Nankang 115, Taiwan

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Jeng-Ping Chen, Hsuan-Ching Ho, and Kwang-Tsao Shao (2007) A new lizardfish (Aulopiformes: Synodontidae) from Taiwan with descriptions of three new records. *Zoological Studies* 46(2): 148-154. In total, 13 species of the genus *Synodus* of the family Synodontidae are recorded from Taiwan. Of these species, *Synodus taiwanensis* sp. nov. is described as new based on 3 specimens; and, *S. capricornis*, *S. lobeli*, and *S. tectus* are new recorded from Taiwan. The new species, *Synodus taiwanensis* sp. nov., differs from other congeneric species by having a prominent black pigment spot on the upper edge of operculum. It can be further distinguished by the following characteristics: opercular black spot undivided; pectoral fin not extend beyond a line from base of pelvic fin to origin of dorsal fin; snout relatively short; slightly fewer peritoneal spots than similar species. As for the 3 new records, *S. capricornis* was previously recorded from the southeastern Pacific; *S. lobeli* was recorded from Hawaii and Japan; and *S. tectus* was recorded from the South China Sea to the Great Barrier Reef. The known ranges of these species are now extended to Taiwan. A key to all known species of *Synodus* from Taiwan is provided. <http://zoolstud.sinica.edu.tw/Journals/46.2/148.pdf>

Key words: Taxonomy, Synodontidae, New species, Taiwan, West Pacific.

The Indo-Pacific species of the lizardfish genus, *Synodus*, were reviewed by Cressey (1981), and Waples and Randall (1988) reviewed the species from the Hawaiian Is. In total, 36 valid species are recognized worldwide (Eschmeyer 1998). In Taiwan, Chen (1969) first recorded the 3 species, *Synodus variegatus*, *S. fuscus*, and *S. macrops*, among which *S. variegatus* was probably misidentification of *S. dermatogenys*, formerly known as *S. variegatus*. In a later revision, Cressey (1981) included 3 more species from Taiwan: *S. binotatus*, *S. jaculum*, and *S. rubromarmoratus*.

Shen (1984a) subsequently provided photographs of the 3 latter species mentioned above. Based on the photo, *S. jaculum* was actually *S. dermatogenys*, while his *S. variegatus* was actually *S. ulae*. Shen (1984b) included 7 species of this

genus from Taiwan. However, his additional record of *S. englemani* was treated as a junior synonym of *S. variegates* by subsequent authors (Randall et al. 1990, Randall and Lim 2000). Chen and Yu (1986) added an additional species, *S. dermatogenys*, as a synonym of *S. variegates*, since *S. dermatogenys* was not resurrected until 1988 by Waples and Randall (1988). However, Shen et al. (1993) only recorded 3 of the above species with an additional species, *S. ulae* because the lacking of voucher specimens of those species previously recorded. Chen (1993) recognized 4 species collected from Penghu (the Pescadores), west of Taiwan in the central Taiwan Strait. Yu (1996) listed 10 species for Taiwan, which included 1 new record, *S. doaki*, but he provided no specimen data or citations for his list.

In this paper we describe a new species and

*To whom correspondence and reprint requests should be addressed. Tel: 886-2-27899545. Fax: 886-2-27883463. E-mail: zoskt@gate.sinica.edu.tw

3 new records collected from southern Taiwan. A key to all known species of *Synodus* from Taiwan is provided as well.

MATERIALS AND METHODS

Standard length (SL) and head length (HL) are used throughout. Counts and measurements for *Synodus* generally follow Hubbs and Lagler (1958), with the exception of gill raker counts, snout length, orbital diameter, and least interorbital distance, which follow Waples and Randall (1988). Vertebral counts were made from radiographs and include the hypural. The count of lateral-line scales did not include the small pored scales on the caudal-fin base. All specimens examined in this study are deposited at the Research Center for Biodiversity, Academia Sinica, Taipei, Taiwan (ASIZP) and the National Museum and Marine Biology Aquarium, Pintung, Taiwan (NMMBP).

Synodus Scopoli, 1777

Synodus Scopoli, 1777: 449 (type species by absolute tautonymy, *Esox synodus* L.).

Synodus differs from the other genera of the family Synodontidae in Taiwan by having the entire lateral line scaled (restricted to the posterior 1/2 in *Harpadon*); 8 pelvic fin rays (9 in *Saurida*), inner and outer rays shorter than the middle rays (equal in length in *Saurida*); anal fin rays 8-11 (13-18 in *Trachinocephalus*); a single row of widely spaced teeth on upper jaw, visible when the mouth is closed; absent from vomer; no scales on caudal fin rays; and 3-4 rows of sharp palatine teeth forming a single band (2 bands in *Harpadon*).

Key to species of the genus *Synodus* in Taiwan

- 1a. Anterior palatine teeth longer than posterior ones and in a discrete group.....2
- 1b. Anterior palatine teeth not longer than posterior ones and not in a discrete group.....10
- 2a. Scale rows above lateral line 3.5.....3
- 2b. Scale rows above lateral line 5.5.....7
- 3a. A prominent black spot at upper edge of operculum.....4
- 3b. No black spot at upper edge of operculum.....5
- 4a. Pectoral fin short, not reaching a line from origin of pelvic fin to origin of dorsal fin; a single undivided black opercular spot.....*S. taiwanensis* sp. nov.
- 4b. Pectoral fin reaching a line from origin of pelvic to origin of dorsal fin; opercular spot divided dorsally into 4 separate finger-like branches.....*S. tectus*
- 5a. Pectoral fin extending well beyond a line from origin of pelvic fin to origin of dorsal fin; 2 prominent dark spots on

- tip of snout; with 0-3 peritoneal spots.....*S. binotatus*
- 5b. Pectoral fin not extending beyond a line from origin of pelvic fin to origin of dorsal fin; no dark spots on snout; more than 6 peritoneal spots.....6
- 6a. Dorsal fin rays 10-12; pored lateral line scales 53-55; pectoral fin not reaching a line from origin of pelvic fin to origin of dorsal fin; about 30 teeth on free end of tongue.....*S. fuscus*
- 6b. Dorsal fin rays 13-15; pored lateral line scales 55-58; pectoral fin reaching a line from origin of pelvic fin to origin of dorsal fin; about 50 teeth on free end of tongue.....*S. doaki*
- 7a. Caudal peduncle and caudal fin base with a large black lateral spot; nasal flap very short.....*S. jaculum*
- 7b. Caudal peduncle and caudal fin base without a large black lateral spot; nasal flap long and tapering.....8
- 8a. Pored lateral line scales 61-63; nasal flap slender; 7-10 peritoneal spots.....*S. variegatus*
- 8b. Pored lateral line scales more than 63; nasal flap broad; 11-12 peritoneal spots.....9
- 9a. Nasal flap long and broad; peritoneum pale.....*S. ulae*
- 9b. Nasal flap short and triangular; peritoneum light brown.....*S. capricornis*
- 10a. Peritoneum dark brown to black; with 5-6 peritoneal spots; posterior pelvic process narrow.....*S. macrops*
- 10b. Peritoneum pale; more than 6 peritoneal spots; posterior pelvic process broad.....11
- 11a. Four scale rows between lateral line and anal fin; nasal flap slender and moderately long; pale with small fin; dark spots forming longitudinal line on upper 1/2 of body.....*S. lobeli*
- 11b. Five to 6 scale rows between lateral line and anal fin; nasal flap slender and long; lateral of trunk with 8 pigmented patches.....12
- 12a. Pored lateral line scales 54-55; scale rows above lateral line 3.5; pectoral fin not reaching a line from origin of pelvic fin to origin of dorsal fin; peritoneal spots 12-13; vertebrae 52-55.....*S. rubromarmoratus*
- 12b. Lateral line pored scales 59-62; scale rows above lateral line 5.5; pectoral fin reaching a line from origin of pelvic fin to origin of dorsal fin; peritoneal spots 10-12; vertebrae 57-60.....*S. dermatogenys*

Synodus taiwanensis sp. nov.

(Figs. 1, 2; Table 1)

Materials: *Holotype*: ASIZP 0064389, 185 mm SL, female, SW Taiwan off Hobihu, ca. 80 m, 14 Apr. 2004. *Paratype*: NMMBP 7890, 186 mm SL, female, SW Taiwan off Hobihu, ca. 80 m, 15 Aug. 2002. ASIZP 0064390, 195 mm, female, SW Taiwan off Hobihu, ca. 80 m, 11 Oct. 2004.

Diagnosis: *Synodus taiwanensis* differs from other Taiwanese species by having a large black spot on the edge of operculum. It further differs from other members in the genus by the following combination of characteristics: opercular black spot undivided; 8-10 peritoneal spots; pectoral fin not reaching a line from base of pelvic fin to origin of dorsal fin; posterior pelvic process wide; dorsal-fin rays 13; pectoral-fin rays 12-13; anal-fin rays 9;

pored lateral-line scales 55-56; rows of scales between lateral line and dorsal fin 3.5; anterior palatine teeth longer than posterior teeth; outer row of teeth posteriorly angled outwardly; nasal flap short and rounded; gill rakers 23-24; snout relatively short (6.2%-6.5% SL); eye small, orbital diameter 4.9%-5.4% SL; interorbital relatively narrow (2.7%-3.2% SL).

Description: Measurements and counts are given in table 1. Body slender; large cycloid scales on body, operculum, and preoperculum, those on anterior of operculum a vertical row, those on preoperculum with 5 diagonal scale rows; head somewhat depressed; snout relatively short, sharply pointed in dorsal view, broader than long; nostrils in lateral view on a line between upper edge of pupil and tip of snout, posterior nostril in front of orbit by about 1/3 of orbit diameter; a short, rounded dermal flap posteriorly on anterior nostril, just reaching rear edge of posterior nostril when fully laid back; interorbital space concave and narrow; eyes relatively small; mouth terminal and slightly oblique; jaws extending posteriorly beyond eyes; origin of dorsal fin in front of mid-body; adipose fin above 5th anal fin ray; pectoral fin rays short, not reaching a line from base of pelvic fin to origin of dorsal fin; pelvic fin in front of dorsal fin origin; origin of anal fin anterior to a vertical with adipose fin; posterior bony pelvic process broad; caudal peduncle narrow and somewhat compressed.

Upper jaw with 2 closely set rows of needle-sharp teeth that angle inwardly, inner row much longer than outer one, outer row fixed; lower jaw with 3-4 closely set rows of needle-sharp teeth, most-anterior row longest and most-posterior one angling forward; dorsal surface of tongue with 4-5 rows of sharp slender teeth angled to rear, outer rows slightly longer than inner ones, about 32 teeth; palatines with 3 rows of sharp slender teeth, anterior teeth longer than posterior ones, innermost row of palatine teeth longest, inner 2 rows angled to rear and inwardly, whereas posterior region of outer row clearly angled to rear and outwardly.

Gill rakers 22 (8+14) in holotype, ASIZP 0064389; 25 (9+16 and 10+15) in 2 paratypes, NMMBP 7890 and ASIZP 0064390. Peritoneal spots 10 in holotype; 8-9 in paratype NMMBP 7890 and 8 in ASIZP 0064390.

Color in life: Orange to reddish on head and upper region of body, white interspersed with yellowish below; pupil black surrounded by bright red; a prominent pigment mark on upper edge of oper-

culum; all branches somewhat fused together on upper margin; all fins translucent; upper part of pectoral fin light yellow, posterior margin bearing small bright-yellow spots; a series of about 3 to 4 horizontal bars on anterior region of dorsal fin, pelvic fin, and anal fin rays; a series of 6 vertical, alternating orange and white bands on lower fork of caudal fin. A series of 8 or 9 reddish-brown saddle-like blotches on dorsal margin of body extending laterally, alternating light and dark, 2 before dorsal fin, 2 at dorsal fin base, 2 between end of dorsal and adipose fin, 2 behind adipose fin, and 1 at upper margin of caudal fin base; a series of small brown bars on lateral line; a series of 8 irregular orange to reddish blotches along lateral line which alternate with dorsal blotches, some light-yellow bars present in middle of blotches.

Color in preservative: Head and upper 1/2 of body white to gray, lower 1/2 white; pupil transparent, surrounded by dark pigment; a prominent black spot at upper edge of operculum; 8 grayish brown blotches on dorsal fin extending laterally; a row of short, dark bands on lateral line; all fins transparent.

Distribution: The holotype and paratypes were collected from southwestern Taiwan, off Hobihu, from about 80 m depth on sandy substrate.

Etymology: The specific name *taiwanensis* is for the type locality of Taiwan.

Remarks: *Synodus taiwanensis* is similar to other species with a black spot at the upper edge of the operculum, especially *S. hoshinonis* and *S. tectus*. However, the pigmented spot is a single black mark in *S. taiwanensis* allowing it to be easily distinguished from *S. hoshinonis* and *S. tectus*, in which the spot is split dorsally into 3 or 4 finger-like processes. Two other species, *S. indicus* and *S. similis*, have only 2 and 3 fully separated spots, respectively. *Synodus taiwanensis* can be further distinguished from these species by its pectoral fins which reach a line from the origin of the pelvic fin to the dorsal fin base, and its shorter snout. The peritoneal spot count (8-10) for *S. taiwanensis* is slightly lower than that of *S. hoshinonis* (12-13) and overlaps with the range for *S. tectus* (10-11).

***Synodus capricornis* Cressey and Randall,
1978**

(Fig. 3; Table 1)

Synodus capricornis Cressey and Randall 1978: 767 (off Ahu Akapu, Easter I., SE Pacific).

Materials: A single specimen: ASIZP

0064388, 160 mm, female, off Maobitou, at the southern tip of Taiwan, ca. 80 m, 10 Sept. 2004.

Diagnosis: Dorsal-fin rays 13 (12-14 in Cressey 1981); pectoral-fin rays 13 (14); anal-fin rays 9; pored lateral-lateral line scales 64 (65-66 in Cressey 1981); scale rows above lateral line 5.5; post-oral portion of cheeks naked; peritoneal spots 11 (10-12 in Cressey 1981); pectoral fin not reaching a line from origin of pelvic fin to origin of dorsal fin; posterior pelvic process wide; a series of rectangular blotches along lateral line; nasal flap short and triangular.

Description: Based on 1 specimen, 160 mm SL, collected from Taiwan.

Measurements and counts are given in table 1. Body slender; large cycloid scales on body, but operculum naked; interorbital space wide, 3.8% SL; pelvic fin relatively long, about 22.5% SL; dermal nostril flap a short, triangular process posteriorly positioned on anterior nostril, barely reaching anterior edge when laid fully forward; predorsal scales 20; pectoral fin not reaching a line from base of pelvic fin to origin of dorsal fin; posterior bony process of pelvic fin base broad; gill rakers 25 (10+15); peritoneal spots 10; peritoneal light brown.

Lower jaw with 3-4 closely set rows of needle-sharp teeth, posteriorly positioned teeth angled forward; dorsal surface of tongue with 5-7 rows of sharp slender teeth, angled to rear, uniformly strong, and about 50 in number; palatine with 3 or 4 rows of sharp slender teeth; anterior palatine teeth slightly longer than posterior teeth, innermost row longest, outermost with 1 or 2 rows of short teeth, all teeth angled to rear and inwardly.

Distribution: *Synodus capricornis* is known only from Easter I. and the Pitcairn Is. in the south-eastern Pacific and the Hawaiian Is. in the central Pacific. Its known range is now extended to



Fig. 3. *Synodus capricornis*, ASIZP 0064388, 160 mm.

Taiwan. The specimen was captured at a depth of 25-80 m on a sandy substrate.

Remarks: Cressey and Randall (1978) separated this species from *S. ulae* by its high lateral line scale and vertebrae count, as well as its short triangular nostril dermal flap (long and broad in *S. ulae*).

***Synodus lobeli* Waples and Randall 1988**

(Fig. 4; Table 1)

Synodus lobeli Waples and Randall 1988: 198 (Off Kailua, Kona coast of Hawaii I., Hawaiian Is., central Pacific).

Materials: A single specimen: ASIZP 0064387, female, 215 mm, SW Taiwan off Hobihu, 80 m, 14 Apr. 2004.

Diagnosis: Dorsal-fin rays 12 (11-12 in Waples and Randall 1988); pectoral-fin rays 12; anal-fin rays 9; pored lateral-line scales 53 (53-55 in Waples and Randall 1988); scale rows above lateral line 3.5; post-oral portion of cheeks without scales; peritoneal spots 10 (10-11, in Waples and Randall 1988); pectoral fin not reaching a line from origin of pelvic fin to origin of dorsal fin; posterior



Fig. 4. *Synodus lobeli*, ASIZP 0064387, 215 mm.



Fig. 5. *Synodus tectus*, NMMBP 3349, 227 mm.

pelvic process wide; nasal flap moderate and slender.

Description: Based on 1 specimen, 215 mm SL, collected from Taiwan. Measurements and counts are given in table 1. Body relatively slender; snout short (6.5% SL); interorbital space relatively narrow (2.8% SL); upper jaw relatively short (15.8% SL); origins of anal fin and adipose fin relatively close, adipose above 3rd anal fin ray; dorsal fin base relatively short (12.1% SL); longest anal fin ray relatively short (5.6% SL); gill rakers 27 (9+18; 24-27 in Waples and Randall 1989); peritoneal spots 10 (10-11 in Waples and Randall 1989); pectoral fin not reaching a line from base of pelvic and dorsal fins; anterior palatine teeth not longer than posterior teeth and not in a discrete group; 4 scale rows between lateral line and anal fin; body color pale, with small dark spots forming a longitudinal line on upper 1/2 of body.

Dermal nostril flap positioned posteriorly on anterior nostril, slender and moderately pointed, reaching rear edge of posterior nostril when fully laid back; pectoral fin rays short, not reaching a line from base of pelvic fin to origin of dorsal fin; posterior pelvic bony process broad.

Lower jaw with 3-4 closely set rows of needle-sharp teeth, posterior teeth angled forward; dorsal surface of free end of tongue with 4 rows of sharp slender teeth angled to rear, 2 outer rows longer than inner row, about 30 in total; palatine with 3-4 rows of sharp slender teeth, anterior palatine teeth slightly longer than posterior ones, innermost row longest, outermost rows with 2 rows of short teeth, all angled to rear and inwardly.

Distribution: *Synodus lobeli* was previously known only from Japan and Hawaii. The known range of this species is here extended to southwestern Taiwan in the West Pacific, with 1 specimen collected from sandy substrate at mixed depths of 32-80 m.

***Synodus tectus* Cressey, 1981**

(Fig. 5; Table 1)

Synodus tectus Cressey 1981: 39 (Visayan Sea, the Philippines).

Materials: Two specimens: NMMBP 3349, 215 mm, female, off Hobihu, SW Taiwan, ~80 m, 3 Sept. 2002. NMMBP 7889, female, 190 mm, off Hobihu, SW Taiwan, ~80 m, 11 Oct. 2004.

Diagnosis: Dorsal-fin rays 13 (13-14 in Cressey 1981); pectoral-fin rays 12-13 (12 in Cressey 1981); anal-fin rays 9-10; pored lateral-

line scales 55 (55-57 in Cressey 1981); rows of scales between lateral line and dorsal fin 3.5; post-oral portion of cheeks scaly; peritoneal spots 10 (10-11 in Cressey 1981); pectoral fin reaching a line from base of pelvic fin to origin of dorsal fin; posterior pelvic process wide; upper distal edge of operculum with prominent black spot divided dorsally into 2-4 finger-like processes; nasal flap short and rounded.

Description: Based on 2 specimens of 190 and 215 mm SL collected from Taiwan.

Measurements and counts are given in table 1. Body slender and somewhat broad; large cycloid scales on body, operculum, and preoperculum; eyes relatively large, orbit diameter (5.6% and 5.9% SL); interorbital space relatively wide (3.5% and 4.2% SL); gill rakers 23 and 25 (9-10+14-15); peritoneal spots 10 (10-11 in Cressey 1981).

Dermal nostril flap a short, rounded process posteriorly on anterior nostril, barely reaching rear edge of posterior nostril when fully laid back; pectoral fin rays reaching a line from base of pelvic fin to origin of dorsal fin; posterior bony pelvic process broad.

Lower jaw with 3-4 closely set rows of needle-sharp teeth, posterior rows angled forward, those at anterior end longest; dorsal surface of free end of tongue with 4 rows of sharp slender teeth angled to rear, outer 2 rows slightly longer than inner rows, about 30 teeth in total; palatines with 3-4 rows of sharp slender teeth, anterior teeth longer than posterior ones, innermost row longest, outer row with slender teeth. Teeth of 2 inner rows angled to rear and inwardly; those of outer row enlarged posteriorly and clearly angled to rear and outwardly.

Distribution: *Synodus tectus* is known only from the South China Sea in the West Pacific to the Great Barrier Reef. Its known range is now extended to southwestern Taiwan. This species is the 1st record collected from Dapong Bay in southwestern Taiwan. The specimens were captured from a depth of 25-80 m on a sandy substrate.

Remarks: Russell and Cressey (1979) separated *S. tectus* from *S. hoshinonis* by the number of peritoneal spots of 10-11 (vs. 12-13) and the presence of the parasitic copepod *Metataeniacanthus pacificus*. However, we found no parasitic copepods from our specimens.

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