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A new species of tonguefish (Pleuronectiformes: Cynoglossidae) from Taiwanese waters

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Abstract

Symphurus multimaculatus new species, described from nine specimens captured in deep waters off Taiwan, is distinguished from congeners by the following combination of characters: predominant 1–2–2–2–2 pattern of interdigitation of dorsal pterygiophores and neural spines, 14 caudal-fin rays, 92–94 dorsal-fin rays, 79–82 anal-fin rays, 9 abdominal and 50–51 total vertebrae, 5 hypurals, deep body (28.6–35.1 % SL), small scales (102–108 scales in longitudinal series, 45–48 scales in transverse row), blackish-brown ocular-side opercle, bluish-black blind-side opercle, uniformly reddish-brown to dark-brown ocular-side background pigmentation with some specimens also having 5–7 mostly complete crossbands, and uniformly white to light-yellow blind side with dense patches of blackish-brown chromatophores predominantly covering pterygiophore regions of the dorsal and anal fins. *Symphurus multimaculatus* were retrieved from commercial catches of fishing trawlers landed at three regional fish ports operating in deep waters off northeastern and southwestern Taiwan. The only information associated with these specimens is the general region of capture based on where fishing trawlers operate. Data on relative abundance, depth of capture, geographic distribution, and microhabitat conditions where this species is captured are unavailable at this time.

Key words: *Symphurus*, flatfish, deep waters, systematics, Pepperdot tonguefish

Introduction

Symphurus Rafinesque comprises a genus of small to medium-sized, left-sided flatfishes belonging to the Cynoglossidae. Approximately 77 species are considered valid in this genus, with 27 species having been recorded from the Indo-Pacific region (Bleeker 1879; Alcock 1889; Alcock 1891; Alcock 1894; Alcock 1899; Gilbert 1905; Fowler 1934; Chabanaud 1954; Chabanaud 1955a; Chabanaud 1955b; Chabanaud 1955c; Chabanaud 1956; Munroe 1992; Krabbenhoft & Munroe 2003; Munroe 2006; Munroe & Hashimoto 2008; Lee *et al.* 2009). Indo-Pacific *Symphurus* can be separated into phenotypic groups of species with either 12 or 14 caudal-fin rays (Munroe 1992). Twenty species with 14 caudal-fin rays have been described from the Indo-Pacific, of which, ten species have been collected in the western Pacific Ocean, including *S. australis* McCulloch, *S. bathyspilus* Krabbenhoft & Munroe, *S. gilesii* (Alcock), *S. hondoensis* Hubbs, *S. marmoratus* Fowler, *S. megasomus* Lee, Chen & Shao, *S. schultzi* Chabanaud, *S. strictus* Gilbert, *S. thermophilus* Munroe & Hashimoto, and *S. undatus* Gilbert. Of these, only *S. bathyspilus*, *S. gilesii*, and *S. thermophilus* usually have 90–100 dorsal-fin rays, 75–85 anal-fin rays and <55 total vertebrae.

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The earliest recorded species of *Symphurus* from Taiwanese waters (Chen and Weng 1965) purportedly is *S. orientalis* (Bleeker). In their description of *S. orientalis*, Chen and Weng (1965) indicated the specimens they examined had 14 caudal-fin rays, whereas *S. orientalis* typically has only 12 caudal-fin rays (Ochiai 1963; Munroe 1992). *Symphurus orientalis* has subsequently been documented from Taiwanese waters (Shen 1993). Possibly, Chen and Weng examined *S. orientalis* in their study, but mis-counted the number of caudal-fin rays in their specimens. Also possible is that they examined another, or other, species of *Symphurus* in their study. Unfortunately, specimens examined by Chen and Weng (1965) are lost, thereby precluding any possibility to determine their identity. Though we are unable to confirm the identity of these specimens, counts for caudal-fin rays reported by these authors raised the distinct possibility that more species than *S. orientalis* occur in Taiwanese waters. And in fact, four species of *Symphurus* are now known from deep waters around Taiwan (Shen 1993; Lee *et al*. 2009; Lee unpubl. data). Two of these, *S. strictus* and *S. hondoensis*, belong to species groups within *Symphurus* featuring 14 caudal-fin rays and high numbers of vertebrae, dorsal- and anal-fin rays, and high scale counts. *Symphurus megasomus*, recently described from Taiwanese waters by Lee *et al.* (2009) also has 14 caudal-fin rays.

While sampling commercial deep-sea trawler landings over a one-year period at three important fish ports in Taiwan, nine specimens of an unusual species of *Symphurus* were collected among a total of several hundred specimens of *Symphurus* encountered. These specimens, characterized by 14 caudal-fin rays and low meristic features, are most similar in fin-ray counts and also share the same pattern of interdigitation of dorsal proximal pterygiophores and neural spines (ID pattern; see Munroe 1992) as those of two other western Pacific species, *S. bathyspilus* (Krabbenhoft & Munroe 2003) and *S. thermophilus* (Munroe & Hashimoto 2008). Detailed comparisons of these specimens with *S. bathyspilus* and *S. thermophilus* revealed distinct differences in ocular-side pigmentation as well as some meristic and morphometric features, which indicated they belong to an undescribed species. The purpose of this paper is to provide a detailed description for this species.

Materials and methods

Nine specimens of the new species were sorted from catches of deep-sea commercial trawlers landed at three fish ports: Nanfang-Ao and Da-shi fish ports located in northeastern Taiwan, and Dong-gang fish port located in southwestern Taiwan. All nine specimens were radiographed. Methods for counting meristic characters and for measuring morphometric features and for general terminology follow those of Munroe (1998). Terminology and formulae for interdigitation patterns of proximal dorsal pterygiophores and interneural spines (ID pattern) follow those of Munroe (1992). Osteological nomenclature follows that of Chapleau (1988). Morphometric characters were taken to the nearest 0.1 mm using either dial calipers or a dissecting microscope fitted with an ocular micrometer. Morphometric features are expressed either as proportions in percent standard length (SL) or percent head length (HL).

Description of pigmentation features are based primarily on freshly-landed specimens, with supplemental information provided from specimens preserved in formalin and transferred to 75% ethanol. Maturity was estimated by macroscopic examination of the extent of posterior elongation of ovaries and presence of developing ova in the ovaries (both observed by using light transmitted through the body). In species of *Symphurus*, no obvious differences are apparent in testis size between mature and immature males; therefore, estimates of maturity are based entirely on females.

Institutional abbreviations follow those listed in http://www.asih.org/codons.pdf, except for that of ASIZP (formerly ASIZT), the Biodiversity Research Center, Academia Sinica, Taipei, Taiwan. Comparative materials for all other Indo-Pacific species of *Symphurus* were listed in Shen (1993), Munroe (1992), Munroe and Amaoka (1998), Krabbenhoft and Munroe (2003), Munroe (2006), Munroe and Hashimoto (2008) and Lee *et al.* (2009).

***Symphurus multimaculatus*, new species**
(Figs. 1–2, Tables 1–2)
Pepperdot Tonguefish

Holotype. ASIZP 67634, female, 93.5 mm SL; Nanfang-Ao fish port in landings of commercial bottom trawler fishing off northeastern coast of Taiwan; M.-Y. Lee; 6 Jan 2007.

Paratypes. (all collected from commercial fish catches of bottom trawlers landed at fish ports). ASIZP 67647, female, 79.6 mm SL; off northeastern coast of Taiwan, Da-shi fish port; M.-Y. Lee; 22 Jun 2007. ASIZP 67648, female, 75.0 mm SL; off northeastern coast of Taiwan, Da-shi fish port; M.-Y. Lee; 22 Jun 2007. ASIZP 67654, male, 64.7 mm SL; off southwestern coast of Taiwan, Dong-gang fish port; M.-Y. Lee; 4 Jul 2007. ASIZP 67655, male, 69.5 mm SL; off southwestern coast of Taiwan, Dong-gang fish port; M.-Y. Lee; 4 Jul 2007. USNM 394605, male, 90.6 mm SL; off southwestern coast of Taiwan, Dong-gang fish port; H.-C. Ho; 13 Nov 2007. USNM 394606, male, 78.5 mm SL; off southwestern coast of Taiwan, Dong-gang fish port; H.-C. Ho; 13 Nov 2007.

Additional non-type specimens examined. (all collected from commercial fish catches of bottom trawlers landed at fish ports). ASIZP 67641, female, 103.8 mm SL; off northeastern coast of Taiwan, Da-shi fish port; M.-Y. Lee; 9 Mar 2007. ASIZP 67642, male, 92.2 mm SL; off northeastern coast of Taiwan, Nanfang-ao fish port; M.-Y. Lee; 28 Feb 2007.

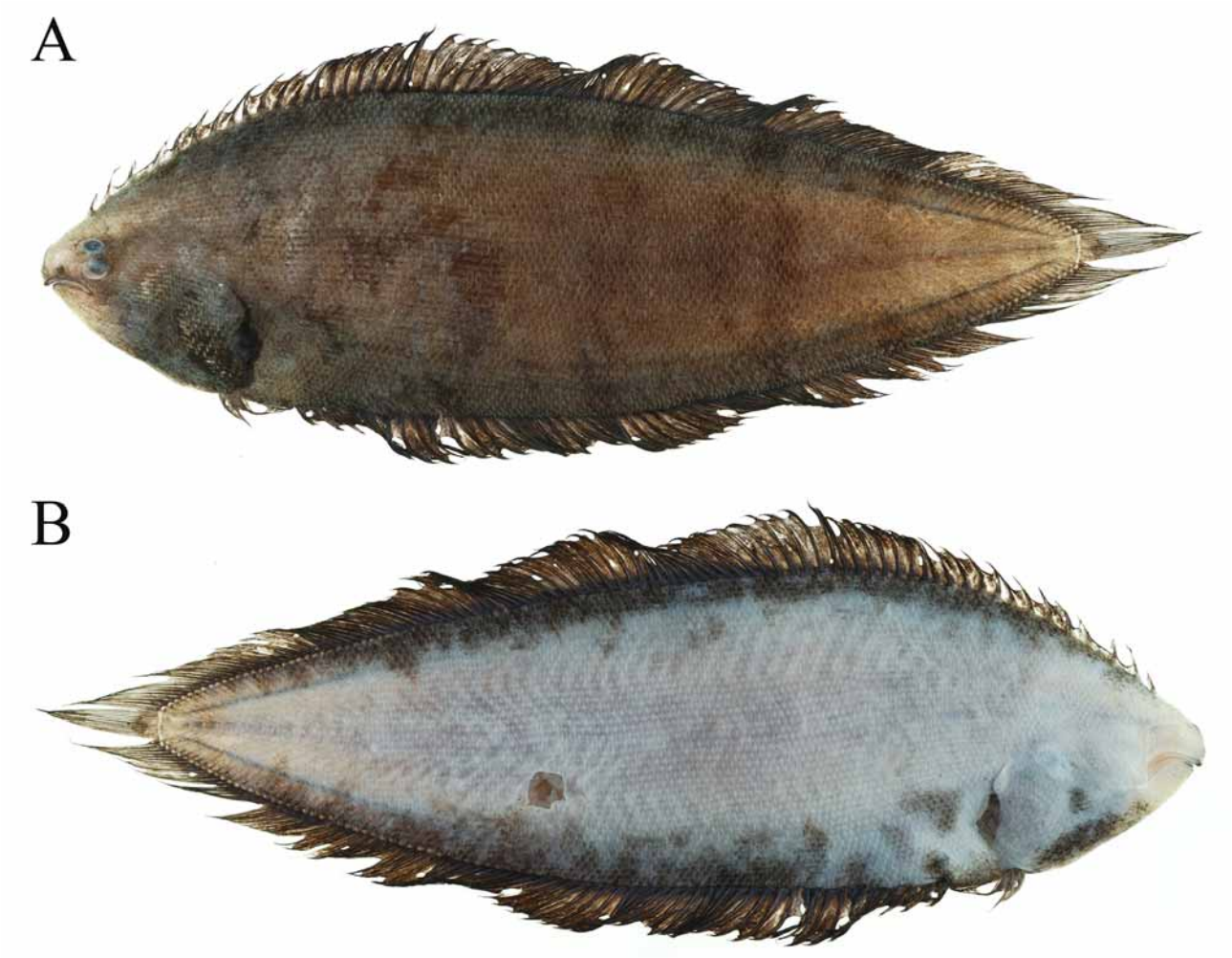

FIGURE 1. *Symphurus multimaculatus*, new species, holotype (ASIZP 67634, 93.5 mm SL) taken by commercial trawler off northeastern Taiwan. A. Ocular-side pigmentation of freshly-caught adult female. B. Blind-side coloration of same specimen.

Diagnosis. *Symphurus multimaculatus* is distinguished from all congeners by the combination of: 1–2–2–2–2 ID pattern, 14 caudal-fin rays, 9 abdominal vertebrae, 50–51 total vertebrae, 5 hypurals, 92–94 dorsal-fin rays, 79–82 anal-fin rays, 102–108 longitudinal scales, 45–48 scales in a transverse row, a small eye (9.1–10.1% HL), deep body (28.6–35.1% SL), and blind-side pigmentation featuring conspicuous, irregular, blackish-brown speckles especially conspicuous overlying pterygiophore regions of the dorsal and anal fins.

Description. *Symphurus multimaculatus* is a medium-sized species, reaching sizes to 103.8 mm SL. Meristic characters are summarized in Table 1. Predominant ID pattern 1–2–2–2–2 (9/9 specimens). Caudal-fin rays 14 (two specimens abnormalities). Dorsal-fin rays 92–94. Anal-fin rays 79–82. Pelvic-fin rays 4. Total vertebrae 50–51; abdominal vertebrae 9(3 + 6). Hypurals 5. Longitudinal scale rows 102–108. Scale rows on head posterior to lower orbit 21–24. Transverse scales 45–48.

TABLE 1. Meristic features for *Symphurus multimaculatus* taken off Taiwan. Counts for holotype (ASIZP 67634) indicated by asterisk (*). Footnote refers to specimen with anomalous vertebrae (vertebral count estimated, See Methods and Remarks); ANO = Abnomality.

	ID Pattern		Caudal-fin rays		Abdominal Vertebrae		Total vertebrae	
	1–2–2–2–2*		ANO	14*	9*		50*	51
Frequency	9		2	7	9		5[a]	4
	Dorsal-fin rays				Anal-fin rays			
	92	93	94*		79	80	81*	82
Frequency	1	3	5		1	2	2	4
	Head Scales				Transverse scale			
	21	22*	23	24	45	46	47*	48
Frequency	2	4	2	1	1	3	3	2
	Longitudinal scales							
	102*	103	104	105	106	107	108	
Frequency	1	1	3	2	1	-	1	

[a]Includes specimen with two sites of fused caudal vertebrae indicated by multiple neural and haemal spines in the first fusion, and by two haemal spines in the second site of fusion.

Proportions of morphometric features are presented in Table 2. Body relatively deep; maximum depth in anterior one-third of body usually at point between anus and fourth anal-fin ray, with moderate posterior taper from anus to posterior body margin. Preanal length smaller than body depth. Head moderately short and wide; head width slightly shorter than body depth, and much greater than head length (HW/HL= 1.26–1.50, $\bar{x}$ = 1.33). Upper head lobe wider than lower head lobe (UHL/LHL= 1.34–1.67, $\bar{x}$ = 1.48); slightly longer than postorbital length. Lower lobe of ocular-side opercle wider than upper opercular lobe; posterior margin of lower lobe projecting slightly beyond posterior margin of upper opercular lobe. Snout moderately long, slightly round to obliquely blunt anteriorly, its length greater than eye diameter (SNL/ED= 1.54–1.90, $\bar{x}$ =1.74). Dermal papillae present, but not well developed, on blind-side snout. Ocular-side anterior nostril tubular and short, usually not reaching anterior margin of lower eye when depressed posteriorly. Ocular-side posterior nostril a small, rounded tube located on snout just anterior to interorbital space. Blind-side anterior nostril tubular and slightly elongate, easily distinguishable from dermal papillae; blind-side posterior nostril a shorter and wider posteriorly-directed tube situated posterior to vertical at posterior margin of jaws. Jaws long and slightly arched; upper jaw length longer than snout length; posterior margin of upper jaw usually extending to point between verticals through anterior margin of pupil and midpoint of lower eye. Ocular-side lower jaw without fleshy ridge. Cheek depth slightly greater than snout length. Eyes moderately large and oval, separated by three to four rows of small ctenoid scales in narrow interorbital space. Eyes usually equal in position, or upper eye slightly in advance of lower eye. Pupillary operculum absent. Dorsal-fin origin located

at point between verticals through anterior margin of pupil and anterior margin of dorsal eye; predorsal length moderately short. Anteriormost dorsal-fin rays slightly shorter than more posterior fin rays. Scales absent on both sides of dorsal- and anal-fin rays. Pelvic fin moderately long; longest pelvic-fin ray, when extended posteriorly, usually reaching base of first anal-fin ray. Posteriormost pelvic-fin ray connected to anal fin by delicate membrane. Caudal fin relatively long, with several rows of ctenoid scales on base of fin. Scales numerous, strongly ctenoid on both sides of body.

TABLE 2. Morphometrics for holotype (ASIZP 67634), six paratypes and two non-type specimens of *Symphurus multimaculatus* taken off Taiwan. SL in mm; characters 2–15 in % of SL; 16–23 in % of HL.

		Holotype and other specimens		
Character	Holotype	n	Range	Mean±SD
1. Standard length	93.5	9	64.7–103.8	83.04±12.74
2. Body depth	32.6	9	28.6–35.1	31.16±2.00
3. Trunk length	82.2	9	79.3–85.2	82.47±1.83
4. Predorsal length	3.1	9	3.1–3.9	3.39±0.28
5. Preanal length	24.2	9	22.4–25.3	23.80±1.00
6. Dorsal-fin length	96.7	9	95.7–96.9	96.42±0.43
7. Anal-fin length	75.8	9	74.0–77.6	76.17±1.11
8. Pelvic-fin length	5.7	9	5.7–7.2	6.34±0.54
9. Pelvic to anal length	3.0	9	2.2–4.4	3.10±0.71
10. Caudal-fin length	11.8	9	10.2–13.9	12.00±1.23
11. Head length	20.3	9	18.3–20.8	19.89±0.76
12. Head width	27.2	9	24.5–30.2	26.54±2.07
13. Postorbital length	14.1	9	12.6–14.5	13.88±0.60
14. Upper head lobe width	16.1	9	14.4–18.2	15.83±1.16
15. Lower head lobe width	11.0	9	9.2–12.6	10.76±1.02
16. Predorsal length	16.3	9	15.2–19.1	17.14±1.41
17. Postorbital length	69.5	9	67.8–71.7	69.91±1.34
18. Snout length	17.4	9	15.6–18.8	17.01±1.06
19. Upper jaw length	23.2	9	22.2–25.1	23.48±1.08
20. Eye diameter	9.7	9	9.1–10.1	9.78±0.30
21. Chin depth	15.8	9	15.8–22.1	18.68±2.08
22. Lower opercular lobe	31.6	9	29.6–37.6	31.86±2.65
23. Upper opercular lobe	22.6	9	21.1–30.3	23.82±3.05
24. HW/HL	1.34	9	1.26–1.50	1.33±0.080
25. Pupil/Eye diameter	0.68	9	0.61–0.72	0.68±0.039

Teeth present and recurved slightly inwards on all jaws, but better developed on blind-side jaws. Ocular-side premaxilla and dentary with single row of sharply pointed, well-developed teeth. Blind-side premaxilla with three to four rows of sharp, recurved teeth. Blind-side lower jaw with three to five rows of well-developed teeth.

Coloration (Figs.1–2)**. Freshly-caught specimens.** Background body coloration differing slightly

between adults and juveniles. Ocular-side background pigmentation of adults (Fig. 1) generally reddish-brown to dark-brown; juveniles (Fig. 2) with bluish-black to purple background coloration. General background coloration more intense on body areas overlying dorsal and anal pterygiophores. Adults and juveniles usually with 5–7 distinct, wide (covering 4–8 scales), complete and incomplete dark blackish-brown crossbands on body (crossbands faded and indistinct in some specimens); crossbands not continued onto dorsal and anal fins. Anteriormost crossband on body region between opercle and vertical through anus; successive crossbands on mid-body region to caudal-fin base. External surface of abdominal area sometimes bluish-black, but usually with same general coloration as that of ocular-side body (because darker peritoneal pigment obscured by abdominal wall and not visible externally). Background coloration of ocular-side head generally similar to that on body. Ocular-side snout light brown. Outer surface of ocular-side opercle blackish-brown; inner surface of ocular-side opercle with small blackish-brown or black chromatophores. Ocular-side lips and chin region dark brown, margins of lips pigmented with small black chromatophores. Ocular-side anterior nostril blackish-brown. Upper aspects of eyes and eye sockets light blue; pupils bluish-black.

Blind side generally white to light yellow with numerous, small, blackish-brown pepper-dots irregularly distributed over blind-side body, but usually most dense and conspicuous on body regions overlying pterygiophores of dorsal and anal fins. A cluster of blackish-brown speckles usually surrounding anus. External surface of abdominal region whitish in adults (because peritoneal coloration difficult to observe through thick abdominal wall), but lightly bluish-black in juveniles where dark peritoneum shows through abdominal wall. Outer surface of blind-side opercle bluish-black. Inner surface of blind-side opercle with numerous, small, blackish-brown chromatophores.

FIGURE 2. *Symphurus multimaculatus*, new species, paratype (ASIZP 67648, 75.0 mm SL) taken by commercial

trawler off northeastern Taiwan. A. Ocular-side pigmentation of freshly caught juvenile female. B. Blind-side coloration of same specimen.

Fin rays of dorsal, anal, and pelvic fins uniformly reddish-brown or bluish-brown; basal regions of fin rays and membranes covering fin rays grayish-blue. Numerous, small, dense, and nearly spherical spots covering entire fin membranes on both sides of fins, giving fin membranes a reddish-brown or bluish-brown color. Basal margins of fin rays on blind side, and associated fin membranes, reddish-brown to grayish-blue.

Coloration of recently preserved specimens similar to that of freshly-caught fishes, except that coloration of fin rays (on both sides) of some preserved specimens faded to nearly transparent.

Size and sexual maturity. Nine specimens range in size from 64.7–103.8 mm SL. Four of these are females; two (75.0–79.6 mm SL) are immature showing little elongation of the ovaries, while two others (93.5–103.8 mm SL) are non-gravid, mature females with elongate ovaries, but without any ova evident. Males (n = 5, 64.7–92.2 mm SL) attain similar sizes to those of females.

Distribution. *Symphurus multimaculatus* is currently known only from commercial fish catches taken on the continental shelf and/or upper continental slope off Taiwan. All nine specimens examined in this study were collected by trawlers operating in deep waters near Da-shi and Nanfang-Ao off northeastern Taiwan, and off Dong-gang, southwestern Taiwan. Though specific depth of capture information is lacking for these specimens, we conclude that *S. multimaculatus* is a deepwater tonguefish that occurs on the continental shelf and/or continental slope based on the evidence that all nine specimens were retrieved from catches landed at fishing ports that also contained *S. orientalis* and other deep-sea fishes known to occur at depths of about 300–400 m. Additionally, *S. multimaculatus* also features a black peritoneum, a pigmentation feature characteristic of other deepwater (>200 m) species of *Symphurus* (Munroe 1998; Munroe 2006; Munroe and Amaoka 1998; Krabbenhoft and Munroe 2003; Munroe and Hashimoto 2008; Lee *et al.*2009).

Symphurus multimaculatus apparently is a rarely-caught species. Only nine specimens were retrieved from numerous port samples that were sorted, and which also contained several hundred specimens of other species of *Symphurus*. Furthermore, research vessels conducting bioinventories of deep waters around Taiwan during the past several years (K.-T. Shao, unpubl. data) also have not collected any specimens of this species during these investigations. Further collections by research vessels with capabilities for discrete sampling are needed to gain better understanding of the ecology, abundance and life history of this species.

Etymology. The name *multimaculatus* is derived from the Latin, *multi* meaning many, and *maculatus*, meaning spots, in reference to the numerous blackish-brown speckles on the blind-side body and fins of this species.

Remarks. In *S. multimaculatus*, one of nine specimens has two sites of fused caudal vertebrae as evidenced by the presence of multiple neural and/or haemal spines on a centrum, which also has a different size and shape compared with other centra. The first site of fused vertebrae is located at caudal vertebrae No. 27, which has double neural and haemal spines. The second site of fused vertebrae is located at vertebrae No. 32, which has double haemal spines. Presence of multiple neural and haemal spines on caudal vertebra indicates that some unknown number of vertebrae either failed to develop or have fused during development. Based on previous studies (Munroe & Mahadeva 1989; Munroe & Hashimoto 2008), estimating only two vertebrae involved in such fusions resulted in vertebral counts that were within the range of this count recorded for specimens without fused vertebrae. In the case of *S. multimaculatus*, each fusion, when interpreted as involving only two vertebrae, results in a vertebral count of 50, which is within the range recorded for the other specimens of *S. multimaculatus* without fused vertebrae (Table 1).

Two of the nine specimens also have anomalies associated with their caudal-fin rays as reflected in abnormal shapes of their hypurals and/or associated skeletal elements. For example, one specimen has two sites of fused caudal-fin rays; one site is located on caudal-fin rays supported by the parhypural and hypural–1, and the other site involves caudal-fin rays associated with hypural–1. Normal specimens usually have four fin-rays associated with the parhypural and hypural–1 and three fin-rays associated with hypural–1 and hypural–2. In this specimen, the fin ray located between the parhypural and hypural–1 is slender and is fused

with the last fin-ray supported by the parhypural, which results in only three fin rays being located between the parhypural and hypural–1. The fin ray associated with hypural–1 is also fused with the fin ray on hypural–2 resulting in a single, wider fin ray, and this fusion consequently results in only two fin rays being located between hypurals–1 and –2. The other specimen with anomalous caudal-fin rays has the bases of the first and second caudal-fin rays, which are supported by the parhypural, fused together. Also in this specimen, the epural and proximal radial of the posteriormost dorsal fin are fused. This anomaly results in a fusion of the bases of the first four caudal-fin rays with their respective rays radiating distally.

Comparisons

Among Indo-Pacific *Symphurus*, in addition to *S. multimaculatus*, 17 valid species possess 14 caudal-fin rays and either a 1–2–2–2–2 or 1–2–2–1–2 ID pattern (Munroe 1992; Krabbenhoft & Munroe 2003; Munroe 2006; Munroe & Hashimoto 2008). Of these, only *S. arabicus* Chabanaud, *S. bathyspilus*, *S. gilesii* (Alcock), *S. ocellatus* Von Bonde, *S. thermophilus*, and *S. woodmasoni* (Alcock) share similar counts for other meristic features including dorsal-fin rays (90–100), anal-fin rays (75–85), and total vertebrae (usually <55) to those observed in *S. multimaculatus*. *Symphurus multimaculatus* has the same ID pattern (1–2–2–2–2) and 9 abdominal vertebrae, and has meristic features that overlap those of *S. bathyspilus*, which has been collected in deep waters off the Philippines and Indonesia (Krabbenhoft & Munroe 2003), and *S. thermophilus* collected between 239–733 m at several active hydrothermal vents in the western Pacific (Munroe & Hashimoto 2008). *Symphurus multimaculatus* differs from *S. bathyspilus* in having smaller scales, which is reflected both in the greater number of scales in longitudinal series (102–108 vs. 76–92 in *S. bathyspilus*) and in more scales in a transverse row (45–48 vs. 29–34 in *S. bathyspilus*). These two species also differ in many aspects of their morphology, for example, *S. multimaculatus* has a deeper body (BD 28.6–35.1% SL vs. 21.8–25.8% in *S. bathyspilus*) and a wider (HW 24.5–30.2% SL vs. 20.8–25.8% in *S. bathyspilus*) and shorter head (18.3–20.8% SL vs. 21.0–24.6% in *S. bathyspilus*), which is reflected in a larger HW/HL ratio (HW/HL= 1.26–1.50 vs. 0.99–1.03 in *S. bathyspilus*). *Symphurus multimaculatus* also has a much wider upper head lobe (14.4–18.2% SL vs. 8.9– 13.0% in *S. bathyspilus*) and smaller eye (9.1–10.1% SL vs. 12.2–16.3%) than those of *S. bathyspilus.*

Symphurus multimaculatus differs conspicuously from *S. thermophilus* in aspects of both its ocular- and blind-side pigmentation. In *S. multimaculatus*, the rays of the dorsal and anal fins are uniformly reddish-brown or bluish-brown in the anterior two-thirds of these fins, becoming light brown posteriorly and the caudal-fin is also light brown (vs. dorsal and anal fins with alternating series of prominent pigmented blotches and lighter areas, and caudal-fin base with prominent conspicuous spots in *S. thermophilus*). On its blind side, *S. multimaculatus* has numerous blackish-brown speckles overlying pterygiophore regions of the dorsal and anal fins (vs. uniformly white or light yellow blind side), the outer surface of the opercle is bluish-black (vs. uniformly whitish), and the external surface over the peritoneum is usually white (vs. black peritoneum visible externally in *S. thermophilus*). *Symphurus multimaculatus* also differs from *S. thermophilus* in having a shorter (HL 18.3–20.8% SL vs. 21.6–23.2 % in *S. thermophilus*) and wider head (HW/HL= 1.26–1.50% SL vs. 1.18–1.30% in *S. thermophilus*), a smaller eye (9.1–10.1% HL vs. 10.2–16.3% HL in *S. thermophilus*), and in having a more anteriorly placed dorsal fin as reflected in its shorter predorsal length (15.2–19.1% HL vs. 24.2–31.9% HL in *S. thermophilus*),

Symphurus multimaculatus shares the same ID pattern and number of abdominal vertebrae as those of *S. ocellatus*, a species known from deep waters (430–640 m) off East Africa from Durban to Mozambique (Heemstra 1986), but differs notably from this species in having uniformly reddish-brown coloration on its dorsal and anal fins (vs. large, conspicuous brownish-black spot on about 10 fin rays in the posterior dorsal and anal fins in *S. ocellatus*). *Symphurus multimaculatus* also has fewer fin rays (92–94 dorsal- and 79–82 anal-fin rays vs. 97–103 dorsal- and 85–89 anal-fin rays in *S. ocellatus*), fewer vertebrae (50–51 in *S. multimaculatus* vs. 54–56 in *S. ocellatus*), and smaller scales (102–108 in longitudinal series and 45–48 scales

in a transverse row vs. ca. 80–88 longitudinal scales and ca. 31–34 transverse scales in *S. ocellatus*) than does *S. ocellatus*.

Symphurus multimaculatus has some meristic features similar to those of *S. arabicus*, *S. gilesii* and *S. woodmasoni* (Munroe 1992), but differs from these species most notably in its ID pattern (1–2–2–2–2 vs. 1–2–2–1–2 in these other species) and numbers of abdominal vertebrae (9 in *S. multimaculatus* vs. 10 in the others). *Symphurus multimaculatus* differs further from *S. arabicus*, a species only known from the holotype taken off the south coast of Arabia (Chabanaud 1954; Munroe 1992), in having fewer dorsal-fin rays (92–94 vs. 97 in *S. arabicus*), anal-fin rays (79–82 vs. 84 in *S. arabicus*) and total vertebrae (50–51 vs. 53 in *S. arabicus*). *Symphurus multimaculatus* is also distinguished from *S. gilesii*, known from only nine specimens taken in deep waters (347–396 m) of the Bay of Bengal and at the Indo-Australian archipelago (Alcock 1889; Alcock 1899; Norman 1928; Weber & Beaufort 1929), also in having fewer dorsal-fin rays (95–99 in *S. gilesii*), fewer vertebrae (53–54 in *S. gilesii*) and by its smaller scales (102–108 scales in longitudinal series and 45–48 scales in a transverse row in *S. multimaculatus* vs. ca. 90 scales in longitudinal series and ca. 38 transverse scales in *S. gilesii*). From *S. woodmasoni*, known from several specimens collected in deep waters (ca. 865–895 m) in the Bay of Bengal and Andaman Sea (Alcock 1889; Alcock 1894; Alcock 1899), *S. multimaculatus* is easily distinguished in having more scales in longitudinal series and a greater number of scales in a transverse row (ca. 88 longitudinal scales and ca. 34 transverse scales in *S. woodmasoni*). *Symphurus multimaculatus* also differs from *S. woodmasoni* in having complete or incomplete crossbands on its ocular-side (vs. ocular side of *S. woodmasoni* uniformly pigmented without crossbands), and a uniformly white blind side with blackish brown speckles overlying pterygiophore regions of the dorsal and anal fins compared to the uniformly bluish-gray blind side without speckles of *S. woodmasoni*.

Some meristic features of *S. multimaculatus* partially overlap those of four other Indo-Pacific species, *S. microrhynchus* (Weber), *S. orientalis* (Bleeker), *S. septemstriatus* (Alcock), and *S. trifasciatus* (Alcock), and these species also have the same 1–2–2–2–2 ID pattern and numbers of abdominal vertebrae (Munroe 1992; Munroe & Marsh 1997) as those of *S. multimaculatus*. *Symphurus multimaculatus* is readily distinguished from these species in having 14 caudal-fin rays and five hypurals (vs. 12 caudal-fin rays and four hypurals in these other species).

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