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Eastern Atlantic Tonguefishes (Symphurus: Cynoglossidae, Pleuronectiformes), with Descriptions of Two New Species

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EASTERN ATLANTIC TONGUEFISHES (*SYMPHURUS*: CYNOGLOSSIDAE, PLEURONECTIFORMES), WITH DESCRIPTIONS OF TWO NEW SPECIES

Thomas A. Munroe

ABSTRACT

Six species of symphurine tonguefishes, including two previously undescribed, from the Mediterranean Sea and eastern Atlantic Ocean (including the Azores, Madeira, Ascension, and St. Helena) are described and illustrated. A key to the species is provided. *Symphurus vanmelleae*, a rarely captured and poorly-known bathyal species (361-944 m), previously thought to be conspecific with *S. ligulatus*, is now considered distinct. The species is known from 65 specimens collected off the continental shelf and upper continental slope of tropical West Africa (14°N–12°S). *Symphurus vanmelleae* is unique among eastern Atlantic tonguefishes in its combination of twelve caudal-fin rays, ten abdominal vertebrae, black peritoneum, and 1-2-2-2-1 pattern of interdigitation (ID pattern) of dorsal pterygiophores and neural spines. Two other deep-sea species, *S. ligulatus* (205–1,024 m) and *S. nigrescens* (47–1,400 m, usually 90–350 m), have sympatric but mostly allotopic distributions in the Mediterranean Sea and adjacent portions of the eastern Atlantic Ocean. *Symphurus ligulatus* is the only eastern Atlantic (Mediterranean—18°N) species possessing 14 caudal-fin rays, black peritoneum and a 1-2-2-2-2 ID pattern. *Symphurus nigrescens*, a widespread species (Bay of Biscay, Azores, throughout the Mediterranean, to ca. 7°S), is distinguished from all other eastern Atlantic species by the combination of 12 caudal-fin rays, 1-3-2 ID pattern, black peritoneum, and lack of small scales on the blind-side dorsal- and anal-fin rays. *Symphurus normani* occurs in moderate depths (22–75 m) on the continental shelf off tropical West Africa (12°N–9°S) and is readily distinguished from all other eastern Atlantic species by a unique combination of an unpigmented or lighly spotted peritoneum, pepper-dot pigmentation on the blind side of the body, 1-3-3 ID pattern, and presence of small scales on blind-side dorsal- and anal-fin rays. Two new species occurring on remote oceanic islands in shallow water on sandy bottoms are *S. lubbocki* (Ascension Island) and *S. reticulatus* (St. Helena, Madeira). These are among the smallest species in the genus and are readily distinguished from other eastern Atlantic tonguefishes by a combination of 12 caudal-fin rays, 1-3-2 ID pattern, unpigmented peritoneum, absence of scales on the blind-side dorsal- and anal-fin rays, and presence of 101–109 small scales in a longitudinal series along the body. Primary differences between these two diminutive species are cream-colored ocular-side pigmentation with several incomplete, brown crossbands in *S. lubbocki* versus dark chocolate-brown body color with an alternating series of X- and Y-shaped markings in *S. reticulatus*, dark brown blotches on the dorsal and anal fins in *S. reticulatus* versus their absence in *S. lubbocki*, and several morphometric features (*S. lubbocki* with greater head length, predorsal distance, upper jaw length, dorsal-fin base length, and snout length).

Symphurine tonguefishes (Cynoglossidae: Symphurinae) are small to medium-sized, sinistral flatfishes comprising a single genus (*Symphurus*) with approximately 70 nominal species. The worldwide distribution of *Symphurus* is extensive, with the majority of species occurring primarily in bathyal depths of the Indo-west Pacific ocean and coastal tropical and temperate seas (between 34°N and 25°S latitudes) of the New World (ca. 28 and 36 nominal species, respectively). *Symphurus* is poorly represented in the eastern Atlantic Ocean and Mediterranean Sea, with only four species described to date from these waters (two additional nominal species, *Plagusia lactea* Bonaparte and *P. picta* Costa, are regarded as junior synonyms of *S. nigrescens* Rafinesque).

Historically, tonguefishes have been known from the Mediterranean region

beginning with the brief and inadequate descriptions of *S. nigrescens* Rafinesque, 1810 and *Bibronia ligulata* Cocco, 1844 (=*Symphurus ligulatus*). Two additional West African species, *S. normani* Chabanaud, 1950 and *S. vanmelleae* Chabanaud, 1952, were described much more recently.

Symphurus species occur throughout the temperate and tropical regions of the eastern Atlantic Ocean and Mediterranean Sea, ranging from the Bay of Biscay (45°N; Vaillant, 1888), throughout most of the Mediterranean Sea (Kyle, 1913; Scordia, 1929; Chabanaud, 1950; Maurin, 1962; 1968; Ben-Tuvia, 1971; MacPherson, 1978; Papaconstantinou and Tortonese, 1980), and extending southward on the continental shelf and upper continental slope off northern (Kyle, 1913; Maurin, 1962; 1968; Merrett and Marshall, 1981) and equatorial Africa to approximately 12°S (Chabanaud, 1950; Nielsen, 1963). In addition, three species, including two described herein, have also been collected from tropical and temperate oceanic islands-Ascension (Lubbock, 1980), St. Helena (Nielsen, 1963; Edwards and Glass, 1987), and Madeira (Maul, 1976). Eastern Atlantic species of *Symphurus* have been collected on muddy and sandy substrates encompassing a wide bathymetric range of approximately 1–1,400 m.

Only the widespread *S. nigrescens,* which occurs over wide geographic (45°N–7°S) and bathymetric ranges (47–1,400 m), has been collected in sufficient numbers to permit detailed studies by earlier investigators (Kyle, 1913; Scordia, 1927; 1929; Chabanaud, 1950). Consequently, no comprehensive review of eastern Atlantic tonguefishes exists and most studies deal with only one or two species. This lack of broad overview is reflected in the inadequate diagnoses and frequent misidentifications of the various species. This situation is further complicated by the fact that three of four described species of eastern Atlantic *Symphurus* are rarely collected because of their relatively small size, cryptic habits, and great depth of occurrence. More intensive collecting programs in deep-sea habitats of the eastern Atlantic Ocean and Mediterranean Sea (Nielsen, 1963; Maurin, 1962; Voss, 1966a; 1966b; Maul, 1976; MacPherson, 1978; 1981; Papaconstantinou and Tortonese, 1980; Merrett and Marshall, 1981; Allué, 1985) have yielded many more specimens of these previously poorly known deep-sea flatfishes. Additionally, two undescribed species of diminutive tonguefishes from remote oceanic islands have been collected in shallow-water habitats using SCUBA and rotenone (Maul, 1976; Lubbock, 1980; Edwards and Glass, 1987). The present study is a revision of *Symphurus* species occurring in the eastern Atlantic region.

METHODS

Specimens examined in this study are listed by institutional acronym following Leviton et al. (1985). Methods for counting meristic and measuring morphometric characters and general terminology, in part, follow Munroe and Mahadeva (1989). More detailed descriptions of characters are presented below.

Meristic Features.—Meristic data, exclusive of scale counts, were taken from radiographs. In species accounts, total ranges for meristic features are presented first, followed by modal counts.

INTERDIGITATION PATTERN (ID). Patterns of interdigitation of proximal dorsal pterygiophores and neural spines were recorded for the first three, or for some species, the first five interneural spaces. The number of dorsal pterygiophores inserted into interneural spaces 1–5 was found to be diagnostic for species or groups of species (Munroe, in prep.). Patterns are recorded by a pterygiophore formula such as 1-2-2-1-2, indicating one pterygiophore inserts in interneural space one, two in interneural space two, and two in interneural space three, one in interneural space four, and two in interneural space five. The first neural spine abuts directly against the cranium so there is no obvious space between it and the cranium. Therefore, the first interneural space reflected in the formula is that between the first and second neural spines.

CAUDAL-FIN RAYS. Several authors (Ginsburg, 1951; Mahadeva, 1956; Menezes and Benvegnú, 1976; Munroe, 1987) have found that caudal-fin ray count is extremely conservative within the genus. Previous studies have included the ultimate dorsal- and anal-fin rays in the caudal-ray counts. This method is followed in the present study.

DORSAL- AND ANAL-FIN RAYS. Includes all rays except the ultimate ray. The thick, muscular gonadal duct preceding the first anal-fin ray is not counted.

VERTEBRAL COUNTS. In all eastern Atlantic *Symphurus,* except for *S. vanmelleae,* there are consistently nine abdominal vertebrae, three without and six with haemopophyses; these counts are reported as (3+6). Abdominal vertebrae counts for *S. vanmelleae* are usually 10 (3+7). Counts of total vertebrae include the urostylar centrum.

HYPURAL COUNTS. Includes all separate hypurals without any implied interpretation of the fate (fused or lost during ontogeny) of the fifth hypural which may not always be present as a separate element.

SCALE COUNTS. Accurate, repeatable scale counts are difficult to make on species of *Symphurus,* especially for those trawled from any appreciable depths in which scales are often abraded and lost. Approximate counts were based on partial scale counts, counts of scale pockets, or a combination of the two. The longitudinal scale row count includes the total number of complete diagonal rows of scales along a hypothetical line starting immediately above the opercular angle to the end of the hypural plate; the few rows of scales along the caudal-fin base are not included and the last scale must be at least half in front of the hypural plate. The transverse scale count is the number of scales in a diagonal row from the base of the dorsal fin at a point directly above the posterior margin of the operculum to the base of the anal fin. Scales extending out onto the dorsal- and anal-fin rays are not included. The head scale row count includes all the oblique rows of scales on the head counted posteriorly from the first complete row of scales immediately behind the posterior border of the lower eye; it includes the last complete row of scales immediately anterior to the mid-point emargination on the posterior border of the operculum, but the few small rows of scales present on either the dorsal or ventral fleshy lobes of the operculum are not included.

Morphometrics.—All measurements were made on the ocular surface except where noted. Measurements were taken to the nearest 0.1 mm with dial calipers or ocular micrometer. Measurements are expressed either as thousandths of standard length (SL) or thousandths of head length (HL). Standard length: distance from tip of fleshy snout to posterior end of hypural plate. Body depth (BD): distance across body at the anus, exclusive of fins; measured on blind side. Preanal length (PAL): tip of fleshy snout to a vertical equal with origin of anal fin; measured on blind side. Caudal-fin length (CFL): base of articulations of middle caudal-fin rays to tip of longest middle rays. Pelvic-fin length (PL) (only blind-side pelvic fin present in adults): basal articulation to distal tip of the longest ray. Pelvic to anal length (PA): shortest horizontal distance from base of most posterior pelvic-fin ray to anal-fin origin. Dorsal-fin length (DFL): vertical equal with origin of dorsal fin to posterior end of hypural plate. Predorsal length (PDL): most anterior point of fleshy snout to origin of dorsal fin. Anal-fin length (AFL): vertical equal with origin of anal fin to posterior end of hypural plate (measured on blind side). Head length: tip of fleshy snout to most posterior extension of upper fleshy lobe of operculum. Head width (HW): greatest distance across head at posterior portion of operculum. Postorbital length (POL): posterior margin of lower eye to posterior extent of upper fleshy lobe of operculum. Upper head lobe width (UHL): distance at operculum from dorsal margin of body to dorsal origin of operculum. Lower head lobe width (LHL): distance at operculum from dorsal origin of operculum to most ventral part of operculum. Width of upper opercular lobe (OPUL): distance from dorsal origin of operculum to mid-point (usually at emargination) of posterior border of operculum. Width of lower opercular lobe (OPLL): distance from mid-point (usually at emargination) on posterior border of operculum to most ventral point of operculum. Snout length (SNL): anterior rim of lower eye to tip of snout. Upper jaw length (UJL): shortest distance from bony tip of premaxilla to angle of mouth. Eye diameter (ED): greatest horizontal diameter of the cornea of the lower eye; does not include fleshy tissue surrounding eye. Chin depth (CD): vertical distance from angle of mouth to most ventral aspect of head.

Qualitative Characters.—The following qualitative characters are also important in identifying *Symphurus* especially when used in combination with meristic and morphometric data.

PUPILLARY OPERCULUM. A pigmented, usually triangular-shaped or rounded, structure on the upper part of the cornea. Mahadeva (1956) and Munroe (1987) found this character useful for diagnosing some eastern Pacific and Atlantic species. A pupillary operculum is not found in any species of eastern Atlantic tonguefish and its absence is useful in distinguishing the eastern Atlantic *Symphurus* from some western Atlantic species with similar meristic and morphometric features but also possessing a well-developed pupillary operculum.

JAW POSITION. Position of the symphysis of the jaws with respect to the lower eye.

DORSAL-FIN ORIGIN. Position of the dorsal-fin origin with respect to the migrating (upper) eye.

SQUAMATION ON DORSAL- AND ANAL-FIN RAYS. Presence and number of scales on the dorsal and anal-fin rays, especially on blind-side rays.

PIGMENTATION. All descriptions of pigmentation patterns are based on preserved specimens.

Maturity.—Was estimated by macroscopic examination of the extent of posterior elongation of the ovaries (ovaries of mature females are conspicuous through the body wall when light is transmitted from beneath the specimen; in immature females, developing ovaries are best observed by dissection) and stages of developing ova. Since no obvious differences in testicular size were apparent in males, maturity estimates were based entirely on females.

Depth of Capture.—If depth included a range of depths over which nets were towed, an average depth for that particular trawl was calculated.

Statistical analyses (SPSS and SPSSX) were conducted on the Primos Computer system at the Virginia Institute of Marine Science. Analyses of meristic and morphometric data were conducted on log-transformed data.

Synonomies are selective for *S. ligulatus* and *S. nigrescens* because of the numerous locality citations; synonomies are presumed to be complete for the other species.

KEY TO MEDITERRANEAN AND EASTERN ATLANTIC SPECIES OF *SYMPHURUS*

1a. Dorsal-fin rays more than 100; body elongate with gradual posterior taper, depth nearly uniform for most of length; caudal-fin rays 12–14; peritoneum black 2
1b. Dorsal-fin rays fewer than 95; body deep with rapid posterior taper, greatest depth in anterior third of body; caudal-fin rays 12, occasionally 13; peritoneum black or unpigmented 3
2a. Anal opening without ring of dark pigment; inner lining of operculum on both sides of body darkly pigmented; caudal-fin rays usually 12, occasionally 13; dorsal-fin rays 101–108; anal-fin rays 86–93; abdominal vertebrae 3+7; total vertebrae 55–59, usually 56–58; ID pattern usually 1-2-2-2-1 or 1-2-2-1-2 ..... *S. vanmelleae*
2b. Anal opening with ring of dark pigment; inner lining of operculum on both sides of body lightly pigmented; caudal-fin rays usually 14, occasionally 13; dorsal-fin rays 102–113; anal-fin rays 90–102; abdominal vertebrae 3+6; total vertebrae 56–61, usually 58–60; ID pattern usually 1-2-2-2-2 ..... *S. ligulatus*
3a. Small ctenoid scales present on blind-side dorsal- and anal-fin rays; blind side with pepper-dot pigmentation; eye relatively small, usually 7–9% HL ..... *S. normani*
3b. Small ctenoid scales absent from blind-side dorsal- and anal-fin rays; blind side without pepper-dot pigmentation; eye relatively large, usually larger than 10% HL 4
4a. Peritoneum black; 72–91 scales in longitudinal series; adults typically exceeding 60 mm SL ..... *S. nigrescens*
4b. Peritoneum unpigmented; 101–109 scales in longitudinal series; species small; adults typically not exceeding 60 mm SL 5
5a. Ocular surface light yellow or cream colored with incomplete, dark crossbands; fins unpigmented; snout 23.1–23.5% HL; upper jaw 21.5–22.1% HL ..... *S. lubbocki*
5b. Ocular surface dark chocolate brown with alternating, lighter X- and Y-shaped markings; fins pigmented; snout 18.2–22.1% HL; upper jaw 19.7–22.0% HL ..... *S. reticulatus*

Symphurus vanmelleae Chabanaud, 1952
Figure 1a

Symphurus vanmelleae Chabanaud, 1952:3 (West Africa 6°25'S–11°53'S; 430–500 m). Nielsen, 1963: 27 (West Africa 2°09'N–7°55'S; 260–600 m; counts, measurements, figure; doubtful synonymy with *S. ligulatus*). Maurin, 1968:56 (mentioned, West Africa). ?Aldebert, 1970:216 (West Africa, Port Juby; 420–700 m; suggested synonymy with *S. ligulatus*; specimen either *S. vanmelleae* or *S. ligulatus*). Matallanas, 1984:198 (doubtful synonymy with *S. ligulatus*).

Symphurus vanmellae. Blache et al., 1970:79 (listed, Gulf Guinea and Angola). Torchio, 1971:262 (synonymized with *S. ligulatus*). Torchio, 1973:636 (doubtful synonymy with *S. ligulatus*). Maul, 1976:64 (counts, distinguished from *S. ligulatus*). Allué, 1982:306 (mentioned; synonymized with *S. ligulatus*).

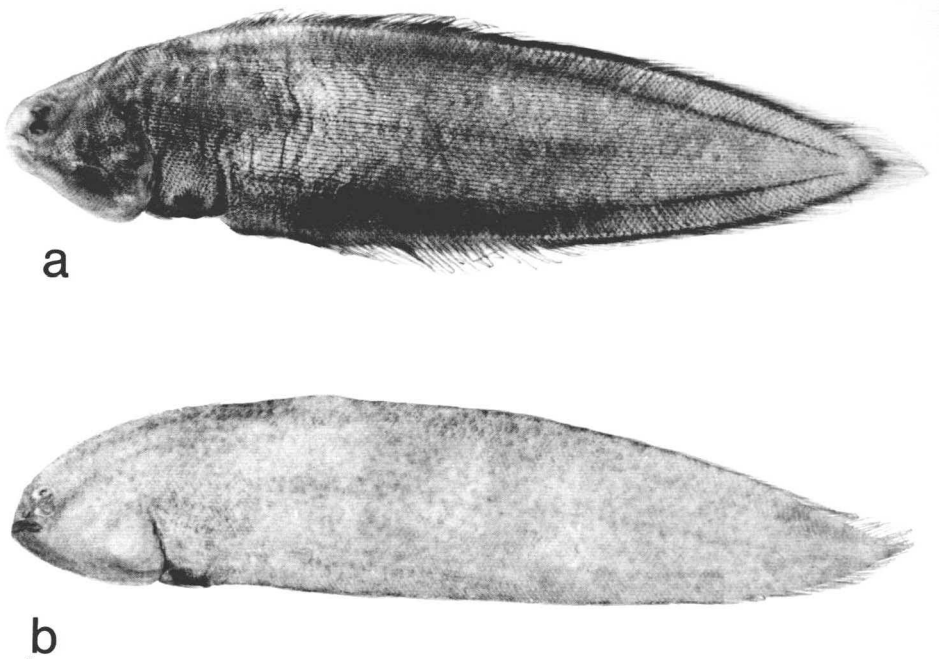

Figure 1. (a) *Symphurus vanmelleae,* IOS Discovery Station 10873, female, 103.0 mm SL; West Africa 14°49.40'N, 17°43.69'W. (b) *Symphurus ligulatus,* ANSP 123249, female, 84.5 mm SL; Gulf of Patti, Mediterranean Sea.

Diagnosis.—The only Atlantic species with the combination of 10–11 (3+7–8) abdominal vertebrae, 56–58 total vertebrae, a 1-2-2-1-2 or 1-2-2-2-1 ID pattern, and 12 caudal-fin rays. *Symphurus vanmelleae* is an elongate species similar in body shape and overall size to the eastern Atlantic *S. ligulatus* and western Atlantic *S. nebulosus* (Goode and Bean) and *S. marginatus* (Goode and Bean). In addition to differences in ID pattern (1-2-2-1-2 or 1-2-2-2-1 in *S. vanmelleae* versus 1-2-2-2-2 in *S. ligulatus* and *S. nebulosus*; and 1-3-2 in *S. marginatus*) and number of abdominal vertebrae (3+7 versus 3+6 in the other three species), *S. vanmelleae* differs from *S. ligulatus* and *S. nebulosus* in having fewer caudal- (12 versus 14), dorsal-, and anal-fin rays. Additionally, the anal opening in *S. vanmelleae* is unpigmented (although sometimes there is a ring of dark pigment around the base of the anal sphincter). In contrast, *S. ligulatus* and *S. nebulosus* have a conspicuous ring of black pigment around the anal opening and no ring of pigment at the base of the anal sphincter. Furthermore, *S. vanmelleae* has darkly pigmented inner linings of the opercula (versus lightly pigmented inner linings in *S. ligulatus*). *Symphurus vanmelleae* further differs from *S. marginatus* in total vertebral number (56–58 versus 52–54) and pigmentation (uniform brown or bluish-gray in *S. vanmelleae* versus brownish-gray with a well-developed, dark brown caudal blotch in *S. marginatus*).

Among tonguefishes occurring outside the Atlantic Ocean, *S. vanmelleae* is most similar in abdominal vertebrae number and ID pattern to three Indo-Pacific species, *S. regani* (Weber and deBeaufort), *S. gilesii* (Alcock), and *S. arabicus* Chabanaud. All three species, however, are readily distinguished from *S. vanmelleae* by caudal-fin ray count (14 versus 12). *Symphurus arabicus,* known only

Table 1. Frequency distributions of predominant interdigitation (ID) patterns of dorsal pterygiophores and neural spines for eastern Atlantic species of *Symphurus*

Species	ID pattern				
	1-2-2-1-2†	1-2-2-2-2	1-3-2	1-3-3	Other
vanmelleae	59*				3
ligulatus	4	27			6
lubbocki			2*		
reticulatus			5*		
nigrescens		2	144*	2	11
normani			2*	24	4

† Includes specimens with the following patterns: 1-2-1-2-2 (N = 4); and 1-2-2-2-1 (N = 8).
* Count observed for primary type.

from the holotype, differs further from *S. vanmelleae* most notably in its lower number of dorsal- (97 versus 101–108) and anal-fin rays (84 versus 86–93), and total number of vertebrae (53 versus 56–58). *Symphurus vanmelleae* differs from *S. gilesii* in having more dorsal- (101–108 versus 97–98) and anal-fin rays (86–93 versus 83–85). *Symphurus vanmelleae,* however, overlaps *S. regani* in most meristic characters except caudal-fin ray number (12 versus 14).

Description.—A moderate-sized tonguefish attaining maximum lengths of approximately 118 mm SL. ID pattern usually 1-2-2-1-2 or 1-2-2-2-1 (Table 1). Caudal-fin rays 12, less frequently 11 or 13 (Table 2). Dorsal-fin rays 101–108 (Table 3). Anal-fin rays 86–93 (Table 4). Pelvic-fin rays 4. Total vertebrae 56–59, usually 56–58 (Table 5); abdominal vertebrae 10, rarely 11 (3+7–8). Hypurals usually 5 (48 of 60 specimens), less frequently 4 (12/60). Longitudinal scale rows 107–124 (Table 6). Scale rows on head posterior to lower orbit 20–28, usually 21–26 (Table 7). Transverse scales 38–42 (Table 8).

Body elongate (depth 210–270 SL, $\bar{x}$ = 242) with gradual taper posteriorly. Preanal length 163–285 SL, $\bar{x}$ = 232; nearly equal to body depth. Head relatively short (130–234 SL, $\bar{x}$ = 193); slightly less than body depth. Head relatively narrow (117–241 SL, $\bar{x}$ = 193), usually equal to or less than head length (HW/HL = 0.62–1.09, $\bar{x}$ = 1.00); lower head lobe 66–120 SL, $\bar{x}$ = 100 nearly equal in width to upper head lobe (81–130 SL, $\bar{x}$ = 105). Opercular lobes of ocular side nearly equal in width (lower opercular lobe 199–366 HL, $\bar{x}$ = 274; upper opercular lobe 138–446 HL, $\bar{x}$ = 243). Postorbital length 111–161 SL, $\bar{x}$ = 127. Snout moderately long (157–286 HL, $\bar{x}$ = 201), covered with small ctenoid scales. Anterior nostril on ocular side much closer to rostral extremity of premaxilla than to lower eye; not passing midpoint of distance between nostril base and lower eye when de-

Table 2. Frequency distributions of numbers of caudal-fin rays for eastern Atlantic species of *Symphurus*

Species	Caudal ray number			
	11	12	13	14
vanmelleae	2	54*	3	
ligulatus		1	4	33†
lubbocki		2*		
reticulatus		4*		
nigrescens	6	148*	1	
normani		33*		

* Count observed for primary type.
† Count reported by Torchio (1971) for neotype.

pressed backwards. Dermal papillae well-developed on blind-side snout and lower jaw. Jaws moderately long; upper jaw length 169–268 HL, $\bar{x}$ = 200; posterior extension of maxilla usually reaching a vertical equal with anterior margin of pupil of lower eye or sometimes extending almost to vertical through middle of lower eye. Chin depth 61–232 HL, $\bar{x}$ = 156. Lower eye moderate in size (111–196 HL, $\bar{x}$ = 133); eyes equal in position; usually with 3–6 small ctenoid scales in narrow interorbital space. Pupillary operculum absent. Length of dorsal-fin base 875–976 SL, $\bar{x}$ = 948. Dorsal-fin origin usually reaching a vertical equal with midpoint of upper eye, rarely reaching a vertical anterior to midpoint of upper eye; predorsal length 38–63 SL, $\bar{x}$ = 52. Length of anal-fin base 693–772 SL, $\bar{x}$ = 747. Scales absent from blind-side dorsal and anal fins. Pelvic fin relatively short, 44–76 SL, $\bar{x}$ = 61; longest pelvic-fin ray usually not reaching anal-fin base or occasionally reaching base of first anal-fin ray; pelvic to anal distance 43–83 SL, $\bar{x}$ = 60. Posteriormost pelvic-fin ray connected to body by a delicate membrane terminating immediately anterior to anus or occasionally extending posteriorly almost to origin of anal-fin base (membrane torn in most specimens). Caudal fin relatively short (72–109 SL, $\bar{x}$ = 93).

Teeth well developed on both jaws. Dentary on ocular side with single row of strong teeth; premaxilla on ocular side usually with a complete or nearly complete single row of teeth.

Scales small, numerous, strongly ctenoid on both sides of body.

Pigmentation.—(Based mostly on recently preserved (1983) material from IOS 10873). Ocular surface usually uniformly dark brown to grayish-blue with no obvious pattern of spots or crossbands. Pigment underlying scales forming longitudinal streaks beginning immediately dorsad of the eyes to base of caudal fin. Blackened longitudinal line more or less evident in area of horizontal septum. Pterygiophore regions of anal and dorsal fins demarcated from main trunk myomeres by obvious longitudinal black line. Pterygiophore region dark brown or bluish-gray, darker in color than trunk. Blind side mostly unpigmented, occasionally with some diffuse yellowish-brown markings on trunk. Peritoneum black, easily visible through abdominal wall on both sides of body. Anal opening without pigmentation. In some specimens, a ring of dark pigment surrounding base of anal sphincter.

Snout region unpigmented. Outer margin of operculum on ocular side dusky-brown to bluish, slightly darker than general background. Inner linings of both opercula, both sides of isthmus, and inner lining of mouth with black pigmentation. Tongue unpigmented. Obvious dark band on upper lip of ocular side.

Dark brown or grayish-blue pigment from pterygiophore region continuing onto proximal half of dorsal- and anal-fin rays; distal half of rays unpigmented. Caudal-fin rays dusky, without obvious pigment pattern.

Size and Sexual Maturity.—The material examined included 28 males and 34 females, ranging in size from approximately 65–118 mm SL (sex not determined for three specimens). Females were slightly larger (three largest measured 118, 115, and 113 mm SL) than males (three largest were 110 mm SL). *Symphurus vanmelleae* matures at relatively large sizes (slightly larger than 73 mm SL) compared to other species. The smallest female (65.2 mm SL) was immature with the ovaries just beginning elongation. Five other small females (77.2–86.0 mm SL) were undergoing gonad elongation or had elongate ovaries with ripening ova. Five of the larger females, 94.2–99.2 mm SL, had fully elongate ovaries without visible signs of ripened ova (spent ?). Sixteen females ranging in size from 73.4 to 118 mm SL had fully extended ovaries containing ripe ova.

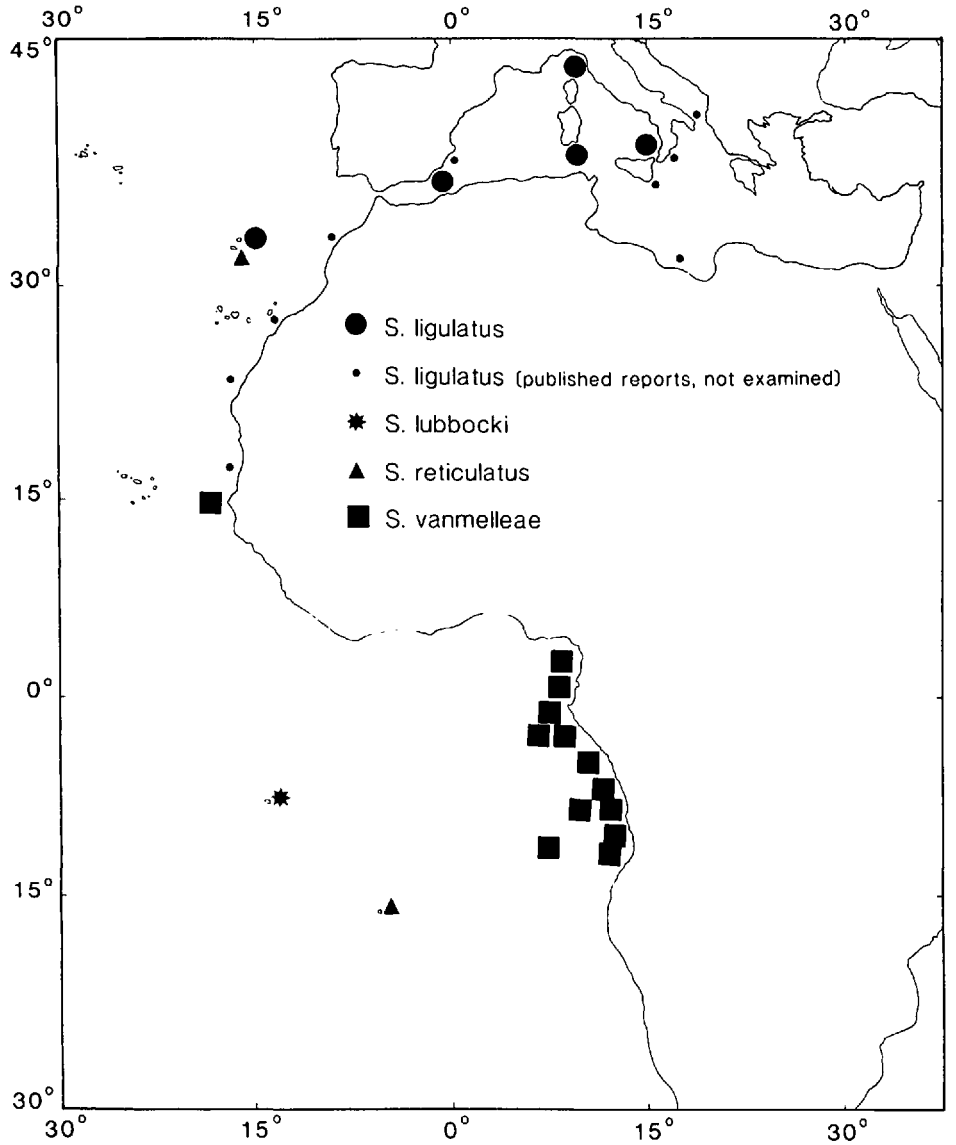

Figure 2. Geographic distributions of *Symphurus vanmelleae, S. ligulatus, S. lubbocki* and *S. reticulatus* based on specimens examined and published records. Dots indicating collection localities may represent more than one occurrence and more than a single specimen from each locality.

Geographic Distribution (Fig. 2).—A bathyal species (260–945 m) inhabiting mud bottoms along the upper continental slope off equatorial West Africa from approximately 14°N to 12°S. This species has been captured primarily in the relatively restricted region extending from ca. 2°N to 12°S (Chabanaud, 1952; Nielsen, 1963). It has not, however, been taken in this region in any abundance (7 of 13 collections were single specimens; only 6 collections contained 2 or more specimens, the largest consisting of 11 specimens). The northernmost collection (IOS 10873), from 14°49'N, 17°43'W, represents a northwesterly range extension of

approximately 2700 km from the previous record at 2°09'N (Nielsen, 1963). This collection is both the largest (30 specimens) and one of the deepest captures for the species (925 m). Aldebert (1970) reported the capture of a single tonguefish (not examined in the present study) off Cape Juby (ca. 28°N) between 420 and 700 m that was possibly *S. vanmelleae.* However, Aldebert stated that counts (not listed) for the specimen were typical for those of *S. vanmelleae* or *S. ligulatus.* Since the identity of this specimen cannot be accurately determined without more specific information than that provided, it is not included in the geographical distribution of *S. vanmelleae* represented in Figure 2.

Nielsen (1963) pointed out that the only two "Atlantide" stations where *S. vanmelleae* were taken were where nets were successfully towed at depths greater than 200 m. He noted that these records, together with those of Chabanaud (1952), indicated that *S. vanmelleae* occurred on the continental slope. This finding is supported by the 65 specimens in the present study which were all trawled from deep-water habitats on the continental slope. The shallowest occurrence among the 65 specimens is a single specimen taken between 260–650 m. The remaining specimens were collected at the following depths: 29 at 400–500 m, four at 500–600 m, 30 at 925 m (IOS 10873), and one was taken at 945 m (UMML 21682). Given that the largest single collection of this species occurred at 925 m, it is possible that the center of abundance of this species occurs significantly deeper on the continental slope than indicated by the shallower depths reported for the majority of captures of solitary individuals. The second largest collection (11 individuals; USNM 300118) was taken at 400 m just south of the equator at 1°26'S, 8°24'E.

Virtually nothing is known concerning the life history of *S. vanmelleae.* The discontinuous geographic distribution (Fig. 2) may reflect a spotty distribution of habitat preferred by this species, or it may merely reflect the lack of adequate sampling at appropriate depths (>300 m) on the continental slope throughout the entire region off equatorial Africa. A stratified sampling regime in this area is required to resolve this question.

Co-occurring Species.—*Symphurus vanmelleae* occurs sympatrically throughout its range with *S. normani* and *S. nigrescens.* It is not, however, syntopic with these species which occupy much shallower habitats (*S. nigrescens* usually occurs at 300 m or less; *S. normani* has not been collected in depths over 100 m).

Remarks.—There has been considerable confusion in the literature regarding the status of *S. vanmelleae,* especially prior to discovery and description of adult specimens of *S. ligulatus* (Torchio, 1963). Both species are superficially similar in overall body shape (Fig. 1a–b) and meristic characters (Tables 1–8). Additionally, both are deep-sea inhabitants that until recently have not been collected in sufficient numbers for direct comparative study. Chabanaud's (1952) tentative suggestion in the original description of *S. vanmelleae* that it was possibly the adult of *S. ligulatus* further confused the issue. Nielsen (1963) also tentatively proposed that *S. vanmelleae* and *S. ligulatus* were the same species, but his study was conducted prior to Torchio's (1963) published account on adult specimens of *S. ligulatus.*

Even following discovery and description of adults of *S. ligulatus,* the status of *S. vanmelleae* was still questioned by some authors (Aldebert, 1970; Torchio, 1971; 1973; Golovan, 1978; Matallanas, 1984). For example, morphological similarities between the two species prompted Torchio (1971) to incorrectly conclude, even after directly examining adults of both species, that the material represented

Table 3. Frequency distributions of numbers of dorsal-fin rays for eastern Atlantic species of *Symphurus*

Species	Dorsal ray number																							
	82	83	84	85	86	87	88	89	90	91	92	//	101	102	103	104	105	106	107	108	109	110	111	112	113
vanmelleae													3	4	5	10	20	7*	8	3					
ligulatus														1	—	2	1	1	2	3†	9	8	5	3	3
lubbocki						1	1*																		
reticulatus							2*	2																	
nigrescens	1	2	3	7	21	28	33*	38	20	5	2														
normani						1	10	10	7*	4	1														

* Count observed for primary type.
† Count reported by Torchio (1971) for neotype.

Table 4. Frequency distributions of numbers of anal-fin rays for eastern Atlantic species of *Symphurus*

Species	Anal Ray Number																									
	69	70	71	72	73	74	75	76	77	78	79	//	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102
vanmelleae													3	4	5	13	14*	10	4	7									
ligulatus																	2	2	—	6	5	8	11†	2	—	—	—	—	1
lubbocki						2*																							
reticulatus						2*	2																						
nigrescens	2	1	3	20	30	42*	28	22	9	2	1																		
normani				1	4	12	12	2*	2																				

* Count observed for primary type.
† Count reported by Torchio (1971) for neotype.

only one species. Maul (1976) subsequently properly diagnosed *S. ligulatus* (based on caudal-fin ray counts and other meristic differences) and clearly established the validity of both *S. vanmelleae* and *S. ligulatus.*

Relationships.—*Symphurus vanmelleae* is interesting in that it possesses 10 (3+7) or rarely 11 (3+8) abdominal vertebrae, an arrangement quite unusual for *Symphurus* (Chabanaud, 1952). All but three other species in the genus (*S. regani, S. gilesii* and *S. arabicus*) possess 9 (3+6) abdominal vertebrae. Interestingly, the four species with 10 abdominal vertebrae occupy deep-water substrates (one each in the eastern Atlantic and western Pacific Oceans and two Indian Ocean species). Besides having the same number and arrangement of abdominal vertebrae and an elongate body-shape, these four species also have similar ID patterns (1-2-2-1-2 or 1-2-2-2-1) not typical of other species in the genus. If these patterns are derived, then the relationships of *S. vanmelleae* would lie with those species.

Material Examined.—64 specimens, 65.2–118.4 mm SL. *Counted and Measured.*—(41 specimens)—IRSNB 16808-439; holotype (104.8); 11°53′S, 13°20′E; 500 m; 18 Dec 1948. IRSNB 16808-440; paratype (96.9); 7°16′S, 12°02′E; 440 m; 1 Oct 1948. IOS DISC ST 10873; 30(82.6–118.4); 14°49.40′N, 17°43.69′W; 925 m; 7 Aug 1983. ZMUC 86226; (97.1); 2°09′N, 9°27′E; 455 m; 1 Mar 1946. UF 33891; 4(77.2–107.0); 2°00′S, 8°46′E; 536 m; 4 Sep 1963. UMML 34320; 2(68.0–83.7); 2°30′S, 8°52′E; 494 m; 5 Sep 1964. UMML 34321; (80.5); 3°02′S, 9°16′E; 400 m; 6 Sep 1963. ZMUC 86227; (113.0); 7°55′S, 12°38′E; 400 m; 17 Mar 1946. *Counted.*—(20 specimens)—USNM 300117; 3(81–101); 1°57′S, 8°47′E; 400 m; 4 Sep 1963. USNM 300118; 11(94.1–110.5); 1°26′S, 8°24′E; 400 m; 3 Sep 1963. USNM 300119; (102.4); 4°07′S, 10°23′E; 400 m; 8 Sep 1963. BMNH 1962.6.18:138–139; 2(97.3–102); 7°55′S, 12°38′E; 400 m; 17 Mar 1946. ZMUC 86230; (105); 7°55′S, 12°38′E; 400 m; 17 Mar 1946. ZMUC 86233; (94.0); 7°55′S, 12°38′E; 400 m; 17 Mar 1946. UMML 34322; (97.4); 10°36′S, 13°12′E; 361 m; 12 Apr 1968. *Other Material Examined.*—UMML 21422; 2(65.2–99.2); 4°56–56.5′N, 5°01–03′W; 416 m; 13 May 1964. UMML 21682; (73.4); 4°54′N, 4°58–56.5′W; 944 m; 31 May 1964.

Symphurus ligulatus (Cocco, 1844)
Figure 1b

Bibronia liculata (lapsus calami) Cocco, 1844:26 (description, figure of symmetrical larvae; Mediterranean, Messina).

Bibronia ligulata. Bonaparte, 1846:46 (listed, Mediterranean near Sicily). Giglioli, 1880:39 (symmetrical larvae of *Bibronia* identified as Pleuronectidae; *Ammopleurops* possibly adults of *Bibronia*). Cocco, 1884:26 (listed, Mediterranean, Messina; placed in subfamily Bibronini, Family Bibronidi). Facciola, 1885:261 (Mediterranean, Messina; discussion of larval flatfishes; description of symmetrical larvae after Cocco, 1844). Facciola, 1886:147 (listed). Raffaele, 1888:53 (*Peloria rueppeli* Emery synonymized with *Bibronia ligulata*). Jordan and Goss, 1889:330 (discussion of larval forms; possible synonymy with *S. nigrescens*).

Ammopleurops sp. Lo Bianco, 1909:513 (larvae; Mediterranean, Naples; *Bibronia* synonymized with *Ammopleurops*).

Symphurus ligulata. Kyle, 1913:138 (description of symmetrical larvae; counts, figure, synonymy, distinguished from *S. nigrescens*; Mediterranean, Ionian Sea and Atlantic, south of Canary Islands).

Symphurus ligulatus. Chabanaud, 1931:33 (listed, Mediterranean; synonymy). Chabanaud, 1939: 26 (listed, Mediterranean; eastern Atlantic; Canary Islands). Padoa, 1942:105 (Mediterranean, Messina; description of metamorphosed pelagic juveniles; counts; comparison with *S. nigrescens*). Chabanaud, 1952:5 (comparison with *S. vanmelleae*; *S. vanmelleae* possibly metamorphosed form of *S. ligulatus*). Padoa, 1956:875 (Straits of Messina, Mediterranean Sea; synonymy; description of asymmetrical pelagic juvenile, counts, morphometrics, figures; literature summary of larval forms; comparison with *S. nigrescens*). Lozano y Rey, 1960:613 (synonymized with *S. nigrescens*). Nielsen, 1963:27 (*S. vanmelleae* might be metamorphosed form of *S. ligulatus*). Torchio, 1963:273 (first report of adults; 600 m or deeper, Ligurian Sea, Mediterranean, Italy; description, counts, morphometrics; comparison with *S. nigrescens*). Bini, 1968:87 (description, counts, morphometrics, figures; summary of distributional and life history information). Maurin, 1968:44 and 56 (West Africa: Cape Juby, Nouakchott; 420–695 m; distinguished from *S. nigrescens*). ?Aldebert, 1970:216 (West Africa: Cape Juby; specimen (not examined in present study) either *S. ligulatus* or *S. vanmelleae*). Arena and Bombace, 1970:145 (Mediterranean, Gulf of Patti). Maurin et al., 1970:20 (listed, West Africa; Cape Juby 420–695 m, Nouakchott 205–282

Table 5. Frequency distributions of numbers of total vertebrae for eastern Atlantic species of *Symphurus*

Species	Abdominal vertebrae	Total vertebrae number												
		47	48	49	50	51	//	55	56	57	58	59	60	61
vanmelleae	(3+7)							1	17	24	15*	2		
ligulatus	(3+6)								1	1	4	19	10	3
lubbocki	(3+6)		1*	1										
reticulatus	(3+6)		1*	3										
nigrescens	(3+6)	2	42	79*	31	4								
normani	(3+6)		7	21	3*									

* Count observed for primary type.

m). Tortonese and Casanova, 1970:43 (Mediterranean, Ligurian Sea; comparison with *S. nigrescens*; summary of distribution records). Relini Orsi and Relini, 1971–72:15 (Mediterranean: Ligurian Sea, 600–700 m; counts and measurements). Torchio, 1971:259 (neotype designation; color and black and white photographs; comparison with *S. nigrescens*; *S. vanmelleae* synonymized with *S. ligulatus*; comments on ecology and bathymetric distribution). Aldebert and Pichot, 1973: 57 (Mediterranean, Libya). Bombace and Froglia, 1973:160 (Mediterranean, southern Adriatic; 300–700 m). Torchio, 1973:636 (synonymy, summary of life history and geographic distribution; *S. vanmelleae* synonymized with *S. ligulatus*). Tortonese, 1975:522 (synonymy; in key; figure; counts, measurements, summary of distribution and biology). Maul, 1976:64 (West Africa, Morocco; 500 m; 112 specimens, 48–77 mm SL; meristics, measurements, figures of adult specimen and caudal skeleton; diagnosed from *S. vanmelleae*). Cau, 1977:393 (Mediterranean, Sardinian Sea; 400–500 m). Golovan, 1978:231 (listed, West Africa; *S. vanmelleae* synonymized with *S. ligulatus*). Cau and Deiana, 1979:247 (Mediterranean: Cagliari, Sicily Bay; 2,000 specimens; reproduction, age estimate, distribution). Quero and Vayne, 1979:37 (included in key). Cau et al., 1980:15 (Mediterranean: Cagliari, Sicily Bay; sexual dimorphism in morphometrics). Allué, 1982:305 (Mediterranean, Spain; 651–1,024 m; counts, measurements, description of otolith; comparison with *S. nigrescens*). Cerro and Portas, 1984:17 (listed, Spanish Mediterranean, 500–700 m). Lloris et al., 1984:182 (listed, Mediterraean, Catalan Coast, Spain). Matallanas, 1984: 198 (listed, Mediterranean, Catalan Coast, Spain; 600–750 m; summary of distribution records). Quero et al., 1986:1325 (in key, figure, brief summary of ecology and distribution).

Diagnosis.—The combination of an elongate body with relatively uniform depth (gradual posterior taper, with uniform depth for approximatley 80% of standard length), 1-2-2-2-2 ID pattern, 14 caudal-fin rays, black peritoneum and numerous dorsal- (102–113) and anal-fin rays (90–102) and vertebrae (56–61) distinguishes this species from all other Atlantic *Symphurus* except the western Atlantic *S. nebulosus* (Goode and Bean) (see Tables 9–10).

Although *Symphurus ligulatus* is superficially similar to the eastern Atlantic *S. vanmelleae,* it can be distinguished from this species by a higher caudal-fin ray count (14 versus 12), vertebral counts (abdominal vertebrae 3+6, total vertebrae 59–60 versus 3+7–8 abdominal vertebrae and 56–58 total vertebrae), modally higher fin-ray counts (dorsal-fin rays 102–113 versus 101–108; anal-fin rays 90–102 versus 86–93 in *S. vanmelleae*) and ID pattern (1-2-2-2-2 versus 1-2-2-1-2 or 1-2-2-2-1). There are also pigmentation differences between these species. *Symphurus ligulatus* has a dark ring of pigment surrounding the anal opening which is absent in *S. vanmelleae.* The inner linings of the opercula are only lightly pigmented in *S. ligulatus* in contrast to the darkly pigmented linings in *S. vanmelleae.*

Symphurus ligulatus is very similar in body shape and meristic features to the western Atlantic *S. nebulosus* but may be distinguished by a modally higher vertebral count (59–60 versus 58–59) and by differences in body depth (*S. ligulatus* is more elongate) and head morphology (*S. ligulatus* has a narrower lower opercular lobe and shorter postorbital head length compared to *S. nebulosus*).

Table 6. Frequency distributions of longitudinal scale rows for eastern Atlantic *Symphurus*.

	Number of scale rows																															
Species	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	//	95	96	97	98	99	100	101	102	103	104
vanmelleae																															
ligulatus																															
lubbocki																															
reticulatus																												1	—	1	—
nigrescens	1	—	1	1	—	2	2	1	5	2	7	6	6	4*	8	11	6	5	3	2											
normani																										2	1	—	2	2	1

	Number of scale rows																															
Species	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
vanmelleae			2	2	2	4	3	2	2	3	3	2	2	2	—	—	—	1	1	1											
ligulatus†											1	—	1	—	—	1	—	1	1	2	—	—	1	4	1	—	1	1	—	—	1
lubbocki	—	1*	1*	—	1																										
reticulatus			—	—	1																										
nigrescens																															
normani	—	—	1	3	1*																										

* Count observed for primary type.
† Torchio (1971) reported an approximate count of 110 scales for the neotype.

Table 7. Frequency distributions of numbers of scale rows on the post-orbital head region for eastern Atlantic species of *Symphurus*

Species	Scale row count												
	16	17	18	19	20	21	22	23	24	25	26	27	28
vanmelleae					1	3	3	13*	6	3	6	—	1
ligulatus				3	4	6	—	1					
lubbocki				1	1*								
reticulatus			2*	1	1	1							
nigrescens	4	10	18*	13	14	4	1						
normani							2	3	3	3*			

* Count observed for primary type.

Symphurus ligulatus differs from 13 other species possessing a 1-2-2-2-2 ID pattern and 14 caudal-fin rays by combined meristic and morphometric differences. Among these species, other than *S. nebulosus, S. ligulatus* is most similar to the South African *S. variegatus* (Gilchrist), which is known only from the holotype. *Symphurus ligulatus* may be distinguished from *S. variegatus* by its higher vertebral count (59–60 versus 56) and several morphometrics (values for *S. ligulatus* listed first): shorter head (HL 157–201, $\bar{x}$ = 182 versus 208); narrower lower head lobe (71–100, $\bar{x}$ = 86 versus 109); shorter postorbital length (110–128, $\bar{x}$ = 119 versus 140); longer snout (180–250, $\bar{x}$ = 214 versus 168); and longer upper jaw (180–252, $\bar{x}$ = 216 versus 154).

Description.—A rather small species attaining maximum sizes of approximately 92 mm SL (Cau and Deiana, 1979; Allué, 1982). The largest specimen examined in the present study was 84.5 mm SL. ID pattern usually 1-2-2-2-2, occasionally 1-2-2-1-2 (Table 1). Caudal-fin rays normally 14, occasionally 12 or 13 (Table 2). Dorsal-fin rays 102–113 (Table 3). Anal-fin rays 90–102 (Table 4). Pelvic-fin rays 4. Total vertebrae 56–61, usually 59–60 (Table 5); abdominal vertebrae (3+6). Hypurals normally 5 (21/31) or less often 4 (10/31). Longitudinal scale rows 115–135 (Table 6). Scale rows on head posterior to lower orbit 19–23 (Table 7). Transverse scales 42–46 (Table 8).

Body notably slender (depth 194–238, usually 210–220 SL, $\bar{x}$ = 213); of nearly uniform width for most of length. Preanal length 205–247 SL, $\bar{x}$ = 225, usually equal to or slightly greater than body depth. Head relatively short, 157–201 SL, $\bar{x}$ = 182. Head narrow (169–216 SL, $\bar{x}$ = 193), usually equal to or only slightly greater than HL (HW/HL = 0.86–1.16, $\bar{x}$ = 1.1); upper head lobe (101–137 SL, $\bar{x}$ = 118) slightly wider than lower head lobe (71–100 SL, $\bar{x}$ = 86). Lower opercular lobe (220–360 HL, $\bar{x}$ = 293) wider than upper opercular lobe (108–240 HL, $\bar{x}$ = 177) and usually projecting posteriorly beyond posterior margin of upper opercular lobe. Postorbital length moderately long (110–128 SL, $\bar{x}$ = 119). Snout moderately long (180–250 HL, $\bar{x}$ = 214); with scaleless area on dorsal portion. Anterior nostril not reaching eye when depressed posteriorly. Snout and chin on blind side with well-developed dermal papillae; papillae not extending to dorsal-fin origin. Mouth relatively long; upper jaw length 180–252 HL, $\bar{x}$ = 216, slightly arched; posterior extension of maxilla reaching to or slightly posterior to vertical line through anterior margin of lower eye. Chin depth 136–254 HL, $\bar{x}$ = 206. Lower eye subelliptical, moderately-sized (98–141 HL, $\bar{x}$ = 120); eyes usually equal in position or upper eye only slightly in advance of lower. Eyes not covered with scales; usually with only 1–2 small scales in narrow interorbital space. Pupillary operculum absent. Length of dorsal-fin base 938–965 SL, $\bar{x}$ = 950. Dorsal-fin origin equal with vertical through anterior edge of pupil of upper eye; or rarely, only

Table 8. Frequency distributions of transverse scale count for eastern Atlantic species of *Symphurus*

Species	Scale count																							
	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
vanmelleae									1	—	4	1	1											
ligulatus													3	—	—	1	2							
lubbocki														1	—	—	—	—	1*					
reticulatus												1	—	1	—	—	—	—	—	—	—	—	—	1*
nigrescens	1	—	1	1	2	2	4*	1	2	4	2	3	2											
normani											2	—	—	—	1	4	—	1*						

* Count observed for primary type.

equal with vertical through anterior margin of upper eye; predorsal distance 35–62 SL, $\bar{x}$ = 50. Anteriormost dorsal-fin rays shorter and more separated at bases than others. Length of anal-fin base 677–790 SL, $\bar{x}$ = 756. Scales absent from blind-side dorsal and anal fins. Pelvic fin relatively short (52–76 SL, $\bar{x}$ = 63); longest pelvic-fin ray reaching to base of first or second anal-fin ray; pelvic to anal distance 40–64 SL, $\bar{x}$ = 53. Posteriormost pelvic-fin ray connected to body by a delicate membrane terminating immediately anterior to anus or occasionally extending posteriorly almost to origin of anal-fin base (membrane typically torn in most specimens). Caudal fin relatively short (86–107 SL, $\bar{x}$ = 96).

Teeth well developed on both jaws. Jaws on ocular side usually with a complete row of slender teeth; occasionally with tooth row present only on anterior two-thirds of upper jaw.

Scales small, strongly ctenoid on both sides of body.

Pigmentation.—Ocular side without distinctive markings. Nearly uniform light brown or yellowish brown, sometimes with overlying speckling of light brown dots. Body immediately posterior to opercular opening sometimes darker brown than general body coloration. Blind side off-white. Anal opening with conspicuous circular ring of black pigment. Peritoneum black, clearly evident through abdominal wall on both sides of body.

Pigmentation of outer surface of operculum on ocular surface similar to general background color; inner linings of both opercula and isthmus lacking dark pigmentation. Upper and lower lips on ocular side darkly pigmented. Prominent dark band usually present on ocular-side upper lip.

Fins lack obvious pigmentation. Dorsal- and anal-fin rays light brown along entire lengths; little if any speckling on fin membranes. Proximal third of caudal fin with diffuse brown pigment. Distal two-thirds of caudal fin usually unpigmented or only faintly pigmented with diffuse speckling of melanophores.

Size and Sexual Maturity.—*Symphurus ligulatus* attains maximum sizes of approximately 92 mm SL although most specimens are smaller. Maul (1976) collected 112 specimens off Morocco ranging in size from 48–77 mm SL and specimens examined in the present study ranged in size from 47.5–84.5 mm SL. One of the largest specimens known (104 mm total length) was collected in the Spanish Mediterranean (Allué, 1982).

Cau and Deiana (1979) reported on size and age of sexual development and seasonality of reproduction for *S. ligulatus* collected in the Gulf of Cagliari, Mediterranean Sea. Based on 2,024 fishes, they found a male to female ratio of 0.46. Female *S. ligulatus* were somewhat larger (90–92 mm SL) than males (84 mm SL) but males matured at smaller sizes (42–44 mm SL) and earlier ages (age II) than females. Although some females were sexually mature at 52–54 mm SL, 100% maturity did not occur in females until 58–60 mm SL when they are approximately 3 years old.

Cau and Deiana (1979), using length-frequency distribution, concluded that at least four age groups were represented among their material. They estimated that metamorphosis and settlement occurred at sizes ranging from 31–40 mm SL. Size at age was estimated as follows: age I 40–50 mm SL; age II 58–68 mm SL; age III 70–78 mm SL; age IV >78 mm SL.

In the Mediterranean Sea, *S. ligulatus* has an extended spawning season from June to November (Bini, 1968; Cau and Deiana, 1979).

Geographic Distribution (Fig. 2).—Mediterranean Sea and nearby Atlantic Ocean southward to about 18°N latitude. Within the Mediterranean Sea, adults have

been taken on soft mud bottoms in the following regions: Ligurian Sea (Torchio, 1963; Tortonese and Casanova, 1970; Relini Orsi and Relini, 1971-72), southern Italy and Sicily (Arena and Bombace, 1970; Torchio, 1971; Cau, 1977; Cau and Deiana, 1979), southern Adriatic Sea (Bombace and Froglia, 1973), off the Libyan coast (Aldebert and Pichot, 1973), and several specimens have been taken in studies of deep-sea communities off the Spanish Mediterranean coast (Allué, 1982; Cerro and Portas, 1984; Lloris et al., 1984; Matallanas, 1984). This species has not been collected in the easternmost regions of the Mediterranean.

In the eastern Atlantic, Kyle (1913) reported on a larval *S. ligulatus* taken near the Canary Islands (24°49'N); Maurin (1968) collected adults off Cape Juby (ca. 28°N); and Maul (1976) collected 112 adults off Morocco (33°12.6'N). The southernmost record (Maurin, 1968) for *S. ligulatus* is Nouakchott, Mauritania (ca. 18°N).

Adult *S. ligulatus* were seldom captured before 1970. The great depth of occurrence, relatively small adult sizes, and infrequency of successful sampling in deep-sea areas, undoubtedly, contributed to the rarity of this species in museum collections. However, since 1970 more specimens have been taken as a result of increased collecting in bathyal regions of the Mediterranean Sea and nearby Atlantic Ocean. Thus far, the largest collections of *S. ligulatus* have come from the central Mediterranean in the Sea of Cagliari and Sicily Bay (Cau and Deiana, 1979) and off the coast of Morocco (Maul, 1976). The relative abundance of *S. ligulatus* at these particular locations compared with its absence in other bathyal regions that have been intensively sampled (Merrett and Marshall, 1981) may indicate that this species has strong preferences for particular substrates. Another possibility may be that differences in abundance of this species from region to region merely reflect the relative success of different trawling efforts in capturing this small flatfish. More detailed collecting is required to identify substrate preference and factors that affect distributional patterns observed for this species.

Bathymetric Distribution.—*Symphurus ligulatus* is resident on the outer continental shelf and upper continental slope. It has usually been collected between 400–700 m (Torchio, 1963; 1971; Relini Orsi and Relini, 1971–72; Maul, 1976; Cau, 1977; Cerro and Portas, 1984; Matallanas, 1984). Cau and Deiana (1979) reported on 2,000 specimens captured between 250–800 m in the Gulf of Cagliari. The deepest recorded depth of capture is 1,024 m (Allué, 1982) for a specimen taken in the Spanish Mediterranean. The shallowest reported occurrence is 205–282 m off Nouakchott, Mauritania (Maurin, 1968). The bathymetric range of specimens in this study was 400–600 m.

Ecology.—Stomach analysis of 200 *S. ligulatus,* 118 of which contained food, indicated that diet was dominated by isopods, euphausiids, small decapods, polychaetes, bivalves, gastropods, small echinoids, foraminiferans, small fishes, and fish scales (Cau and Deiana, 1979).

Co-occurring Species.—Although *S. ligulatus* is sympatric with *S. nigrescens* throughout its geographic range, it is largely if not completely allotopic with respect to bathymetric distribution. *Symphurus ligulatus* usually occurs much deeper (>300 m) than the shallower-occurring *S. nigrescens* (usually 90–350 m, only occasionally deeper) but two collections (both deeper than 300 m) from the Mediterranean Sea contained both species.

Remarks.—The binomial, *Bibronia liculata,* was only used once in the original description (Cocco, 1844:26) but it is highly probable that this spelling of the specific epithet is a lapsus calami given that the original publication is replete

with typographical errors. Also, the specific epithet *liculata* has no meaning whereas *ligulata* is derived from the Latin "ligula", meaning little tongue. This was clearly the author's original intent because he used the common name "linguetta," which translated from the Italian means little tongue. Further evidence of the author's original intent is that Cocco described the body shape as being that of a small tongue. Additional support for accepting *B. ligulatus* as the appropriate spelling is found in Cocco's Index of the Fishes of the Seas of Messina published posthumously from 1884–1886 but based on an unpublished manuscript dated 1845 (Facciola, 1886). In that publication the species is listed (1884:26) as *B. ligulatus*. All subsequent references to this species have used the form *ligulatus* and this is the spelling accepted in the present study.

Larvae comprising the basis for the description of *B. ligulata* were not initially recognized as developmental stages of a flatfish and were unrecognized as a larval *Symphurus* for almost 40 years following their description (Giglioli, 1880). In the Index of the Fishes of Messina, Cocco (1884) included *B. ligulata* in a new family, Bibronidi, placed near the Pleuronectidae but with some uncertainty regarding their affinities. Cocco (1884:26) noted similarities between his Bibronidi and the Pleuronectidae and observed that other than the symmetrical and bilateral position of the eyes, it would appear that *Bibronia* was a true pleuronectid. Bonaparte (1846) also recognized that these larvae were similar to the Pleuronectidae and placed them in the family Bibronidi. Giglioli (1880) first recognized that *B. ligulata* was both a larval flatfish and also probably a tonguefish. He suggested that *Ammopleurops* Günther (=*Symphurus*) might be the adult stage of *Bibronia*.

Other early literature references concerning *S. ligulatus* were similarly descriptions of symmetrical larval stages (Emery, 1883; Raffaele, 1888; Lo Bianco, 1909; Kyle, 1913) utilizing a variety of generic and specific names for this species. Emery (1883), in comparing his specimens with *Bibronia ligulata* and *Peloria ruppellii* (=*Arnoglossus rueppelli*) described by Cocco (1844) and curated at the Zoological Museum of the Royal University of Naples, was apparently unaware that stoppers for jars containing these species had been interchanged. Due to this labelling mix-up, Emery identified his specimens, which actually were *B. ligulata* (based on meristic data and figures included in his description), as *Peloria rueppeli* Cocco (spelling emended by Emery). Raffaele (1888) pointed out this mix-up noting that specimens identified by Emery as *Peloria rueppellii* Cocco (spelling emended by Raffaele) were actually *Bibronia ligulata* Cocco.

Despite the mix-up in specimens, Emery (1883) recognized that the larvae he examined represented a developmental stage of a flatfish probably belonging to the genus *Plagusia* (=*Symphurus*). He directly compared his specimens with descriptions of *Plagusia lactea* Bonaparte (=*Symphurus nigrescens*) and concluded that his *P. rueppeli* represented a different species. Raffaele (1888) and later, Lo Bianco (1909), agreed with Emery (1883), that *B. ligulata* Cocco was a larval stage of a tonguefish but not one conspecific with *Ammopleurops* (=*Symphurus*) *lactea* Bonaparte.

After Cocco's *B. ligulata* was recognized as a larval tonguefish (Giglioli, 1880; Emery, 1883; Raffaele, 1888; Lo Bianco, 1909), the specific status remained uncertain because adult fish matching characteristics of these larvae were unknown. In 1913, Kyle published a detailed description of *S. ligulatus* based on two larvae (one each from the Mediterranean and Canary Islands). In this work, Kyle clearly demonstrated salient differences between larvae of *S. ligulatus* and those of the widespread Mediterranean and northeast Atlantic species, *S. nigrescens*. Kyle noted that his specimens had more finrays (D 106–109, A 95–96) than those reported by Cocco (1844) for *B. ligulata* (D ca. 90, A ca. 80). He noted that the

Table 9. Results of MANOVA analysis of 14 morphometric variables comparing body shapes of *Symphurus ligulatus* and *S. nebulosus* (Abbreviations defined in text)

	S. ligulatus		*S. nebulosus*			
Morphometric	Range	$\bar{x}$	Range	$\bar{x}$	F	*P*
BD	194–238	213.1	165–282	233.5	10.83	0.002
PDL	35–62	50.0	33–69	50.3	1.84	0.181
PAL	205–247	225.2	163–246	223.2	2.91	0.095
DBL	938–965	950.0	931–967	949.7	2.56	0.117
ABL	677–790	756.2	708–790	757.0	4.19	0.046
HL	157–201	181.9	159–208	186.7	8.93	0.005
HW	169–216	192.8	186–239	216.3	18.02	<0.001
POL	110–128	118.7	110–133	124.0	11.64	<0.001
SNL	31–49	39.0	29–47	39.0	2.98	0.091
UJL	32–46	39.4	31–47	38.5	2.13	0.151
ED	18–26	21.9	16–26	21.3	1.79	0.187
CD	26–48	37.6	26–52	39.1	3.41	0.071
UHL	101–137	118.3	64–144	122.4	4.92	<0.032
LHL	71–100	86.2	82–129	103.6	24.46	<0.001

number of rays reported by Cocco were, instead, more similar to those of *S. nigrescens* (D 84–91, A 71–78) and suggested that perhaps Cocco had larvae of both species in his material (since the larvae are now lost (Torchio, 1971), this cannot be resolved). Kyle pointed out that the figure accompanying the description of *B. ligulata* was distinctly that of a species different than *S. nigrescens*. He also deduced (correctly, as would be shown by later studies), based on relative size and high meristic features of the *S. ligulatus* larvae, that adults of this species were deep-sea inhabitants.

From Kyle's study in 1913 until the capture of adult specimens approximately 119 years after the original description (Torchio, 1963), the validity of *S. ligulatus* was still questioned by some authors. For example, Chabanaud (1931) was unsure of the validity of *S. ligulatus* and Lozano y Rey (1960) still considered there to be only one *Symphurus* in the Mediterranean despite the detailed descriptions by Kyle (1913) and Padoa (1942, 1956) of two types of *Symphurus* larvae (corresponding to *nigrescens* and *ligulatus*) from this region.

Chabanaud's description (1952) of *S. vanmelleae* resulted in still more confusion regarding the validity of *S. ligulatus*. *Symphurus vanmelleae* is a rarely collected, deep-sea tonguefish occurring off West Africa. It overlaps *S. ligulatus* in meristic features and also has an elongate body. Since adult *S. ligulatus* were unknown at the time that *S. vanmelleae* was described, similarities in meristic features, body shape, and the fact that *S. vanmelleae* had been captured in deep water (the type of habitat that Kyle (1913) indicated adult *S. ligulatus* would be found to occur) prompted Chabanaud (1952) to tentatively suggest that *S. vanmelleae* might be the adult form of *S. ligulatus*.

Adult *S. ligulatus* were finally described in 1963, when Torchio reported on two specimens collected from the Ligurian Sea in the north central Mediterranean. This discovery confirmed the existence of a second *Symphurus* (other than *S. nigrescens*) in the Mediterranean and provided information for identifying the two species based on differences in meristic features and body shape. Interestingly, these specimens were collected between 500–600 m, corroborating Kyle's earlier proposal (1913), based strictly on larval characteristics, that adult *S. ligulatus* were most likely deep-sea inhabitants.

Table 10. Characters used in the discriminant-function analysis of *Symphurus ligulatus* and *S. nebulosus* and the untransformed character coefficients for the first canonical variate from the discriminant-function analysis of the two species (Abbreviations defined in text)

Character	Coefficient
1) BD	0.91
2) PDL	−0.01
3) PAL	−0.98
4) DBL	0.12
5) ABL	−0.79
6) HL	−1.35
7) HW	−0.12
8) POL	2.05
9) SNL	0.37
10) UJL	0.13
11) ED	0.30
12) CD	0.13
13) UHL	−0.61
14) LHL	1.27

The discovery of adult specimens of *S. ligulatus* did not, however, stabilize the nomenclature for this species. Several authors, including Nielsen (1963) and Torchio (1971, 1973) followed Chabanaud in considering *S. vanmelleae* to be the adult stage of *B. ligulata.* Torchio (1971, 1973), even after directly examining adults of both species and noting differences in body shapes (especially body depth), considered *S. vanmelleae* to be a junior synonym of *S. ligulatus.* He (1971) noted that these nominal species had overlapping dorsal- and anal-fin ray counts and similarities in ocular-side pigmentation and considered differences in counts of caudal-fin rays (14 in *S. ligulatus* versus 12 in *S. vanmelleae*) and abdominal vertebrae (9 in *S. ligulatus* versus 10 in *S. vanmelleae*; evident in a radiograph (Fig. 6) of both species, insufficient to warrant recognition of two species.

The validity of both *S. ligulatus* and *S. vanmelleae* was finally established when Maul (1976), based on 112 specimens of *S. ligulatus* collected off the coast of Morocco, clearly demonstrated differences between the two species.

The larvae on which the original description of *S. ligulatus* was based have been lost, and Torchio (1971) designated a neotype (CSI 2507) for *S. ligulatus,* an adult (83 mm TL, 78 mm SL) specimen collected in 400–550 m in the Gulf of Patti, Mediterranean Sea off Sicily on 1 July 1970. Although the neotype was not directly examined in the present study, fin-ray counts (caudal-fin rays 14; dorsal-fin rays 108; anal-fin rays 96) and the color photograph (Plate 5) provided by Torchio (1971) show clearly that this specimen is *S. ligulatus* and not *S. vanmelleae,* which in addition to having different meristic features (Tables 2–4) also does not occur within the Mediterranean (Fig. 2).

Relationships.—Intra-generic relationships of this species are not resolved. Historically, comparisons of *S. ligulatus* have been made only with *S. nigrescens* and *S. vanmelleae.* However, neither of these species was thought by Munroe (1987) to be closely related to *S. ligulatus.* As stated above and as Chabanaud (1952) hypothesized, *S. vanmelleae* is more closely related to three Indo-Pacific species. *Symphurus nigrescens* was thought (Munroe, 1987) to belong to a species group characterized by 12 caudal-fin rays and a 1-3-2 ID pattern. Munroe (1987) proposed that *S. ligulatus* belongs to a species group characterized by a 1-2-2-2-2 ID pattern and 14 caudal-fin rays. This group includes *S. nebulosus,* a deep-water

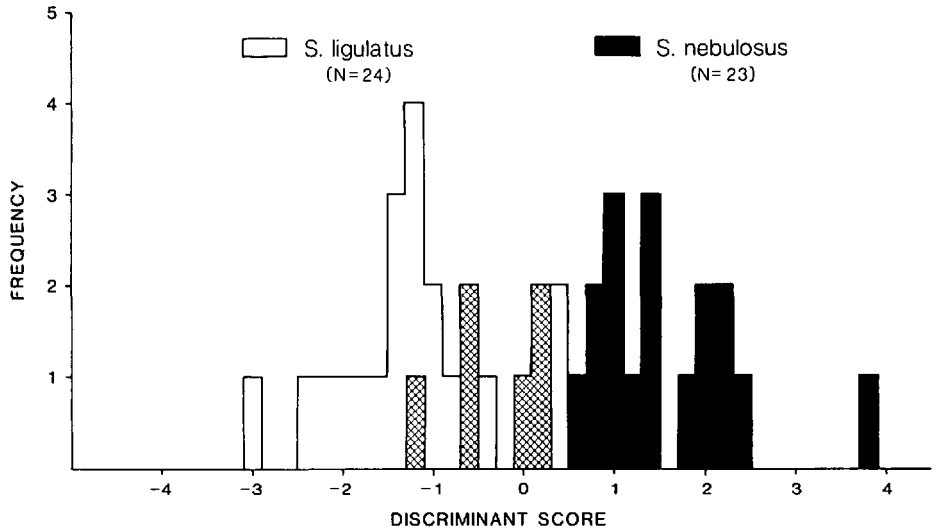

Figure 3. Frequency plot of discriminant-function scores based on analysis of 14 morphometric characters for 24 specimens of *Symphurus ligulatus* (eastern Atlantic) and 23 specimens of *S. nebulosus* (western Atlantic).

species of the western North Atlantic (Goode and Bean, 1883), which, as was briefly noted by Chabanaud (1952) in a short footnote, has similar meristic features to *S. ligulatus*.

Direct comparisons of *S. ligulatus* and *S. nebulosus* were conducted using analysis of variance (ANOVA) on log-transformed values of selected meristic characters and multivariate analysis of variance (MANOVA; Table 9) and discriminant-function analysis (DFA; Table 10; Fig. 3) on 14 log-transformed morphometric characters.

Results of these analyses reveal significant differences ($F = 5.64$, $P = 0.02$) in the mean number of total vertebrae of these species. *Symphurus ligulatus* tends to have a higher number of vertebrae (total vertebrae usually 59–60, $\bar{x} = 59.2$) compared to *S. nebulosus* (total vertebrae usually 58–59, $\bar{x} = 58.6$). However, there were no significant differences between species in the numbers of dorsal- ($F = 0.42$; $P > 0.51$) and anal-fin rays ($F = 0.86$; $P > 0.75$).

Statistically significant differences ($P < 0.05$) were also revealed in 7 of 14 morphometric characters analyzed by MANOVA. The most notable differences between these species are in head width ($F = 18.02$, $P < 0.001$), postorbital length ($F = 11.64$, $P < 0.001$), lower head lobe width ($F = 24.46$, $P < 0.001$), and body depth ($F = 10.83$, $P < 0.002$). With the discriminant function derived from these morphometric data (Table 10; Fig. 3), 83% of the *S. ligulatus* and 87% of the *S. nebulosus* individuals were correctly classified into their respective species group. Character coefficients from DFA of morphometric variables (Table 10) reveal that postorbital length and head length (both shorter in *S. ligulatus*), lower head lobe width (narrower in *S. ligulatus*), and body depth (*S. ligulatus* has a narrower, more elongate body) contributed most to the separation of these species.

Despite the morphological differences between *Symphurus ligulatus* and *S. nebulosus*, they share osteological characters (Munroe, in progress) and similarities in pigmentation, supporting the hypothesis that they comprise a closely-related species pair with distributions in bathyal depths of the temperate waters on either side of the North Atlantic.

Material Examined.—38 specimens, 47.5–84.5 mm SL. *Mediterranean*—ANSP 123249; (84.5); Gulf of Patti, Messina; 450 m; 1970 (collected with the neotype). MSNG 45458; 4(65.1–76.6); east Ligurian Sea; 590 m; 1973. IRSNB 20.810; 3(65.7–72.7); Gulf of Cagliari; 550 m; 28 Feb 1967. *Eastern Atlantic*—MMF 22492; 30(47.5–74.5); 33°12.6'N, 9°15.2'W; 500 m; 30 Jan 1967.

Neotype (CSI 2507)-Attempts to borrow the neotype were unsuccessful. Thus, this specimen could not be included in the present study.

Symphurus lubbocki new species
Figure 4a

Symphurus sp. Lubbock, 1980:297 (Ascension Island; counts). Edwards and Glass, 1987:667 (listed, Ascension Island).

Diagnosis.—A diminutive species readily distinguished from all other *Symphurus* by the combination of a 1-3-2 ID pattern; 12 caudal-fin rays; unique pigmentation pattern (cream-colored ocular surface with several, mostly incomplete, crossbands and no pigment on the unpaired fins); numerous, fine scales (107–109 longitudinal scale rows); and an unpigmented peritoneum. *Symphurus lubbocki* is most similar to two other diminutive species, the eastern Atlantic *Symphurus reticulatus* (described below) and the western Atlantic *S. rhytisma* Böhlke, which share the 1-3-2 ID pattern, unpigmented peritoneum, unusually ornate pigmentation (for a tonguefish), numerous, fine scales along the body, and diminutive adult size. *Symphurus lubbocki* differs from *S. reticulatus* in pigmentation of the ocular surface (cream-colored with several, mostly incomplete, crossbands and no pigment on the unpaired fins versus dark, chocolate-brown body pigmentation with alternating X- and Y-shaped markings on the body and dark blotches in the dorsal, anal and caudal fins). *Symphurus lubbocki* also differs from *S. reticulatus* in morphometrics, including a shorter dorsal-fin base (918–919 versus 937–962 SL), longer head (230–243 versus 207–226 SL), greater predorsal distance (309–338 versus 183–303 HL), longer snout (231–235 versus 182–221 HL), longer upper jaw (215–221 versus 197–220 HL), wider chin (215–221 versus 121–208 HL), and smaller upper head lobe (600–618 versus 657–826 HL).

Symphurus lubbocki differs from *S. rhytisma* in pigmentation pattern (*S. rhytisma* of comparable size (20–35 mm SL) usually have a dark blotch on the caudal region of the ocular side of the body) and *S. lubbocki* has more dorsal- (87–88 versus 83–85) and anal-fin rays (74 versus 68–71), and more vertebrae (48–49 versus 46–48, usually 47). *Symphurus lubbocki* also has smaller scales, as evidenced by the greater number of longitudinal scale rows (107–109 versus 91–97 in *S. rhytisma*).

Symphurus lubbocki is similar in some meristic features to two other Atlantic species, the eastern Atlantic *S. nigrescens* and western Atlantic *S. pusillus* (Goode and Bean), both characterized by a 1-3-2 ID pattern and 12 caudal-fin rays. *Symphurus lubbocki* differs from both species in having an unpigmented peritoneum (versus black in the others) and much smaller scales (107–109 longitudinal rows versus 95 or less in the others).

Certain meristic features of *S. lubbocki* also partially overlap ranges of those of the West African *S. normani*. *Symphurus lubbocki* differs from *S. normani*; however, in ID pattern (1-3-2 versus 1-3-3 in *S. normani*), body size (*S. normani* is a much larger species), pigmentation (*S. normani* with ocular side uniform light brown color and faint crossbanding with blind side with a pepper-dot pattern). Finally, *S. lubbocki* lacks the series of 6–8 small scales present on blind-side dorsal- and anal-fin rays in *S. normani*).

Description.—*Symphurus lubbocki* is a diminutive species and among the smallest species in the genus. Two known specimens, measuring 28.0 and 28.3 mm SL,

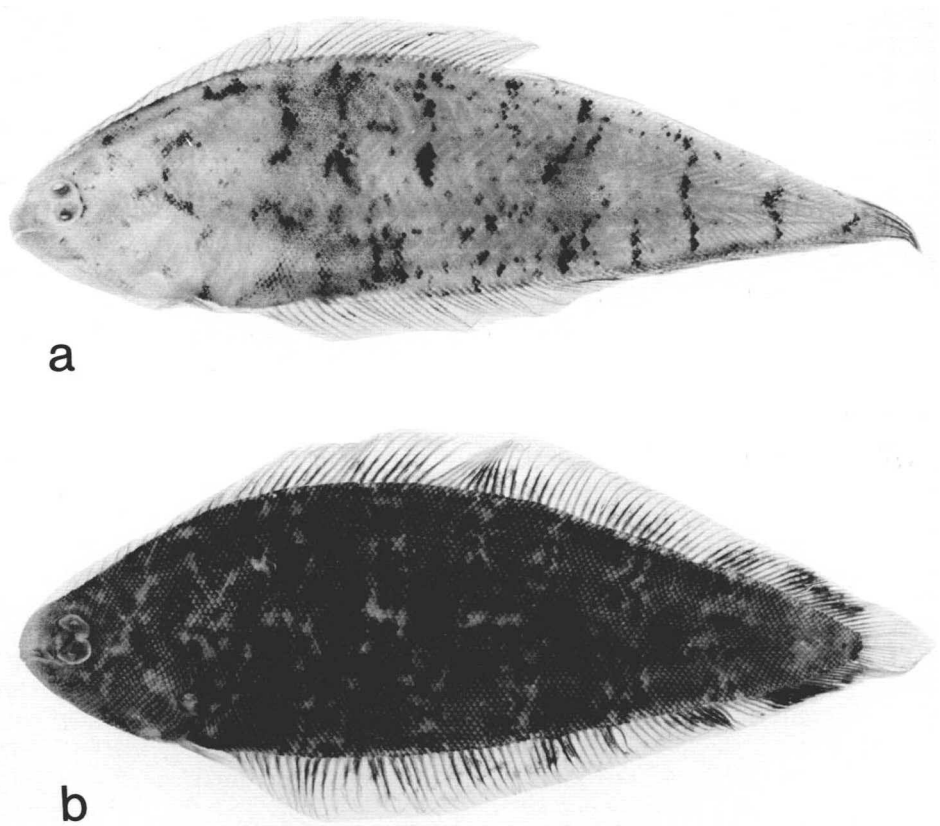

Figure 4. (a) *Symphurus lubbocki*, new species, holotype, BMNH 1979.1.5:237, female, 28.0 mm SL; Ascension Island. (b) *Symphurus reticulatus*, new species, holotype, BMNH 1984.7.16:246, male, 59.2 mm SL; Saint Helena Island.

are females with at least partially elongate (maturing) ovaries. In the description below, counts and measurements are presented first for the holotype, followed by values for the paratype if different. ID pattern 1-3-2. Caudal-fin rays 12. Dorsal-fin rays 87, 88. Anal-fin rays 74, 75. Pelvic-fin rays 4. Total vertebrae 48, 49; abdominal vertebrae 3+6. Hypurals 4. Longitudinal scale rows 107, 109. Scale rows posterior to lower orbit 19, 20. Transverse scales 43, 48.

Body moderately deep (293, 258 SL); greatest depth in anterior half of body. Preanal length 250, 272 SL. Head relatively long (230, 243 SL) and narrow (width 257, 226 SL); approximately equal in length and width (HW/HL = 1.06, 0.98). Lower head lobe (114, 64 SL) narrower than upper head lobe (150, 138 SL). Postorbital length relatively short (146, 131 SL). Snout long (231, 235 HL); without scales. Anterior nostril, when depressed backwards, not reaching anterior margin of lower eye. Dermal papillae evident on blind-side snout but not well developed. Jaws relatively long; upper jaw length 221, 215 HL. Posterior extension of maxilla reaching a vertical line through anterior margin of pupil of lower eye. Chin depth 221, 215 HL. Lower eye relatively large (132, 154 HL); eyes equal in position. Eyes not covered with scales. No scales evident in narrow interorbital region. Pupillary operculum absent. Length of dorsal-fin base 918, 919 SL. Dorsal-fin origin on a vertical line through mid-point of upper eye. Predorsal length 309,

338 HL. Length of anal-fin base 725, 738 SL. No scales on blind-side dorsal and anal fins. Pelvic fin relatively short, 71, 78 SL; longest pelvic-fin ray reaches to base of first anal-fin ray; pelvic to anal distance 36, 50 SL. Posteriormost pelvic-fin ray connected to body by a delicate membrane extending posteriorly almost to origin of anal-fin base. Caudal fin moderately long, 118, 127 SL.

Teeth present on all jaws. Jaws on blind side with teeth well developed. Ocular-side dentary with incomplete row (holotype) or complete row (paratype) of rather large teeth. Single, incomplete row of teeth on anterior three-fourths of ocular-side premaxilla in holotype; paratype with teeth on entire length of ocular-side premaxilla.

Scales small, strongly ctenoid on both sides of body.

Pigmentation.—Ocular surface with cream-colored background. Pigment forming a series of variable, mostly incomplete crossbands along body. Dorsal surface of head midway between eyes and opercular opening with short, incomplete, crossband of small brown pigment spots extending ventrally to a point equal with horizontal through eyes. Small brown blotches or partial crossbands along posterior head and anterior part of trunk. Most blotches or crossbands oriented dorsoventrally, but some horizontally. Posterior fifth of body with two complete crossbands. Posteriormost band located short distance from caudal-fin origin. Outer operculum with only general background color. Inner linings of opercula and isthmus not darkly pigmented. No pigment band on ocular-side upper lip. Blind side of body cream-colored to off-white. Holotype with dark black internal pigment spots evident on both sides of body at junction of epaxial and hypaxial muscles; paratype with pigment spots less numerous and only evident on blind side. Peritoneum unpigmented.

Fins without obvious pattern of spots or blotches. Vertical fin-rays with pigment along entire length of ray. Pigment heaviest in portions of fins adjacent to banding on body. Caudal fin with narrow pigment stripe at base, remainder of fin usually without pigment. No pigment on pelvic-fin base or on pelvic-fin rays.

Etymology.—In recognition of his keen interest and contribution to the knowledge of Ascension Island fishes, cut short by his untimely death, this species is named in honor of the late Roger Lubbock.

Size and Sexual Maturity.—The advanced state of development of the ovaries at such small sizes (28.0, 28.3 mm SL) indicates that these specimens are ripening females of a diminutive species of *Symphurus*.

Distribution and Ecology (Fig. 2).—The two known specimens were collected at Klinka Klub Bay, Ascension Island with rotenone on a sandy substrate near rocks at 20 m depth.

Co-occurring Species.—*Symphurus lubbocki* is the only species of *Symphurus* recorded from Ascension Island.

Remarks.—In his account on the shore fishes of Ascension Island, Lubbock (1980) provided a brief description of these tonguefishes and recognized that they probably represented an undescribed species. Lubbock did not formally name or describe the species because he lacked adequate comparative material to provide a proper diagnosis.

Relationships.—*Symphurus lubbocki* is a shallow-water, diminutive tonguefish inhabiting sandy substrates. It is characterized by a 1-3-2 ID pattern, 12 caudal-fin rays, and numerous small scales in a longitudinal series. Of other species sharing

similar features (*S. reticulatus* from St. Helena and Madeira islands and *S. rhytisma* from the Caribbean Sea), *S. lubbocki* is most similar to *S. reticulatus.*

Material.—BMNH 1979.1.5:237; holotype (28.0); Klinka Klub Bay, Ascension Island; 20 m. BMNH 1979.1.5:238; Paratype (28.3); Ascension Island; 20 m. Collected on sand near rocks 8 Jan 1978 during the January 1978 collecting expedition to Ascension Island by R. Lubbock and colleagues.

Symphurus reticulatus new species
Figure 4b

Symphurus nigrescens (not of Rafinesque, 1810). Nielsen, 1963:25 (in part; St. Helena; counts, measurements). Cadenat and Marchal, 1963:1311 (in part; St. Helena). Maul, 1976:63 (in part; Madeira Island).

Symphurus sp. Edwards and Glass, 1987:667 (James Bay, St. Helena at 7 m).

Diagnosis.—A diminutive *Symphurus* characterized by a 1-3-2 ID pattern, 12 caudal-fin rays, unique pigmentation pattern (dark chocolate-brown body color with series of alternating X- and Y-shaped marks along head and anterior region of trunk, and bases of vertical fin rays heavily pigmented), numerous, fine scales (101–109 longitudinal scale rows), and unpigmented peritoneum. *Symphurus reticulatus* most closely resembles other diminutive *Symphurus,* especially the eastern Atlantic *S. lubbocki* and the western Atlantic *S. rhytisma.* It differs from *S. lubbocki* in pigmentation (dark, chocolate-brown body color with series of alternating X- and Y-shaped marks along head and anterior region of trunk, and bases of vertical fin rays heavily pigmented versus general cream-colored body with mostly incomplete crossbands and fins generally devoid of pigment in *S. lubbocki*). *Symphurus reticulatus* also differs from *S. lubbocki* in the following morphometric features: longer dorsal-fin base (937–962 versus 918–919 SL); shorter head (207–226 versus 230–243); shorter predorsal distance (183–303 versus 309–338 HL), shorter snout (182–221 versus 231–235 HL), shorter upper jaw (197–220 versus 215–221 HL), narrower cheek (121–208 versus 215–221 HL), and larger upper head lobe (657–826 versus 600–618 HL).

Symphurus reticulatus is distinguished from *S. rhytisma* in its higher counts (dorsal-fin rays 88–89 versus 83–85; anal-fin rays 74–75 versus 68–71; vertebrae 48–49, usually 49 versus 46–48, usually 47; and especially longitudinal scale count 101–109 versus 91–97). These two species also differ in pigmentation patterns (*S. rhytisma* has a generally light, cream-colored background without X- and Y-shaped markings and has a dark caudal blotch developed in most of the smaller specimens; *S. reticulatus* has a dark, chocolate-brown background color with prominent X- and Y-shaped markings and shows no indication of a caudal blotch at any size).

Symphurus reticulatus is similar in some meristic features to those of two other species possessing a 1-3-2 ID pattern and 12 caudal-fin rays (*S. nigrescens* and *S. pusillus*). It differs from both in ocular-side pigmentation (dark, chocolate-brown background color with prominent X- and Y-shaped markings versus lighter brown background color with horizontal crossbands) and especially, in pigmentation of the peritoneum (unpigmented in *S. reticulatus* versus black in the others). *Symphurus reticulatus* also has much smaller scales (101–109 in a longitudinal series versus 95 or less in the others).

In certain meristic features, *S. reticulatus* overlaps those of the West African *S. normani.* It differs from this species primarily in ID pattern (1-3-2 in *S. reticulatus* versus 1-3-3 in *S. normani*), pigment pattern (dark, chocolate-brown with alternating X- and Y-shaped marks on ocular surface and unpigmented blind side versus uniformly light brown ocular surface with faint crossbands and pepper-

Table 11. Body proportions for holotype (BMNH 1984.7.16:246) and other specimens of *Symphurus reticulatus*. Measurements, except Standard Length (mm), expressed as thousandths of Standard Length. (Abbreviations defined in text)

	SL	BD	PAL	DBL	ABL	PL	PA	HL	HW	POL	UHL	LHL	CFL
Holotype	59.2	328	240	946	790	78	47	223	260	128	184	117	115
ZMUC 86222	59.9	329	244	950	738	78	63	217	239	135	150	108	110
ZMUC 86223	31.6	288	244	937	718	82	48	209	225	133	139	98	146
ZMUC 86220	31.0	271	261	942	748	81	55	226	239	136	148	103	142
MMF 22999	50.3	286	233	962	754	70	64	207	242	129	155	101	–

dot pattern of pigmentation on the blind side of *S. normani*), and absence of scales on dorsal- and anal-fin rays (6–8 small scales present in *S. normani*).

Description.—*Symphurus reticulatus* is a diminutive species, the largest of five known specimens is 59.9 mm SL. In the description below, counts and measurements are presented for the holotype, followed by ranges for the three paratypes if different. Only a limited number of counts and measurements could be reliably taken from the fifth specimen (MMF 22999) which has a damaged caudal fin. Where possible, values for this specimen were also included in the account below. ID pattern 1-3-2 (Table 1). Caudal-fin rays 12 (Table 2). Dorsal-fin rays 88, 88–89 (Table 3). Anal-fin rays 74, 74–75 (Table 4). Pelvic-fin rays 4. Total vertebrae 48, 49; abdominal vertebrae 3+6 (Table 5). Hypurals 4. Longitudinal scale rows 106, 101–109 (Table 6). Scale rows on head posterior to lower orbit 18, 18–21 (Table 7). Transverse scales 53, 41–43 (Table 8).

Proportional measurements are presented in Tables 11 and 12. Body relatively deep (328, 271–329 SL, $\bar{x}$ = 300); greatest depth in anterior third of body. Preanal length 240, 233–261 ($\bar{x}$ = 244). Head relatively short (223, 207–226 SL, $\bar{x}$ = 216), considerably less than body depth. Head relatively wide (HW 260, 225–260 SL, $\bar{x}$ = 241); wider than long (HW/HL = 1.17, 1.06–1.17, $\bar{x}$ = 1.11). Lower head lobe much narrower (117, 98–117 SL, $\bar{x}$ = 105) than upper head lobe (184, 139–184 SL, $\bar{x}$ = 155). Postorbital length relatively short (128, 128–136 SL, $\bar{x}$ = 132). Snout moderately long (220, 182–221 HL, $\bar{x}$ = 200); with small ctenoid scales present in most specimens. Anterior nostril on ocular side usually reaching base of lower eye when depressed backwards. Dermal papillae well developed on blind-side snout and chin; occasionally extending onto anterior margin of snout and ventral margin of chin on ocular side. Dermal papillae not as well-developed in smaller specimens. Jaws moderately long; upper jaw length 220, 197–220 HL ($\bar{x}$ = 207). Posterior extension of maxilla reaching a vertical through middle of lower eye in smaller specimens; only to vertical through anterior margin of pupil of lower eye in larger specimens. Chin depth 182, 121–208 HL ($\bar{x}$ = 172). Lower eye relatively large (189, 129–189 HL, $\bar{x}$ = 152); eyes usually equal in position, occasionally upper eye slightly anterior to lower eye. Small scales partially covering anterior portion of eyes; usually with 3–6 ctenoid scales in narrow interorbital space. Pupillary operculum absent. Length of dorsal-fin base 946, 937–962 SL ($\bar{x}$ = 947). Dorsal-fin origin along vertical through mid-point of upper eye; occasionally reaching vertical through anterior margin of upper eye; predorsal length 208, 183–303 HL ($\bar{x}$ = 239). Length of anal-fin base 790, 718–790 SL ($\bar{x}$ = 750). No scales on blind-side dorsal- and anal-fin rays. Pelvic fin moderately long, 78, 70–82 SL ($\bar{x}$ = 78); longest pelvic-fin ray usually reaching first, or occasionally second, anal-fin ray; pelvic to anal distance 47, 47–64 SL ($\bar{x}$ = 55). Posteriormost

Table 12. Body proportions for holotype (BMNH 1984.7.16:246) and other specimens of *Symphurus reticulatus*. Measurements, except HW/HL, expressed as thousandths of Head Length. (Abbreviations defined in text)

	HW/HL	POL	PDL	SNL	UJL	ED	CD	UHL	LHL	OPUL	OPLL
Holotype	1.17	576	208	220	220	189	182	826	523	212	265
ZMUC 86222	1.10	623	231	192	208	138	208	692	500	215	292
ZMUC 86223	1.08	636	303	182	197	167	121	667	470	167	273
ZMUC 86220	1.06	600	271	186	200	129	157	657	457	171	286
MMF 22999	1.17	625	183	221	212	135	192	750	490	240	240

pelvic-fin ray connected to body by a delicate membrane terminating immediately anterior to anus or occasionally extending posteriorly almost to origin of anal-fin base (membrane torn in most specimens). Caudal fin moderately long (115, 95–146 SL, $\bar{x} = 122$).

Teeth well developed on blind-side jaws. Ocular-side dentary usually with a single, complete row of slender teeth. Ocular-side premaxilla with dentition developed to variable degree. Some specimens (both large and small) with single row of slender teeth extending along anterior half or three-fourths of premaxilla; specimen from Madeira (50.3 mm SL) with complete row of teeth on premaxilla, smallest specimen (31.0 mm SL) from St. Helena with only a few teeth just anterior to anterior nostril on ocular-side premaxilla.

Scales small, strongly ctenoid on both sides of body.

Pigmentation.—(Based almost entirely on holotype): Ocular surface with a generally dark chocolate-brown color. Body with eight yellowish to olive-colored crossbands. First four bands interconnected, forming series of alternating X- and Y-shaped marks across entire ocular side of body. First band situated on head immediately posterior to eyes. Second band located just posterior to opercular opening, conjoined with two other bands on trunk. Next four bands on trunk completely separate. Posteriormost band crosses body at origin of caudal fin. Outer surface of operculum with mottled areas easily visible with magnification, but pigment pattern not obviously distinct against general body color. Dark band evident on upper lip of ocular side, with heaviest pigment obvious in angle of jaws. Inner linings of opercula and isthmus without pigment. Pelvic fin with pigment on rays and membrane. Blind side yellowish-green with no melanophores evident along mid-line of body.

Dorsal and anal fins with series of eight, dark brown blotches alternating with unpigmented areas. Blotches, beginning at approximately eighth dorsal-fin ray and first anal-fin ray, variable in size, usually covering 5–10 fin-rays and alternating with 4–8 unpigmented fin-rays. Brown blotches only on basal half of fin-rays; distal half of fin-rays unpigmented. Darkest pigment on fin-rays associated with proximate crossbands on body. Caudal fin with dark brown, vertical line on fin base, but remainder of fin entirely unpigmented.

The three paratype specimens collected by Mortenson (ZMUC 86220, 86222–223) are mostly faded, or have pigment present only where scales still remain on the body. The striking banding pattern featured on recently captured specimens is only slightly evident in one specimen. The only noticeable coloration still evident in these mostly faded specimens is the alternating blotches (5–7 in each fin) and unpigmented areas in the vertical fins. The remaining pigment is heaviest only on the basal half of the fin-rays, although in one specimen (ZMUC 82222)

the blotches extend for about seven-eighths of the length of the fin-rays. A band of dark pigment on the ocular-side upper lip is also still evident in all three specimens. Apparent in these specimens, but not in the holotype, are a series of dark internal pigment spots extending almost the entire length on the blind side of the body along the axial skeleton at the junction of the epaxial and hypaxial muscles. One specimen also has axial pigmentation on the ocular side of the body. In the Madeira specimen, axial pigmentation is also evident, but only on the posterior three-fourths of the blind side of the body.

Etymology.—*reticulatus* from Latin meaning netlike, in reference to the bold, netlike, interconnected X- and Y-shaped markings on the body.

Size and Sexual Maturity.—This colorful species reaches adult sizes of approximately 60 mm SL. The largest specimen (59.9 mm SL) and only female has elongate ovaries with a number of developing ova. The largest male (59.2 mm SL) is the holotype. The specimen collected from Madeira measures 50.3 mm SL and is also a male. The other two specimens collected at St. Helena are small males (31.0 and 31.6 mm SL). Little else is known concerning the life history of this species.

Distribution and Ecology (Fig. 2).—Four of five known specimens of *S. reticulatus* were collected from depths between 5 and 45 m over bottom types consisting of sand, broken shells, stones, and gravel at St. Helena Island (Nielsen, 1963; Edwards and Glass, 1987). The fifth specimen was collected at Madeira Island (Maul, 1976) from a seaside swimming pool into which it had been brought in with sea water pumped from a submerged intake located offshore at approximately 1 m depth. I incorrectly listed this specimen as coming from Spain in information supplied to Edwards and Glass (1987).

Co-occurring Species.—*Symphurus reticulatus* co-occurs with *S. nigrescens* at St. Helena (see discussion under the account for *S. nigrescens*). However, based on available information, it would appear that the two species are segregated by depth of occurrence. *Symphurus reticulatus* occurs much shallower (5–45 m) than *S. nigrescens* (70 m).

Remarks.—Previous investigators (Cadenat and Marchal, 1963; Nielsen, 1963; Maul, 1976) misidentified specimens of this new species as *S. nigrescens*, a species with similar meristic features commonly collected throughout the eastern Atlantic in relatively deep waters on the continental shelf. Although these two species have similarities in meristic features they clearly differ in pigmentation patterns and ecology (see diagnosis above).

Relationships.—*Symphurus reticulatus* is a shallow-water, diminutive tonguefish inhabiting sandy substrates. It is characterized by a 1-3-2 ID pattern, 12 caudal-fin rays, and numerous small scales in a longitudinal series. Other species sharing similar features include *S. lubbocki* from Ascension Island and *S. rhytisma* from the Caribbean Sea. Of these, it is most similar to *S. lubbocki* in meristic and morphometric features.

Material.—5 specimens, 31.0–59.9 mm SL. BMNH 1984.7.16:246; holotype (59.2); St. James Bay, St. Helena; 5–10 m; Collected by A. Edwards. ZMUC 86220; paratype (31.0); James Bay, St. Helena; 35 m. ZMUC 86222; paratype (59.9); off Old Woman Valley, St. Helena; 20 m. ZMUC 86223; paratype (31.6); off Lemon Valley, St. Helena; 45 m. MMF 22999; (50.3); Madeira Island; 1 m. (Nontype); not designated as a paratype because it has a damaged caudal fin and comes from a different locality.

Symphurus nigrescens Rafinesque, 1810
Figure 5a

Symphurus nigrescens Rafinesque, 1810:52 (Mediterranean, off Sicily). Jordan and Goss, 1889:321 (synonymy; in key). Collett, 1896:103 (synonymy; off Azores; 454 m; summary of distribution records). Fage, 1907:74 (listed, Mediterranean, Baleares). Lozano y Rey, 1919:83 (Spanish Mediterranean). Roule and Angel, 1930:113 (description of larval stages). de Buen, 1935:86 (listed, Spanish Mediterranean). Chaine, 1936:241 (description of otoliths). Fowler, 1936:523 (listed, West Africa; counts, measurements). Chabanaud, 1939:26 (listed, Mediterranean; summary of distribution records-Mediterranean, eastern Atlantic, Gulf of Gascogne to Angola). Chabanaud, 1949:88 (in part) (synonymy, summary of distribution records). Chabanaud, 1950:624 (redescription, counts, morphometrics, summary of distribution records; distinguished from *S. normani*). Dollfus, 1950:119 (host for new species of parasitic copepod). Ben-Tuvia, 1953:13 (listed, Mediterranean, Israel; rare). Albuquerque, 1954–56:1001 (Portugal; synonomy; description with counts, measurements; summary of distribution records). Dieuzeide et al., 1955:335 (Algeria; description with counts, measurements and figure; 100–300 m; summary of distribution records). Bauzá Rullán, 1956:132 (description of otoliths). Tirelli, 1958:85 (description of sensory papillae). Blache, 1962:79 (listed, Mediterranean to Mauritania). Maurin, 1962:180 (distribution in western Mediterranean and northwest Africa). ?Nielsen, 1963:25 (in part) (West Africa, St. Helena; three of four specimens from St. Helena were *S. reticulatus*; the fourth specimen possibly *S. nigrescens*; counts, measurements). ?Cadenat and Marchal, 1963:1311 (in part) (listed, St. Helena; three of four specimens were *S. reticulatus*; the fourth specimen possibly *S. nigrescens*). Torchio, 1963: 273 (comparison with *S. ligulatus*; counts). Bini, 1968:85 (partial synonymy; description with counts, measurements and figure; summary of ecology and distribution). Maurin, 1968:19 (distribution in western Mediterranean and northwest Africa). Tortonese and Casanova, 1970:43 (Ligurian Sea, Mediterranean; comparison with *S. ligulatus*; description with counts, measurements and figure; summary of distribution records). Ben-Tuvia, 1971:34 (listed, Israel, Mediterranean; rare). Torchio, 1971:259 (comparison with *S. ligulatus*; summary of bathymetric and geographic distributions). Bombace and Froglia, 1973:160 (listed, Adriatic, Mediterranean). Galloti, 1973:125 (Gulf of Taranto, Mediterranean; 95–390 m). Torchio, 1973:635 (synonymy; ecological synopsis; summary of distribution records). Tortonese, 1975:521 (synonymy; in key; figure, counts, measurements, summary of distribution and ecology). Economidis and Bauchot, 1976: 895 (Aegean Sea). Maul, 1976:63 (in part) (specimen from Madeira is *S. reticulatus*; eastern Atlantic-Portugal to Morocco; counts, measurements; summary of distribution records). Cau, 1977:393 (Sardinian Sea, Mediterranean; 50–60 m). Mouneimne, 1977:56 (Libya; figure; rare in eastern Mediterranean). Golovan, 1978:230 (listed, West Africa). MacPherson, 1978:325 (Spanish Mediterranean; feeding ecology). Matallanas, 1979:140 (Spanish Mediterranean; 40–700 m). Matallanas and Rubio, 1979:563 (listed, Mediterranean-Catalan Sea). Tsimenidis et al., 1979:69 (Saronikos Gulf, Aegean Sea, eastern Mediterranean, 200–420 m). Papaconstantinou and Tsimenidis, 1979:12 (Aegean Sea; 90–400 m; counts). Papaconstantinou and Tortonese, 1980:38 (Thermaikos Gulf Aegean Sea; 63–94 m; counts). Matallanas et al., 1981:127 (listed, Spanish Mediterranean). Allué, 1982:306 (counts, measurements and figure of otolith; compared with *S. ligulatus*). Cerro and Portas, 1984:17 (listed, Spanish Mediterranean; 300–700 m). Lloris et al., 1984:182 (listed, Catalan Sea, Mediterranean). Allué, 1985:79 (234 specimens Barcelona fishing grounds, western Mediterranean Sea; comments on diet and bathymetric distribution). Quero et al., 1986:1325 (in key, figure, counts, description, brief summary of ecology and distribution).

Plagusia lactea Bonaparte, 1833 (Mediterranean, Tyrrhenian Sea; distinguished from *S. nigrescens*). Costa, O., 1829–53:60 (listed, Mediterranean Sea). Canestrini, 1861:43 (description with figures; Gulf of Genova; *Rhombus candidissimus* Risso removed from synonymy of *P. lactea*). Costa, A., 1862:45 (distinguished from *Plagusia picta*; *Rhombus candidissimus* Risso removed from synonymy of *lactea*). Steindachner, 1868:728 (listed, Barcelona, Spain). Canestrini, 1872:168 (brief description; Italian Mediterranean; senior synonym of *Ammopleurops lacteus* Günther). Moreau, 1881:627 (brief description; partial synonymy; counts, measurements; rare in French Mediterranean). Emery, 1883:405 (distinguished from *Peloria rueppeli* Cocco (=*Symphurus ligulatus*); senior synonym of *Plagusia picta* Costa). Gibert, 1912:183 (listed, Spanish Mediterranean). de Buen, 1926:94 (listed, Spanish Mediterranean). Scordia, 1927:289 (central Mediterranean; 90–322 m; sandy or rocky substrates with dead and live corals). Scordia, 1929:348 (central Mediterranean; 60 specimens; 60–169 m; soft muddy clay bottoms).

Plagusia (*Symphurus*) *nigrescens*. Bonaparte, 1833 (distinguished from *S. lactea*).

Plagiusa lactea. Bonaparte, 1841 (substitute name for *Plagusia*). Bonaparte, 1846:51 (listed, Mediterranean). Kaup, 1858:106 (listed, Mediterranean).

Plagusia picta Costa, A., 1862:49 (color figure, Mediterranean; compared with *P. lactea*). Canestrini,

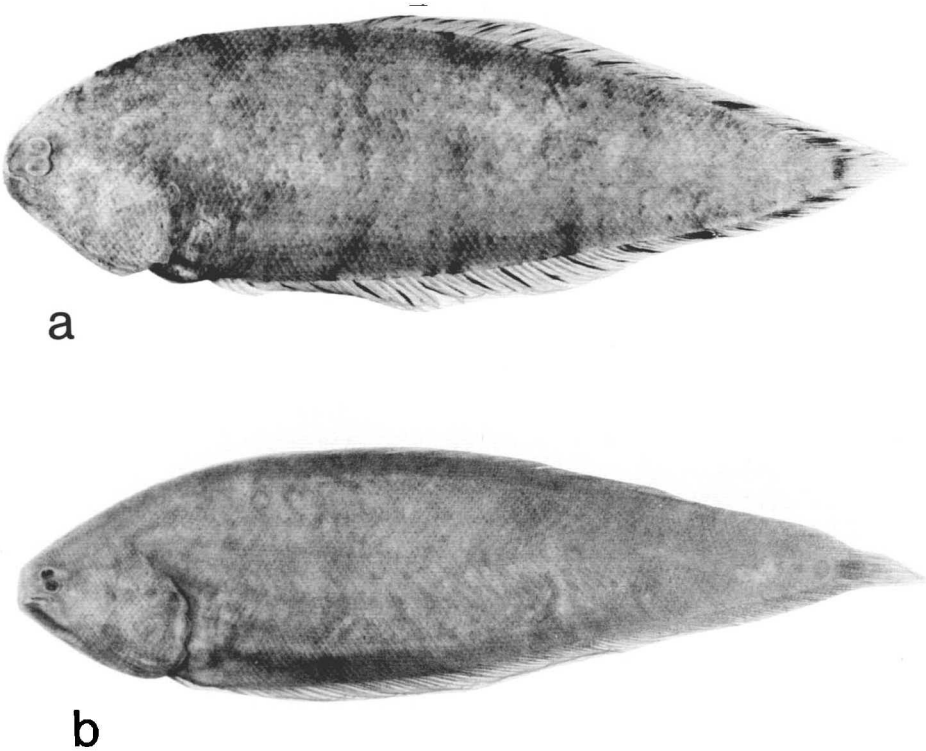

Figure 5. (a) *Symphurus nigrescens*, IOS 8020, female, 97.3 mm SL; eastern Atlantic, 20°45.1'N, 17°39.3'W. (b) *Symphurus normani*, holotype, BMNH 1930.5.6:51, female, 81.4 mm SL; off Cape Lopez, French Congo.

1872:168 (brief description and comparison with *Plagusia lactea*; suggested that status of *P. picta* be re-examined). Emery, 1883:405 (synonym of *Plagusia lactea* Bonaparte).

Ammopleurops lacteus. Günther, 1862:490 (Mediterranean Sea; substitute for *Plagusia lactea* Bp.). Canestrini, 1872:168 (synonymized with *Plagusia lactea* Bp.). Giglioli, 1880:39 (listed, Italy; rare). Raffaele, 1888:53 (senior synonym of *A. pictus* Costa). Vaillant, 1888:192 (Gulf of Gascogne, Spain, Banc d'Arguin, and Sudan; 60–420 m; counts and measurements). Carus, 1889–93:594 (listed, Mediterranean). Kyle, 1900:347 (osteology and classification within flatfishes). Roule, 1919:135 (western Mediterranean, 280 m). Soljan, 1963:11 (listed, Adriatic).

Trachypterus taenia (not Bloch and Schneider, 1801). ?Emery, 1879:581 (in part) (larvae (figs. 1–2) identified as *T. taenia* are probably *S. nigrescens*).

Ammopleurops pictus. Giglioli, 1880:39 (listed, Italy; rare).

Symphurus lacteus. Kolombatovic, 1888:25 (listed, Adriatic). Roule and Angel, 1930:113 (western Mediterranean; larvae; description, measurements, figures). Chabanaud, 1931:32 (synonymy; listed, Mediterranean). Padoa, 1942:105 (listed, Mediterranean, Naples). Padoa, 1956:870 (Mediterranean; description of egg and larval stages; counts, measurements and figures).

Symphurus lactea. Kyle, 1913:130 (western Mediterranean and Gulf of Taranto; synonymy; description of larval stages; counts, measurements, figures; summary of distribution records; *Plagusia picta* synonymized with *S. lactea*). Kyle, 1921:101 (development, eye migration). de Buen, 1926: 94 (synonymy; distribution records for Spanish Mediterranean).

Symphurus nigricens. Merrett and Marshall, 1981:226 (174 specimens, northwest Africa 8–20°N; 279–482 m). Merrett and Domanski, 1985:384 (after Merrett and Marshall, 1981).

Simphurus nigrescens. MacPherson, 1981:183 (western Mediterranean; trophic ecology, resource partitioning).

Symphurus normani (not Chabanaud, 1950). Merrett and Marshall, 1981:244 (northwest Africa 8–20°N; 279–482 m).

Misidentifications. Norman, 1930:363 (type series of *S. normani* Chabanaud). Norman, 1935:34 (after Norman, 1930).

Diagnosis.—*Symphurus nigrescens* is the only eastern Atlantic *Symphurus* characterized by the combination of 1-3-2 ID pattern, 12 caudal-fin rays, and black peritoneum.

Symphurus nigrescens and the eastern Atlantic *S. normani* partially overlap in some meristic features. Historically, these species have been confused in the literature, but they are quite distinctive. *Symphurus nigrescens* differs from *S. normani* in ID pattern (1-3-2 versus 1-3-3), a much larger eye (12–15% HL versus 7–9% HL), larger scales (72–91 longitudinal scales versus 95–105), and *S. nigrescens* lacks scales on the blind-side dorsal- and anal-fin rays (6–8 present in *S. normani*). Additionally, *S. nigrescens* has an unpigmented blind side and frequently has vertical streaks or pigment blotches in the dorsal and anal fins (versus pepper-dot pattern on the blind side and no obvious pigmentation in the vertical fins of *S. normani*).

Certain meristic features of *S. nigrescens* also overlap those of three diminutive *Symphurus, S. rhytisma* from the Caribbean, and two eastern Atlantic species (*S. reticulatus* and *S. lubbocki*). It differs from these shallow-water species principally in peritoneal color (black versus unpigmented), larger scales (72–91 versus 97–110), and much larger size (117 mm versus 45–60 mm SL). It differs further from *S. rhytisma* in its modally greater number of vertebrae (47–51, usually 48–50 versus 46–48, usually 47 in *S. rhytisma*).

Symphurus nigrescens is morphologically similar to and has meristic features that completely overlap those of the western Atlantic *S. pusillus* (Goode and Bean). It can, however, be distinguished from this species by differences in caudal-fin lengths, pigmentation, relative body size, and size at sexual maturity. The caudal fin of *S. nigrescens* is distinctly shorter than that of *S. pusillus* (76–122 versus 115–154 SL in *S. pusillus*). *Symphurus nigrescens* usually is dark brown with up to 5 to 7 dark brown crossbands, and has the dorsal and anal fins highly pigmented with either alternating series of oblong blotches throughout the length of the fins, or alternating fin-rays streaked over half of their length with dark pigment. In *S. pusillus,* the body is yellowish with several dark crossbands (usually only 3–4 clearly evident) and the dorsal and anal fins, although pigmented along their basal margins, lack any other obvious pattern such as blotches or streaking along the length of the fin-rays. *Symphurus nigrescens* is a larger species with adults attaining maximum sizes of ca. 117 mm SL and, although some females mature as small as 46 mm SL, most of those examined were not mature until ca. 70 mm SL. In contrast, *S. pusillus* is a diminutive species, reaching maximum sizes of only 65 mm SL and maturing at sizes as small as 40 mm SL.

Symphurus nigrescens and the western Atlantic *S. piger* (Goode and Bean) have some similarities in meristic features but are easily distinguished by scale counts. *Symphurus nigrescens* has smaller and more numerous scales in a longitudinal series (72–91 rows along the body versus 62–75 in *S. piger*). *Symphurus nigrescens* also has only four hypurals in the caudal skeleton (versus five in *S. piger*). Additionally, these two species have distinctly different body shapes (*S. piger* has a much deeper body (244–350 SL, $\bar{x}$ = 322 versus 258–305 SL, $\bar{x}$ = 281) and wider head (242–313 SL, $\bar{x}$ = 277 versus 218–257 SL, $\bar{x}$ = 239) than *S. nigrescens*).

Although meristic features of *S. nigrescens* overlap those of the amphi-American species pair comprised of the western Atlantic *S. pelicanus* Ginsburg and the eastern Pacific *S. gorgonae* Chabanaud, there are considerable differences between these species. The most apparent difference is the blind-side pigmentation (whitish or cream-colored in *S. nigrescens* versus a pepper-dot pattern of black melanophores in the others). *Symphurus nigrescens* also has higher counts than *S. pelicanus* (dorsal-fin rays 82–92, usually 85–91 versus 78–85 in *S. pelicanus*; anal-fin

rays 69–79, usually 72–77 versus 64–69 in *S. pelicanus*), especially total vertebrae (47–51, usually 48–50 versus 44–46 in *S. pelicanus*). The dorsal fin originates at a vertical through the anterior margin or middle of the upper eye in *S. nigrescens* versus a more posterior origin (at a vertical line through rear margin of eye or even posterior to eye) in *S. pelicanus*. *Symphurus nigrescens* also has a much shorter caudal fin (76–122 SL) than *S. pelicanus* (128–185 SL). *Symphurus nigrescens* is also a much larger fish (maximum size 117 mm versus 70 mm SL in *S. pelicanus* and *S. gorgonae*).

Meristic values of *S. nigrescens*, the western South Atlantic *S. ginsburgi* Menezes and Benvegnú, and an undescribed species (species C of Munroe, 1987) from the western North Atlantic overlap partially, but are higher in *S. ginsburgi* and the undescribed species (counts for *S. ginsburgi* and undescribed species C are: vertebrae 50–52, usually 51–52; dorsal-fin rays 87–94, usually 90–94; and anal-fin rays 75–81).

Numbers of dorsal- and anal-fin rays, and total vertebrae of *S. nigrescens* overlap almost entirely those of the western South Atlantic *S. trewavasae* Chabanaud. However, these two species are only superficially similar and differ in many features including ID pattern (1-3-2 in *S. nigrescens* versus 1-3-3 in *S. trewavasae*), caudal-fin ray count (12 versus 10), peritoneum color (black versus unpigmented) and maximum size (117 versus 139 mm SL).

Description.—A medium-sized tonguefish attaining maximum sizes of approximately 117 mm SL. ID pattern usually 1-3-2 (Table 1). Caudal-fin rays usually 12, occasionally 11 or 13 (Table 2). Dorsal-fin rays 82–92, usually 85–91 (Table 3). Anal-fin rays 69–79, usually 72–77 (Table 4). Pelvic-fin rays 4. Total vertebrae 47–51, usually 48–50 (Table 5); abdominal vertebrae 3+6. Hypurals 4. Longitudinal scale rows 72–91 (Table 6). Scale rows on head posterior to lower orbit 16–22, usually 17–20 (Table 7). Transverse scales 30–42 (Table 8).

Body moderately deep (258–305 SL, $\bar{x}$ = 281); maximum depth in anterior third of body. Body with moderate posterior taper. Preanal length 197–284 SL, $\bar{x}$ = 251; less than body depth. Head relatively long, (HL 197–240 SL, $\bar{x}$ = 218); head length less than body depth. Head only moderately wide (218–257 SL, $\bar{x}$ = 239), head width greater than head length (HW/HL 1.01–1.24, $\bar{x}$ = 1.1). Lower head lobe (88–142 SL, $\bar{x}$ = 113) narrower than upper head lobe (121–172 SL, $\bar{x}$ = 143). Lower opercular lobe (209–332 HL, $\bar{x}$ = 281) usually wider than upper opercular lobe (124–354 HL, $\bar{x}$ = 252). Postorbital length moderately long (128–157 SL, $\bar{x}$ = 144). Snout relatively short, somewhat pointed (169–238 HL, $\bar{x}$ = 200); covered with small ctenoid scales. Anterior nostril when depressed backwards not reaching anterior margin of lower eye in most specimens. Dermal papillae well developed on blind-side snout, chin, and dorsal region of head at base of dorsal fin; in some specimens, dermal papillae extend onto ocular side of snout. Jaws moderately long, upper jaw length 177–232 HL, $\bar{x}$ = 205. Posterior extension of maxilla reaching a vertical line through anterior margin of pupil or occasionally only reaching a vertical through anterior margin of lower eye. Chin depth 142–267 HL, $\bar{x}$ = 207. Lower eye moderately to relatively large (91–153 HL, $\bar{x}$ = 120); eyes usually equal in position, although occasionally upper eye slightly in advance of lower eye. Eyes not covered with scales; 1–3 scales in narrow interorbital space. Pupillary operculum absent. Length of dorsal-fin base 891–976 SL, $\bar{x}$ = 947. Dorsal-fin origin usually on a vertical through middle of upper eye or on a vertical line through anterior margin of upper eye; predorsal length 42–66 SL, $\bar{x}$ = 54. Length of anal-fin base 716–797 SL, $\bar{x}$ = 749. Scales absent on blind-side dorsal and anal fins. Pelvic fin relatively short (46–78 SL, $\bar{x}$ = 66);

longest pelvic-fin ray usually reaching to base of first anal-fin ray; pelvic to anal distance 31–91 SL, $\bar{x}$ = 66. Posteriormost pelvic-fin ray connected to body by a delicate membrane terminating immediately anterior to anus or occasionally extending posteriorly almost to origin of anal-fin base (membrane torn in most specimens). Caudal-fin relatively short (76–122 SL, $\bar{x}$ = 105).

Teeth well developed on blind-side jaws. Lower jaw on ocular side with a single, mostly complete row of teeth; upper jaw on ocular side usually with a single row of teeth extending along anterior three-fourths of premaxilla or occasionally entire premaxilla bearing teeth.

Scales relatively large, strongly ctenoid on both sides of body.

Pigmentation.—Ocular surface usually darkly pigmented, without crossbands. Majority of specimens with dark, irregular blotches on ocular surface. Occasional specimens with 4–6 dark brown, sharply contrasting, crossbands. Crossbands, when present, not continuing onto dorsal and anal fins. Specimens missing scales with ocular surface light brown or mostly faded. Outer surface of ocular-side operculum not pigmented except for general background color. Inner linings of opercula not usually pigmented; occasionally with light speckling of melanophores on inner lining of ocular-side operculum. Ocular-side upper and lower lips usually speckled with pigment, but only small number of individuals with definite dark band. A V-shaped pattern of melanophores on anterior part of snout, dorsal to upper eye. Blind side usually unpigmented, occasionally with dark pigment blotch in caudal region. Peritoneum black, obvious through abdominal wall on both sides of body.

Dorsal and anal fins usually with well-developed alternating series of small blotches (2–5 fin-rays wide) and unpigmented areas. Sometimes with dorsal- and anal-fin rays individually streaked with dark brown pigment but without pigment blotches or basal third of dorsal and anal fins and intervening membrane dark brown and distal two-thirds of fins colorless. Dorsal fin with a series of black, dermal pigment spots along bases of anteriormost fin-rays. Caudal fin usually not heavily pigmented except for proximal scale-covered base. Sometimes a diffuse, roughly circular spot of variable intensity immediately anterior to caudal-fin base.

Size and Sexual Maturity.—The largest specimen examined, a male measuring 117 mm SL, was slightly larger than the largest female (112 mm SL). Most individuals studied ranged between 60 and 95 mm SL. Chabanaud (1950) reported distinctly smaller sizes of 89 and 80 mm SL for females and males, respectively.

Among 147 fish for which sex could be determined, 63 were males (42.3–117 mm SL) and 84 were females (40.3–112 mm SL). Sexual maturity is achieved at a relatively small size in this species. Of 84 females, 76, ranging from 46.2–112 mm SL were mature. Most mature females, however, were larger (75–100 mm SL) than 60 mm SL. There were only four mature females smaller than 60 mm SL (46.2, 54.2, 55.8, and 59.6 mm SL). In the smallest female examined (40.3 mm SL), the ovaries had just started to elongate posteriorly. In all other immature females the ovaries had already initiated elongation.

Merrett and Marshall (1981) collected specimens of this species ranging from 29–107 mm SL. Three peaks were evident in sizes of their material, possibly corresponding to year classes. Estimated lengths at age were ca. 65, 90, and 102 mm SL for Ages I, II, and III.

Geographic Distribution (Fig. 6).—*Symphurus nigrescens* is the most common and widespread species of *Symphurus* in the eastern Atlantic Ocean. This species ranges throughout the Mediterranean Sea and eastern Atlantic from the southern

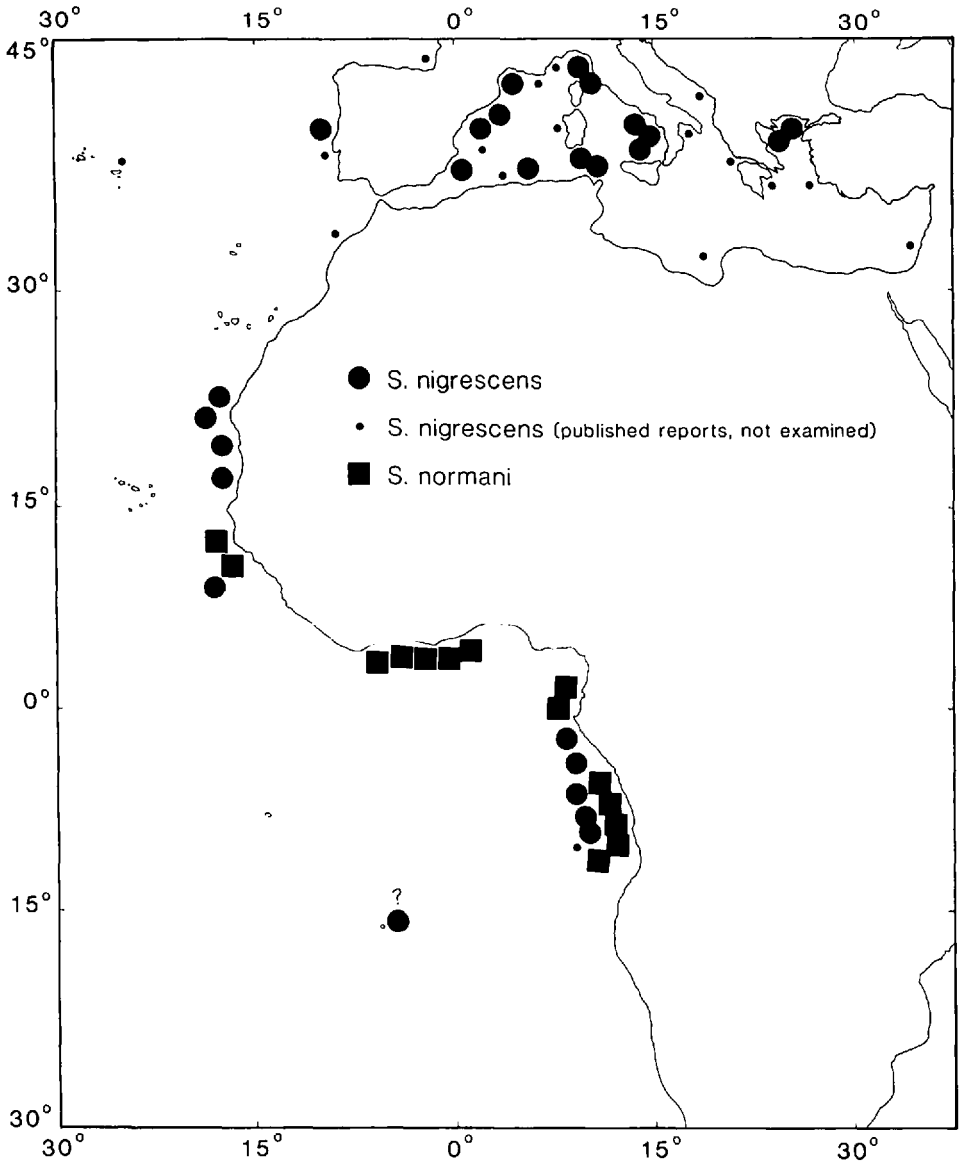

Figure 6. Geographic distributions of *Symphurus nigrescens* and *S. normani* based on specimens examined and published records. Dots indicating collection localities may represent more than one occurrence and more than a single specimen from each locality.

Bay of Biscay (Vaillant, 1888) to at least as far south as northern Angola (ca. 7°S) (Chabanaud, 1939; 1950; Nielsen, 1963).

Within the Mediterranean, it has been collected at numerous locations ranging from the eastern Adriatic Sea (Kolombatovic, 1888; Soljan, 1963; Bombace and Froglia, 1973) and Aegean Sea (Economidis and Bauchot, 1976), including the Thermaikos Gulf (Papaconstantinou and Tortonese, 1980) and Saronikos Gulf (Papaconstantinou and Tsimenidis, 1979) where it is considered to be very common. In the northeastern Mediterranean, Economidis and Bauchot (1976) re-

ported only two specimens from the Aegean Sea and considered this species as rare. However, Kolombatovic (1888) reported that 20–30 individuals were taken each summer off the coast of Dalmatia. In the southeastern Mediterranean, Ben-Tuvia (1953; 1971) noted that this species is rarely taken in deeper waters off the Israeli coast. *Symphurus nigrescens* has been collected frequently from many locations in the central Mediterranean (Kyle, 1913; Scordia, 1927; 1929; Padoa, 1956), including the Ligurian Sea (Tortonese and Casanova, 1970), Gulf of Taranto (Galloti, 1973), Sardinian Sea (Cau, 1977), and off the coast of Algeria (Chabanaud, 1950; Dieuzeide et al., 1955; Maurin, 1962; 1968). In the western Mediterranean it appears on almost every checklist of deep-sea fishes. Studies reporting this species from the western Mediterranean include Vaillant (1888), Chabanaud (1950), Maurin (1962; 1968), MacPherson (1978; 1981), Matallanas (1979), Cerro and Portas (1984) and Allué (1985).

In the open Atlantic, *S. nigrescens* has been reported once from as far north as the Bay of Biscay (Vaillant, 1888). Albuquerque (1954–56) listed this species as rare off Portugal, but it has more recently been collected there by Maurin (1962; 1968) and Maul (1976). Many specimens have been taken during studies of deep-sea communities off the north African coast (Blache, 1962; Maurin, 1962; 1968; Maul, 1976; Merrett and Marshall, 1981; Merrett and Domanski, 1985). It has also been taken at the Azores (Collett, 1896; Kyle, 1913; Chabanaud, 1950), along the continental shelf of West Africa, off Morocco (Maul, 1976), listed for West Africa (Fowler, 1936), and off the coast of Angola (listed by Chabanaud, 1939; collected by Nielsen, 1963 at 7°19'S).

Although *S. nigrescens* has been reported from St. Helena Island (Nielsen, 1963; Cadenat and Marchal, 1963), all previous identifications of this species from that locality, with one possible exception, were incorrect. The exception is ZMUC 86221, a juvenile (28.1 mm SL), collected at 70 m off Jamestown, St. Helena Island by Thomas Mortenson (Nielsen, 1963; Cadenat and Marchal, 1963). Because of the size and condition of this specimen, I am unable to identify it with certainty. It has a black peritoneum, 1-3-2 ID pattern, 12 caudal-fin rays, 92 dorsal-fin rays, 80 anal-fin rays, 51 vertebrae, and four hypurals. It agrees with *S. nigrescens* with respect to ID pattern, numbers of caudal-fin rays and hypurals, and presence of a black peritoneum. Other meristic features including vertebral and dorsal- and anal-fin ray counts, are at the high end of ranges noted for these features in *S. nigrescens.* If this specimen is *S. nigrescens,* then it is the only representative of this species known from St. Helena. Other than this specimen, all previous references of this species from St. Helena (Cadenat and Marchal, 1963; Nielsen, 1963; and others) are based on misidentifications of *S. reticulatus.*

Chabanaud (1949:89) recorded *S. nigrescens* from the western Atlantic Ocean based on a 13.5 mm SL juvenile, collected a "considerable distance" off the northern coast of South America (0°22'N, 38°25'W). Although dorsal- (89) and anal-fin ray (73) counts lie within ranges reported for *S. nigrescens,* the specimen has only 10 caudal-fin rays, which differs from the 12 caudal-fin rays characteristic of this species. Counts for the specimen are more typical of those for *S. trewavasae,* a commonly-occurring species of the inner continental shelf off Brazil (Chabanaud, 1948; Menezes and Benvegnú, 1976; Munroe, 1987). Based on the meristic data, especially the caudal-fin ray count, and the fact that no other study has reported *S. nigrescens* in the western Atlantic (Ginsburg, 1951; Menezes and Benvegnú, 1976; Munroe, 1987), it is assumed that Chabanaud misidentified this specimen.

Bathymetric Distribution.—*Symphurus nigrescens* has been collected over an extensive vertical range (47–1,400 m) on the continental shelf and upper continental slope. The center of abundance, based on frequency of capture and numbers of

individuals taken, occurs between 90–350 m. The majority of 114 specimens of *S. nigrescens* (95%) in the present study were collected between 90–336 m. The shallowest depth of capture was 47 m where a single specimen was collected; the deepest collections (all solitary individuals) were taken at 500, 550, and 615 m.

Capture depths of specimens in the present study are typical for published accounts of the species in general. Most studies that have listed capture depths note the occurrence of this species between 100–400 m. The deepest capture of *S. nigrescens* was reported by Maurin (1962) for a specimen collected off southern France (Sete) between 1,000–1,400 m. The shallowest captures for this species occur at approximately 40–50 m. Previous reports (Nielsen, 1963) of this species collected at St. Helena at 20 m were based on specimens of *S. reticulatus*. Tsimenidis et al. (1979) considered *S. nigrescens* as very common in the Saronikos Gulf between 20–420 m. However, their 20 m depth might be a typographical error for 200 m, since the focus of the paper was the fishes collected from the "subpelagic zone", a zone extending from 200 to 400 m and beyond. Papaconstantinou and Tsimenidis (1979) and Papaconstantinou and Tortonese (1980) reported this species as very common in the Saronikos and Thermaikos Gulf regions of the Aegean Sea in shallow waters (67–94 m) with other captures extending to about 420 m. In the central Mediterranean Sea, Scordia (1927, 1929) reported collecting *S. nigrescens* from 60–322 m with the majority (37 of 60 specimens) occurring at 60 m (Scordia, 1929) while Tortonese and Casanova (1970) collected 25 specimens in the Ligurian Sea between 300–350 m and Galloti (1973) collected five specimens in the Gulf of Taranto between 95–390 m.

In the western Mediterranean, *S. nigrescens* has been collected at depths ranging from as shallow as 40–60 m (Vaillant, 1888; Matallanas, 1979; one specimen in each study) to 700 m (one specimen, Matallanas, 1979), with the majority of specimens occurring between 100–400 m. Off the Algerian coast, Dieuzeide et al. (1955) reported that this species is abundant at 100–300 m, while Maurin (1968) collected it as deep as 400–700 m. Off the Mediterranean coast of Spain, MacPherson (1978) reported on 1,256 specimens collected between 150 and 600 m. Matallanas (1979) collected 13 specimens off the Catalan coast at depths ranging from 40–700 m and Cerro and Portas (1984) listed the species as occurring at depths from 300–700 m in the Spanish Mediterranean. The only detailed study of bathymetric occurrence for *S. nigrescens* in the western Mediterranean was made by Allué (1985) who analyzed depth of capture for 234 *S. nigrescens* and found that there was no center of abundance of individuals inhabiting depths ranging from 132–450 m.

Symphurus nigrescens also occurs over a wide depth range (47–700 m) in the eastern Atlantic (Collett, 1896; Maurin, 1962; 1968; Nielsen, 1963; Maul, 1976). In their study of the demersal fishes off northwest Africa, Merrett and Marshall (1981) collected 174 *S. nigrescens* between 279–482 m. The largest catch (165 specimens) was taken at 279 m.

Geographic Variation.—Little variation was found in the numbers of vertebrae, dorsal-fin rays, and anal-fin rays of specimens collected from the eastern Mediterranean (Thermaikos Gulf) to Angola (Table 13). Meristic features have slightly higher values in *S. nigrescens* collected from the central and western regions of the Mediterranean and for specimens collected at 21–20°N in the open Atlantic. In specimens collected from the central and western Mediterranean Sea, the highest counts for the species were noted in vertebrae ($\bar{x}$ = 49.4 and 48.8, respectively, versus 48.4–48.7 for specimens collected elsewhere), dorsal-fin rays ($\bar{x}$ = 88.1 and 88.3, respectively, versus 85.2–87.8) and anal-fin rays ($\bar{x}$ = 74.3 and 74.6, respectively, versus 71.6–73.8).

Table 13. Summary of geographic variation in meristic features of *Symphurus nigrescens*. Abbreviations in table are: EM—eastern Mediterranean; CM—central Mediterranean; WM—western Mediterranean; EA1—eastern Atlantic (21–20°N); EA2—eastern Atlantic (18–10°N); and EA3—eastern Atlantic (2–7°S)

	N	Range	Mean	SD
		Vertebrae		
EM	13	48–50	48.4	0.65
CM	20	48–51	49.4	0.67
WM	40	47–51	49.4	0.74
EA1	67	47–51	48.8	0.76
EA2	10	48–49	48.7	0.48
EA3	8	48–49	48.4	0.52
		Dorsal-fin rays		
EM	13	82–87	85.2	1.42
CM	20	85–92	88.1	1.78
WM	40	85–91	88.3	1.49
EA1	67	84–92	88.1	1.60
EA2	10	86–89	87.8	0.92
EA3	8	83–90	87.5	2.45
		Anal-fin rays		
EM	13	69–73	71.6	1.39
CM	20	72–79	74.6	1.71
WM	40	71–78	74.3	1.64
EA1	67	72–78	74.4	1.52
EA2	10	72–75	73.8	1.03
EA3	8	72–76	73.8	1.39

Ecology.—Scordia (1927, 1929) found that *S. nigrescens* in the central Mediterranean region were most frequently collected on soft muddy-clay bottoms. MacPherson's (1978) extensive food-habit study, based on 1,256 specimens, revealed that *S. nigrescens* consumed over 47 types of prey, almost exclusively small, benthic invertebrates. The most abundant food items were polychaetes, ophiuroids, mollusks, the decapod crustacean *Calocaris macandreae,* and other crustaceans. Pronounced seasonal and ontogenetic differences in diets were noted, with ophiuroids comprising a higher percentage of the winter diet while polychaetes were generally more important in diets during other seasons. MacPherson also found that the burrowing decapod *C. macandreae* was more important in diets of fish larger than 10 cm in length.

Co-occurring Species.—Throughout various segments of its range, *S. nigrescens* co-occurs sympatrically with four other species of *Symphurus.* In the Mediterranean and adjacent Atlantic Ocean, *S. nigrescens* co-occurs with *S. ligulatus.* These species are largely allotopic with respect to depth of occurrence, with *S. nigrescens* usually occupying much shallower depths (100–300 m) than *S. ligulatus* (usually >300 m). Only two of the collections containing either species that was examined in the present study had both species present. Both collections containing the two species were made deeper than 300 m. Along West Africa, *S. nigrescens* occurs sympatrically with *S. vanmelleae* and *S. normani. Symphurus vanmelleae* occurs well beyond (361–925 m) the usual bathymetric range of *S. nigrescens. Symphurus nigrescens* may occur syntopically with *S. normani,* since both have been collected shallower than 50 m. However, the centers of abundance of these species, based on numbers of individuals and frequency of capture,

indicate that *S. normani* inhabits much shallower waters (22–75 m) than *S. nigrescens* (40–300 m, but usually deeper than 100 m). None of the collections examined in the present study contained both species.

Remarks.—Although *S. nigrescens* Rafinesque (1810) was described well over one hundred and fifty years ago, a considerable amount of confusion regarding nomenclature and status of this species has persisted until very recently. A variety of specific and generic names have been used and most nomenclatorial rearrangements resulted directly from the inadequate description and lack of type material for *S. nigrescens.*

The description of *S. nigrescens* from the waters near Sicily by Rafinesque (1810:52) is both vague and incomplete. Rafinesque clearly indicated that the specimen forming the basis of his new genus and species was a sinistral flatfish characterized by united caudal, dorsal, and anal fins. Beyond this brief description, no diagnostic counts, measurements, or figures were provided. Moreover, Rafinesque further confounded the issue in indicating that the specimen had a single lateral line. Jordan and Goss (1889) suggested that the lateral line referred to by Rafinesque in all probability was the longitudinal depression at the junction of the epaxial and hypaxial myomeres in the mid-body.

Subsequent to the description of *S. nigrescens,* two additional nominal species, *Plagusia lactea* Bonaparte (1833) and *Plagusia picta* Costa (1862) were also described from Mediterranean waters near Italy.

Costa (1862), in describing *Plagusia picta,* was either unaware of or did not consider *S. nigrescens* to be similar to his species, given that there is no reference to this species in his work. Costa distinguished *P. picta* from *P. lactea* noting its more elongate body, smaller scales, and distinctly different mottled coloration. Unfortunately, Costa provided neither a fin-ray formula nor a vertebral count with the original description. Other authors (Canestrini, 1872; Giglioli, 1880) stated that *P. picta* Costa was close to *P. lactea* Bonaparte and suggested that further study was warranted. All other studies since Giglioli (1880) have regarded *P. picta* as a junior subjective synonym of *P. lactea* Bonaparte (Emery, 1883; Raffaele, 1888; Kyle, 1913; Padoa, 1956) or *S. nigrescens* (Jordan and Goss, 1889; Chabanaud, 1949; this study), differing from these other nominal species only in color pattern.

Bonaparte (1833), based primarily on differences in coloration, believed his *Plagusia lactea* to be different from Rafinesque's *S. nigrescens.* Undoubtedly the vague description of *S. nigrescens* by Rafinesque was at least partially responsible for Bonaparte's conclusion. Historically, *P. lactea* Bonaparte has had considerable application. However, *Plagusia* is unavailable because it is pre-occupied in crustacea (Latreille, 1806). Bonaparte (1841) substituted *Plagiusa* for *Plagusia* to accommodate *Plagusia lactea.* Kaup (1858) also used the combination *Plagiusa lactea* Bonaparte for the Mediterranean tonguefish. In 1862, Günther created *Ammopleurops* (consisting of only *A. lacteus* Bonaparte) to replace *Plagusia* Bonaparte. He did not refer to Bonaparte's replacement genus *Plagiusa.* Jordan and Goss (1889), however, considered *Symphurus* Rafinesque to be the senior synonym of *Ammopleurops* Günther. Furthermore, they considered *Ammopleurops lactea* (Bonaparte) and *Plagusia picta* Costa as junior subjective synonyms for *S. nigrescens* Rafinesque. Jordan and Evermann (1898) agreed with the findings of Jordan and Goss.

Subsequent authors, however, did not agree with Jordan and Goss. Although Kyle (1913) accepted the validity of Rafinesque's genus *Symphurus,* he noted that there were two species of *Symphurus* in the Mediterranean, and Rafinesque's

description could refer to either or both, or neither. Kyle rejected *S. nigrescens* Rafinesque because the description of this species was so vague that it could not be accepted as valid. Instead, he recommended using Bonaparte's *lactea* in combination with *Symphurus* Rafinesque because Bonaparte's species was accompanied by a more complete description. Kyle reasoned that *lacteus* (or *lactea* depending on the generic combination) had been used by all European ichthyologists and thus claimed the right of usage as well as of priority in that the species was sufficiently well-defined for the first time by Bonaparte.

Not everyone accepted Kyle's interpretation either. Others (Roule, 1919; Soljan, 1963) continued to use a combination of Bonaparte's *lactea* (emended to *lacteus*) with *Ammopleurops* Günther. Still others (Scordia, 1927; 1929) continued to use *Plagusia lactea* Bonaparte.

Chabanaud (1931) in his list of the flatfishes of the Mediterranean followed Kyle (1913) in using the combination *Symphurus lacteus* (Bonaparte). Later, however, in his catalogue of the flatfishes of the world, Chabanaud (1939) placed *Plagusia lactea* Bonaparte in the synonymy of *S. nigrescens*. In 1949, Chabanaud provided a partial synonymy of *S. nigrescens* but did not discuss his conclusions about the nomenclature of this species in any detail. In a footnote, he commented that it was impossible to determine the exact identity of the species described by Rafinesque (1810) but argued against rejecting *S. nigrescens* because to do so would be to admit that Rafinesque had the second species of tonguefish occurring in the Mediterranean, *S. ligulatus*, whose adults were still unknown at that time (1949).

The only modern author not accepting *S. nigrescens* as the oldest available name for this species is Padoa (1942; 1956). Padoa (1956) argued that since Rafinesque, *S. nigrescens* had not been used until the works of Jordan and Goss (1889), Jordan and Evermann (1898), and Chabanaud (1939). He disagreed with these authors and instead supported conclusions reached by Kyle that the specific designation *nigrescens* of Rafinesque could not be a senior synonym of *P. lactea* because the original description was insufficient or completely inappropriate for this species, especially concerning the mention of a generally light pigmentation and presence of a lateral line, features which certainly did not characterize *P. lactea* Bonaparte (yet Bonaparte also described his nominal species as having a lateral line which is not mentioned by either Kyle or Padoa). Padoa recommended, as Kyle did earlier (1913), that it was necessary to retain Bonaparte's *lactea* in combination with Rafinesque's *Symphurus*.

Although use of *S. nigrescens* began in the 1930's by Chabanaud (1939), consistent usage of this name for this species followed only after the synonymy and redescription provided by Chabanaud (1949; 1950). This name has prevailed in most of the important taxonomic and ecological literature (see synonymy). Rafinesque's description of *S. nigrescens* clearly refers to a sinistral flatfish with united caudal, dorsal, and anal fins. It is the oldest available name for a tonguefish occurring in the Mediterranean Sea. Since two species of *Symphurus* occur there (*S. nigrescens* and *S. ligulatus*), and Rafinesque's description could apply to either, it cannot be known with certainty to which species the description applies because no type specimen exists. Based on general availability, it would seem more probable that the species available to Rafinesque was the shallower occurring *S. nigrescens*, a widespread species that during the last century was captured frequently, was included in the by-catch (in the "minutaglia") of commercial fisheries (Bonaparte, 1833), and recorded from locations throughout almost the entire Mediterranean Sea. *Symphurus ligulatus*, on the other hand, is a deep-dwelling species that was known to researchers of the last century only as pelagic, symmetrical

larvae. Adults were completely unknown until Torchio (1963) reported the capture of two specimens taken in waters deeper than 600 m off northern Italy. There has been such a confused nomenclatural history for *S. nigrescens,* primarily because of the inadequate and incomplete original description and lack of a type specimen(s), that it is necessary to designate a neotype, in order to stabilize the nomenclature and fix the identity of this first described species from the Mediterranean Sea. Therefore, the following specimen is designated as the neotype of *S. nigrescens* Rafinesque: MNHN 1989-1208 (formerly USNM 48292); 94.1 mm SL; mature (not gravid) female; collected by S. E. Meek, April 1897, from the Bay of Naples in the central Mediterranean. The neotype has the following meristic features: ID pattern 1-3-2; caudal-fin rays 12; dorsal-fin rays 88; anal-fin rays 74; abdominal vertebrae 3+6; total vertebrae 49; four hypurals; longitudinal scales 85; transverse scale count 36; and 18 scale rows on the head posterior to the lower eye.

Relationships.—*Symphurus nigrescens* is a moderately deep-water species characterized by a 1-3-2 ID pattern, 12 caudal-fin rays, moderate body size, black peritoneum, relatively large scales (72–91 in longitudinal series), four hypurals, and 47–50 vertebrae. There are 13 other species, 10 Atlantic and three eastern Pacific, which have a 1-3-2 ID pattern and 12 caudal-fin rays (Munroe, 1987). Of these, the western Atlantic *S. pusillus* is most similar to *S. nigrescens* in many meristic and morphometric features examined. The possibility that these two species comprise a closely-related amphi-Atlantic species pair warrants further investigation.

Study Material.—161 specimens, 40.3–117 mm SL. *Measured and Counted.*—(33 specimens). *Eastern Mediterranean*—MNHN 1975-412; 2(73.3–93.7); Greece, off Thassos; 26 Feb 1974. USNM 304446; 11(81.7–114); Thermaikos Gulf, Greece; Apr–June 1976. *Central Mediterranean*—MNHN 1989-1208 (formerly USNM 48292); neotype, (94.1); Bay of Naples, Italy; April 1897. MNHN 59-608; 4(70.8–79.8); Bou Haroum, Algeria. MNHN 58-157; 2(67.9–82.4); Tunisia. MSNG 41890; 5(61.5–88.5); East Ligurian Sea; 325 m. MSNG 47614; (86.1); East Ligurian Sea; 615 m. *Western Mediterranean*—MNHN 59-183; 3(106–117); Banyuls-Frontier, France. *Eastern Atlantic*—BMNH 1890.6.16: 46; (72.8). IOS 7810; 2 of 9(60.5–101); 18°05.2'N, 16°32'W; 307 m; 27 Feb 1972. *Central Eastern Atlantic*—ZMUC 86219; (46.2); 7°19'S, 12°40'E; 47 m. *Counted.*—(127 specimens)—*Central Mediterranean*—IRSNB 23724-16576; (76.7); Gulf of Cagliari, Sardinia; 550 m; 28 Feb 1967. MCZ 26397; (74.7); Bay of Naples, Italy. USNM 10092; 2(76.7–78.6); Italy, unspecified locality. USNM 48292; (106.0); Bay of Naples, Italy; Apr 1897. USNM 49333; (74.4); Bay of Naples, Italy. *Western Mediterranean*—UAB 30/XI/84; (112); Catalan Sea, Spain; 500 m; 30 Nov 1984. UAB 14/II/74; 4(52.2–69.7); Catalan Sea, Spain; 100 m; 14 Feb 1974. USNM 304447; 32(59.6–94.7); Spain; 90 m; 11 Apr 1984. *Eastern Atlantic*-ISH 194177; 14(46.5–79.9); 21°30'N, 17°08'W; June 1968. IOS 7810; 7 of 9(48.4–97.0); 18°05.2'N, 16°32'W; 307 m; 27 Feb 1972. IOS 8020; 28(46.2–105); 20°45.1'N, 17°39.3'W; 279 m; 27 Jul 1972. MCZ 58645; 18(51.4–80.6); 21°43'N, 17°27'W; 336 m; 24 May 1974. MCZ 58646; (40.3); 21°08'N, 17°31'W; 149 m; 22 May 1974. MCZ 58647; (83.8); 21°08'N, 17°31'W; 97 m; 22 May 1974. MCZ 58648; (89.6); 21°21'N, 17°37'W; 400 m; 23 May 1974. MCZ 58649; (42.3); 21°00'N, 17°22'W; 64 m; 22 May 1974. MCZ 58650; 2(42.3–43.8); 21°08'N, 17°31'W; 149 m; 22 May 1974. MNHN 1967-539; (75.0); 10°49'N, 17°00'W; 100 m; 8 Dec 1963. *Central Eastern Atlantic*—UF 33890; (84.3); 2°00'S, 8°55'E; 100 m; 4 Sep 1963. UMML 34324; 5(86.9–92.5); 2°31'S, 8°51'E; 300 m; 30 Sep 1962. USNM 300120; 2(88.3–90.4); 4°03'S, 10°22'E; 0–300 m; 8 Sep 1963. IRSNB 16808-14787; (68.9); 6°29'S, 11°35'E; 230 m; 7 Aug 1948. *Other Material Examined.*—MNHN 59-606; 1 Specimen; Mediterranean, Bay of Naples. ZMUC 86221; (28.1); St. Helena, off Jamestown; 70 m (identification uncertain).

Symphurus normani Chabanaud, 1950
Figure 5b

Symphurus nigrescens (not of Rafinesque, 1810). Norman, 1930:363 (Cape Lopez, French Congo and St. Paul de Loanda, Angola; 13 specimens; 58–67 m). Norman, 1935:34 (after Norman, 1930).

Symphurus normani Chabanaud, 1950:625 (17 specimens; Cape Lopez, French Congo to St. Paul de Loanda; 48–68 m; distinguished from *S. nigrescens*). Blache, 1962:791 (listed, Gulf of Guinea and Angola). Nielsen, 1963:26 (Portuguese Guinea; 55–80 m; counts, measurements, figure). Blache et al., 1970:439 (West Africa; in key).

Misidentification. Merrett and Marshall, 1981:244 (northwest Africa; specimens were *S. nigrescens*).

Diagnosis.—A distinctive species with the following combination of characters: 1-3-3 ID pattern, 12 caudal-fin rays, an unpigmented or lightly spotted peritoneum, series of 6–8 well-developed ctenoid scales on blind-side dorsal- and anal-fin rays, and pepper-dot pigmentation on the blind side of the body.

Symphurus normani has most often been confused with the eastern Atlantic *S. nigrescens*. It differs from *S. nigrescens,* with which it co-occurs along the West African shelf region, in the following characters: ID pattern 1-3-3 versus 1-3-2; scales present on blind-side dorsal and anal fins (absent in *S. nigrescens*); much smaller eyes (7–9 compared to 12–15% HL); larger mouth that reaches a vertical line through the posterior border of the lower eye versus mouth not reaching beyond a vertical line through the front of pupil or front margin of lower eye; and much smaller and more numerous scales in a longitudinal series (95–105 compared to 72–91). The two species also differ in pigmentation. In *S. normani,* the peritoneum is usually unpigmented or only lightly speckled (versus black in *S. nigrescens*); and in *S. nigrescens,* ocular-side pigmentation usually consists of widely separated, irregular blotches, whereas in *S. normani,* the body is uniformly light brown or if transverse bands are present, they extend without interruption across the body to the bases of the dorsal and anal fins. Furthermore, *S. normani* has a pepper-dot pattern of small pigment spots on the blind side (*S. nigrescens* usually has a uniformly whitish blind side without spotting).

Among three other species (*S. trewavasae, S. varius* Garman, and *S. atramentatus* Jordan and Bollman) in the genus possessing a 1-3-3 ID pattern, *S. normani* is most similar in meristic characters to the western South Atlantic species, *S. trewavasae. Symphurus normani* differs from this species, however, in caudal-fin ray count (12 versus 10 in *S. trewavasae*) and the presence of scales on the blind-side dorsal and anal fins (absent in *S. trewavasae*). It differs from the eastern Pacific *S. varius* principally in peritoneal color (unpigmented or lightly speckled versus black in *S. varius*). *Symphurus normani* has lower counts (dorsal-fin rays 87–92 versus 92–96; anal-fin rays 72–77 versus 77–81; vertebrae 48–50 versus 50–52), smaller body size (ca. 80 versus 134 mm SL), and lacks a pupillary operculum (versus present) when compared to the eastern Pacific *S. atramentatus.*

In certain meristic features, *S. normani* overlaps those of *S. lubbocki* and *S. reticulatus.* It differs from these species primarily in ID pattern (1-3-3 versus 1-3-2 in *S. reticulatus* and *S. lubbocki*) and pigmentation. *Symphurus normani* has a uniformly light brown ocular surface with faint crossbands and pepper-dot pattern of pigmentation on the blind side of the body versus dark, chocolate-brown color with alternating X- and Y-shaped marks on ocular surface (in *S. reticulatus*) or cream-colored with several, mostly incomplete, crossbands (in *S. lubbocki*) and unpigmented blind side (both *S. reticulatus* and *S. lubbocki*). Furthermore, *S. normani* has a series of 6–8 small scales on dorsal- and anal-fin rays (versus absence in *S. reticulatus* and *S. lubbocki*).

Description.—A medium-sized tonguefish attaining maximum lengths slightly larger than 80 mm SL. ID pattern usually 1-3-3, rarely 1-3-2 (Table 1). Caudal-fin rays 12 (Table 2). Dorsal-fin rays 87–92 (Table 3). Anal-fin rays 72–77 (Table 4). Pelvic-fin rays 4. Total vertebrae 48–50 (Table 5); abdominal vertebrae (3+6). Hypurals 4, occasionally 5. Longitudinal scales 99–109 (Table 6; Chabanaud

(1950) reported 95–105 [108?] scale rows). Scale rows on head posterior to lower orbit 22–25 (Table 7). Transverse scales 40–47 (Table 8).

Body moderately deep (250–287 SL, $\bar{x}$ = 269); greatest depth usually in anterior third of body in region of anal rays 5–18. Preanal length nearly equal to body depth (215–282 SL, $\bar{x}$ = 249). Head relatively short (206–238 SL, $\bar{x}$ = 216); considerably less than body depth. Head relatively narrow (208–239 SL, $\bar{x}$ = 223); usually equal to or only slightly larger than head length (HW/HL 0.96–1.15, $\bar{x}$ = 1.0). Lower head lobe (86–123 SL, $\bar{x}$ = 106) narrower than upper head lobe (121–150 SL, $\bar{x}$ = 136). Lower opercular lobe (231–298 HL, $\bar{x}$ = 271) wider than upper opercular lobe (170–301 HL, $\bar{x}$ = 235). Postorbital length 142–163 SL, $\bar{x}$ = 154. Snout short (148–220 HL, $\bar{x}$ = 179), covered with small ctenoid scales. Anterior nostril when depressed posteriorly only occasionally reaching to anterior margin of lower eye. Dermal papillae present on blind-side snout only. Mouth relatively large; upper jaw length 189–245 HL, $\bar{x}$ = 222; posterior extension of maxilla reaching a vertical through posterior edge of pupil of lower eye or sometimes extending to vertical through rear margin of lower eye. Chin depth 175–256 HL, $\bar{x}$ = 210. Lower eye small (76–109 HL, $\bar{x}$ = 89); eyes usually equal in position, occasionally slightly subequal with upper eye in advance of lower eye; with 1–6 small ctenoid scales covering anterior and dorsal surface of eyes; 1–4 scales extending into narrow interorbital space. Pupillary operculum absent. Length of dorsal-fin base 935–961 SL, $\bar{x}$ = 945. Dorsal-fin origin posteriorly situated; usually along vertical line through posterior edge of pupil of upper eye or occasionally reaching only to vertical through rear margin of migrating eye; predorsal length 39–65 SL, $\bar{x}$ = 54. Length of anal-fin base 724–784 SL, $\bar{x}$ = 750. Dorsal- and anal-fin rays with 3–9 (usually 4–8) small ctenoid scales on both blind-side and ocular surfaces. Pelvic fin moderately long (58–77 SL, $\bar{x}$ = 69); longest pelvic-fin ray usually reaching to base of first anal-fin ray; pelvic to anal distance 49–78 SL, $\bar{x}$ = 58. Posteriormost pelvic-fin ray connected to body by delicate membrane terminating immediately anterior to anus or occasionally extending posteriorly almost to origin of anal-fin base (membrane torn in most specimens). Caudal fin moderately long (107–127 SL, $\bar{x}$ = 118).

Teeth well developed on all jaws. Ocular-side jaws with single row of slender teeth extending over entire surfaces of premaxilla and dentary.

Scales relatively small, ctenoid on both sides of body.

Pigmentation.—Ocular surface uniformly light brown, usually without strongly contrasting crossbanding. Bands, if present, not readily evident but extending across body to bases of dorsal and anal fins. Outer surface of operculum on ocular side usually not pigmented other than general body color. One specimen with darkly shaded outer operculum, possibly remnant of crossband. Inner lining of operculum and isthmus on ocular side lightly pigmented in approximately one half of specimens. Inner lining of blind-side operculum without noticeable pigment. Ocular-side lips variously pigmented, but without well-developed dark band. Some specimens completely lacking pigment on lips; others with light spotting on upper lip, or less frequently spotting on both lips. Blind side mostly whitish or cream-colored, sprinkled with finely pigmented spots in all but oldest, most faded specimens. Spots most dense in pterygiophore regions of trunk. Peritoneum usually lightly pigmented, sometimes with scattering of small dark melanophores on dorsal area of peritoneal lining. Specimens missing scales sometimes with a row of deep internal pigment spots evident on blind side along body midline.

Dorsal and anal fins without obvious pigment spots. Pigmentation on fins restricted to faint coloration along basal half of fin rays, more intense in areas

corresponding to banding on body. Specimens missing scales with a series of black, dermal melanophores evident along bases of anteriormost dorsal-fin rays. These melanophores sometimes evident for a considerable extent along base of dorsal fin.

The preceding color description differs slightly from Chabanaud's (1950) account based on recently collected (i.e., 1948) material. He described the color in alcohol as follows: ocular surface reddish brown or greyish, sometimes uniform, sometimes variegated with dark shaded areas that appear to form, more or less, four to five large transverse bands. Bands not interrupted across the vertebrae. Anteriormost crossband at point of greatest body depth (a short distance before middle of SL); posteriormost crossband situated about a third or fourth of the SL from base of caudal fin. Opercular region sometimes darkened by the outline of a cephalic band and traces of a fifth band, situated at the base of caudal fin, ordinarily perceptible. Transverse bands not continuing onto fins. Fins without prominent pigment, but frequently decorated with blackish marks on the proximal half of the rays. Blind side unpigmented or uniformly white.

Size and Sexual Maturity.—*Symphurus normani* attains maximum lengths of approximately 83.0 mm SL. The largest specimens examined were a male (82.6 mm SL) and two females (81.7 and 81.4 mm SL). The second largest female is the holotype (Chabanaud incorrectly reported the sex of this specimen as a male). There is no sexual dimorphism in size as the largest of 12 males was comparable in size to females (69–81.7 mm SL).

Symphurus normani matures around 65 mm SL. All females larger than 64 mm SL had elongate ovaries, one female of 58.1 mm SL had elongate ovaries without any evidence of ova development, and two females, measuring 53.9 and 57.0 mm SL, were immature with little gonad elongation. Females measuring 64.3, 66.8, 70.3, 80.4, and 81.7 mm SL were gravid.

Geographic Distribution (Fig. 6).—Equatorial waters off the west coast of Africa extending from approximately 12°N to Saint Paul de Loanda (8°40'S). Based on the small number of specimens available, this species appears to have a comparatively narrow geographic range along the open continental shelf off equatorial West Africa. The report of *S. normani* from off northwest Africa (Merrett and Marshall, 1981:244) is based on misidentified specimens of *S. nigrescens.*

Bathymetric Distribution.—This species is confined to a relatively narrow depth range (22–75 m) along the inner continental shelf. All but six of 31 specimens were taken between 40 and 75 m. Fifteen specimens were collected between 60–75 m, one was taken at 51 m, nine between 40–50 m, two at 37 m, one at 25 m, and three were collected at 22 m.

Ecology.—Little is known concerning the life history of this species. It is poorly represented in collections and whether this reflects the species actual abundance in nature or results from inadequate sampling at appropriate depths or suitable substrates is unknown.

Co-occurring Species.—*Symphurus normani* has a sympatric distribution off equatorial Africa with *S. nigrescens* and *S. vanmelleae.* However, these three species are largely, if not exclusively, allotopic with respect to bathymetry. *Symphurus vanmelleae* occurs at depths ranging from 361–925 m, completely below the range for *S. normani.* Although depths occupied by *S. normani* (22–75 m) overlap those reported for *S. nigrescens* from this region (40–300 m), none of the collections examined contained both species.

Relationships.—Systematic relationships of *S. normani* are unknown. This species has a 1-3-3 ID pattern, which in the genus (Munroe, 1987) is shared only by the western South Atlantic *S. trewavasae* and two eastern Pacific species, *S. atramentatus* and *S. varius*. Of these, only *S. varius* and *S. atramentatus* share with *S. normani* the presence of 12 caudal-fin rays. *Symphurus normani* has unusual pepper-dot pigmentation on the blind side of the body, especially well developed in regions overlying the pterygiophores. Similar pigmentation occurs in the western North Atlantic *S. piger* and *S. pelicanus* and the eastern Pacific *S. gorgonae* (species characterized by a 1-3-2 ID pattern and 12 caudal-fin rays). It is unknown if similarities in blind-side pigmentation and caudal-fin ray numbers indicate relationship between these species and *S. normani.*

Study Material.—34 specimens, 38.6–82.6 mm SL. *Measured and Counted* (14 specimens).—BMNH 1930.5.6:51; holotype (81.4); from 8.5 mi N of 71°E to 15 mi N of 24°E, off Cape Lopez Light, Cape Lopez, French Congo (ca. 0°40'S); 62 m; 10 Aug 1927. Paratypes—IRSNB 16808-404; (53.9); 5°54'S, 11°58'30"E; 50 m; 25 Aug 1948. IRSNB 16808-405; (71.7); 5°55'S, 12°01'E; 25 m; 8 Sep 1948. IRSNB 16808-406; (57.0); 5°56'S, 11°55'E; 50 m; 27 Oct 1948. *Non-type material.*—IRSNB 16808-14788 #105; (70.3); 4°48'S, 11°30'E; 49 m; 31 Mar–1 Apr 1949. IRSNB 16808-14788 #106; (61.6); 4°48'S, 11°30'E; 49 m; 31 Mar–1 Apr 1949. MNHN 1967-540; (81.7); 12°09'30"N, 17°12'W; 40 m; 11 Dec 1963. UMML 16759; 3(64.3–69.1); 5°40'N, 0°17–30'E; 46 m; 26 May 1964. UMML 34323; 2(38.6–74.2); 5°00'N, 5°00'W; 75 m; 31 May 1964. ZMUC 86224; (67.6); 11°54'N, 17°14'W; 67 m; 17 Apr 1946. ZMUC 86225; (63.8); 11°54'N, 17°14'W; 67 m; 17 Apr 1946. *Counted* (20 specimens).—BMNH 1930.5.6: 46–50; paratypes; 5(22–67.7); 8°40'15"–8°38'15"S, 13°13'45"–13°13'00"E; 64 m; 4 Aug 1927. BMNH 1930.5.6:52–54; paratypes; 3(55.6–68.3); Cape Lopez, French Congo (ca. 0°40'S); 63 m; 10 Aug 1927. BMNH 1935.5.11:230; paratype; (39.0); Angola; 64 m; 4 Aug 1927. IRSNB 16808-407; paratype (66.3); 5°56'S, 12°00'E; 60 m; 14 Nov 1948. UMML 15244; (66.8); 4°23–22'N, 7°06.5–08.5'W; 68 m; 2 Jun 1964. UMML 15262; (72.0); 4°35'N, 6°40–41'W; 64 m; 2 Jun 1964. UMML 15291; 2(74.6–82.6); 4°45–44'N, 6°13.5–16.0'W; 46 m; 1 Jun 1964. UMML 16847; (67.1); 4°40–39'N, 2°00–02'W; 51 m; 28 May 1964. UMML 16982; 3(49.7–80.4); ca. 5°05'N, 4°59.5'W; 22 m; 31 May 1964. UMML 21502; 2(54.5–58.1); 4°44–41'N, 5°17–19'W; 37 m; 13 May 1965.

Discussion

Species of *Symphurus* found in the eastern Atlantic Ocean and Mediterranean Sea are endemic to this region. Within the putative species groups proposed by Munroe (1987), eastern Atlantic *Symphurus* have affinities both with species from the Indo-Pacific and with those of the western Atlantic (see relationships sections under individual species accounts). *Symphurus vanmelleae* is unique among eastern Atlantic *Symphurus* in its combination of 10 abdominal vertebrae and a 1-2-2-1-2 ID pattern. This combination occurs elsewhere in the genus only in three Indo-Pacific species. *Symphurus normani* is the only eastern Atlantic species with a 1-3-3 ID pattern. Only three additional species in the genus, one western Atlantic (*S. trewavasae*) and two eastern Pacific (*S. atramentatus* and *S. varius*), have this arrangement of dorsal pterygiophores and neural spines. *Symphurus ligulatus* is characterized by a 1-2-2-2-2 ID pattern and 14 caudal-fin rays. It appears to be most closely related to the western Atlantic *S. nebulosus,* the only other Atlantic species in the species group characterized by 14 caudal-fin rays and a 1-2-2-2-2 ID pattern, with all other members being almost entirely deep-sea, Indo-Pacific species. Three species (*S. nigrescens, S. lubbocki,* and *S. reticulatus*) possess a 1-3-2 ID pattern and 12 caudal-fin rays, but are not necessarily closely related. They belong to a larger species group that also includes eight western Atlantic and three eastern Pacific species. *Symphurus nigrescens* occurs throughout a wide depth range on the continental shelf and is a relatively deep-sea species. *Symphurus lubbocki* and *S. reticulatus* are very similar to the Caribbean *S. rhytisma.* These diminutive fishes, among the smallest species in the genus, occupy similar substrates in shallow-water sandy areas in tropical regions. A closer relationship

Table 14. Summary of selected life-history attributes for species of *Symphurus* occurring in the eastern Atlantic and mid-Atlantic Islands

Species	Maximum size		Minimum size at maturity	Depth range	Center of abundance	Preferred substrate
	M	F				
vanmelleae	118	110	73	361–945	925	Mud
ligulatus	92	84	58	205–1,024	>300	Mud
nigrescens	112	117	46	47–1,400	90–350	Muddy clay*
lubbocki	28	?	?†	20	20	Sand
reticulatus	59	60	60‡	5–45	5–45	Sand
normani	82	83	58	22–75	40–75	?

* Reported from variety of substrates, but this is substrate most frequently recorded.
† Two ripening females of 28 mm SL are the only known specimens of this species.
‡ Based on the only female known. It is probable that this species matures at even smaller sizes than that reported here.

among these three diminutive species is hypothesized (Munroe, unpubl.) based on the possession of shared derived characters in osteology, ornate pigmentation patterns when compared to other species in the genus, and similarities in meristic features, especially the possession of numerous, small scales. The species also have in common small body sizes, small sizes at sexual maturity, and appear to have similar substrate preferences (see also Table 14).

Species studied in this paper have quite distinct life histories (see Table 14 for a summary of selected attributes). Major differences occur in body size, size at sexual maturity, depth of occurrence, and substrate preference. Body size is most similar in *S. lubbocki* and *S. reticulatus,* which have small adult body sizes (28–60 mm SL) and also mature at small sizes (60 mm and smaller) when compared to congeners. Given that the two specimens of *S. lubbocki* are not fully mature but already have maturing ovaries at 28 mm SL, it is not unreasonable to assume that maturity is reached at sizes around 40 mm SL. These species are completely allopatric (Ascension Island and St. Helena-Madeira, respectively) but appear to have very similar life histories and ecological requirements.

Of interest too are comparisons between the life histories of the three deeper-dwelling species (*S. vanmelleae, S. ligulatus,* and *S. nigrescens*). Maximum sizes observed for each species range from 92 mm SL for *S. ligulatus* to 117–118 mm SL for *S. nigrescens* and *S. vanmelleae.* Females are slightly larger than males in both *S. vanmelleae* and *S. ligulatus* and smaller in *S. nigrescens.* The most significant size-related difference between these three species is the size at sexual maturity for females (maturity not assessed in males). *Symphurus vanmelleae,* the largest of the three, also matures at much larger sizes (73 mm SL) than the others (as small as 58–60 mm SL in *S. ligulatus* and 46 mm SL in *S. nigrescens*). It is interesting to note that *S. vanmelleae* and *S. ligulatus,* both of which occur at similar depths on the continental slope (but have allopatric distributions), have quite different size-related attributes. Both male and female *S. vanmelleae* are larger (almost 30 mm larger than *S. ligulatus*), with females maturing at considerably larger sizes (some 20–30 mm larger) than sizes reported for *S. ligulatus* (Cau and Deiana, 1979). *Symphurus nigrescens,* which inhabits moderate depths on the continental shelf, presents an interesting contrast to these other deep-dwelling species. Although *S. nigrescens* is similar in overall size to *S. vanmelleae* and is larger than *S. ligulatus,* females of this species mature at sizes even smaller than those reported for *S. ligulatus.* Based on this observation, *S. nigrescens* has precocious development when compared to these other deep-sea tonguefishes. Munroe (1987) hypothesized that *S. nigrescens* belonged to a species group whose members inhabit diverse environments ranging from shallow-water areas to outer

continental shelf substrates. Included in this group were seven species of diminutive tonguefishes (*S. pusillus, S. pelicanus, S. gorgonae, S. lubbocki, S. reticulatus, S. rhytisma,* and *S. arawak* Robins and Randall), ranging in adult size from approximately 45 mm SL (*S. rhytisma*) to 70 mm SL (*S. pelicanus*) and maturing at sizes from 30 mm SL (*S. arawak*) to 55 mm SL (*S. pelicanus*). If Munroe's (1987) species groups reflect evolutionary relationships, then it would seem that early maturation and small adult sizes may be characteristic of this species group in general.

Other differences between the species are depth of occurrence and perhaps also substrate preferences. *Symphurus ligulatus* and *S. vanmelleae* occur on mud bottoms in deep-water habitats (usually greater than 300 m) on the continental shelf and slope. *Symphurus nigrescens* occurs on a variety of substrates, but has been collected most often on soft, muddy clay substrates on the continental shelf at depths ranging from 90–350 m. *Symphurus normani* occurs at somewhat shallower depths than *S. nigrescens,* ranging from 22–75 m on the continental shelf. *Symphurus lubbocki* and *S. reticulatus* occur on sandy substrates in shallow-water (5–45 m) and are quite distinct from the other species in both depth of occurrence and preferred substrate. Although more information is needed for most of the species, it is evident from Table 14 that symphurine tonguefishes, even those occurring in similar environments, employ different ecological strategies that vary according to individual species or species group.

There are some striking contrasts in geographical distributions when comparing *Symphurus* from the eastern and western Atlantic oceans. For example, symphurine tonguefishes are widely distributed on both sides of the Atlantic Ocean. In the eastern Atlantic, *Symphurus* ranges northward occasionally to the Bay of Biscay (*S. nigrescens,* ca. 45°N) but more commonly are collected further south in and near the Mediterranean Sea (*S. nigrescens* and *S. ligulatus*) and along the continental shelf and slope off equatorial Africa to about 12°S (*S. nigrescens, S. normani,* and *S. vanmelleae*). In contrast, western Atlantic tonguefishes have a more extensive latitudinal distribution; *S. minor* Ginsburg and an undescribed species (Munroe, 1987) range northward (45°N) onto the Scotian shelf (Ginsburg, 1951; Markle et al., 1980). In the southern hemisphere, three *Symphurus* species (*S. tessellatus* (Quoy and Gaimard), *S. trewavasae,* and *S. jenynsi* Evermann and Kendall) are reported from temperate seas (ca. 35–38°S) off southern Brazil and Argentina (Menezes and Benvegnú, 1976). Undoubtedly, the more extensive latitudinal distribution of symphurine tonguefishes in the western Atlantic is strongly influenced by prevailing warm-water currents (Gulf Stream, Brazil) in the North and South Atlantic Oceans.

The dispersal of tonguefishes with relatively large-sized and perhaps, long-lived, planktonic larvae (Kyle, 1913) may be evident in the occurrence of three species (*S. lubbocki, S. reticulatus,* and maybe *S. nigrescens*) at remote Ascension and St. Helena islands, situated approximately 1,500 and 1,870 km from the nearest continental land masses.

There are no cosmopolitan Atlantic species of *Symphurus,* but rather, a series of possibly closely related species pairs (see relationships section under individual species accounts) occur in eastern and western Atlantic regions. Possible species pairs are (eastern Atlantic species listed first): *S. ligulatus* and *S. nebulosus*; *S. nigrescens* and *S. pusillus*; and *S. reticulatus* and/or *S. lubbocki* and the diminutive species *S. rhytisma* from the Caribbean.

At all latitudes and in all environments except deep-water substrates on the continental slope, the eastern Atlantic symphurine tonguefish fauna is depauperate when compared with that of western Atlantic regions (Munroe, 1987). In fact, the

eastern Atlantic has the lowest number of *Symphurus* species reported for any tropical or warm-temperate ocean. Twenty-one species of *Symphurus* occur in the western Atlantic compared to only six in the eastern and mid-Atlantic areas. The Mediterranean Sea with only two species (*S. nigrescens* and *S. ligulatus*) is considerably less diverse than three western North Atlantic temperate regions (Carolinean, eastern Gulf of Mexico, and western Gulf of Mexico with 10, 9, and 10 species, respectively). The tropical eastern Atlantic, with three species, is also the least diverse tropical region in the Atlantic in contrast to the Caribbean and West Indian regions, which, with 13 and 12 species, respectively, are the most diverse. No *Symphurus* have been taken in boreal regions of the eastern Atlantic, while six species are known from boreal regions of the western North Atlantic (Munroe, 1987). Such large differences in numbers of species within genera between western Atlantic and eastern Atlantic areas support patterns seen in most other studies.

With the exception of the 1-2-2-2-2 ID pattern group, represented by a single species, there has been a pronounced proliferation of species in the western versus the eastern Atlantic in all of the species groups that occur there. Major differences between these regions result mostly from a larger number of species in the 1-3-2 ID pattern group in the western Atlantic (8 species versus 3 in the eastern Atlantic) and also from the presence of endemic New World species groups (the 1-4-2 ID pattern group (4 species) and 1-4-3 pattern group (7 species).

The near complete absence of *Symphurus* species in the eastern Atlantic in such shallow water environments as estuaries and coastal neritic zones contrasts markedly with the situation observed in the western Atlantic. The eastern Atlantic *Symphurus* belong to species groups with 1-3-2, 1-3-3, 1-2-2-1-2, and 1-2-2-2-2 ID patterns. Members of these groups typically inhabit deeper continental-shelf and upper-continental-slope waters (Munroe, 1987). The four eastern Atlantic *Symphurus* inhabit relatively deep water. Although *S. nigrescens* has been reported from depths as shallow as 47 m (Nielsen, 1963), most specimens have been taken between 90–300 m. *Symphurus normani* inhabits moderate depths (22–75 m) on the continental shelf while *S. ligulatus* and *S. vanmelleae* are strictly bathyal species, inhabiting depths between 200–1,000 m. Only two diminutive species (*S. lubbocki* and *S. reticulatus*), occurring on mid-ocean islands, inhabit shallow-water substrates in the eastern Atlantic. It is interesting to note also that in the eastern Atlantic there is a second tonguefish genus (*Cynoglossus*) whose species inhabit shallow-water areas normally occupied by *Symphurus* species in the western Atlantic.

More detailed analysis of distributional patterns of eastern Atlantic symphurine tonguefishes awaits refinement and resolution of monophyletic groups within the genus (Munroe, in progress). Dependent on that study, it may then be possible to identify contributing factors to distributional patterns observed for *Symphurus* occurring in eastern Atlantic waters.

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