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## A Systematic Review of the Scorpionfishes of the Atlantic Ocean (Pisces: Scorpaenidae)

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# A Systematic Review of the Scorpionfishes of the Atlantic Ocean (Pisces: Scorpaenidae)<sup>1</sup>

By

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## INTRODUCTION

The scorpionfishes, family Scorpaenidae, comprise a diverse group of about 350 valid species. The family is best represented in shallow waters of tropical seas, but important groups occur at high latitudes, particularly in the North Pacific Ocean; the greatest diversity is present in the tropical waters of the Indo-Pacific. Besides the commercially important species, some fishes of the family have received much attention because of the presence of toxic substances associated with fin spines. Despite the interest in scorpionfishes, our understanding of the systematic status of the species is poor for most areas of the world.

The present account deals with Atlantic species. Western Atlantic species which I have not treated earlier (Eschmeyer, 1965a, b; Eschmeyer and Collette, 1966; Eschmeyer and Bailey, in press) are studied in most detail, but all western Atlantic species are mentioned and are included in the keys (except North Atlantic species of the genus *Sebastes*). Pertinent additional material, references, or comments are given for some species treated in my earlier papers. Of the species occurring in the eastern Atlantic, those from the Gulf of Guinea are given most attention, based on collections by the Institute of Marine Sciences, the Guinean Trawling Survey, and the United States Fish and Wildlife Service. Other species from the eastern Atlantic, Mediterranean Sea, and islands of St.

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<sup>1</sup> Contribution no. 1068 from the Marine Laboratory, Institute of Marine Sciences, University of Miami, Florida.

Helena, Ascension, and Tristan de Cunha are included, except North Atlantic species of *Sebastes*.

Fifty-eight species in 11 genera are recognized; this includes one western Atlantic species of doubtful validity. Two species are treated as composed of two subspecies. In the eastern Atlantic the species occurring in the Mediterranean Sea and adjacent parts of the Atlantic deserve additional study, particularly in regard to distribution and early literature. The most comprehensive accounts of eastern Atlantic scorpionfishes are those by Norman (1935a), Fowler (1936), Cadenat (1945), and Boutiere (1958). Recently several species have been described as new from the eastern Atlantic: *Scorpaenodes arenai* Torchio 1962a, *Scorpaena gaillardae* Roux 1954 (= *S. stephanica*), and *Scorpaena jolgori* Postel and Roux 1964 (here placed in *Neomerinthe*). Eschmeyer and Collette (1966) reported *Ectreposebastes imus* from the Gulf of Guinea and the western Atlantic. Wheeler and Eschmeyer (1968) removed *Helicolenus microphthalmus* from the Atlantic fauna. The supposed western Atlantic species *Scorpaena microlepis* Gunter was found (Eschmeyer and Bailey, in press) to have been described from a specimen of the eastern Pacific species *S. guttata* which had incorrect locality data. A new subgenus and three new species are described in the present paper.

The scorpionfishes found in the Atlantic Ocean belong to the more generalized subfamilies. Zoogeographically, several distributional patterns are evident. Comparison of species on both sides of the Atlantic shows that the deeper the species lives the greater the likelihood that it has a close relative on the opposite side of the Atlantic or occurs on both sides of the Atlantic. The genera containing shallow-water species show more endemism. In the genus *Sebastes* (broadly defined), the single species occurring in the extreme South Atlantic has affinities with the small South American Pacific fauna which in turn probably arose from ancestors which were able to move south along the tropical Central American coast; the presence of three species of *Sebastes* in the extreme North Atlantic is most easily explained by a trans-Arctic origin. A few of the warm-water genera are so far known only from the Atlantic, but most are represented in the Indian and Pacific oceans. Some world-wide tropical and south-temperate genera are more speciose in the Atlantic than in other areas; in some cases this may be a result of more collection and study of the Atlantic fauna.

Species of the western Atlantic are given first within each genus, and in most cases the sections on comparisons in each species' account deal mainly with species of the same genus from the same side of the Atlantic. Major comparisons of the faunas and comments on zoogeography are given in a separate section. The key is divided into two parts, the first for western Atlantic species and the second for species occurring in the eastern Atlantic and islands of Saint Helena, Ascension, and Tristan da Cunha.

## ACKNOWLEDGMENTS

Specimens from the eastern Atlantic were obtained from several sources. Many came from the *Pillsbury* collections in the Gulf of Guinea. My participation in the two *Pillsbury* cruises off West Africa was supported by the University of Miami Deep-Sea Biological Program sponsored by the National Geographic Society. Operation of the *Pillsbury* was financed by a biological ship-time grant from the National Science Foundation. Additional specimens are from the Guinean Trawling Survey in the Gulf of Guinea (through Frank J. Williams), collections by Bruce B. Collette on Guinean Trawling Survey 1, and from collections by the United States Fish and Wildlife Service research vessel *Geronimo*; William J. Richards (Tropical Atlantic Biological Laboratory) provided some specimens collected by the R/V *Geronimo*. Julio Rodriguez-Roda (Instituto de Investigaciones Pesqueras, Cadiz, Spain) generously loaned specimens reported by Cervigon (1960) from Mauritania; Fernando Cervigon provided additional information. J. Blache (Institute Fundamental D'Afrique Noire, Gorée, Sénégal) loaned specimens of *Scorpaenodes africanus*. Edward C. Raney (Cornell University) loaned specimens collected by Gilbert Bane in the Gulf of Guinea. Donald P. de Sylva (Institute of Marine Sciences) provided color slides of two species from the Azores. A loan of specimens from the British Museum (Natural History) was through the generosity of Alwyne C. Wheeler and P. Humphrey Greenwood.

Specimens from the western Atlantic were from collections made by the United States Fish and Wildlife Service research vessel *Oregon*, sent by Harvey R. Bullis, Jr. Additional material was from collections by the Institute of Marine Sciences vessels *Gerda* and *Pillsbury*. Loans of additional specimens were from the United States National Museum, through Ernest A. Lachner, and from the Field Museum of Natural History, through Loren P. Woods and Miss Pearl M. Sonoda. Mrs. Myvanwy M. Dick, Museum of Comparative Zoology, Harvard University, loaned a specimen of *Scorpaena* collected at Bermuda.

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Additional help came from various sources. James E. Böhlke (Academy of Natural Sciences of Philadelphia) provided information on species occurring in the Bahamas. Tomio Iwamoto (Institute of Marine Sciences) supplied color

slides of several species from *Oregon* stations. Jon C. Staiger (Institute of Marine Sciences) and Peter J. P. Whitehead (British Museum [Natural History]) examined the holotype of *Pontinus nematophthalmus* in the British Museum. Victor Sadowsky (Instituto Oceanografico, São Paulo) sent specimens of *Scorpaena plumieri* collected off southern Brazil.

I completed most of this study (in dissertation form) while associated with the Institute of Marine Sciences' program of oceanic fishes supported by the National Science Foundation (NSF grants 1350 and 4389), C. Richard Robins, principal investigator. I thank C. Richard Robins, committee chairman, for his guidance during the study. I am grateful to members of my dissertation committee, Frederick M. Bayer, Clarence P. Idyll, Donald R. Moore, and Edward S. Iversen, for their suggestions and comments.

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#### METHODS

Terminology of spines is shown in figure 1. In earlier papers (1965a, b; Eschmeyer and Collette, 1966) I followed Ginsburg (1953) in naming spines, but I have now changed some names to agree more closely with the terminology of other authors. Confusion exists in the literature concerning the names of some head spines; terminology used by several authors for some spines is shown below.

	Ginsburg, 1953		
	Eschmeyer, 1965a, b	Schultz, 1943	
Present study	Eschmeyer and Collette, 1966	Smith, 1957a	Matsubara, 1943
interorbital	interorbital	coronal	(unnamed)
coronal	(unnamed)	postfrontal	coronal
tympanic	frontal	tympanic	tympanic
parietal	anterior parietal	parietal	parietal
nuchal	posterior parietal	nuchal	nuchal
supracleithral	supracleithral	humeral	supracleithral
upper and lower posttemporal	upper and lower posttemporal	posttemporal	posttemporal

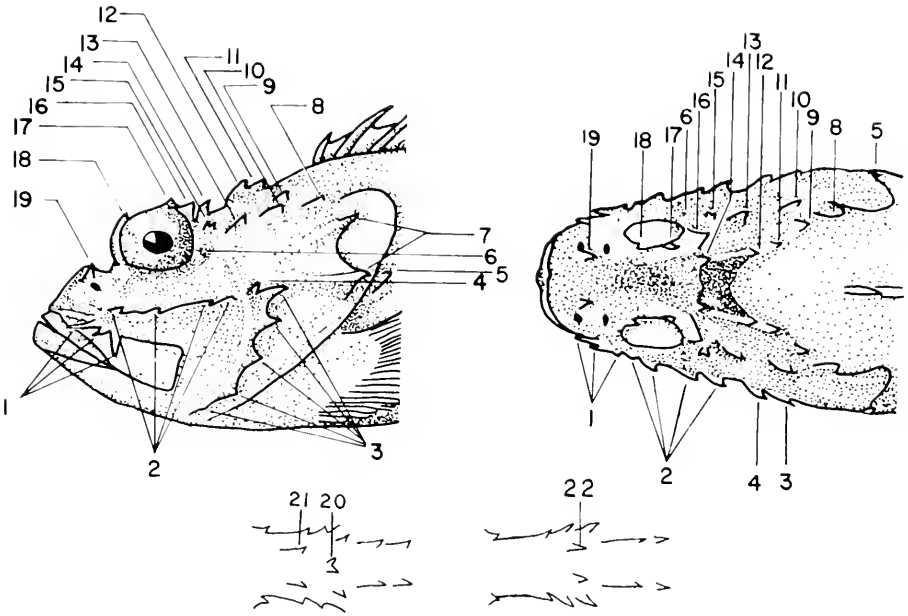


FIGURE 1. Diagram of head spines in scorpionfishes. (Numbers refer to names below.)

- |                                    |                  |
|------------------------------------|------------------|
| 1. Preorbital                      | 12. Parietal     |
| 2. Suborbital                      | 13. Pterotic     |
| 3. Preopercular                    | 14. Tympanic     |
| 4. Supplemental preopercular       | 15. Sphenotic    |
| 5. Cleithral                       | 16. Postocular   |
| 6. Fourth suborbital (postorbital) | 17. Supraocular  |
| 7. Opercular                       | 18. Preocular    |
| 8. Supracleithral                  | 19. Nasal        |
| 9. Upper posttemporal              | 20. (unnamed)    |
| 10. Lower posttemporal             | 21. Interorbital |
| 11. Nuchal                         | 22. Coronal      |

In Atlantic species the interorbital spines occur only in some species of *Scorpaenodes*; they do not seem to be identical to the coronal spines. The tympanic spines form the anterior corners of the occipital pit when present. These spines may be more lateral in species lacking a pit, and in some cases they are at the ends of long ridges which pass through the interorbital area; the tympanic spines are rarely absent. Some of the spines become blunt or almost imperceptible in larger specimens of some species; also the larger specimens of some species may have some spines variously split into numerous spinous points.

Measurements are as defined by Eschmeyer (1965a). Most are similar to measurements used to describe teleost fishes, with the following modifications: (1) Measurements originating at the snout are taken at the most anterior part of the left premaxillary because of the variable notch between the premaxillaries; (2) pectoral-fin length is measured from the base of the first ray to the apex of the fin, because the pectoral base is fleshy in some species and the ray bases difficult to distinguish. Some proportions change considerably with growth, particularly orbit diameter which tends to be proportionally smaller in larger specimens.

Several counts are useful in distinguishing species. The last two elements of the soft-dorsal and anal fins are counted as one. Gill-raker counts are usually given as total counts; distinction between rudiments and developed gill rakers is made in some cases. In some species the rudiments on the lower arch are difficult to count because of coalescence. The use of different methods for counting scales has caused confusion in the literature; some counts given as lateral-line scales refer rather to lateral scale rows. The tubed lateral-line scales are counted from the first one behind the supracleithral spine to the one over the posterior edge of the hypural; frequently one to three additional tubed scales are present on the caudal, and these are added with a plus sign. Vertical scale rows are counted above the lateral line from the row over the posterior end of the supracleithral spine to the row at the end of the hypural.

Abbreviations of depositories of specimens are as follows: AMNH—The American Museum of Natural History, New York, New York. ANSP—The Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania. BMNH—The British Museum (Natural History), London, England. CAS—California Academy of Sciences, San Francisco, California. FMNH—The Field Museum of Natural History, Chicago, Illinois. IFAN—Institut Français d'Afrique Noire, Gorée, Sénégal. IIP—Instituto de Investigaciones Pesqueras, Cadiz, Spain. TABL—Tropical Atlantic Biological Laboratory, Miami, Florida. UMMML—University of Miami Marine Laboratory, Institute of Marine Sciences, Miami, Florida. USNM—United States National Museum, Washington, D. C.

#### KEY TO SCORPIONFISHES OF THE ATLANTIC OCEAN

The following key is divided for convenience into two parts, the first dealing with western Atlantic species and the second with species of the eastern Atlantic and islands of Saint Helena, Ascension, and Tristan da Cunha. Some characters useful in identification are shown in figure 2 and are referred to in the key. Specimens are depicted in figures 3-13.

A. Western Atlantic	1
B. Eastern and central Atlantic	30



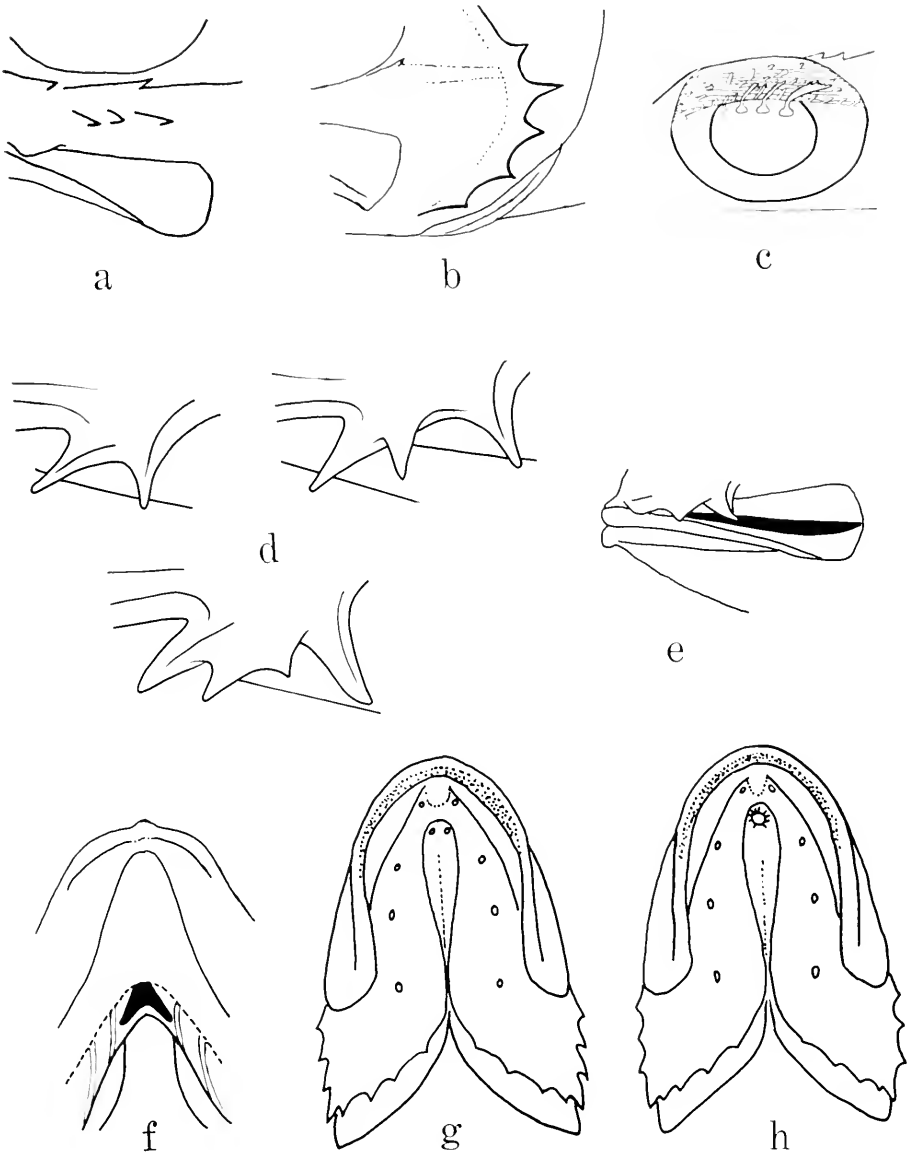


FIGURE 2. Characters useful in identification of Atlantic scorpionfishes. a. Additional row of spines on the suborbital bones in *Scorpaenodes caribbaeus*. b. Preopercular spines in *Helicolenus dactylopterus*. c. Mushroom-like tabs on cornea of *Scorpaena inermis*. d. Pre-orbital bones with 2, 3 and 4 spinous points. e. Maxillary with a median crest in *Scorpaena loppei*. f. Hypophyals (black) in *Pontinus nematophthalmus* (mouth open). g. Anterior mandibular pores separate. h. Anterior mandibular pores united. (g and h from Boutiere, 1958)

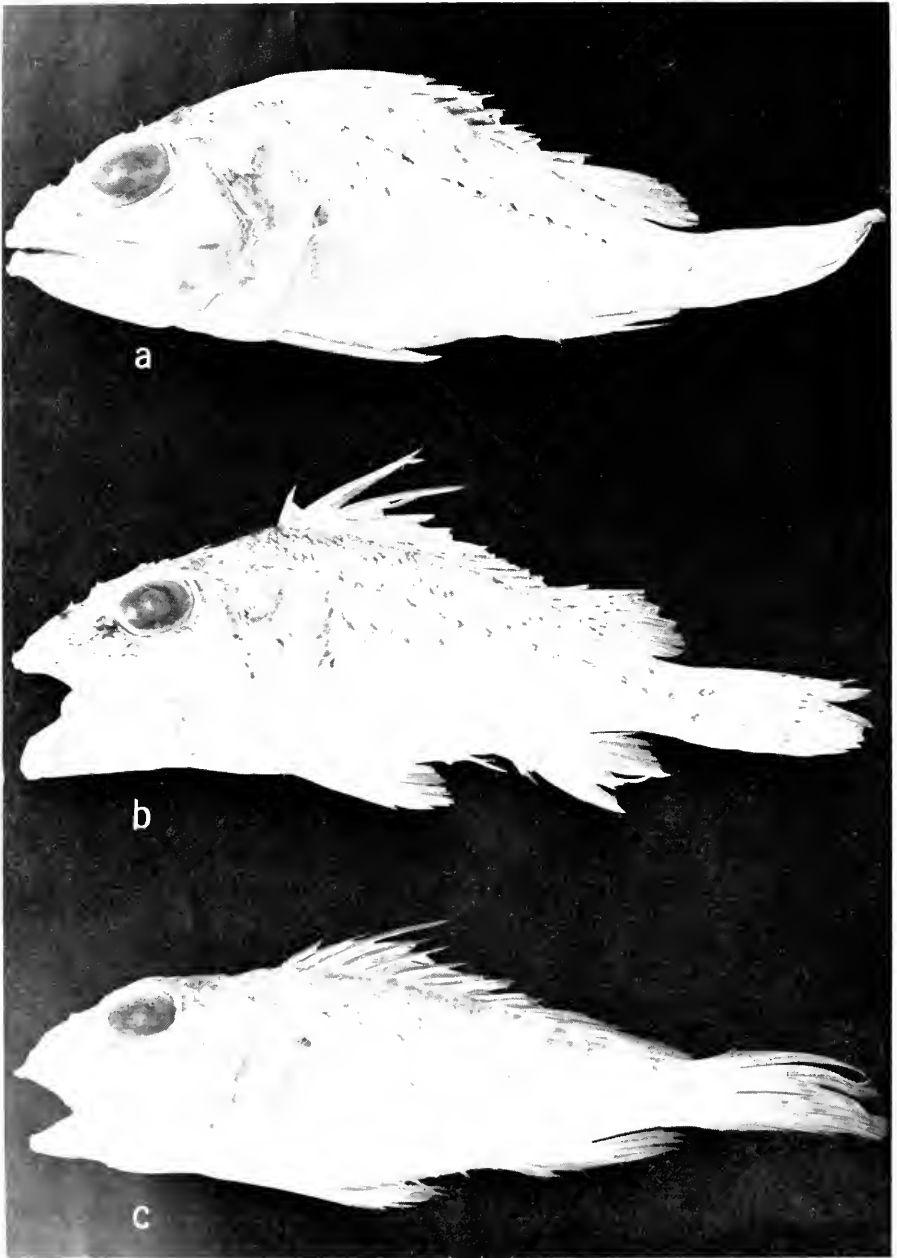


FIGURE 1.—a, *Pontinus leda* (holotype), adult, 132 mm. S.L., CAS no. 24282, GERONIMO CREEK, Gabon. b, *Pontinus accraensis*, adult, 158 mm. S.L., UMMML 21770, Ivory Coast. c, *Pontinus longipinis*, adult, 162 mm. S.L., UMMML 14017, Venezuela.

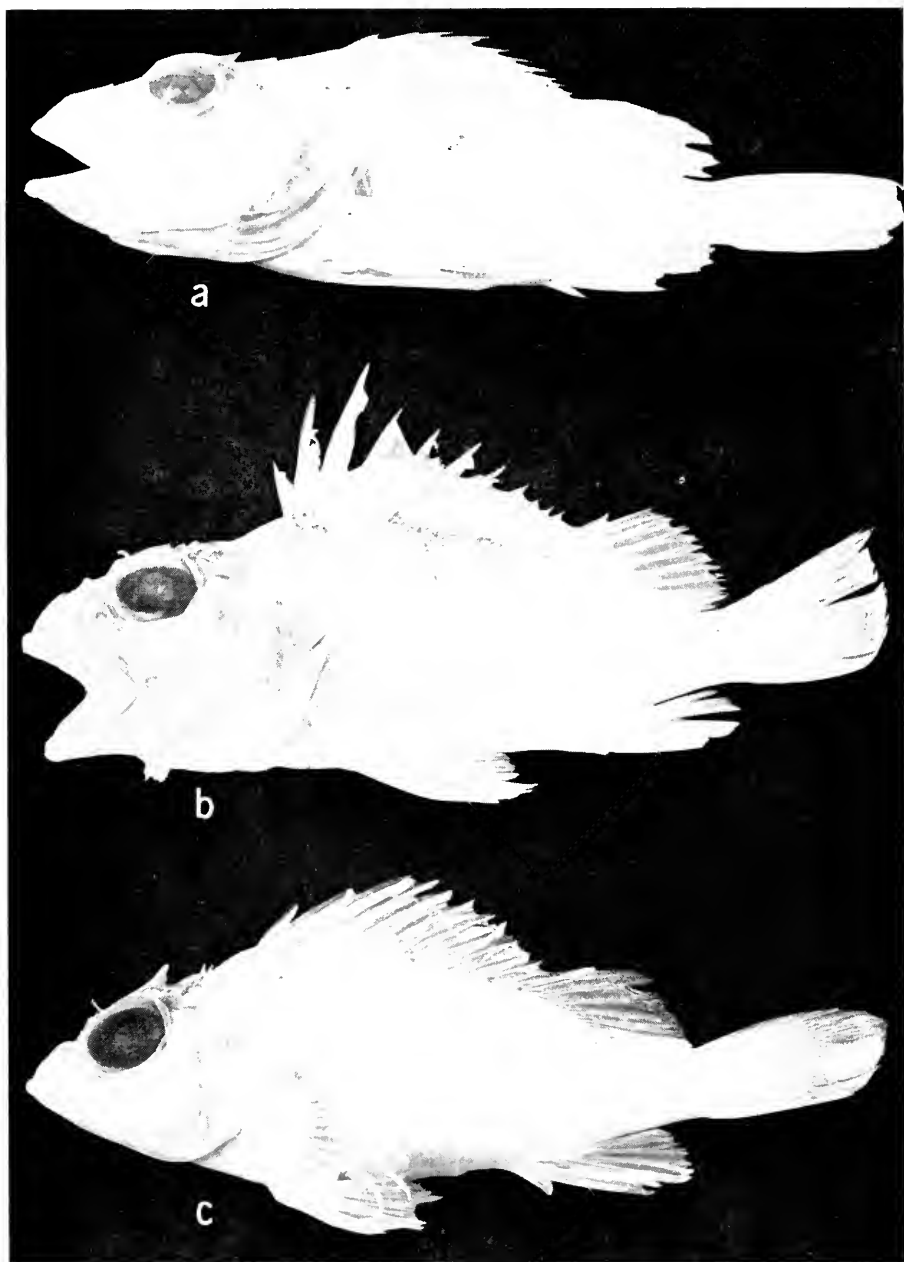


FIGURE 4. a. *Pontinus castor*, juvenile, 64 mm. S.L., UMMML 14002, Haiti. b. *Pontinus nematophthalmus*, adult, 96 mm. S.L., UMMML 14010, Venezuela. c. *Pontinus rathbuni*, adult, 72 mm. S.L., UMMML 10359, Florida.

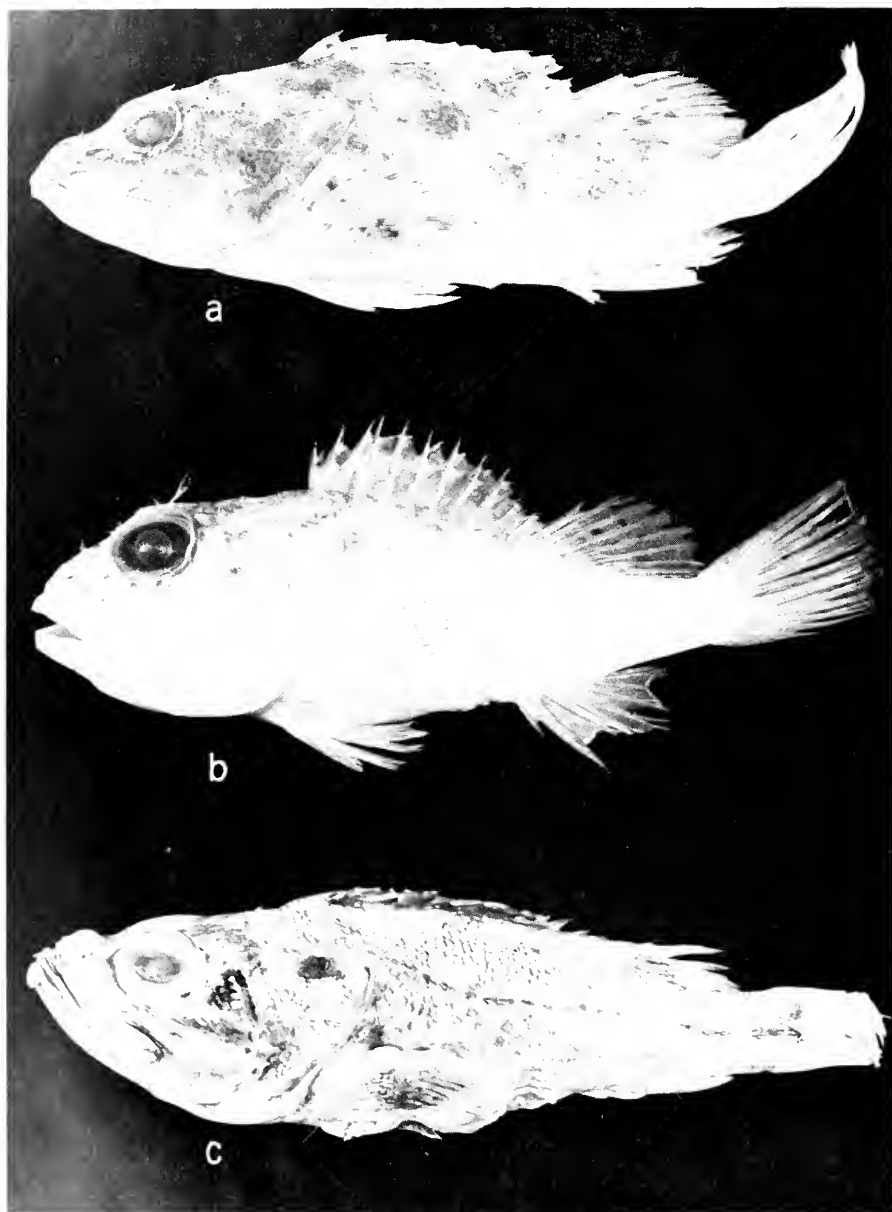


FIGURE 5. a. *Neomerinthe hemingwayi*, adult, 163 mm. S.L., UMMML 14361, Georgia. b. *Neomerinthe beanorum*, adult, 69 mm. S.L., UMMML 22171, Colombia. c. *Trachyscorpia capensis*, adult, 320 mm. S.L., BMNH.1935.5.2.10, Tristan da Cunha (caudal fin fore-shortened).

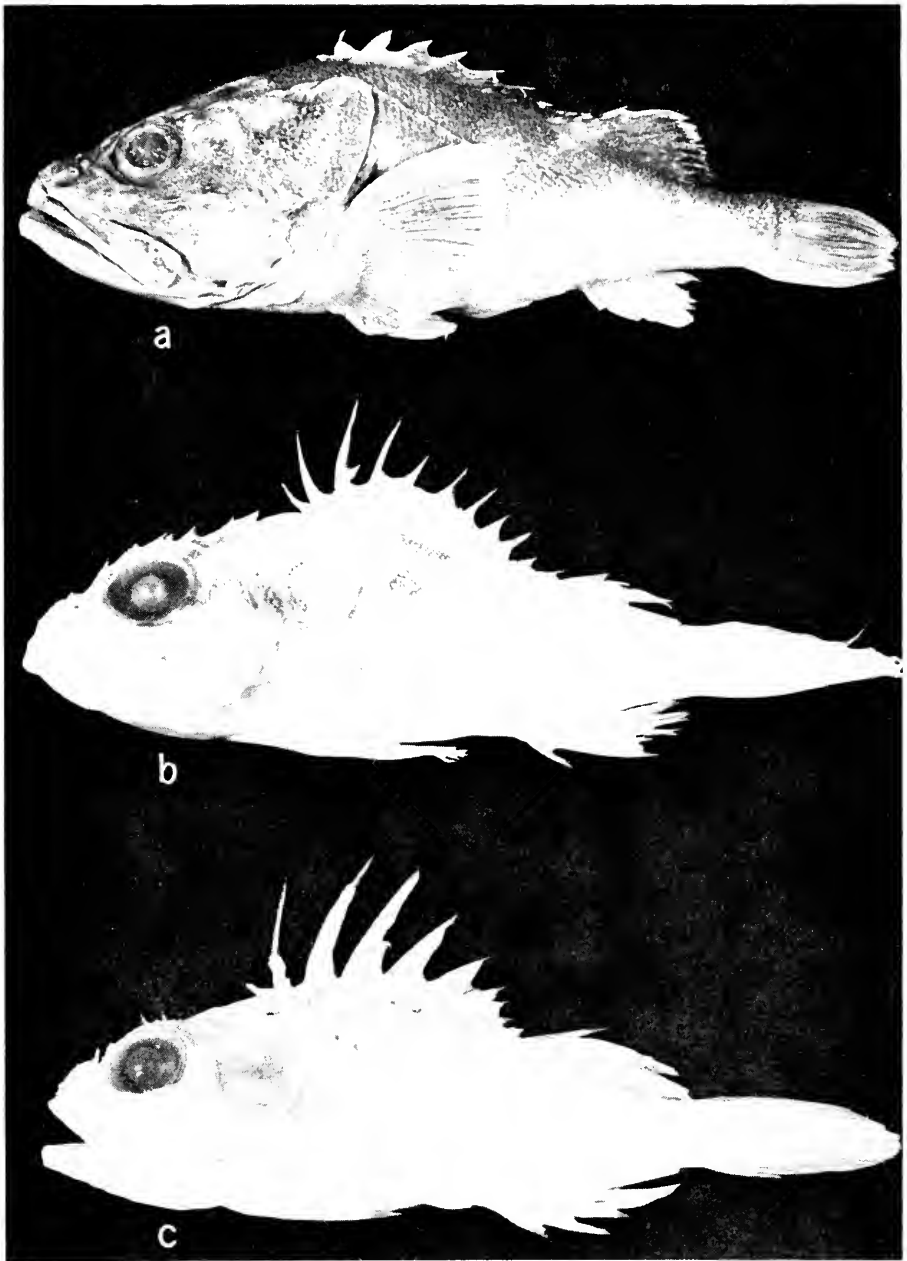


FIGURE 6. a. *Trachyscorpia cristulata cristulata*, large adult male, 345 mm. S.L., UMML 22223, Northern Gulf of Mexico. b. *Trachyscorpia cristulata cristulata*, juvenile, 75 mm. S.L., UMML 13732, Tortugas, Florida. c. *Scorpaena normani*, adult, 86 mm. S.L., UMML 21761, Nigeria.



FIGURE 7. a. *Scorpaena notata*, adult, 115 mm. S.L., USNM 48301, Bay of Naples. b. *Scorpaena notata*, subadult, 51 mm. S.L., UMMI uncat., Spain. c. *Scorpaena loppei*, adult, 60 mm. S.L., USNM 201148, Bay of Naples.

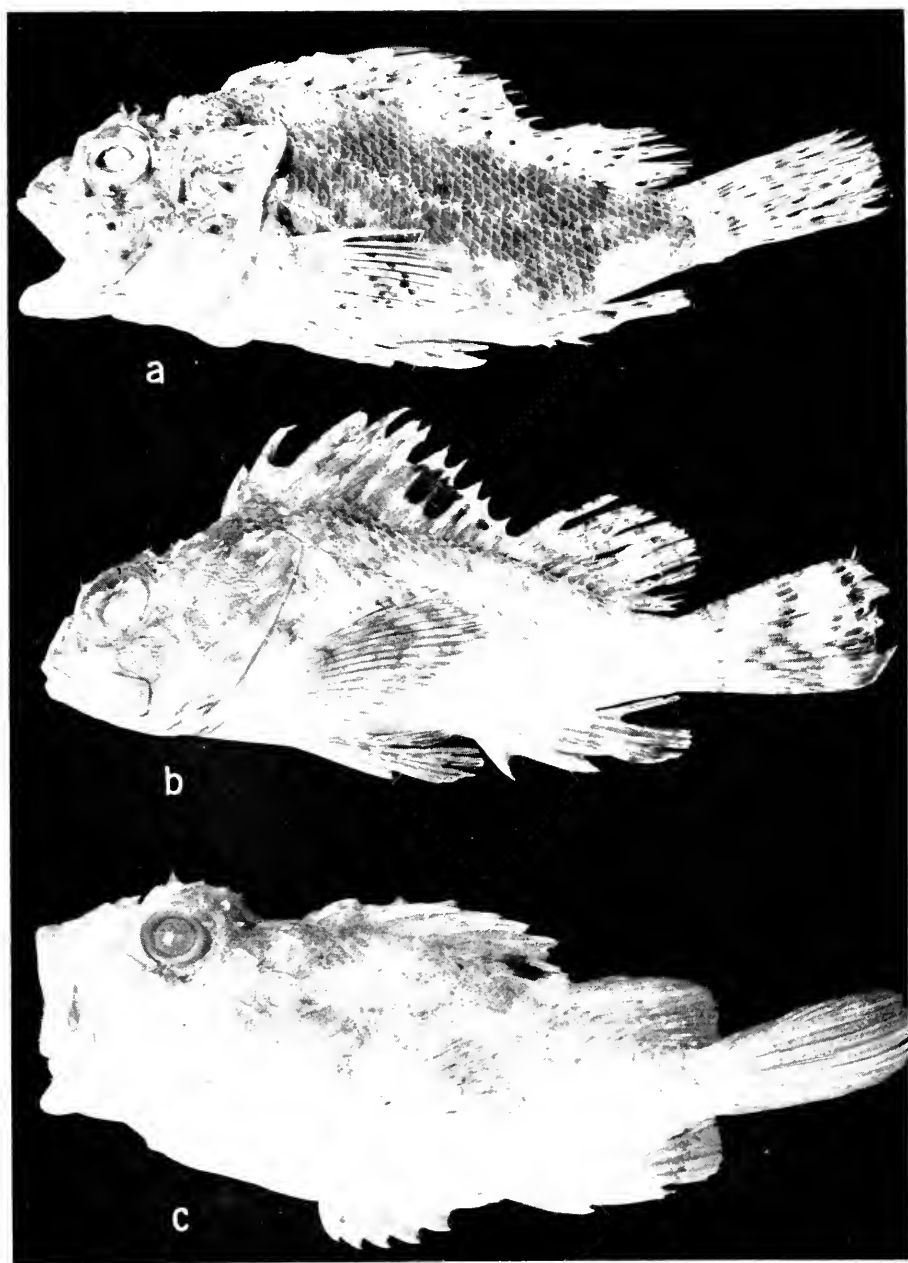


FIGURE 8. a. *Scorpaena azorica* (holotype), adult, 98 mm. S.L., USNM 94463, Azores. b. *Scorpaena angolensis*, adult, 91 mm. S.L., UMML 21772, Ghana. c. *Scorpaena annobonae* (holotype), adult, 44 mm. S.L., UMML 22219, Annobon.

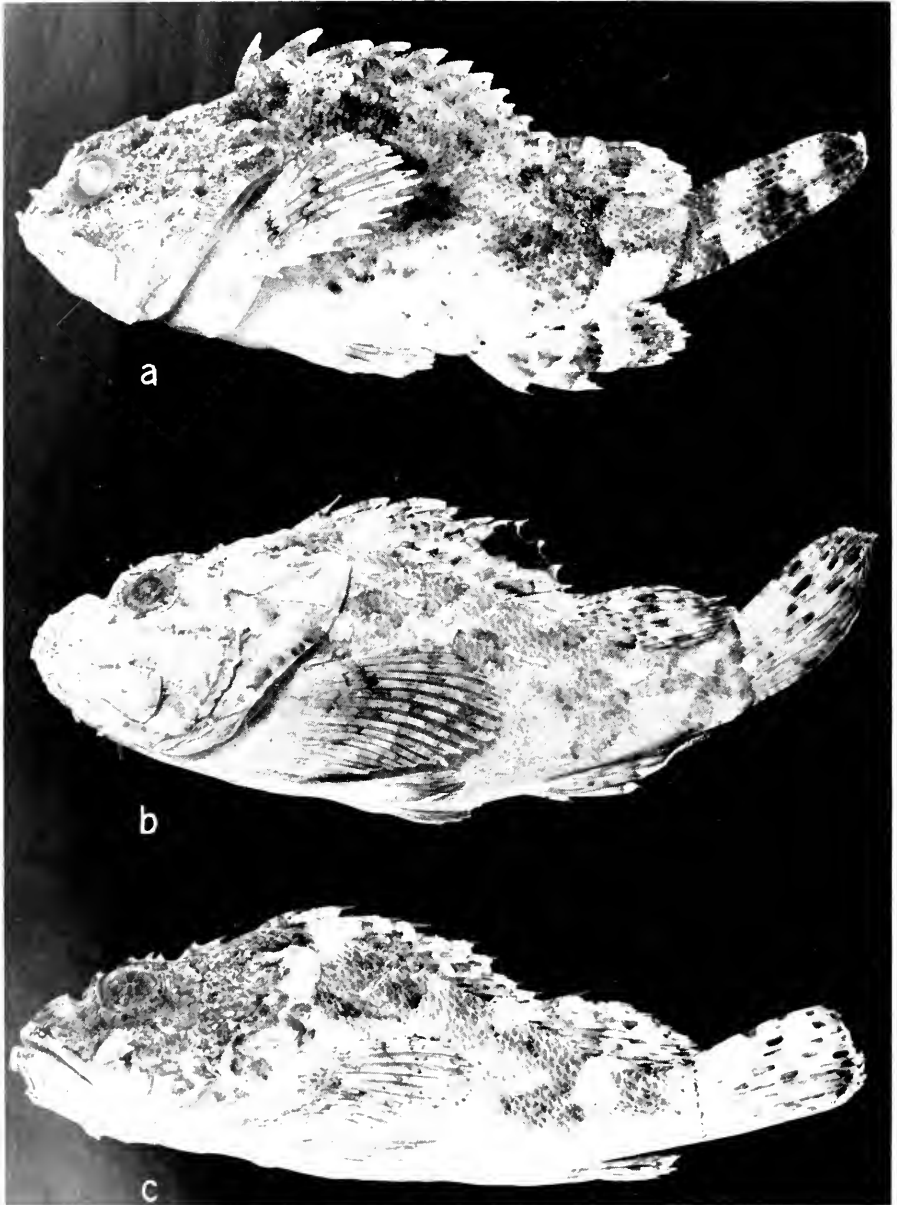


FIG. PL. 9. a, *Scorpaena porcus*, adult, 71 mm. S.L., UMML uncat., Spain. b, *Scorpaena crofa*, adult (with dark spot on spinous dorsal fin), 135 mm. S.L., USNM 48302, Bay of Naples. c, *Scorpaena scrofa*, adult (lacking dark spot on spinous dorsal fin), 135 mm. S.L., USNM inc. t., GTS Trans. 1, sta. 6, Portuguese Guinea.



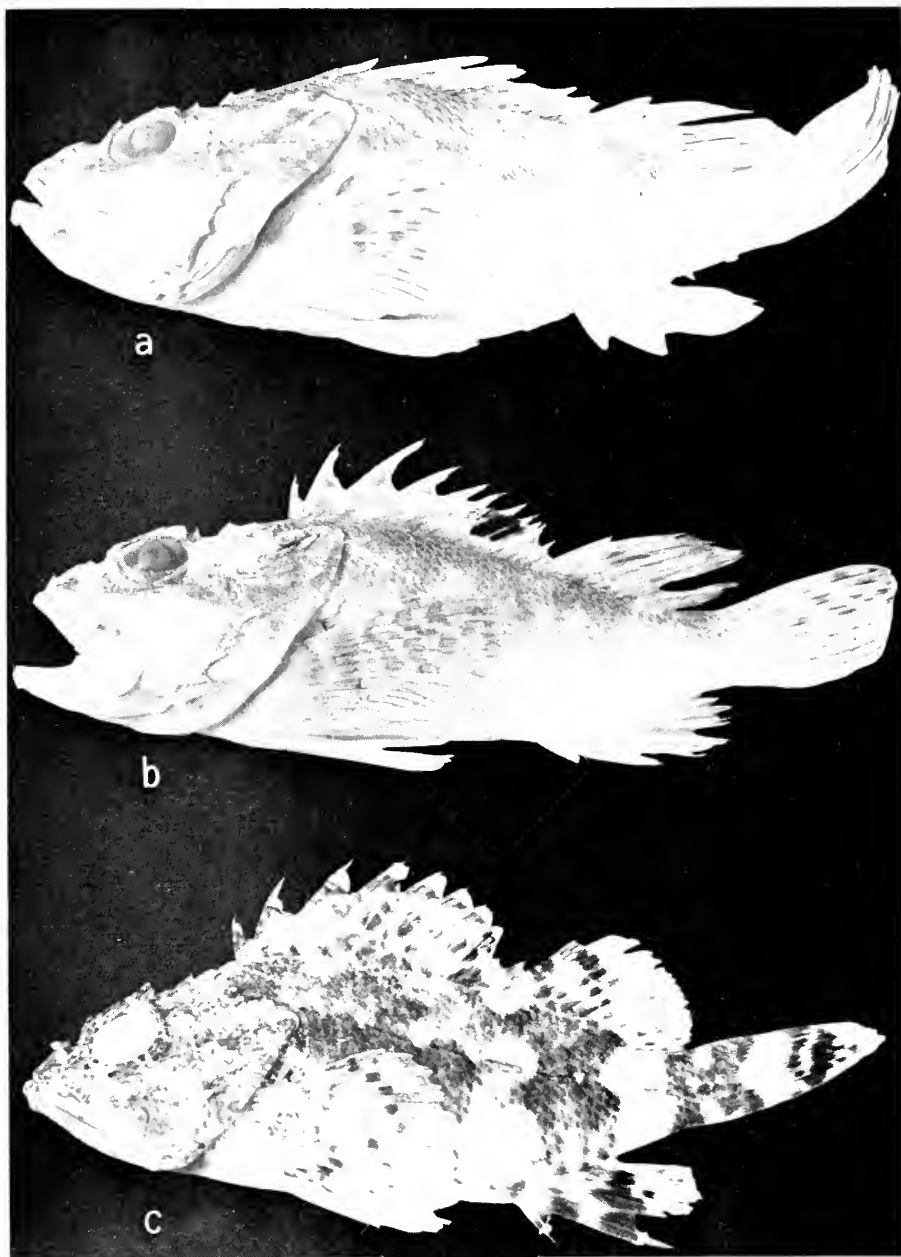


FIGURE 10. a. *Scorpaena elongata*, adult, 224 mm. S.L., UMMI uncat., Portuguese Guinea. b. *Scorpaena stephanica*, adult, 148 mm. S.L., UMMI 22873, Liberia. c. *Scorpaena maderensis*, juvenile, 41 mm. S.L., USNM 196334, Lebanon.

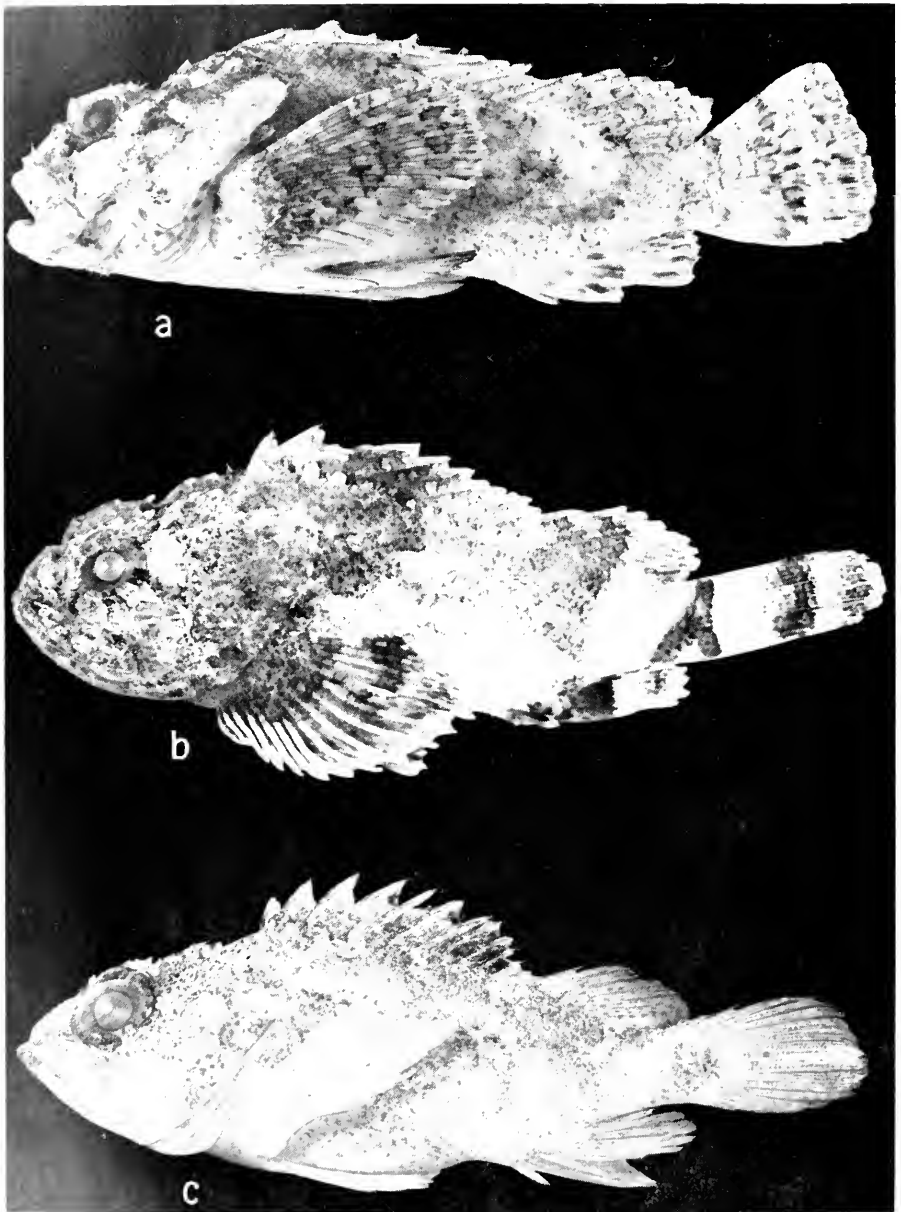


FIGURE 11. a. *Scorpaena lacvis*, adult 200 mm. S.L., UMMML 22217, Annobón. b. *Scorpaena lacvis*, juvenile, 46 mm. S.L., UMMML 22218, Annobón. c. *Scorpaenodes tredecimfasciatus*, adult, 41 mm. S.L., UMMML 19232, Florida.

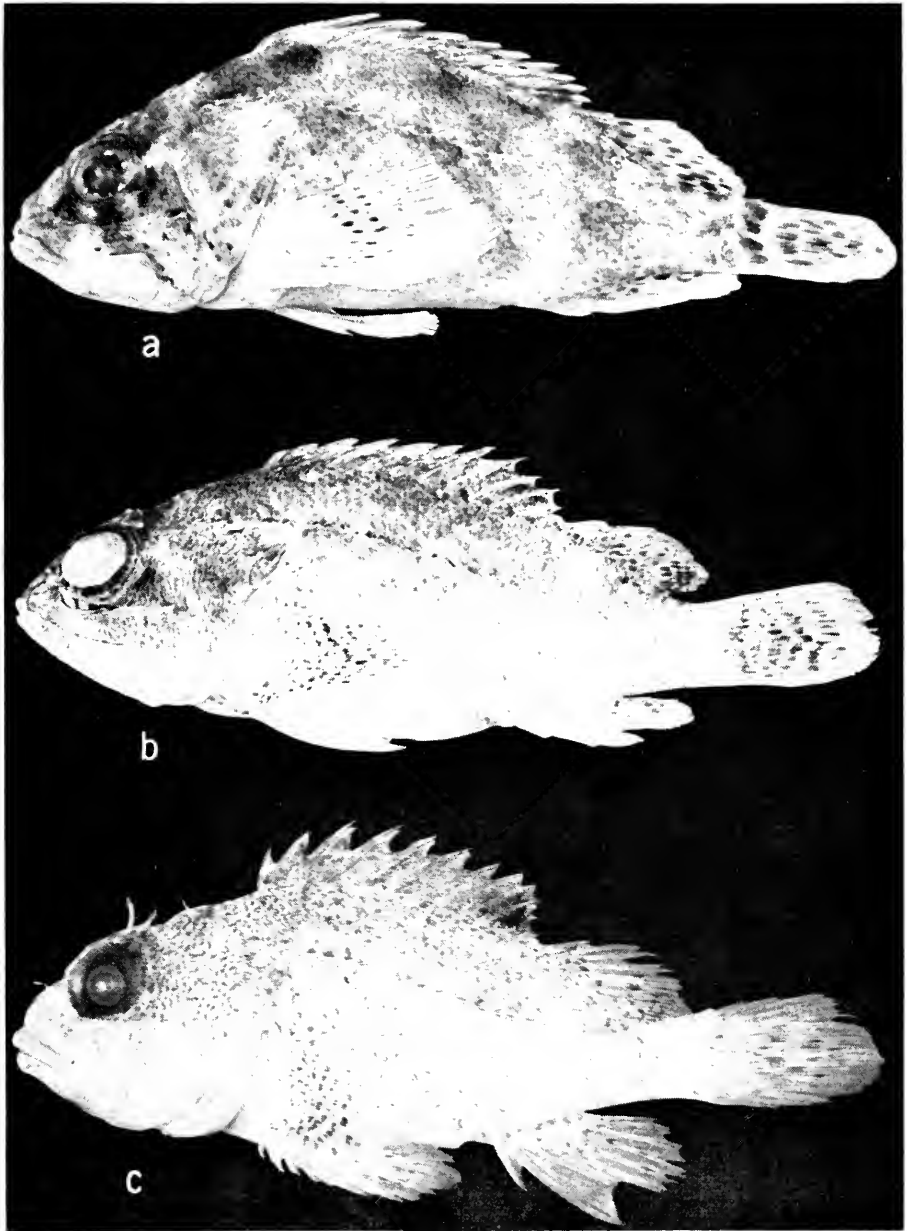


FIGURE 12. a. *Scorpaenodes caribbaeus*, adult, 74 mm. S.L., UMMI 3740, Virgin Islands. b. *Scorpaenodes africanus*, adult 50 mm. S.L., Gorée 58-184, Gorée, Sénégal. c. *Scorpaenodes africanus*, adult, 33 mm. S.L., UMMI 22220, Annobón.

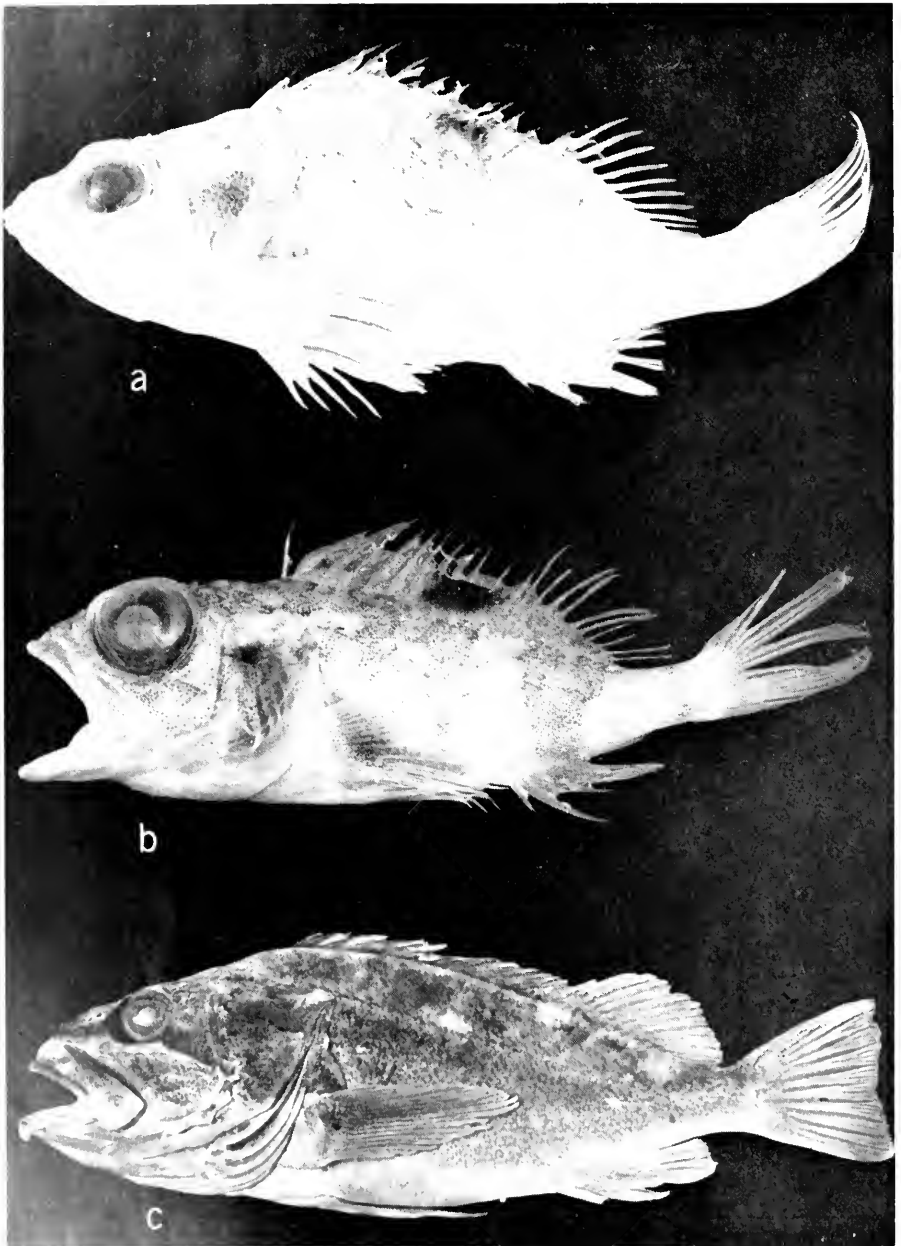


FIGURE 1. — a, *Helicolenus dactylopterus dactylopterus*, small adult, 124 mm. S.L., UMMI 1935.5.2.176, Florida Straits. b, *Helicolenus dactylopterus dactylopterus*, juvenile, 55 mm. S.L., UMMI 14771, West Coast. c, *Sebastes capensis*, adult, 280 mm S.L., BMNH 1935.5.2.176, Le Gulf.

## WESTERN ATLANTIC

- |  |  |
|--|--|
| 1. Dorsal spines 13 or more  | 2  |
| 1. Dorsal spines 12 (abnormal specimens with 13 dorsal spines will not possess the combination of characters of any triplet in 2)  | 4  |
| 2. (Trichotomous) Dorsal spines 14 or more; anal soft rays 7 or more (North-temperate to sub-Arctic)   | <i>Sebastes</i> (species not treated in detail). |
| 2. Dorsal spines 13; anal soft rays usually 6; palatine teeth present (South Atlantic); specimen figure 13c  | <i>Sebastes capensis</i>                         |
| 2. Dorsal spines usually 13; anal soft rays usually 5; palatine teeth absent (tropical to temperate)   | <i>Scorpaenodes</i>                              |
| 3. Pectoral rays 18-20, usually 19; one or more small spines just below main row of suborbital spines (fig. 2a); specimen figure 12a   | <i>Scorpaenodes caribbaeus</i>                   |
| 3. Pectoral rays 16-18, usually 17; suborbital ridge with a single row of spines; specimen figure 11c  | <i>Scorpaenodes tredecimspinosus</i>             |
| 4. Lateral line of tubed scales; supraocular and postocular spines present; bones of head strongly ossified  | 5  |
| 4. Lateral line a continuous channel, roofed by thin scales; supraocular and postocular spines absent (except in juveniles); bones of head weakly ossified, cavernous        | 6  |
| 5. Second preopercular spine longest (fig. 2b); dorsal soft rays 11 or more (last double); specimen figure 13a, b  | <i>Helicolenus dactylopterus</i>                 |
| 5. First preopercular spine longest (as in fig. 1); dorsal soft rays 10 or fewer (last double)   | 7  |
| 6. Pectoral rays 18-20; anal soft rays usually 6; orbit diameter about 2 times into interorbital width   | <i>Ectreposebastes imus</i>                      |
| 6. Pectoral rays 21-24; anal soft rays usually 5; orbit diameter about equal to interorbital width   | <i>Equates guentheri</i>                         |
| 7. Lateral line incomplete, only anterior 4-6 scales present   | <i>Phenacoscorpius nebris</i>                    |
| 7. Lateral line complete, extending to caudal base (sometimes some scales rubbed off)  | 8  |
| 8. Scales on body cycloid; (occipital pit present in all but 2 species)  | <i>Scorpaena</i>                                 |
| 8. Scales on body ctenoid; (no occipital pit)  | 9  |
| 9. Pectoral fin not wedge-shaped, longest rays near upper edge (fin tends to be slightly bilobed in larger specimens); pectoral rays 21-24, rarely 20; specimen figure 6a, b | <i>Trachyscorpia cristulata cristulata</i>       |
| 9. Pectoral fin more or less wedge-shaped; pectoral rays usually 19 or fewer, rarely 20  | 10   |
| 10. All pectoral rays unbranched   | <i>Pontinus</i>                                  |
| 10. At least some pectoral rays branched (except in juveniles)   | 15   |
| 11. Pectoral rays 19-20  | <i>Pontinus helena</i>                           |
| 11. Pectoral rays 15-18  | 12   |
| 12. Snout long, orbit into snout 1.3-2 or more times; specimen figure 4a   | <i>Pontinus castor</i>                           |
| 12. Snout short, about equal to orbit diameter   | 13   |
| 13. Pectoral rays 16, rarely 15 or 17; ventral hypohyals with long descending arm (visible when mouth is open, see figs. 2f and 4b); specimen figure 4b                      | <i>Pontinus nematophthalmus</i>                  |
| 13. Pectoral rays 17-18, rarely 16; ventral hypohyals without long descending arm  | 14 <sup>2</sup>                                  |

<sup>2</sup> *Pontinus corallinus*, a nominal species known from southern Brazil and of uncertain validity, would probably key to couplet 14.

14. Third dorsal spine notably elongate in specimens greater than about 120–130 mm. standard length (*Neomerinthe beanorum* is the only other western Atlantic species with this character); first preorbital spine usually directed forward; sides of body usually spotted; specimen figure 3c ..... *Pontinus longispinis*
14. Third dorsal spine not notably elongate, sometimes slightly elongate in *P. nematophthalmus* as in figure 5b; first preorbital spine directed to rear; body with a few dusky smudges, especially in patches at base of dorsal fin; specimen figure 4c ..... *Pontinus rathbuni*
15. Dorsal soft rays usually 10, rarely 9 (last double); scales small, vertical scale rows more than 55; snout long, orbit into snout 1.1–1.7 times; specimen figure 5a ..... *Neomerinthe hemingwayi*
15. Dorsal soft rays 9 (rarely 8 or 10); vertical scale rows fewer than about 50; snout long, orbit into snout 0.7–1.3 times ..... 16
16. Branched pectoral rays split once; body and most fins (especially the pectoral fins) usually with dark spots; 3 or 4 spines on suborbital ridge; (vertebrae 24); specimen figure 5b ..... *Neomerinthe beanorum*
16. Branched pectoral rays split more than once; body and fins mostly pallid; usually 5 or more spines on suborbital ridge; (vertebrae 25) ..... *Idiastion kyphos*
17. Preorbital bone with 2 spinous points over maxillary (fig. 2d) ..... 18
17. Preorbital bone with 3 or 4 spinous points over maxillary (fig. 2d), except 2 in specimens of *Scorpaena plumieri* less than about 40 mm. standard length and probably 2 in specimens of *S. dispar* of the same length ..... 29
18. Supplemental preopercular spine absent (refer to fig. 1); no occipital pit, except in *Scorpaena melasma* ..... 19
18. Supplemental preopercular spine present; occipital pit present, sometimes shallow .... 21
19. Occiput broadly depressed, without a definite pit ..... 20
19. Occiput with a deep pit ..... *Scorpaena melasma*
20. Inverted, mushroom-shaped, whitish (darker in preservative) figures extending down on cornea from base of ocular tabs at boundary of opaque and transparent parts of cornea (fig. 2c); dorsal soft rays usually 8 ..... *Scorpaena inermis*
20. Mushroom-shaped figures absent; dorsal soft rays usually 9 ..... *Scorpaena calcarata*
21. Brown spots (about 0.5–2 mm. in diameter) against pale background in axil of pectoral fin and along sides of body between pectoral and anal fin (sometimes faded); vertical scale rows more than 50 ..... *Scorpaena brasiliensis*
21. No brown spots in axil of pectoral fin; vertical scale rows usually fewer than 50 ..... 22
22. Eye large, snout 1.5–2.2 times in orbit; pectoral fin long, reaching to over posterior end of anal fin (shorter in juveniles) ..... *Scorpaena agassizii*
22. Eye moderate, snout 0.9–1.5 times in orbit; pectoral fin reaching to over third anal spine as maximum ..... 23
23. Spinous dorsal fin with a dark blotch between dorsal spines 3–5 to 6–7 ..... 24
23. Spinous dorsal fin without a dark blotch ..... 25
24. Pectoral rays 17 or 16; suborbital ridge with 1–3 spinous points ..... *Scorpaena bergii*
24. Pectoral rays 18–19, infrequently 17; suborbital ridge without spinous points ..... *Scorpaena isthmensis*
25. Axil of pectoral fin with white specks, less than about 0.5 mm. in diameter, surrounded by brown or on a tan background; supraocular tentacle long, usually two or more times orbit diameter; tympanic spines reduced or absent ..... *Scorpaena grandicornis*
25. Axil of pectoral fin not as above, usually axil pale; supraocular tentacle usually less than orbit diameter; tympanic spines present ..... 26

26. Pectoral rays 16-18; suborbital ridge with 1 spine, infrequently 2	27
26. Pectoral rays 19-20; suborbital ridge usually with 3 spines, infrequently 2	28
27. Pectoral rays usually 18, sometimes 17; body depth 33-38 percent standard length (known only from Brazil)	<i>Scorpaena petricola</i>
27. Pectoral rays 17 or 16; body depth 37-42 percent standard length	<i>Scorpaena elachys</i>
28. Nasal spine usually absent; soft dorsal rays usually 8	<i>Scorpaena brachyptera</i>
28. Nasal spine present; soft dorsal rays 9, rarely 8	<i>Scorpaena albifimbria</i>
29. Axil of pectoral fin with large white spots or irregular blotches on a black background in specimens over about 30 mm. standard length (smaller specimens with a characteristic color pattern)	<i>Scorpaena plumieri</i>
29. Axil of pectoral fin unmarked; body pallid except for dark blotches, especially on pectoral fins and caudal fin	<i>Scorpaena dispar</i>

## EASTERN AND CENTRAL ATLANTIC

30. Dorsal spines 13 or more	31
30. Dorsal spines normally 12	34
31. (Trichotomous) Palatine teeth absent; (shallow-water, tropical Africa and Mediterranean Sea)	<i>Scorpaenodes</i>
31. Palatine teeth present; second suborbital bone narrowing posteriorly; 1 or no spines on suborbital ridge	<i>Sebastes</i> (North Atlantic species not treated in detail; the one South Atlantic species, <i>S. capensis</i> (Gmelin) is treated.)
31. Palatine teeth present; second suborbital bone not narrowing posteriorly; several spines present on suborbital ridge (southern tip of South Africa); specimen figure 5c	<i>Trachyscorpia capensis</i>
32. Main row of spines on suborbitals with one or more spines below (fig. 2a)	<i>Scorpaenodes elongatus</i>
32. One row of spines on suborbitals	33
33. Suborbital ridge with 4 or more spinous points	<i>Scorpaenodes arenai</i>
33. Suborbital ridge with 3 or fewer spinous points; specimen figure 12b, c	<i>Scorpaenodes africanus</i>
34. Dorsal soft rays 11 or more (last double)	35
34. Dorsal soft rays 10 or fewer (last double)	37
35. Pectoral rays 19 or more; second preopercular spine longest (fig. 2b); suborbital ridge with 1 or no spines	36
35. Pectoral rays about 17; first preopercular spine longest (see fig. 1); suborbital ridge with several spinous points	<i>Neomerinthe folgori</i>
36. Body spotted with dark brown (Tristan da Cunha)	<i>Helicolenus tristanensis</i>
36. Body mostly pallid; specimen figure 13a, b	<i>Helicolenus dactylopterus</i>
37. Lateral line a continuous channel roofed by thin scales; supraocular and postocular spines absent (except in juveniles); bones of head weakly ossified; scales tiny and cycloid	38
37. Lateral line of tubed scales; supraocular and postocular spines present; ossification normal; scales on body ctenoid or if cycloid less than 80 vertical scale rows	39
38. Pectoral rays 18-20; anal fin with 6 soft rays (last double); orbit diameter about 2 times in interorbital width; top of head scaled	<i>Ectreposebastus imus</i>
38. Pectoral rays 21-24; anal fin normally with 5 soft rays; orbit diameter about equal to interorbital width; top of head naked	<i>Setarches guentheri</i>
39. Pectoral fin with characteristic shape (see fig. 6a), longest rays near upper part of fin; pectoral rays 20 or more	<i>Trachyscorpia cristulata echinata</i>
39. Pectoral fin wedge-shaped to rounded, longest rays at about middle of fin; pectoral rays usually fewer than 20	40

40. All pectoral rays unbranched; interorbital width 3.1–5.5 percent standard length; total gill rakers including flat rudiments 17–22 .....	<i>Pontinus</i> .....	41
40. Some pectoral rays branched, except in juveniles; interorbital width 4.1–9.0 percent standard length; total gill rakers including rudiments 13–18 .....	<i>Scorpaena</i> .....	44
41. Scales small, vertical scale rows more than about 60 .....	<i>Pontinus kuhlii</i> .....	41
41. Scales larger, vertical scale rows less than about 50 .....	.....	42
42. Occurring at Saint Helena .....	<i>Pontinus nigropunctatus</i> .....	42
42. Occurring off the west coast of Africa .....	.....	43
43. Second anal spine long, about 1.5 (1.2–1.6) times orbit diameter; second and third dorsal spines usually notably elongate in specimens greater than about 130 to 150 mm. in standard length; caudal fin of preserved specimens spotted, especially along dorsal edge of fin (sometimes faded); pectoral rays usually 17 (16–18); specimen figure 3b .....	<i>Pontinus accraensis</i> .....	43
43. Second anal spine about equal to orbit diameter (orbit diameter 0.9–1.2 into length of second anal spine); no dorsal spines notably elongate; caudal fin of preserved specimens entirely clear, or dusky distally in large specimens; pectoral rays usually 18 (17–18); specimen figure 3a .....	<i>Pontinus leda</i> .....	43
44. Occipital pit absent .....	.....	45
44. Occipital pit present .....	.....	47
45. Chest naked; pectoral rays 18 or more; specimen figure 6c .....	<i>Scorpaena normani</i> .....	45
45. Chest scaled; pectoral rays 15–16, possibly 17 .....	.....	46
46. Both preorbital spines point to rear; 1 cleithral spine on each side; no white specks in axil of pectoral fin .....	<i>Scorpaena canariensis</i> .....	46
46. Only posterior preorbital spine points to rear; 2 cleithral spines on each side; white specks in axil of pectoral fin; specimen figure 10c .....	<i>Scorpaena maderensis</i> .....	46
47. Scales cycloid; pectoral-fin base and chest scaled .....	.....	48
47. Scales ctenoid (or if emarginate ( <i>S. porcus</i> ), more than 60 vertical scale rows); pectoral-fin base and chest naked .....	.....	49
48. Scale rows fewer than about 50; specimen figure 11a, b .....	<i>Scorpaena laevis</i> .....	48
48. Scale rows more than about 60 .....	<i>Scorpaena mellissii</i> .....	48
49. Anterior mandibular pores separate (fig. 2h) (sometimes difficult to locate) .....	.....	53
49. Anterior mandibular pores united into a single opening (fig. 2g) (usually easy to locate) .....	.....	50
50. Maxillary with a longitudinal crest (fig. 2e); specimen figure 7c .....	<i>Scorpaena loppei</i> .....	50
50. Maxillary lacking a crest .....	.....	51
51. All fins with large brown spots; preorbital bone with 4 spinous points over maxillary (fig. 4d, lower) (probably only 2 or 3 in juveniles); specimen figure 8c .....	<i>Scorpaena azorica</i> .....	51
51. Spinous dorsal fin with an elongate black spot; preorbital bone with 1–3 spinous points over maxillary .....	.....	52
52. Dorsal soft rays usually 9; preorbital bone with 3 spinous points over maxillary (fig. 2d, upper right), posterior one pointing slightly to rear; specimen figure 8b .....	<i>Scorpaena angolensis</i> .....	52
52. Dorsal soft rays 10 (1 specimen known); preorbital bone with 2 spines, first spine as broad shelf, second strongly curved to rear; specimen figure 8a .....	<i>Scorpaena annobonae</i> .....	52
53. Scales on body emarginate, vertical scale rows more than 60; specimen figure 9a .....	<i>Scorpaena porcus</i> .....	53
53. Scales on body ctenoid; vertical scale rows fewer than about 50 .....	.....	54



54. Cutaneous tabs present on underside of head; specimen figure 9b, c ..... *Scorpaena scrofa*  
 54. Lower jaw without cutaneous tabs ..... 55  
 55. Spinous dorsal fin without a black spot; pectoral rays usually 19, sometimes 18;  
 specimen figure 10a ..... *Scorpaena elongata*  
 55. Spinous dorsal fin with a black spot; pectoral rays usually 17-18, rarely 19 ..... 56<sup>3</sup>  
 56. Orbit diameter about equal to snout (small specimens) or smaller than snout, orbit  
 into snout 0.8-1.2; scales before anus small, more than about 20 rows; specimen  
 figure 10b ..... *Scorpaena stephanica*  
 56. Orbit larger than snout, ratio snout length divided by orbit diameter less than 0.9;  
 scales before anus large, fewer than about 20 rows; specimen figure 7a, b .....  
 ..... *Scorpaena notata*

### Subfamily SCORPAENINAE

**DIAGNOSIS.** Dorsal normally XII-XIII; anal II-III, 3-6 (usually III, 5); pectoral rays normally 15-24; second suborbital bone uniformly broad or gradually becoming wider posteriorly, securely fastened to preopercle; suborbital sensory canal ending at posterior extremity of second suborbital bone; third suborbital bone usually absent; fourth usually present, isolated; vertebrae 24-26, mostly 24; lateral line of tubed scales.

**REMARKS.** This subfamily has been treated in detail by Matsubara (1943, p. 265, and following). The following genera not included by him are tentatively added: *Phenacoscorpius*, *Xcomcrinthe*, *Idiastion*, and *Trachyscorpia*.

### Genus *Pontinus* Poey

*Pontinus* POEY, 1860, p. 172 (type-species *Pontinus castor* Poey [see Eschmeyer, 1965b, p. 527]). BARNHART AND HUBBS, 1946, pp. 373-377 (*Nemapontinus* and *Merinthe* as synonyms; comparisons). GINSBURG, 1953, pp. 42-44 (western Atlantic species). ESCHMEYER, 1965b, pp. 526-530 (nomenclatural problems; diagnosis; one new species added).

*Sebastoplus* GILL, 1863, p. 208 (type-species *Scorpaena kuhlii* Bowdich, by original designation).

*Merinthe* SNYDER, 1904, p. 535 (type-species *Sebastes macrocephalus* Sauvage, by original designation; no description). JORDAN AND EVERMANN, 1905, p. 461 (first description). MATSUBARA, 1943, pp. 286-287 (osteology of one species).

*Nemapontinus* FOWLER, 1938, p. 73 (type-species *Nemapontinus tentacularis* Fowler, by original designation; wrongly stated no palatine teeth).

Not *Pontinus*, MATSUBARA, 1943, pp. 282-283.

**DIAGNOSIS.** Dorsal rays XII, 9-10; anal rays normally III, 5; pectoral rays 15-20, all rays unbranched; swimbladder present; vertebrae 24; scales on body ctenoid; cheek, postorbital area and occiput scaly; no occipital pit; teeth on palatines; slit present behind last gill arch; peritoneum pallid.

**SPINATION.** Preorbital bone with 2 spinous points over maxillae. Suborbital ridge with 3 or 4 spinous points, first on preorbital frequently absent. Supplemental preopercular spine present; first preopercular spine longest,

<sup>3</sup> See Addendum.

second absent in some species (or absent in adults of some species), third present, fourth present, fifth small to virtually absent. Upper posttemporal spine absent in some species. Other spines include nasal, pre-, supra-, and postocular, tympanic, parietal, nuchal, pterotic, sphenotic, lower posttemporal, supracleithral, and cleithral. Some species with second and/or third dorsal spines greatly elongate in adults.

REMARKS. This genus has been discussed recently (Eschmeyer, 1965b, pp. 526-528). About 15 valid species are recognized in the world-wide tropical genus *Pontinus*. In the Indo Pacific two species are valid: *P. macrocephalus* (Sauvage, 1882), including *P. spilistius* Gilbert, 1905 from Hawaii, and *P. tentacularis* (Fowler, 1938) from the Philippines and Japan. Barnhart and Hubbs (1946) correctly placed *P. spilistius* as a synonym of *P. macrocephalus* but also included *P. tentacularis*. The species occurring at Japan and the Philippines has been called *P. macrocephalus* by other authors (for example, Matsubara, 1943, as *Merinthe macrocephala*; Matsubara, 1955, as *Pontinus macrocephalus*; see Barnhart and Hubbs, p. 375); I (1965b) also thought that all might be synonymous. After examination of additional specimens (USNM and ANSP) I feel that two species are involved, one occurring at Hawaii and the other at the Philippines and Japan. The two species are distinguishable on number of pectoral rays and soft dorsal rays. *Pontinus tentacularis* has 16 pectoral rays and 9 soft dorsal rays (three specimens; Matsubara, 1943, gives pectoral rays as 16 (5) or 17 (1) and soft dorsal as 9 (5) or 10 (1). *Pontinus macrocephalus* has 17 pectoral rays and 10 soft dorsal rays (seven specimens). Other species of *Pontinus* show strong modes in these characters, therefore, *P. tentacularis* and *P. macrocephalus* are considered distinct, though closely related, species. *Sebastes hexanema* Günther (1880) from the Arafura Sea appears, however, to be a senior synonym of *P. tentacularis*, based on the figure given with the original description. Alwyne Wheeler informs me that the three types of *Sebastes hexanema* have 16 unbranched pectoral rays. Additional species are expected to occur in the Indo-Pacific area.

In the eastern Pacific there are six nominal species, at least five of which appear to be valid. Barnhart and Hubbs (1946, pp. 377-379) compared the five nominal species known then; *P. clemensi* Fitch was described in 1955.

Nine species are treated as occurring in the Atlantic Ocean. Three are found in the eastern Atlantic: *P. accraensis* Norman, 1935b, *P. kuhlii* (Bowdich, 1825), and *P. leda* Eschmeyer. Another species, *P. nigropunctatus* (Günther, 1868), occurs at Saint Helena. Five western Atlantic species are treated; *P. corallinus* Miranda Ribeiro from southern Brazil remains in doubt.

Characters most useful in separating species of this genus are numbers of pectoral rays and soft dorsal rays; presence of elongate dorsal spines and if elongate, whether the second, second and third, or third; scale size; direction of preorbital spines; and relation of size of orbit to length of snout. Two of these

must be used with caution: the dorsal spines usually do not become elongate until the fish reaches a size of 100 to 150 mm. standard length, and the ratio of snout divided by orbit changes radically with increases in size, those having the snout about twice as long as the orbit diameter in adults will have the two almost equal as juveniles. The length of the supraocular tentacle is of some use in distinguishing some species, but this character shows much variability, and the tentacles are frequently missing.

### ***Pontinus helena* Eschmeyer.**

(See ESCHMEYER, 1965b, pp. 528–530, fig. 2, for a detailed treatment).

*Pontinus helena* ESCHMEYER, 1965b, pp. 528–530, fig. 2 (type locality Gulf de Triste, off Venezuela, 11°10' N., 68°08' W., in 220 fathoms, *Oregon* station 4451; holotype USNM no. 260470-F3, paratype UMML no. 16164).

**DISTINGUISHING FEATURES.** A short-snouted species with no elongate dorsal spines, characterized by a high pectoral fin ray count (19–20 rather than 18 or fewer).

**DISTRIBUTION.** Known only from the type material from off Venezuela in 220 fathoms.

### ***Pontinus longispinis* Goode and Bean.**

*Pontinus longispinis* GOODE AND BEAN, 1896, p. 258, pl. 68, fig. 246 (type locality Gulf of Mexico, 28°36' N., 85°33.5' W., in 111 fathoms, *Albatross* station 2402; holotype USNM no. 39323). JORDAN AND EVERMANN, 1898, pp. 1858–1859 (compiled). EVERMANN AND KENDALL, 1900, p. 88 (compiled). JORDAN, EVERMANN, AND CLARK, 1930, p. 372 (compiled). HILDEBRAND in Longley and Hildebrand, 1941, p. 166 (description; color; Tortugas, Florida, in 60–140 fathoms). GINSBURG, 1953, pp. 45–47 (good description; 79 specimens from South Carolina south to Florida and in the Gulf of Mexico, in depths from 40–142 fathoms). SPRINGER AND BULLIS, 1956, p. 90 (collections by the *Oregon* in the Gulf of Mexico). BRIGGS, 1958, p. 294 (range compiled). BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). MOE, and others, 1966, p. 79 (specimens in Florida Board of Conservation collection). CERVIGON, 1966, pp. 768–770, fig. 325 (description; Venezuela).

**MATERIAL EXAMINED.** (For this species, station refers to *Oregon* stations and catalog numbers refer to UMML specimens unless otherwise noted.)

**Northern population.** ATLANTIC COAST OF FLORIDA: No. 1651 (1, 80) Duval County, off St. John's River entrance in 105 fathoms, vessel *Antillas*. NORTHERN GULF OF MEXICO: No. 16239 (59, 31–171) 29°42' N., 86°45' W., in 100 fathoms, station 4943; no. 16161 (2, 72–77) 29°21' N., 87°40' W., in 80 fathoms, station 4950; no. 14266 (36, 42–151) 29°13' N., 88°11' W., in 100 fathoms, station 4853; no. 16177 (1, 130) 28°59' N., 88°37' W., in 205 fathoms, station 4048; no. 16169 (2, 74–95) 29°13.5' N., 88°12.5' W., in 68 fathoms, station 2804; no. 16187 (6, 79–145) 28°11' N., 90°08' W., in 100 fathoms, station 4696; no. 16160 (1, 82) 28°16' N., 90°13' W., in 50–53 fathoms, station

4695; no. 17306 (4, 62–158) 27°55' N., 91°43' W., in 100 fathoms, station 4750; no. 17302 (2, 95–106) 28°40' N., 92°21.5' W., in 20 fathoms, station 4724 [depth must be wrong or station incorrect]; USNM no. 39323 (3, 54–122, holotype and 2 paratypes) 28°36' N., 85°33'30" W., in 111 fathoms, *Albatross* station 2402; USNM no. 39322 (1, 75, paratype) 28°38'30" N., 85°52'30" W., in 142 fathoms, *Albatross* station 2401.

*Southern population* (west to east). PANAMA: no. 22212 (1, 141) 9°02.3'–00.3' N., 81°23.8'–25.0' W., in 187–189 fathoms, *Pillsbury* station 445. COLOMBIA: no. 16206 (1, 171) 10°24' N., 75°50' W., in 195–190 fathoms, station 4880; no. 16705 (1, 107) 11°06.7' N., 74°30' W., in 100 fathoms, station 4844; no. 17314 (5, 52–145) 11°09.5' N., 74°24.5' W., in 170–180 fathoms, station 4838; no. 16667 (1, 82) 11°08' N., 74°23.8' W., in 100 fathoms, station 4856; no. 16178 (2, 101–132) 11°50' N., 73°05' W., in 175–190 fathoms, station 4911. VENEZUELA: no. 14013 (2, 73–95) 11°53' N., 69°28' W., in 190 fathoms, station 4423; no. 16209 (4, 105–205) 11°49' N., 69°24' W., in 200 fathoms, station 4421; no. 14014 (1, 140) 11°50' N., 69°23' W., in 205 fathoms, station 4424; no. 16186 (3, 118–148) 11°11' N., 68°11' W., in 200 fathoms, station 4434; no. 16199 (3, 143–164) 11°10' N., 68°08' W., in 220 fathoms, station 4451; no. 14017 (5, 84–162) 10°54' N., 68°01' W., in 100 fathoms, station 4446; no. 16193 (9, 76–117) 10°45' N., 66°37' W., in 125 fathoms, station 4465; no. 16198 (4, 94–188) 11°30' N., 60°46' W., in 200–240 fathoms, station 5028. SURINAM: No. 16179 (2, 105–108) 7°30' N., 55°00' W., in 100 fathoms, station 4304; no. 13323 (1, 111) 7°35' N., 54°25' W., in 150 fathoms, station 4302; no. 2033 (1, 68) 7°30' N., 54°16' W., in 125 fathoms, station 2013; USNM no. 185025 (2, 87–104) 7°34' N., 54°50' W., in 200 fathoms, station 2005. BRAZIL: USNM no. 185299 (1, 148) 2°04' N., 47°00' W., in 125 fathoms, station 2080.

DESCRIPTION. Counts and some measurements summarized in tables 1–9; body shape and coloration in figure 3c.

A short-snouted species with the third dorsal spine elongate in specimens over about 120 mm. standard length. Dorsal fin with 12 spines and 9 (rarely 8 or 10) soft rays. Pectoral rays 16–18, mostly 17 in northern population and 17 or 18 in southern population. Gill rakers 6–7 on upper arch, 8–10 on ceratobranchial, plus 3–6 often indistinct rudiments on hypobranchial. Preorbital bone with 2 spines over maxillary, anterior one usually points forward, second points back. Suborbital ridge usually with 4 points, first (on preorbital) sometimes absent. Second preopercular spine small, rarely absent; third preopercular spine points down or back, fifth spine usually sharp. Upper posttemporal spine small or absent. Other spines as for the genus. Vertebrae 24 (16 specimens). Vertical scale rows about 45–50. Supraocular tentacle small or absent, if present less than ½ orbit diameter. Orbit about equal to snout, ratio snout divided by orbit 0.8–1.1 (northern population), 0.7–1.3 (southern population), larger

specimens tend to have higher values; orbit into head 3.0–3.7, 2.9–4.1, larger specimens with higher values; interorbital width into orbit diameter 2.6–3.5, 2.7–3.4, larger specimens tend to have lower values.

Coloration as in figure 3c. Upper part of head and body, soft dorsal fin, and caudal fin with dusky spots or blotches on a pallid background. Frequently dusky pigment fades.

A species of moderate size, largest available 205 mm. in standard length.

**GEOGRAPHIC VARIATION.** Specimens from the two populations differ slightly in several counts and measurements. The southern population averages higher in pectoral-ray count (mean of 17.5 versus 17.0, table 2). The southern population averages a longer head (table 5), and correspondingly averages higher in jaw length (table 8), orbit diameter (table 3), and snout length (table 4). Other differences in modes appear to result mainly from the larger average size of the specimens measured from the southern population. The northern population also appears to average a longer second anal spine.

**COMPARISONS.** *Pontinus longispinis* is the only western Atlantic species of *Pontinus* with elongate dorsal spines (the third), but *P. nematophthalmus* and *P. rathbuni* sometimes have the third spine slightly elongate; this character is useful only for specimens over about 120 or 130 mm. in standard length, a size at which the third spine is notably elongate in *P. longispinis*. One other western Atlantic species, *Neomerinthe beanorum*, also has the third dorsal spine elongate, but it can be separated from *P. longispinis* by the presence of branched pectoral rays. The closest relative of *P. longispinis* is probably the eastern Pacific species *P. jurcirhinus*, which also has the third dorsal spine elongate in larger specimens, anterior premaxillary teeth produced into prominent lobes, and a similar color pattern.

**DISTRIBUTION.** The northern population occurs from South Carolina, south around Florida to the northern Gulf of Mexico. The southern population occurs from Panama to Brazil. The species is considered a continental form. It is unknown from the Bahamas or the Antillian region, and is most abundant in the soft bottom areas south of Tortugas, off the Mississippi Delta, and off Colombia and Venezuela. Depths of capture range from 42 to 205 fathoms (one from 200–240).

### ***Pontinus nematophthalmus* (Günther).**

*Sebastes nematophthalmus* GÜNTHER, 1860, p. 99 (western Atlantic specimen only; [lectotype designation by Ginsburg, 1953, p. 51; see Nomenclatural remarks]). NORMAN, 1935b, p. 22, footnote (types examined; suggested probably two species).

*Pontinus pollux*, DIAZ 1893, p. 87 (misidentified; color description; Cuba).

*Pontinus macrolepis* GOODE AND BEAN, 1896, pp. 257–258, pl. 69, fig. 247 (type locality off Cozumel, Albatross station 2354, 20°59'30" N., 86°23'45" W., in 130 fathoms). EVERMANN AND MARSH, 1900, p. 280, color pl. 43 (description; one specimen from off Puerto Rico, Fish Hawk station 6068, in 224–237 fathoms). JORDAN, EVERMANN, AND CLARK, 1930, p. 372 (compiled). GINSBURG, 1953, pp. 44–45 (good description; specimens from

off Cuba, Virgin Islands, and Puerto Rico, plus the type). BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). *Scorpaena nematophthalmus*, JORDAN AND EVERMANN, 1898, p. 2861 (compiled from Günther). *Merinthe nematophthalma*, JORDAN, EVERMANN, AND CLARK, 1930, p. 372 (new combination; listed). *Pontinus castor*, GINSBURG, 1953, p. 49, p. 51 (in part; designated Günther's western Atlantic specimen as lectotype of *P. nematophthalmus*; wrongly placed in synonymy of *P. castor* [see Nomenclatural remarks]).

NOMENCLATORIAL REMARKS. Norman (1935b) first pointed out that the two specimens in the original description of *P. nematophthalmus* (Günther) represented two species. One specimen was from the West Indies and the other from Ile de France? [Mauritius]. Barnhart and Hubbs (1946, p. 375) suggested that the specimen from the West Indies was obviously the type and was probably a synonym of *P. castor* (They incorrectly thought the other specimen was referable to *P. macrocephalus*). Ginsburg (1953, p. 51) designated the West Indian specimen as lectotype, and he placed *P. nematophthalmus* in the synonymy of *P. castor* on the basis of the long snout mentioned in the original description. On examination of the types, I (1965b, pp. 526–527) found the stuffed specimen from Ile de France? was the one with a long snout but that it was not a species of *Pontinus*. The specimen from the West Indies was a *Pontinus*, but a short-snouted specimen not referable to *P. castor*. At the time (1965b), I was unable to say which species of *Pontinus* Günther's species would replace. I failed to note the condition of the hypohyals, but Jon C. Staiger examined the lectotype for this character and found the long ventral processes well developed. This character, along with the pectoral-ray count of 16, leaves no doubt that *P. nematophthalmus* (Günther, 1860) is a senior synonym of *Pontinus macrolepis* Goode and Bean (1896).

MATERIAL EXAMINED. FLORIDA: UMML no. 21777 (1, 60) 27°18' N., 79°57' W., in 47–53 fathoms, *Oregon* station 5301. BAHAMAS: UMML no. 17720 (1, 102) 25°55'–57' N., 79°19'–18' W., in 208 fathoms, *Gerda* station 626; UMML no. 13747 (1, 64) 27°00'–01.5' N., 79°15.5'–11.5' W., in 130–150 fathoms, *Gerda* station 168. CUBA: USNM no. 100381 (1, 39) 23°10'30" N., 82°20'25" W., in 122 fathoms, *Albatross* station 2162. VIRGIN ISLANDS: USNM no. 117789 (1, 102) 18°51' N., 64°33' W., *Caroline*. PUERTO RICO: USNM no. 126131 (1) Mayaguez. BARBADOS: UMML no. 16157 (1, 68) 13°02' N., 59°34' W., in 110–135 fathoms, *Oregon* station 5015; UMML no. 16173 (7, 29–80) 13°04.5' N., 59°39.5' W., in 80–100 fathoms, *Oregon* station 5016. YUCATAN (Caribbean): UMML no. 16264 (1, 89) 20°31' N., 86°12' W., in 150–164 fathoms, *Oregon* station 4938; UMML no. 16703 (1, 95) 20°25' N., 86°13' W., in 150 fathoms, *Oregon* station 4939. HONDURAS-NICARAGUA: UMML no. 17308 (1, 53) 16°06' N., 81°10.5' W., in 90 fathoms, *Oregon* station 4932. COSTA RICA: USNM no. 188199 (1, 76) 12°28' N., 82°25' W., in 100 fathoms, *Oregon* station 3578. PANAMA: USNM no. 188197 (3, 35–57)

12°32' N., 82°25' W., in 85 fathoms, *Oregon* station 3577. VENEZUELA: UMML no. 14012 (3, 34–53) 12°44' N., 70°52' W., in 55 fathoms, *Oregon* station 4397; UMML no. 14010 (13, 37–96) and UMML no. 14011 (1, 84) 12°37' N., 71°10' W., in 65 fathoms, *Oregon* station 4394; UMML no. 14009 (3, 69–78) 12°32' N., 71°04' W., in 46 fathoms, *Oregon* station 4393; UMML no. 14020 (1, 55) 10°15' N., 66°55' W., in 53 fathoms, *Oregon* station 4461; UMML no. 16172 (1, 93) 11°27' N., 62°17' W., in 65–70 fathoms, *Oregon* station 5040. BRAZIL: UMML no. 14005 (3, 40–67) 0°17' N., 44°27' W., in 60 fathoms, *Oregon* station 4224; USNM no. 185301 (17, 50–86) 2°40' N., 47°56' W., in 63 fathoms, *Oregon* station 2065.

DESCRIPTION. Counts and some measurements summarized in tables 1–9; body shape and coloration in figure 4b.

A small, short-snouted species with no especially elongate dorsal spines. Dorsal fin with 12 spines and 9 (rarely 8) soft rays. Pectoral rays 15–17, almost always 16. Gill rakers 6–7 on upper arch, 7–9 on lower arch, plus 2–5 often indistinct rudiments on lower arch. Preorbital bone with two spines over maxillary, both point back. Suborbital ridge with 3 or 4 spinous points, first on preorbital frequently absent. Second preopercular spine small (rarely absent) and nearer first than third, third and fourth point back or down, fifth blunt to absent. Upper posttemporal spine small to absent. Other spines as for the genus. Vertebrae 24 (12 specimens). Vertical scale rows about 42–47, usually some scales rubbed off. Supraocular tentacle often missing, but when present, usually long and slender, to twice orbit diameter. Orbit larger than snout in small specimens to about equal to snout in larger specimens, range of orbit into snout 0.7–1.1; orbit into head 2.9–3.8, larger specimens tend to have smaller values; interorbital width into orbit diameter 2.9–4.0.

Coloration as in figure 4b. Head and body usually with some dusky pigment; pigment on body usually more concentrated in poorly defined saddles, at beginning, middle, and end of spinous dorsal fin, and a fourth below the soft dorsal fin. Fins usually clear.

A small species, the largest specimen, the lectotype of *P. nematophthalmus*, measuring about 132 mm. standard length.

COMPARISONS. *Pontinus nematophthalmus* usually can be separated from other western Atlantic species on the basis of the pectoral-ray count of 16 (see table 2). The long processes from the ventral hypohyals (figs. 2f, 4b) are diagnostic for *P. nematophthalmus*; it is often necessary to depress the floor of the pharynx to reveal them, and they are frequently impossible to detect if the mouth is closed tightly. *Pontinus nematophthalmus* and *P. rathbuni* appear to be closely related; *P. nematophthalmus* seems to be a clear-water species and *P. rathbuni* a continental form unknown from insular areas. Besides the difference in the number of pectoral rays and the presence of prongs off the ventral hypohyals in *P. nematophthalmus*, the supraocular tentacle is usually

tapered and long in *P. nematophthalmus* and shorter and expanded at the tip in *P. rathbuni*, but the tentacle is often missing in both species.

**DISTRIBUTION.** The species is known from Florida (one specimen), the Bahamas, throughout the Caribbean, and south to about the Amazon off Brazil. The species appears to be common about the islands of the eastern Caribbean. Depths of capture range from about 45 to 225 fathoms.

### **Pontinus castor** Poey.

*Pontinus castor* POEY, 1860, p. 173 (type locality Cuba). POEY, 1861, p. 367 (listed). POEY, 1868, p. 303 (listed). POEY, 1875, p. 4 (listed). DIAZ, 1893, p. 87 (Cuba; color; to 250 mm.). JORDAN AND EVERMANN, 1898, p. 1856 (compiled). HOWELL-RIVERO, 1936, p. 62 (one specimen from off Havana Harbor). GINSBURG, 1953, pp. 49-51, fig. 5 (description; specimens from Cuba and Bermuda; wrongly included *P. nematophthalmus*). BRIGGS, 1958, p. 294 (compiled distribution; record from Gulf of Mexico probably in error [see Nomenclatural remarks]). DUARTE-BELLO, 1959, p. 124 (compiled). BULLIS AND THOMPSON, 1965, p. 54 (*Oregon* station 2607).

*Pontinus pollux* POEY, 1860, p. 174 (type locality off Havana, Cuba [see Nomenclatural remarks]). POEY, 1861, p. 367 (compiled). POEY, 1868, p. 303 (compiled). POEY, 1875, p. 4 (compiled). JORDAN AND EVERMANN, 1898, p. 1857 (compiled from Poey). JORDAN, EVERMANN, AND CLARK, 1930, p. 372 (compiled). HOWELL-RIVERO, 1936, p. 63 (two specimens from deep water off Havana, Cuba).

*Scorpaena castor*, MEEK AND NEWLAND, 1885, pp. 397, 402 (questionably included *P. pollux* Poey; synonymy; description). JORDAN, 1887, p. 596 (compiled).

*Pontinus microlepis* BEAN, 1912, pp. 125-126 (type locality Bermuda; holotype USNM 74113).

*Neomerinthe pollux*, GINSBURG, 1953, pp. 53-56 (in part [see Nomenclatural remarks]). DUARTE-BELLO, 1959, p. 121 (compiled).

**NOMENCLATURE REMARKS.** Ginsburg, in his revision of western Atlantic scorpionfishes, placed *Pontinus pollux* Poey in the genus *Neomerinthe* as a senior synonym of *Neomerinthe hemingwayi* Fowler, but from available information this would appear incorrect and "*pollux*" is better treated as a junior synonym of *P. castor*. The type of "*pollux*" apparently is lost. Poey, in his description of "*pollux*", failed to note if the pectoral rays were branched; the presence of split pectoral rays is the main character separating species of *Neomerinthe* from *Pontinus*. Ginsburg (1953, p. 55) apparently did not consider the possibility that Poey had two specimens of *P. castor*; instead, Ginsburg suggested that since *N. hemingwayi* was very similar to *P. castor* and Poey stated that *P. pollux* was similar to *P. castor*, then *N. hemingwayi* was likely the same as *P. pollux*. Ginsburg (p. 55) noted certain discrepancies in this interpretation, for example, Poey's failure to mention a color pattern for *P. pollux*, and the fact that the width of the interorbital given by Poey for "*pollux*" was a little narrow if "*pollux*" were *N. hemingwayi*. Both of these discrepancies favor the view that Poey probably described "*pollux*" from a specimen of *P. castor*, since *N. hemingwayi* has a wider interorbital than *P. castor* (table 7) and *N. hemingwayi* usually has a definite color pattern while *P. castor* is usually pallid in the pre-



served state. Poey's description of "*pollux*" does not include other information of use in solving the problem. The differences in body shape, particularly the relation of snout length and orbit diameter, between a large and small specimen of *P. castor* would likely be greater than the differences in body shape of two similar-sized specimens of *N. hemingwayi* and *P. castor*; and with few specimens available, Poey could easily suspect two species were in hand.

Because Poey stated that his two species were similar in shape and both had 10 soft dorsal rays, Poey's "*pollux*" is less likely to be *P. nematophthalmus* (a short-snouted species with 9 soft dorsal rays), and the only other species of *Pontinus* which is now known from Cuba. The description as *P. pollux* by Diaz (1893) from Cuba is of *P. nematophthalmus*.

One record for *P. castor* from other than insular areas (Springer and Bullis, 1956) is treated as a misidentification (see account of *Neomeriuthe hemingwayi*).

MATERIAL EXAMINED. BAHAMAS: UMML no. 14002 (3, 42–67) and TABL uncataloged (2, 62–68) south of Greater Inagua, 20°54' N., 73°37' W., in 75–100 fathoms, *Silver Bay* station 3502; UMML no. 17670 (1, 25) NW. Providence Channel, 26°04' N., 79°13' W., in 25–70 fathoms, *Gerda* station 636; TABL uncataloged (1, 66) 24°34' N., 79°16' W., in 150 fathoms, *Silver Bay* station 2471. PUERTO RICO-VIRGIN ISLANDS: USNM no. 187911 (1, 53) and USNM no. 187914 (1, 58) 18°35.5' N., 64°57' W., in 220 fathoms, *Oregon* station 2606 (corrected station list); FMNH no. 65864 (2, 52–64) 18°35' N., 65°03' W., in 42 fathoms, *Oregon* station 2607 (corrected list). BERMUDA: FMNH no. 48526 (1, 256) 90 fathoms, L. L. Mowbray, 19 March 1940.

DESCRIPTION. Counts and measurements summarized in tables 1–9; body shape and coloration of a small specimen in figure 4a.

A long-snouted species with no especially elongate dorsal spines. Dorsal fin with 12 spines and 10 (9–11) soft rays. Pectoral rays 17 in available material. Gill rakers 5–8 on upper arch, 8–10 on ceratobranchial, and 2 to several flat rudiments on hypobranchial. Preorbital bone with 2 spines over maxillary, first blunt to almost imperceptible, second points out to slightly back. Suborbital ridge with 3 spinous points in available material (spines slight to virtually absent in largest specimens), none on preorbital. Second preopercular spine small in small specimens and usually absent in larger specimens; third and fourth spines usually point back; fifth points down and forward or virtually absent. Upper posttemporal spine small to absent. Nasal spine tiny, absent in largest specimen. Other spines as for the genus. Vertebrae 24 (six specimens). Vertical scale rows about 45–55. Supraocular tentacle when present small or elongate, about 2 or 3 times orbit diameter in some specimens, with dusky bands in two specimens. Orbit smaller than snout, ratio snout length divided by orbit diameter 1.0–1.3 in smaller specimens (as in fig. 4a) to 1.7 in largest specimen; orbit into head 3.5–5.2, larger specimens with higher values; interorbital width into orbit diameter 2.5–3.7, larger specimens tend to have lower values.

Preserved specimens generally pallid; some dusky pigment on sides of some specimens. In the smallest specimens there is usually some dusky pigment just before the end of the spinous dorsal fin.

A large species, the largest known about 260 mm. in standard length.

COMPARISONS. The long snout and dorsal soft-ray count of 10 characterize this species of *Pontinus*. The blunt or absent first preorbital spine also is characteristic. The species appears to be more closely related to species of other areas, for example, *P. macrocephalus* from Hawaii and *P. tentacularis* from the West Pacific, than to other Atlantic species in body shape, long snout, and no elongate dorsal spines.

DISTRIBUTION. Records of *P. castor* are rare. Specimens are now known from Bermuda, Cuba, the Bahamas, and north of Puerto Rico and the Virgin Islands. The habitat is presumably rocky or rough bottom, and the species is probably widespread in the Antilles. Depths of capture range from about 40 to 220 fathoms.

### *Pontinus rathbuni* Goode and Bean.

*Pontinus rathbuni* GOODE AND BEAN, 1896, p. 255, pl. 68, fig. 245 (type locality off Cape Hatteras, North Carolina, 35°39' N., 74°52' W., in 80 fathoms, *Albatross* station 2298). JORDAN AND EVERMANN, 1898, pp. 1857-1858 (compiled). JORDAN, EVERMANN, AND CLARK, 1930, p. 372 (compiled). FIRTH, 1931, p. 162 (North Carolina; brief description [AMNH no. 9693]). NICHOLS AND FIRTH, 1936, p. 1 (compiled). HILDEBRAND, 1941, p. 228 (compiled). FOWLER, 1952, p. 4 (off Key West in 90 fathoms, brief description). GINSBURG, 1953, pp. 47-49 (good description; specimens from Virginia south around Florida to Alabama). SPRINGER AND BULLIS, 1956, p. 90 (listed; off Tortugas in 60 fathoms). BRIGGS, 1958, p. 294 (compiled range). BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). MOE, and others, 1966, p. 70 (specimens in Florida Board of Conservation collection).

MATERIAL EXAMINED. NORTH CAROLINA: USNM no. 39325 (1, 116, holotype) 35°39' N., 74°52' W., in 80 fathoms, *Albatross* station 2298; USNM no. 190360 (3, 64-89) 34°04' N., 76°15' W., in 45-55 fathoms, *Silver Bay* station 1500; AMNH no. 9693 (1, 129) off Hatteras in 80 fathoms, F. E. Firth. FLORIDA: UMML no. 2625 (4, 46-87) 28°52' N., 80°05' W., in 65 fathoms, *Combat* station 90; UMML no. 11092 (1, 65) 28°30' N., 80°02' W., in 37-41 fathoms, *Silver Bay* station 3704; UMML no. 10359 (3, 48-73) Monroe County, 5 miles ENE. of Alligator Reef Light, in 55 fathoms, CRR-F-324; UMML no. 17737 (1, 37) off Miami in 50 fathoms; UMML no. 12388 (2, 66-93) 24°29'-32' N., 80°58'-54' W., in 100-103 fathoms, *Gerda* station 133; UMML no. 12389 (2, 78-134) and UMML no. 13914 (1, 55) 24°32'-29' N., 80°54'-53' W., in 109-102 fathoms, *Gerda* station 134; UMML no. 13513 (9, 56-101) 24°34' N., 83°28' W., in 100 fathoms, *Oregon* station 4370; UMML no. 14004 (3, 56-87) 24°30' N., 83°22' W., in 100 fathoms, *Oregon* station 4143; UMML no. 16915 (2, 38-59) 24°30'-33' N., 80°57'-54' W., in 105 fathoms, *Gerda*

station 480; UMML no. 14288 (1, 69) 24°29'–30' N., 80°53'–50' W., in 120 fathoms, *Gerda* station 135; UMML no. 14356 (1, 64) 24°26' N., 83°18' W., in 100 fathoms, *Oregon* station 4556; UMML no. 21778 (1, 44) 25°10' N., 80°06' W., in 100 fathoms, *Gerda* station 763; ANSP no. 96646 (1) SE. of Sand Key Light in 90 fathoms, Thompson and McGinty. VENEZUELA: UMML no. 16211 (1, 197) 10°24' N., 75°50' W., in 190–195 fathoms, *Oregon* station 4880; UMML no. 15407 (1, 65) 12°09' N., 72°47' W., in 100 fathoms, *Oregon* station 4913; UMML no. 21775 (1, 128) 12°13' N., 72°34' W., in 100 fathoms, *Oregon* station 4920. SURINAM-FRENCH GUIANA: USNM no. 185024 (1, 90) 7°32' N., 54°12' W., in 100 fathoms, *Oregon* station 2014; USNM no. 185035 (1, 98) 7°18' N., 53°32' W., in 100 fathoms, *Oregon* station 2021.

DESCRIPTION. Counts and some measurements summarized in tables 1–9; body shape and coloration in figure 4c.

A short-snouted species with no especially elongate dorsal spines. Dorsal fin with 12 spines and 9 soft rays (see table 1 for abnormal specimens). Pectoral fin with 17 (rarely 16 or 18) rays. Gill rakers 6–7 on upper arch, 8–9 on lower arch followed by 3–5 low, often indistinct rudiments. Preorbital bone with 2 spines over maxillary, first points slightly to rear, second longer and curved to rear. Suborbital ridge usually with 4 spinous points, first on preorbital sometimes absent. Second preopercular spine moderate to small, usually nearer first than third; third usually points back, fourth down or slightly back, fifth small to absent. Upper posttemporal spine small to absent. Other spines as for the genus. Vertebrae 24 (three specimens). Vertical scale rows in middle forties, some scales usually rubbed off. Supraocular tentacle usually smaller than orbit, thick, sometimes split, and usually expanded at distal end. Orbit about equal to snout, slightly larger than snout in small specimens to slightly smaller than snout in larger specimens, range of orbit divided by snout 0.8–1.3; orbit into head 3.1–4.2, larger specimens with higher values; interorbital width into orbit diameter 2.6–3.9, larger specimens tend to have lower values.

Coloration as in figure 4c. Preserved specimens often faded; usually some dusky pigment retained in 4 saddle-shaped patches along back, first 3 under spinous dorsal fin and fourth under soft dorsal fin (similar to *P. nematophthalmus*). Dusky smudges infrequently retained on the pectoral fin, anal fin, and caudal fin (especially on the dorsal edge of the caudal fin), on some lateral-line scales, in pectoral-fin axil, on head, and at end of supraocular tentacle. A partially faded fresh specimen had orange (probably red in life) spots on the pectoral fin, soft dorsal fin, and caudal fin.

A species of moderate size, largest specimen available 197 mm. in standard length.

COMPARISONS. See accounts of *Pontinus longispinis* and *P. nematophthalmus*.

DISTRIBUTION. The species occurs from Virginia south around Florida,

in the northern Gulf of Mexico, off Venezuela, and the Guianas. Depths of capture range from about 40 to 200 fathoms.

### *Pontinus corallinus* Miranda Ribeiro.

*Pontinus corallinus* MIRANDA RIBEIRO, 1915, Scorpaenidae, pp. 4-5, pl. (type locality ESE. of Rasa, Brazil, in 100 meters, *Annie*, January 1903; three specimens, length of type 157 mm. total length; one specimen observed in market at Rio de Janeiro). MIRANDA RIBEIRO, 1918, p. 165 (listed). MIRANDA RIBEIRO, 1961a, p. 15 (two from 24°14' S., 44°49' W., and one from 25°18' S., 47°10' W.).

REMARKS. The validity of this species remains in doubt. No specimens are available for study. The color pattern (spots of red, dorsal part of body with dark spots) is most like that of *P. longispinis*. The types of *P. corallinus* are of a size that would not have the third dorsal spine notably elongate. Miranda Ribeiro (1915) gives the gill rakers as 2+4 on the upper arch and 6+4 on the lower arch; if he counted the flat rudiments on the hypobranchial, *P. corallinus* would have about two fewer elements on the lower arch than other western Atlantic species of *Pontinus*, but he probably counted only developed rakers.

### *Pontinus accraensis* Norman.

*Pontinus accraensis* NORMAN, 1935b, p. 23 (type locality Accra, Ghana). IRVINE, 1947, p. 203 (brief description; Accra, Ghana). CADENAT, 1950, p. 241, fig. 177 (Sénégal; figure best fits *P. kuhlii*), p. 307 (listed). CADENAT, 1953, pp. 1088-1089, figs. 28, 29 (distinguished from *P. kuhlii*). POLL, 1959, pp. 177-182, fig. 65 (description; probably included specimens of *P. leda*; specimens from off SW. Africa between 0°00' and 16°36' S.). SANCHEZ, 1966, p. 155 (compiled; Angola).

MATERIAL EXAMINED. GULF OF GUINEA: BMNH 1963.3.24.42 (1, 168, holotype) Accra, Ghana, collected by F. R. Irvine. The following were collected by the *Pillsbury*: UMML no. 16594 (4, 50-126) 4°37' N., 2°32' W., in 110 meters, station 32; UMML no. 21767 (6, 76-160) 4°57.5' N., 5°22' W., in 55-64 meters, station 59; UMML no. 21770 (65, 52-184) and UMML no. 15767 (3, 74-132) 5°05' N., 4°04.5' W., in 73-98 meters, station 65; UMML no. 16882 (1, 123) 4°59' N., 9°37' W., in 156-220 meters, station 83; UMML no. 16956 (1, 86) 4°57' N., 9°30' W., in 150-146 meters, station 82; UMML no. 21769 (14, 81-126, plus 1 cleared and stained) 3°49' N., 7°38' E., in 264-269 meters, station 255. The following 10 specimens were collected by the *Geronimo* in the southern Gulf of Guinea: CAS no. 24279 (4, 79-115) 2°01' S., 8°50' E., in 200 meters, station 203; CAS no. 24280 (1, 68) 2°30' S., 8°58' E., in 200 meters, station 212; CAS no. 24281 (5, 73-141) 4°00' S., 10°35' E., in 100 meters, station 235. Thirty-four additional specimens, 84-149 mm. S. L., collected by Bruce B. Collette on Guinean Trawling Survey 1, between 12°03' N., 17°14' W. to 4°32' N., 8°21' W., in 70-200 meters, have been deposited in the collection of the United States National Museum (USNM nos. 203785-203792). Additional specimens collected by the Guinean Trawling Survey

were identified and returned to IFAN, Gorée, Sénégal. MAURITANIA: IIP uncataloged (1, 170) Arguin Bank, coast of Mauritania.

DESCRIPTION. Measurements and counts summarized in tables 1-10; body shape and coloration in figure 3b.

A large-scaled, short-snouted species with one or usually two elongate dorsal spines in large specimens. Dorsal fin normally with 12 spines and 9 soft rays (last double). Pectoral rays 16-18, mostly 17; 6-7 gill rakers on upper arch, 7-9 on lower arch, followed by 3-5 often indistinct rudiments. Preorbital bone with 2 spines over maxillary, first points out, second curves back. Suborbital ridge usually with 4 spinous points, first on preorbital sometimes absent. Second preopercular spine present, third usually points back to slightly down, fourth down and back, and fifth down to slightly forward. Upper posttemporal spine small or absent. Other spines as for the genus. Vertical scale rows about 45-50. Supraocular tentacle small or absent, if present less than  $\frac{1}{2}$  orbit diameter. Orbit larger than snout in smaller specimens to slightly smaller than snout in larger specimens, ratio snout divided by orbit 0.7-1.2; orbit into head 2.9-4.3, larger specimens with higher values; interorbital width into orbit diameter 2.8-4.0, smaller specimens tend to have higher values.

Coloration usually as in figure 3b. Body and head with dusky spots, often darker spots on some lateral-line scales. Caudal fin usually spotted, especially along the dorsal edge. Soft dorsal fin usually spotted; anal fin sometimes with dark spots retained, especially at about midheight of fin and at bases of spines.

A moderate-sized species, largest available specimen 184 mm. in standard length.

COMPARISONS. *Pontinus accraensis* is similar to *P. leda* in general appearance. *Pontinus leda* has no especially elongate dorsal spines in adults, but this character is useful only for specimens over about 120 or 140 mm. standard length. These two species, which are compared under the account of *P. leda*, differ from *P. kuhlii*, the third eastern Atlantic species, in having larger scales (about 50 or fewer versus 60 or more), in some measurements, and in distribution.

DISTRIBUTION. *Pontinus accraensis* is known from the coast of Mauritania south to Angola. Depths of capture range from about 30 to about 150 fathoms; Poll's specimens from deeper depths possibly represent *P. leda*. Habitat is mud or sand bottom.

### ***Pontinus kuhlii* (Bowdich).**

(A partial synonymy pertinent to the scope of the study. References without information in parentheses were not seen. Some references to this species are probably based on mis-identifications or mixed collections.)

*Scorpaena kuhlii* BOWDICH, 1825, p. 123 (type locality Madeira).

*Sebastes kuhlii*, LOWE, 1841, p. 176. LOWE, 1843, pp. 115-119, pl. 16 (good description; color in life; 100-250 fathoms; Madeira). GÜNTHER, 1860, pp. 102-104 (brief description; skeleton; specimens from Canary Islands at Teneriffe, and Madeira). CAPELLO, 1867,

- p. 255 (Lisboa and Setubal, Portugal; common name). STEINDACHNER, 1867, pp. 69–71 (description; *S. filifer* in synonymy; specimens from Teneriffe, Canaries). BEAN, 1879, p. 23 (specimens in USNM). CAPELLO, 1881, p. 11. VINCIGUERRA, 1893, p. 312. OSORIO, 1898, p. 196 (listed; São Tome). SEABRA, 1911, p. 150. NOBRE, 1935, p. 97 (compiled; Portugal).
- Sebastes filifer* VALENCIENNES, 1835, p. 21, pl. 2, fig. 2 (type locality Canary Islands). CAPELLO, 1881, p. 11. SEABRA, 1911, p. 150. NOBRE, 1935, p. 97 (compiled; Portugal).
- Sebastoplus kuhlii*, GILL, 1863, p. 208 (as type of new genus).
- Sebastoplus filifer*, GILL, 1863, pp. 208–209 (included in *Sebastoplus*; discussed discrepancies in original description of *Sebastes filifer*).
- Sebastes filifera*, STEINDACHNER, 1865, p. 400 (listed; Santa Cruz and Teneriffe, Canary Islands; common name).
- Sebastes (Sebastichthys) bibroni* SAUVAGE, 1878, p. 116, pl. I, fig. 3 (type locality Sicily; figure of scale).
- Sebastes (Sebastichthys) filifer*, SAUVAGE, 1878, p. 118.
- Sebastes kuhlii*, GÜNTHER, 1880, p. 3 (listed). COLLETT, 1896, p. 13 (Teneriffe, Canary Islands). ZUGMAYER, 1911, p. 110 (two specimens from *Princesse Alice* station 1202, 36°40' N., 14°09'45" W., in 264 meters).
- Pontinus kuhlii*, GOODE AND BEAN, 1896, p. 253 (compiled description). FOWLER, 1936, p. 928 (synonymy; description from Günther, 1860; one specimen in United States National Museum from Madeira). CADENAT, 1950, p. 241, fig. 177 (compared with *P. accraensis*; figure best fits *P. kuhlii*). CADENAT, 1953, p. 1088 (compared with *P. accraensis*). COLLINS, 1954, p. 31 (listed; Azores). BOUTIERE, 1958, p. 12, and following (coast of Morocco; life history notes). POLL, 1959, pp. 175–177, fig. 64 (description; good figure; one specimen from 8°30' S., 12°58'30" E., in 190–230 meters). CERVIGON, 1960, p. 93 (coast of Mauritania). BLACHE, 1962, p. 74 (compiled). SANCHEZ, 1966, p. 154, fig. (compiled; Angola).
- Pontinus bibronii*, GOODE AND BEAN, 1896, pp. 253–254 (compiled from Sauvage; thought to be synonym of *P. kuhlii*).
- Pontinus filifer*, GOODE AND BEAN, 1896, pp. 254–255 (compiled description; close to *P. kuhlii*).
- Pontinus kuhlii*, ROULE, 1919, p. 60 (Cape Verde Islands and Bane Seine between Portugal and Madeira in 240 meters). NORMAN, 1935b, pp. 22–23 (synonymy; description; specimens in British Museum from 210–320 mm. total length; range compiled; *P. bibronii* may prove identical; brief description of *P. bibronii* from notes provided by Longley). LOZANO CABO, 1961, p. 147 (compiled). LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara-Mauritania).

MATERIAL EXAMINED. PORTUGAL: USNM no. 10194 (1, 146) from Vienna Museum. MAURITANIA: IIP uncataloged (1, 230) 20°36' N. off coast of Mauritania, in 220 meters. MADEIRA: USNM no. 100717 (1, about 155). AZORES: USNM no. 188404 (5, 157–230) San Miguel, Bruce B. Collette; USNM no. 23301 (1, 170) Fayal, McGuire.

DESCRIPTION. Measurements and counts summarized in tables 1–10.

A small-scaled, moderate-snouted species with the second and third (sometimes second or third) dorsal spines elongate in adults. Dorsal fin with 12 spines and normally 9 soft rays (last double). Pectoral rays usually 17 (infrequently 18, 16 also expected). Gill rakers on upper arch 7 (6–8), 9–10 on lower arch, followed by 4 (3–5) often indistinct rudiments, total 19–21. Preorbital bone

with 2 spines over maxillary, both point back. Suborbital ridge with 3 or 4 points, first on preorbital usually absent. Second preopercular spine small or absent; third and fourth usually point back. Upper posttemporal spine small. Other spines as for the genus. Vertical scale rows about 60–65. Supraocular tentacle small or absent, less than  $\frac{1}{2}$  orbit diameter if present. Orbit smaller than snout in available material (probably about equal to snout in smaller specimens), ratio snout divided by orbit 1.1–1.5; orbit into head 3.8–4.8, larger specimens with higher values; interorbital width into orbit diameter 2.3–2.8.

Coloration of preserved specimens pallid with dusky blotches along side. Soft dorsal fin usually spotted. Sides with blotches, dark pigment more concentrated at bases of dorsal spines. Spinous dorsal fin and anal fin sometimes with dusky blotches. Head with some dark pigment. Color in life as depicted on slides taken by Donald de Sylva of specimens from the Azores is as follows. General color reddish interspersed with yellow. Dusky pigment shows through red in areas described above as dusky in preserved specimens. Yellow especially on head, below suborbital ridge, behind orbit, and on opercle flap. Some yellow on body, more concentrated above pectoral-fin base and on flanks. Fins reddish, spots on soft dorsal, caudal, and pectoral fins. Iris reddish with yellow. A smaller specimen with more yellow; soft dorsal fin and pectoral fin mainly with yellow spots rather than reddish brown spots. Lowe (1843) reports similar coloration for specimens from Madeira and gives the inside of the mouth as white, with a large red patch above and behind near entrance of the gullet.

COMPARISONS. *Pontinus kuhlii* differs chiefly from *P. accraensis* and *P. leda* in having smaller scales. Like *P. accraensis* but unlike *P. leda* and *P. nigropunctatus* (St. Helena), *P. kuhlii* has the second and third dorsal spines elongate in large specimens. *Pontinus kuhlii* also differs in some measurements, especially orbit diameter and snout length. *Pontinus kuhlii* appears to live on hard bottom rather than the coastal mud and sand bottoms inhabited by *P. accraensis* and *P. leda*.

DISTRIBUTION. The species is known from Madeira, Cape Verde Islands, Canary Islands, Azores, Portugal, coast of Morocco and Mauritania, and from one specimen from the Mediterranean Sea (Sicily, type of *P. bibronii*). An old record is from São Tome. One additional record (Poll, 1959) is from off South Africa at 8°30' S., 12°58' W. [see Remarks]. The species was not collected by the vessels *Pillsbury* and *Geronimo*, or the Guinean Trawling Survey in the Gulf of Guinea. The species should prove more widely distributed in the Mediterranean Sea. It is abundant about islands and appears to inhabit hard-bottom areas. Boutiere (1958, p. 58) reported the capture of *P. kuhlii* on coral (rocky) bottom off Morocco. Depths of capture range from about 50 to 250 fathoms.

REMARKS. The specimen collected by Poll off South Africa may represent a new species closely related to *P. kuhlii*. The counts and measurements given by Poll seem to agree with those of similar-sized specimens of *P. kuhlii*. In Poll's drawing only the third dorsal spine is shown as elongate; adult specimens of *P. kuhlii* usually have the second and third spines elongate. This feature is relatively constant in other species.

The record from São Tome (Osorio, 1898) is questionable, but occurrence about the islands of the Gulf of Guinea is not inconsistent with the hard-bottom preference shown by *P. kuhlii*.

**Pontinus leda** Eschmeyer, new species.

(It is probable that many of the specimens reported by Poll (1959, pp. 177-182) as *P. accraensis*, and particularly those from the deeper stations, belong to this new species. His figure is of *P. accraensis*. No other literature applies to this species.)

MATERIAL EXAMINED. All specimens were collected by the Bureau of Commercial Fisheries research vessel *Geronimo* on Cruise 2 in the southern Gulf of Guinea. HOLOTYPE: CAS no. 24282, a specimen 132 mm. in standard length, 3°31' S., 9°53' E., in 400 meters, station 228. PARATYPES: CAS no. 24283 (1, 124) and CAS no. 24284 (1, 133, cleared and stained) taken with the holotype at station 228; USNM no. 204097 (4, 86-138) 1°56' S., 8°47' E., in 300 meters, station 204. ADDITIONAL MATERIAL: CAS no. 24286 (7, 76-123) 4°31' S., 10°53' E., in 300 meters, station 246; CAS no. 24288 (1, 126) 4°03' S., 10°22' E., in 300 meters, station 237; CAS no. 24287 (4, 98-162) 3°02' S., 9°21' E., in 300 meters, station 220; CAS no. 24285 (4, 77-117) 2°31' S., 8°51' E., in 300 meters, station 213; USNM no. 204096 (2, 71-132) and, to be deposited at IFAN (2, 126-128) 1°00' S., 8°29' E., in 100 meters, station 189; TABL uncataloged (1, 163) 0°02' S., 8°50' E., in 295 meters, station 179.

A total of 28 specimens from 71 to 163 mm. in standard length, collected between 0°02' S. and 4°03' S., in depths from 100 to 400 meters.

DESCRIPTION. Measurements and counts summarized in tables 1-10; body shape and coloration in figure 3a.

A large-scaled, short-snouted species with no elongate dorsal spines in large specimens. Dorsal fin with 12 spines and 9 soft rays (one with 13 spines and 8 soft rays), the last double. Pectoral rays 17-18, mostly 18. Total gill rakers on outside of first arch difficult to count in larger specimens because of coalescence of rudiments on lower arch; developed rakers short; upper rudiments and rakers usually 6 (6-7), lower developed rakers usually 8-9 (7-9), rudiments when countable 3-5. Preorbital bone with 2 spines over maxillary, first points out, second out and back. Suborbital ridge usually with 4 spinous points, first on preorbital rarely absent (two specimens with 3 on one side, one with 5 on one



side). Preopercle with supplemental spine and 5 preopercular spines; second preopercular spine smaller than first or third, third usually points down, fourth and fifth down to slightly forward. Upper posttemporal spine small to absent. Other spines as for the genus. Vertebrae 24 (four specimens). Vertical scale rows 40–47. Tubed lateral-line scales 23–24, plus 1–2 on caudal fin. Supraocular tentacle small to absent, less than  $\frac{1}{2}$  orbit. Measurements in tables 3–9. Orbit larger than snout in most specimens to about equal to snout in largest specimens, ratio snout divided by orbit 0.7–1.0; orbit into head 3.1–3.8, larger specimens with higher values; interorbital width into orbit diameter 2.5–3.7.

Coloration usually as in figure 3a. Generally pallid with dusky smudges on body. Dark pigment on sides more concentrated at bases of dorsal spines and along lateral line. Spinous dorsal fin with dark pigment more concentrated at mid-height of membranes, more concentrated just before end of spinous dorsal fin, and appearing as a dark patch in most specimens. Soft dorsal fin clear or with a few dusky blotches or spots. Caudal fin clear in smaller specimens, distal end of fin sometimes dusky in larger specimens. Pelvic, anal, and pectoral fins clear. Color in life unknown.

COMPARISONS. *Pontinus leda* agrees with *P. nigropunctatus* (Saint Helena) and it differs from *P. kuhlii* and *P. accracnsis* in having no elongate dorsal spines in large specimens. *Pontinus leda* has slightly larger scales than *P. kuhlii* and *P. nigropunctatus* (vertical scale rows 40–47 versus 50 or more). *Pontinus leda* is most similar to *P. accracnsis*, the only species of *Pontinus* which overlaps it in distribution. The two can be distinguished on coloration, especially by the presence of dark spots on the caudal fin in *P. accracnsis* (also in *P. nigropunctatus*), while the fin is clear or with the tip dusky in preserved specimens of *P. leda*. The second anal spine is longer in *P. accracnsis* (1.2–1.6 times in orbit versus 0.9–1.2). Slight differences in averages of some measurements are shown in tables 3–9. The pectoral rays usually number 17 in *P. accracnsis* and most frequently 18 in *P. leda*. Differences in measurements of *P. leda*, *P. kuhlii*, and *P. nigropunctatus* are in part due to the larger size of the specimens examined of *P. kuhlii* and *P. nigropunctatus*.

DISTRIBUTION. Known from the material examined from off South Africa between 2°02' S. and 4°03' S. in depths from about 50–200 fathoms. Habitat is mud or sand bottom. The species was not taken by the vessel *Pillsbury* or the Guinean Trawling Survey in the Gulf of Guinea. The northern limit of distribution appears to be about the equator. As mentioned, many of the specimens reported as *P. accracnsis* by Poll from off South Africa, especially those from his deeper and more southern stations, are possibly specimens of the new species.

ETYMOLOGY. The name is from Greek mythology, Leda, mother of Clytemnestra, Castor, Helen, and Pollux.

### *Pontinus nigropunctatus* (Günther).

*Sebastes nigropunctatus* GÜNTHER, 1868, pp. 225, 227–228 (type locality Saint Helena).  
MELLISS, 1875, p. 105, pl. 20, fig. 1 (Saint Helena; common name deep-water jack;  
caught throughout the year in 80–100 fathoms).

*Pontinus nigropunctatus*, NORMAN, 1935b, p. 22 (distinguished from *P. kuhlii* and *P. accraensis*).  
FOWLER, 1936, p. 929 (compiled from Günther). CADENAT AND MARCHAL,  
1963, p. 1305 (listed).

MATERIAL EXAMINED. BMNH 1867.10.8.4–5 (2, 193–272, types) Saint Helena, collected by Melliss.

DESCRIPTION. Measurements and counts summarized in tables 1–10.

A large species with moderate snout, moderate-sized scales, and no elongate dorsal spines. Dorsal fin with 12 spines and 9 soft rays (last double). Pectoral fin with 18 rays. Gill rakers on upper arch 6–7, 12 on lower arch including rudiments. Preorbital bone with 2 spinous points over maxillary, posterior spine multiple in largest specimen. Suborbital ridge with 4 spinous points. Second preopercular spine small, nearer first than to third. Upper posttemporal spine small. Other spines as for the genus. Vertical scale rows 51–52. Orbit smaller than snout in available material, but probably about equal to snout or larger than snout in small specimens, ratio snout divided by orbit 1.3–1.7; orbit into head 4.3–4.9 (smaller specimens probably will have lower values); interorbital width into orbit diameter 2.0–2.3.

Specimens partially faded; a few dusky specks present on body, soft dorsal fin and anal fin. Günther gives the color as reddish-rose, with numerous brownish-black dots and white scattered specks between.

COMPARISONS. *Pontinus nigropunctatus* agrees with *P. leda*, but differs from *P. accraensis* and *P. kuhlii*, in having no elongate dorsal spines in adults. *Pontinus nigropunctatus* differs from the other species in coloration.

DISTRIBUTION. Known from the two type specimens from Saint Helena.

### Genus *Neomerinthe* Fowler

*Neomerinthe* FOWLER, 1935, p. 41 (type-species *Neomerinthe hemingwayi* Fowler, by original designation). GINSBURG, 1953, pp. 51–53 (description; western Atlantic species).

DIAGNOSIS. Dorsal rays XII, 8–11; anal rays III, 5; pectoral rays 16–18; some rays branched; swimbladder present; vertebrae 24; scales on body ctenoid; cheek, postorbital area, and occiput scaled; no occipital pit; teeth on palatines; slit present behind fourth gill arch; peritoneum pallid.

SPINATION. Preorbital bone with 2 spinous points over maxillary, sometimes each subdivided into several spinous points. Suborbital ridge with 3 to many points. Supplemental preopercular spine present; first preopercular spine longest, second small to absent, third and fourth present, fifth present to virtually absent. Upper posttemporal spine small to absent. Other spines present include nasal, pre-, supra-, and postocular, tympanic, parietal, nuchal, pterotic, sphenotic

(usually as group of small spines), lower posttemporal, supracleithral, and cleithral. One species with the third dorsal spine elongate in adults.

REMARKS. The genus *Neomerinthe* is very close to *Pontinus*, differing in having some branched pectoral rays. The branching is simple, rather than compound as found in adults of most species of the subfamily. The genus *Neomerinthe* is restricted to the Atlantic, with two species in the western Atlantic, and one species from the eastern Atlantic tentatively assigned to it.

### *Neomerinthe hemingwayi* Fowler.

*Neomerinthe hemingwayi* FOWLER, 1935, p. 41, fig. (type locality 70 miles southeast of Cape May, New Jersey; holotype ANSP no. 63482).

*Neomerinthe tortugae* HILDEBRAND in Longley & Hildebrand, 1940, p. 247, fig. 13 (type locality Tortugas, Florida; holotype USNM no. 108871, 2 paratypes USNM no. 108872).

LONGLEY AND HILDEBRAND, 1941, p. 166 (listed).

*Pontinus castor*, SPRINGER AND BULLIS, 1956, p. 90 (misidentified [see Nomenclatural remarks]; Gulf of Mexico; listed).

*Neomerinthe pollux*, GINSBURG, 1953, pp. 53–56 (incorrectly treated *P. pollux* Poey as senior synonym of *Neomerinthe hemingwayi* [see Nomenclatural remarks]; synonymy; good description; specimens from New Jersey south to Florida and in the northern Gulf of Mexico). SPRINGER AND BULLIS, 1956, p. 90 (captures by vessel *Oregon* in Gulf of Mexico). BRIGGS, 1958, p. 294 (compiled range; [Cuba incorrect]). BULLIS AND THOMPSON, 1965, p. 53 (*Silver Bay* stations 127, 157, 461, and 1283). MOE, and others, 1966, p. 79 (specimens in Florida Board of Conservation collection).

NOMENCLATURE REMARKS. Reasons for placing *Pontinus pollux* Poey in the synonymy of *P. castor* Poey are given under the account of *P. castor*. *Neomerinthe hemingwayi* Fowler is reinstated as a valid species. The record of *P. castor* in the Gulf of Mexico (Springer and Bullis, 1956: *Oregon* station 18) is inconsistent with the distribution as known for *P. castor* [see account of *P. castor*]; they report *N. hemingwayi* from nearby stations (9 and 35), so their identification is referred to *N. hemingwayi*. (One specimen examined is from *Oregon* station 10.)

MATERIAL EXAMINED. *Atlantic Coast of United States*. DELAWARE-MARYLAND: ANSP no. 63482 (1, about 300, holotype of *N. hemingwayi*) about 70 miles SE. of Cape May, New Jersey. GEORGIA: UMML no. 16226 (14, 102–208), UMML no. 14270 (5, 153–315), and UMML no. 14361 (4, 130–163) 31°59.5' N., 79°11.5' W., in 75–80 fathoms, *Silver Bay* station 5393; UMML no. 16228 (2, 149–164) and UMML no. 14265 (1, 155) 32°01' N., 70°10' W., in 80–75 fathoms, *Silver Bay* station 5397; TABL uncataloged (1) 31°32' N., 79°42' W., in 52–70 fathoms, *Silver Bay* station 3353; TABL uncataloged (1) 31°34' N., 79°43' W., in 30–40 fathoms, *Silver Bay* station 3765. FLORIDA: TABL uncataloged (1) 29°38' N., 80°16' W., in 50 fathoms, *Silver Bay* station 461. *Gulf of Mexico*. USNM no. 196765 (1, about 63) W. C. Renfro, no other data. FLORIDA: UMML no. 16200 (1, 218) 27°56' N., 84°46' W., in 100 fathoms, *Oregon* station 4083; UMML no. 16225 (5, 177–271) 29°42' N.,

86°45' W., in 100 fathoms, *Oregon* station 4943; USNM no. 108871 (1, 200, holotype of *N. tortugae*) and USNM 108872 (2, 108–175, paratypes of *N. tortugae*) south of Tortugas in 60 fathoms, W. H. Longley. MISSISSIPPI DELTA: USNM no. 157671 (1, about 248) 28°45' N., 89°43' W., in 50 fathoms, *Oregon* station 10.

DESCRIPTION. Counts and measurements summarized in tables 1–9; body shape and coloration in figure 5a.

A moderately long-snouted species with 10 soft dorsal rays and no elongate dorsal spines. Dorsal fin with 12 spines and 10 (rarely 9) soft rays; pectoral rays 16–17 (usually 17), usually rays 3 through 7 or 8 (2–9) branched in larger specimens, one of 63 mm. S.L. with no branched rays. Gill rakers 6–7 on upper arch, 9–12 on lower arch including rudiments. Preorbital bone with 2 points over maxillary, first points out, second out and to rear. Suborbital ridge with 1 or no spines on preorbital and usually 3 on suborbitals, additional small points found in some larger specimens. First preopercular spine longest, second absent except in very small specimens, third and fourth moderate to small, fifth small to absent. Upper posttemporal spine usually absent. Other spines as for the genus. Vertebrae 24 (four specimens). Scales ctenoid. About 60–70 vertical scale rows. Dorsal part of head, pectoral-fin base, chest, and maxillary with small ctenoid scales. Supraocular tentacle less than one-third orbit diameter or absent. Orbit about equal to snout in smaller specimens and smaller than snout in larger specimens, ratio of snout divided by orbit 1.1–1.7; orbit into head 4.1 in smaller specimens to 5.2 in largest specimens; interorbital width into orbit diameter 1.6–2.3, smaller specimens tend to have higher values.

Coloration usually as in figure 5a. Blotches on sides better defined in small specimens; larger specimens more speckled. Dark pigment on inside of pectoral fin. A few dark spots often present in pectoral-fin axil. Pelvic fins dusky at distal end in smaller specimens.

A large species, largest specimen studied 315 mm. in standard length.

COMPARISONS. This species is easily distinguished from its western Atlantic congener by the presence of 10 soft dorsal rays (9 or 8 in *N. beanorum*, rarely 9 in *N. hemingwayi*). The third dorsal spine is notably elongate in larger specimens of *N. beanorum* but not in *N. hemingwayi*. They differ in coloration and measurements as given in the accounts and tables.

DISTRIBUTION. The species is known from Maryland, south around Florida, and in the northeastern Gulf of Mexico. Depths of capture range from 30 or 40 to 100 fathoms.

### *Neomerinthe beanorum* (Evermann and Marsh).

*Pontinus beanorum* EVERMANN AND MARSH, 1900, pp. 279–280, fig. 85 (type locality off San Juan Harbor, Puerto Rico, *Fish Hawk* station 6050, in 91 fathoms, holotype USNM no. 49534). JORDAN, EVERMANN, AND CLARK, 1930, p. 372 (compiled). ?HOWELL RIVERO, 1936, p. 63 (two specimens from off Havana, Cuba; no description).

*Neomerinthe beanorum*, GINSBURG, 1953, pp. 56-57 (description; 6 specimens from Puerto Rico). BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels).

MATERIAL EXAMINED. FLORIDA STRAITS OFF THE BAHAMAS: UMML no. 17719 (1, 121) 25°55' 57' N., 79°19' 18' W., in 208 fathoms, *Gerda* station 626; UMML no. 17656 (1, 94) 25°52'-53' N., 79°20' 19' W., in 200-210 fathoms, *Gerda* station 507; UMML no. 17640 (1, 47) 25°49'-51' N., 79°19' W., in 128-118 fathoms, *Gerda* station 624. CUBA: USNM no. 157870 (3, 131-154) 22°59' N., 79°17' W., in 250 fathoms, *Oregon* station 1343; USNM no. 188196 (3) 23°34' N., 79°05' W., in 150 fathoms, *Silver Bay* station 2464. JAMAICA: USNM no. 188194 (1) 17°50' N., 77°52' W., in 170 fathoms, *Oregon* station 3549; USNM no. 188203 (3) 17°53' N., 77°56' W., in 150 fathoms, *Oregon* station 3548. DOMINICAN REPUBLIC: UMML no. 16227 (9, 75-144) 19°48.5' N., 70°30.5' W., in 220-300 fathoms, *Silver Bay* station 5166. PUERTO RICO: USNM no. 49534 (1, 106, holotype of *N. beanorum*) off San Juan Harbor, in 91 fathoms, *Fish Hawk* station 6050; USNM no. 187913 (5, 77-132) 18°26' N., 67°11.5' W., in 175 fathoms, *Oregon* station 2658 (corrected station list); UMML no. 7432 (2, 101-108) 18°26' N., 67°10.5' W., in 150 fathoms, *Oregon* station 2653 (corrected list). VIRGIN ISLANDS: UMML no. 7431 (3, 33-47) 18°13' N., 64°14.5' W., in 125 fathoms, *Oregon* station 2649 (corrected list). HONDURAS: USNM no. 188201 (5) 16°08' N., 81°03' W., in 105-110 fathoms, *Oregon* station 3623. NICARAGUA: UMML no. 14003 (1, 75) 11°40' N., 83°09' W., in 90 fathoms, *Oregon* station 3580; USNM no. 184957 (1) 11°27' N., 83°11' W., in 135 fathoms, *Oregon* station 1902. PANAMA: USNM no. 188207 (16, 35-140) 9°18' N., 80°27' W., in 100 fathoms, *Oregon* station 3588; USNM no. 188200 (1, 93) 9°12' N., 81°30' W., in 135-140 fathoms, *Oregon* station 3585; USNM no. 188205 (10) 9°18' N., 80°22' W., in 125 fathoms, *Oregon* station 3590; USNM no. 188198 (4) 9°02' N., 81°26' W., in 100 fathoms, *Oregon* station 3595; UMML no. 22179 (5) 9°37.5'-37' N., 78°54'-52.5' W., in 70-35 fathoms, *Pillsbury* station 330; UMML no. 22197 (21) 9°59' N., 76°02'-59.7' W., in 24-71 fathoms, *Pillsbury* station 375; UMML no. 22194 (1) 9°45'-48' N., 76°12'-9.6' W., in 55-45 fathoms, *Pillsbury* station 372; UMML no. 22202 (1) 8°52.4' N., 76°50.4'-51.5' W., in 50-54 fathoms, *Pillsbury* station 400; UMML no. 22213 (2) 8°58.1'-56.1' N., 81°26.3'-26.8' W., in 163-60 fathoms, *Pillsbury* station 446. COLOMBIA: UMML no. 17304 (1, 61) 10°00' N., 76°05' W., in 80-100 fathoms, *Oregon* station 4904; UMML no. 17315 (11, 54-108) 11°01.8' N., 75°14' W., in 35 fathoms, *Oregon* station 4872; UMML no. 22171 (2) 9°05.6'-07.2' N., 76°32.1'-30.9' W., in 96-64 fathoms, *Pillsbury* station 398. VENEZUELA: UMML no. 16704 (1, 73) 11°06.7' N., 74°30' W., in 100 fathoms, *Oregon* station 4844; UMML no. 16668 (4, 56-93) 11°08' N., 74°23' W., in 100 fathoms, *Oregon* station 4856.

DESCRIPTION. Counts and measurements summarized in tables 1-9; body shape and coloration in figure 5b.

A short-snouted, moderate-sized species usually with 9 soft dorsal rays and the third dorsal spine notably elongate in specimens over about 120 mm. in standard length. Dorsal fin with 12 spines and 9 (rarely 8) soft rays. Pectoral rays usually 17 (16-18), rays 3 or 4 through 7 to 9 branched in specimens over about 50 mm. in standard length. Gill rakers on upper arch 5-6, 9-11 on lower arch including rudiments. Preorbital bone with 2 spines over maxillary, first points down to slightly forward, second points back. Suborbital ridge with 3 or 4 spinous points, 3 on suborbital bones and 1 or none on preorbital bone. Second preopercular spine small or absent, third usually points down, fourth slightly forward, and fifth forward or absent. Upper posttemporal spine small. Other spines as for the genus. Vertebrae 24 (11 specimens). Scales on body weakly ctenoid; vertical scale rows about 40-45; scales on pectoral-fin base and chest mostly cycloid and partially buried; occipital area and cheek with large weakly ctenoid scales; nape and interorbital area naked. Supraocular tentacle absent or small, about equal to orbit diameter as maximum. Orbit about equal to snout, slightly larger than snout in smaller specimens to slightly smaller in large specimens, ratio snout divided by orbit 0.7-1.2; orbit into head 3.4-4.3, larger specimens with higher values; interorbital width into orbit diameter 2.3-3.5, larger specimens tend to have lower values.

Coloration as in figure 5b. Specimens often faded, but almost always retaining elongate dusky spots on the pectoral fins. Anal and pelvic fins usually clear, sometimes dusky at tips. Upper half of caudal fin and the soft dorsal fin spotted, lower half of caudal fin sometimes dusky near end of fin. Spinous dorsal fin usually with dark pigment at midheight of fin; dark pigment concentrated near end of spinous dorsal fin in small specimens.

A moderate-sized species, largest available specimen about 155 mm. in standard length.

COMPARISONS. See account of *Neomerinthe hemingwayi*.

DISTRIBUTION. The species has been reported from Puerto Rico and Cuba. The range now includes the Bahamas side of the Florida Straits, and throughout the Caribbean (Cuba, Jamaica, Dominican Republic, Puerto Rico, Virgin Islands, Honduras, Nicaragua, Panama, Colombia, and Venezuela). Depths of capture range from about 50 to 205 fathoms (one lot from 35 fathoms possibly with incorrect data).

### *Neomerinthe folgori* (Postel and Roux).

*Scorpaena* sp. CERVIGNON, 1960, p. 95, fig. 54 on p. 97 (one specimen from off Mauritania at 19°04' N., in 310 meters).

*Scorpaena folgori* POSTEL AND ROUX, 1964, pp. 167-170, figs. 1-2 (type locality Cape Verde Islands, Accores de Brava, in 180-200 meters; type in Museum National d'Histoire Naturelle, Paris).

MATERIAL EXAMINED. IIP uncataloged (1, 340), the specimen reported by Cervigon (1960, p. 95) [See above].

DESCRIPTION. (Based on one specimen and information in the original description.) Counts and measurements summarized in tables 1-10.

Dorsal fin with 12 spines and 11 soft rays (last double). Pectoral fin with 17 rays, upper 2 unbranched, next 6 branched once, lower 9 simple. Gill rakers short and stubby, total 19 including rudiments; 7 on upper arch. Most spines on head variously divided into several points (not to be expected in small specimens). Preorbital bone with 2 spinous lobes over maxillary, several points on each. Suborbital ridge with many small points. Supplemental preopercular spine present; first preopercular spine longest; second usually absent (small on left in specimen examined); third and fourth present (divided); fifth virtually absent. Upper posttemporal spine small or absent. Other spines as for the genus. Vertebrae 24 (one specimen). Scales on body ctenoid, about 85 vertical scale rows. Tubed lateral-line scales 27+1. Dorsal part of head, pectoral-fin base, and maxillary with small ctenoid scales; partially embedded, mostly cycloid, scales present on chest. Tentacles on body and head poorly developed. Small appendages associated with posterior preorbital lobe, preocular, supraocular, and fifth preopercular spines, and on a few lateral-line scales. In specimen examined, orbit smaller than snout, ratio snout divided by orbit 1.7; orbit into head 5.5 (smaller specimens should have a proportionally larger orbit); interorbital width into orbit diameter 1.6.

Coloration of preserved specimens mostly pallid. Indication of some dark pigment on body below soft dorsal fin, below middle of spinous dorsal fin, and at front of dorsal fin. Spinous dorsal fin with dark pigment on membranes, more concentrated at anterior part of fin and at about mid-height of fin. The figure of the type (Postel and Roux, 1964, fig. 1) shows the tip of the caudal fin black; it is clear in my specimen. Color in life according to Postel and Roux is generally reddish.

DISTRIBUTION. Known from the Cape Verde Islands (holotype) in 180-220 meters and from the coast of Africa at Mauritania in 310 meters. The type was taken in a lobster trap which suggests that the habitat is rough-bottom. No specimens were collected by Boutiere in trawling off Morocco, and none was collected in the Gulf of Guinea. Postel and Roux (p. 170) report that according to the fishermen the species is rare about the Cape Verde Islands.

REMARKS. The specimen examined agrees well with the description of the holotype. Postel and Roux report the soft dorsal rays as 12, but this results from counting the last double ray as 2. Measurements are similar except for the interorbital width (5.5 versus 7 percent); my lower value is the least width of the interorbital and was probably taken further forward than their measurement. The difference in pigmentation of the caudal fin is discussed above. Another difference which is probably due to differences in sizes of specimens

is that the pelvic fin reaches the anus in their specimen but falls short of the anus in my specimen. They refer to a characteristic tricuspid process in the preocular area which is curved to the rear; this is the posterior preorbital spinous lobe (Matsubara's terminology) which is possibly single in small specimens. The degree of bifurcation of spines is less in their specimen.

The species *Scorpaena folgori* Postel and Roux (1964) differs from species of *Scorpaena* and agrees with species of *Neomerinthe* in having a swimbladder and having a slit behind the fourth gill arch. The two species now included in *Neomerinthe* have 8–10 soft dorsal rays, while "*folgori*" has 11. In other characters, "*folgori*" appears to agree with species now included in *Neomerinthe*. The genus *Neomerinthe* is closely related to *Pontinus*, differing from species of *Pontinus* in having some pectoral rays branched; the branching is simple, rather than the double or triple branching that one finds in most adults of other species of the subfamily Scorpaeninae.

### Genus *Trachyscorpia* Ginsburg

*Trachyscorpia* GINSBURG, 1953, pp. 57–59 (type-species *Scorpaena cristulata* Goode and Bean, by original designation).

DIAGNOSIS. Dorsal rays XII (XI), 8–9 in subgenus *Trachyscorpia* and XIII, 8–9 in subgenus *Mesoscorpia*; anal rays normally III, 5; pectoral rays 20–24, some rays branched, branching compound, longest rays near upper part of fin; lower part of pectoral fins, pelvic fins, and anal fin fleshy in large specimens; swimbladder absent; vertebrae 25 in subgenus *Trachyscorpia* and 26 in subgenus *Mesoscorpia*; scales on body ctenoid; cheek, postorbital area, and occiput scaled; no occipital pit; no slit behind fourth gill arch; palatine teeth present; peritoneum black.

SPINATION. Most spines on head well developed. Preorbital bone with 2 spines over maxillary, first points out, second points out and back. Suborbital ridge prominent, with sharp spines; basically 1 or 2 spinous points on preorbital and 5 or so on the suborbitals (many suborbital spinous points often variously divided, especially in larger specimens, with about 25 points in one specimen of *T. c. cristulata*). Supplemental preopercular spine present; first preopercular spine long; second slightly closer to first than to third; fourth present; fifth small to virtually absent. Upper posttemporal spine absent. Other spines present include nasal, pre-, supra-, and postocular, tympanic, parietal, nuchal, pterotic, sphenotic, lower posttemporal, supracleithral, and cleithral.

REMARKS. *Scorpaena capensis* Gilchrist and Von Bonde is included in the present genus but as a separate subgenus, *Mesoscorpia*, as discussed below. In the subgenus *Trachyscorpia* one species consisting of two subspecies, is recognized.

In general, the number of dorsal spines, especially when 12 or 13, is very important at the generic level as felt by Cadenat (1945), but in this case I



agree with Norman (1935b, p. 32) that *Scorpaena capensis* is congeneric with "*crisulata*" (or at least more closely related to "*crisulata*" than to other species); "*crisulata*" subsequently (Ginsburg, 1953) was removed from the genus *Scorpaena* and placed in the genus *Trachyscorpia*.

The species "*capensis*" appears to agree with *Trachyscorpia* in most characters, differing mainly in having one more dorsal spine and one more vertebra. The two species, "*capensis*" and *T. crisulata*, share several features which are of rare occurrence in the family Scorpaenidae such as the characteristic bilobed shape of the pectoral fins, lower pectoral rays and pelvic and anal fins fleshy in larger specimens, extra large anterior foramina on the frontal bones between the orbits, and extra large median depression present at the middle portion of the frontal bones. These same characters are shared by the species treated by Matsubara (1943, p. 326) in the subfamily Sebastobinae (one genus, *Sebastolobus*); species of this subfamily, which occur in the North Pacific, have more primitive suborbital bones than species of *Trachyscorpia*, though the second suborbital bone is identical in shape, and species of *Sebastolobus* also have more vertebrae (27-30) and dorsal spines (15-17). Matsubara treated the Sebastobinae as close to the Scorpaeninae. An osteological comparison is needed, but from radiographs *T. capensis* and *T. crisulata* do not seem to differ significantly from species of Sebastobinae in other characters, and probably will be shown to belong in the Sebastobinae rather than in the Scorpaeninae.

#### Subgenus **Trachyscorpia** Ginsburg

TYPE-SPECIES. *Scorpaena crisulata* Goode and Bean, 1896, by original designation.

DIAGNOSIS. Dorsal spines normally 12; vertebrae 25.

#### **Trachyscorpia crisulata** (Goode and Bean).

REMARKS. Koehler (1896, p. 478) described the species *Scorpaena echinata* but on a subsequent page (524) in the same work stated in a footnote that his eastern Atlantic species was the same as the species *S. crisulata* described by Goode and Bean (1896) from the western Atlantic. Since that time, both the names "*echinata*" and (more frequently) "*crisulata*" have been used for specimens from the eastern Atlantic. Ginsburg (1953) described the genus *Trachyscorpia* and recognized both *T. echinata* and *T. crisulata* as valid species. However, the single specimen from the eastern Atlantic available to Ginsburg appears to be unusual in some characters, and the differences between specimens from the eastern and western Atlantic would seem to be of about subspecific value or less. Direct comparison of specimens of similar sizes is needed. Ginsburg's specimen from the eastern Atlantic had 20 pectoral rays, while his specimens from the western Atlantic had 22-24, but Boutiere (1958, p. 71) reports pectoral-ray counts for 10 specimens from Mauritania as 21 (3), 22 (6), and

23(1). Counts for 21 specimens from the western Atlantic are 22 (2, one with 21 on right), 23 (17), and 24 (2). Ginsburg's specimen from the eastern Atlantic also had 8 soft dorsal rays, while the most frequent count is 9 (of 20 specimens from the western Atlantic, 2 had 8; Boutiere's specimens from the eastern Atlantic had 8 (four specimens) or 9 (5), when last double ray counted as one). The color pattern as shown by Boutiere (1958, pl. 5b) for a specimen from Mauritania is identical with that of large males from the western Atlantic. Specimens from the eastern Atlantic do appear to have a smaller head than similar-sized specimens from the western Atlantic; other measurements, such as orbit diameter, appear to be correspondingly smaller also. A large series of specimens is needed to evaluate differences in measurements as some values change considerably with growth. Tentatively the eastern and western Atlantic populations are treated as separate subspecies, but if the differences prove to be as small as they seem, subspecies recognition may not be warranted. This species is one of the deeper-living of scorpionfishes, and it would appear easy for this temperate species to cross the North Atlantic. The two subspecies are treated separately below.

### *Trachyscorpia cristulata cristulata* (Goode and Bean).

- Scorpaena cristulata* GOODE AND BEAN, 1896, pp. 246-247, pl. 67, fig. 242 (type locality off Georgia, *Albatross* station 2415, 30°44' N., 79°26' W., in 440 fathoms, USNM no. 39326). JORDAN AND EVERMANN, 1898, pp. 1841-1842 (compiled). JORDAN, EVERMANN, AND CLARK, 1930, p. 372 (included "*echinata*" [misspelled as "*echinita*").
- Trachyscorpia cristulata*, GINSBURG, 1953, pp. 61-63 (description; compared with *T. echinata*; 13 specimens from Atlantic coast of U. S., from Massachusetts to Florida, in 72-440 fathoms). SPRINGER AND BULLIS, 1956, p. 91 (Gulf of Mexico). BRIGGS, 1958, p. 294 (range compiled). BULLIS AND THOMPSON, 1965, p. 54 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels).

MATERIAL EXAMINED. (Unless otherwise stated the stations refer to *Oregon* stations.) GEORGIA: USNM no. 39326 (1, 144, holotype) 30°44' N., 79°26' W., in 440 fathoms, *Albatross* station 2415. FLORIDA ATLANTIC COAST AND FLORIDA STRAITS: UMML no. 575 (1, 106) 29°01' N., 79°58' W., in 165-212 fathoms, *Pelican* station 29; UMML no. 20798 (1, 162) 25°39'-41' N., 80°00'-01' W., in 169-162 fathoms, *Gerda* station 766; UMML no. 12559 (1, 62) 25°30'-45' N., 79°58'-51.5' W., in 180 fathoms, *Gerda* station 197; UMML no. 16205 (2, 144-191) 24°29' N., 83°29' W., in 190 fathoms, station 4336; UMML no. 16221 (1, 237) 24°28' N., 83°26' W., in 225 fathoms, station 4363; UMML no. 13732 (2, 75-116) 24°26' N., 83°31' W., in 300 fathoms, station 4373; UMML no. 16217 (3, 62-253) 24°25' N., 83°29' W., in 300 fathoms, station 4145; UMML no. 14287 (1, 202) 23°53' N., 83°13' W., in 600 fathoms, station 4562; UMML no. 14268 (1, 259) 23°51' N., 83°17' W., in 600 fathoms, station 4563; UMML 16215 (1, 229) 24°27' N., 83°25' W., in 210 fathoms, station 4359; UMML no. 16218 (2, 185-225) 24°30' N., 83°33' W., in 190

fathoms, station 4362; ANSP no. 103415 (1, 153) 29° 50' N., 80° 10' W., in 155–175 fathoms, *Silver Bay* station 1604. NORTHERN GULF OF MEXICO: UMML no. 22222 (1, 352) 29° 23' N., 87° 25' W., in 250 fathoms, station 4947; UMML no. 22223 (2, 345–350) 29° 02' N., 88° 34' W., in 220 fathoms, station 4824.

DESCRIPTION. Counts and measurements summarized in tables 1–9; body shape and coloration in figure 6a, b.

Dorsal fin with 12 spines and 9 (rarely 8) soft rays. Pectoral fin with 21–24 rays (modally 23) rays 2–12 to 2–14 branched in specimens over about 100 mm, standard length, compound branching of some rays; pectoral fin with a characteristic shape, with the longest rays near upper part of fin and fin slightly bilobed; lower pectoral rays and pelvic and anal fins fleshy in large specimens. Vertebrae 25 (10 specimens).

Spination as for the genus. Scales on body ctenoid, about 60–65 (57–67) vertical scale rows. Snout usually naked; interorbital area, cheek, maxillary, pectoral-fin base, and chest scaled, some scales partially embedded and cycloid. Tentacles poorly developed, supraocular tentacle slender and tiny to absent. Orbit larger than snout in small specimens to about equal to snout in large specimens, ratio snout divided by orbit 0.6–1.0; orbit into head about 3.1–3.2 in smaller specimens to 4.0 in large specimens; interorbital width into orbit diameter 1.7–3.5, larger specimens with lower values.

Coloration as in figure 6a, b. Usually some dusky pigment on back and sides, especially below the third or fourth to tenth dorsal spines and below the soft dorsal fin, with a paler area below the tenth to twelfth spines. Inside of pectoral fin often with dusky pigment. Spinous dorsal with dusky pigment between about spines 5 or 7 to 11; this area black in males (fig. 6a) and brown in females and smaller specimens (fig. 6b). Soft dorsal fin, caudal fin, and anal fin frequently dusky, especially in larger specimens. The peritoneum is mostly black in life.

A large species probably reaching 400 or 500 mm, in standard length, largest available about 350 mm.

DISTRIBUTION. This subspecies is known from Massachusetts to the Florida Straits and in the northern Gulf of Mexico. Depths of capture range from 72 to 600 fathoms.

### *Trachyscorpia cristulata echinata* (Koehler).

*Scorpaena echinata* KOEHLER, 1896, p. 478, pl. 27, figs. 4–6 (type locality Bay of Biscay, 45° 57' N., 6° 21' W., in 1,275 meters). NORMAN, 1935a, p. 614 (compiled). NORMAN, 1935b, p. 32 (description; comparisons).

*Scorpaena cristulata*, Koehler, 1896, p. 524 (states in footnote that “*echinata*” equals “*cristulata*” Goode & Bean). HOLT AND BYRNE, 1908, pp. 20–25, pl. 2 (good description; off southwest Ireland in about 500–800 fathoms). KOEFORD, 1927, p. 131 (*Michael Sars* station 4, 49° 38' N., 11° 35' W., in 923 meters, 3 specimens 38–50 cm.; brief description; synonymy). CADENAT, 1945, pp. 535–537 (good description; comparisons). BOUTIERE,

1958, p. 12, and following, pls. 1c, 5a (coast of Morocco; life history notes; figure good). COLLIGNON AND ALONCLE, 1960, p. 25 (food). LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara-Mauritania).

*Sebastes kuhlii* (not of Bowdich), VAILLANT, 1888, pp. 370-373 (measurements and pectoral-ray count are of *T. c. echinata*; description of otoliths; 65 specimens from coast of Africa in 140-2330 meters [specimens from shallower depths are possibly a different species]). GREY, 1956, p. 222 (depth distribution based on Vaillant's record of specimen from 2330 meters).

*Trachyscorpia echinata*, GINSBURG, 1953, pp. 59-61 (placed in new genus; description from a specimen from southwest coast of Ireland; compared with *T. cristulata* [see Remarks under genus]).

*Trachyscorpia cristulata*, MAURIN, 1962, p. 206 (collections in Mediterranean; 500-600 meters).

DESCRIPTION. As for *Trachyscorpia cristulata cristulata* with the following exceptions. This subspecies averages fewer pectoral rays, 20-23 (modally 22) and appears to have a slightly smaller head as well as smaller measurements of head parts (for example, orbit diameter) when expressed as percent standard length; or, conversely, the body is proportionally longer in this subspecies.

DISTRIBUTION. This subspecies is known from Ireland south to Mauritania in depths from about 60 to 1290 fathoms. It was not collected in the Gulf of Guinea. The subspecies in the western Atlantic also tends to be temperate in distribution. This species is reported from deeper depths than any other scorpaenid.

#### Subgenus *Mesoscorpia* Eschmeyer, new subgenus

TYPE-SPECIES. *Scorpaena capensis* Gilchrist and Von Bonde, 1924, here treated as *Trachyscorpia (Mesoscorpia) capensis*.

DIAGNOSIS. Differs from subgenus *Trachyscorpia* by the presence of 26 rather than 25 vertebrae and normally 13 rather than 12 dorsal spines. The tympanic spines are absent in subgenus *Mesoscorpia* and present in subgenus *Trachyscorpia*. [See also Remarks under the genus.]

ETYMOLOGY. The subgeneric name is based on the Greek word middle + *scorpi*a, referring to the apparent intermediate status of the type-species between species of the subfamily Sebastolobinae and the genus *Trachyscorpia*.

#### *Trachyscorpia capensis* (Gilchrist and Von Bonde).

*Scorpaena capensis* GILCHRIST AND VON BONDE, 1924, pp. 18-19 (type locality west coast of South Africa at Pickle stations 66, 86, and 336, in 280-537 fathoms; three specimens to 270 mm.). CADENAT, 1945, p. 534 (not related to *Scorpaena*; no specimens).

*Sebastosemus capensis*, BARNARD, 1927, pp. 909-911 (placed questionably [wrongly] in *Sebastosemus* Gill; description; allied to *Scorpaena echinata*; type in collection of Government Marine Survey; [small specimen with 12 dorsal spines probably not this species]). SMITH, 1949, p. 372, fig. 1044 (brief description; to 12 inches in length; from Cape to Saint Helena Bay, in 250-560 fathoms).

*Scorpaena* (?) *capensis*, NORMAN, 1935b, p. 32 (thought related to *Scorpaena echinata* and *S. cristulata*, and that 13 dorsal spines not an important difference) p. 53 (two specimens of 370-400 mm., from 34°08' S., 17°33' E., in 402-?548 meters).

MATERIAL EXAMINED. BMNH no. 1935.5.2.10 (1, 320) South Africa, 34°08' S., 17°33' E., in 402–?548 meters, Cape trawler *Richard Bennet*, collected 8 July 1927. (Specimen in poor condition.)

DESCRIPTION. (Partially compiled.) Measurements and counts for the single specimen examined in tables 1–9; body shape and coloration in figure 5c.

Dorsal fin normally with 13 spines and 8–9 (usually 9) soft rays. Anal fin normally with 3 spines and 5 soft rays. Pectoral rays 20–23, upper 1 or 2 and lower 6–9 simple in larger specimens; middle rays with compound branching, lower rays very fleshy in large specimens; longest rays near upper part of fin. Ventral and anal fins also fleshy in large specimens. Gill rakers including rudiments 4–5 + 10–12, all fairly short and somewhat difficult to count at upper and lower ends. Vertebrae 26 in specimen examined.

Preorbital bone with 2 spinous points over maxillary, pointing out or slightly to rear. Suborbital ridge prominent, spinous; 1 or 2 spines on preorbital and 4–6 poorly defined spinous points on suborbitals (variability expected in suborbital spination). Tympanic spines absent. Other spines as for the genus.

Scales on body ctenoid, about 60 vertical scale rows; tubed lateral-line scales about 26 + 3. Snout naked; interorbital area, cheek, maxillary, pectoral-fin base, and chest scaled; scales often partially embedded on chest. Tentacles absent in available specimen. Orbit large, specimen examined with orbit diameter into snout 0.7 (orbit may be proportionally larger in smaller specimens); orbit diameter into head length 3.4 (smaller specimens will probably have lower values); interorbital width into orbit diameter 4.8 (smaller specimens will probably average higher values).

The available specimen not differing much in coloration from *T. cristulata*. The spinous dorsal with dark pigment over most of its length; the soft dorsal fin and pectoral fins with brown pigment. (Most scales are missing from the body obscuring the pigmentation.) Some scattered dusky smudges on the head. Peritoneum darkly pigmented.

COMPARISONS. Besides the differences in number of dorsal spines, vertebrae, and presence or absence of tympanic spines, *T. capensis* differs from *T. cristulata* in having the posterior roof of the cranium broader and flatter. Some differences in measurements are shown in the tabular data.

DISTRIBUTION. Known only from the southwestern tip of South Africa. Specimens have been collected in depths from about 200 to 550 fathoms.

### Genus *Phenacoscorpius* Fowler

*Phenacoscorpius* FOWLER, 1938, pp. 69–70 (type-species *Phenacoscorpius megalops* Fowler, by original designation; monotypic). NORMAN, 1939, p. 94 (one new species added). SMITH, 1957a, p. 69 (probably incorrectly included a new species). ESCHMEYER, 1965b, pp. 522–523 (genus redescribed; one new species added).

DIAGNOSIS. Dorsal rays XII, 9; anal rays III, 5; pectoral rays 15–17, some

rays branched; swimbladder present; vertebrae 25; scales on body ctenoid; cheek, occiput, and pectoral base scaly; scales on cheek and belly cycloid; lateral line incomplete, only anterior 3–6 tubed scales present; no occipital pit; teeth on palatines present in a small patch or absent; slit behind fourth gill arch tiny in the western Atlantic species; peritoneum pallid.

SPINATION. (Applies to the Atlantic species.) Most spines on head well developed. Preorbital bone with two spinous points over maxillary, first rounded, second broadly pointed. Suborbital ridge with 5–8 spinous points in available Atlantic specimens. Supplemental preopercular spine present; first, third, fourth, and fifth preopercular spines present, second small or absent. Upper posttemporal spine present. Other spines present include nasal, pre-, supra-, and postocular, tympanic, parietal, nuchal, pterotic, sphenotic, lower posttemporal, supracleithral, and cleithral.

### **Phenacoscorpius nebris** Eschmeyer.

(See ESCHMEYER, 1965b, pp. 522–525, fig. 1, for a detailed treatment.)

*Phenacoscorpius nebris* ESCHMEYER, 1965b, pp. 522–525, fig. 1 (type locality Peninsula de Guajira, Venezuela, 12°46' N., 70°59' W., in 190 fathoms, *Oregon* station 4396).

CORRECTION OF LOCALITY DATA. The holotype of this species was correctly reported from Venezuela, but subsequent information shows that the two paratypes are also from Venezuela and not from the northern Gulf of Mexico as reported in the original description. Tomio Iwamoto recently provided color slides of scorpionfishes which he took while working for the Fish and Wildlife Service Bureau of Commercial Fisheries on the vessel *Oregon*. Two of the slides depict the two paratypes, and his notes show that they were from *Oregon* station 4453. The station number on the label with the specimens was *Oregon* 4780, a fish trap station in the northern Gulf of Mexico in 35 fathoms. Iwamoto has informed me that the fish traps used were of too coarse a mesh to retain fishes of the size of the paratypes, and he feels that his notes listing the station as 4453 are correct. The specimens were definitely taken during the cruise off Venezuela. The locality data for station 4453 are as follows: 10°54' N., 67°08' W., in 220 fathoms, 40-foot flat trawl. The holotype was collected in a similar depth (190 fathoms) and slightly further west at 12°46' N., 70°59' W. (The additional specimens reported below are, however, supposed to be from the Gulf of Mexico.)

ADDITIONAL MATERIAL. USNM no. 159148 (4, 59–81) and 159149 (3, 67–81) 29°06' N., 88°19' W., in 260 fathoms, *Oregon* station 1283.

ADDITIONAL INFORMATION. The slides of the paratypes show the specimens have the head and body pinkish-red. The caudal fin and soft dorsal fin are spotted with darker red. The pectoral fins are not in focus but appear to be spotted with red. The iris is reddish in color.

The additional specimens agree well with the types. The second preopercular

spine is present in some specimens, and more suborbital spinous points are also present in some of the additional specimens. Counts are entered in tables 1-2.

### Genus *Idiastion* Eschmeyer

*Idiastion* ESCHMEYER, 1965b, p. 530 (type-species *Idiastion kyphos* Eschmeyer, by original designation; one species).

DIAGNOSIS. Dorsal rays XII, 9; anal rays III, 5; pectoral rays 17-18 (two specimens); swimbladder present; vertebrae 25; scales ctenoid; head scaled between orbits, along suborbital ridge, on cheeks, and opercle; spines strongly developed, often multiplicate; no occipital pit; teeth on palatines; small slit behind fourth gill arch; peritoneum pale.

SPINATION. Preorbital bone with 2 spines over maxillary, first blunt, second sharp. Suborbital ridge with numerous spinous points (two known specimens with 5 or more on suborbitals and 3 on preorbital). Supplemental preopercular spine present; first preopercular spine longest; second tiny or absent, third, fourth, and fifth point mostly towards rear. Upper posttemporal spine absent. Other spines present include nasal, pre-, supra-, and postocular, tympanic, parietal, nuchal, pterotic, sphenotic (as group of small spines), lower posttemporal, supracleithral, and cleithral.

REMARKS. The genus is based on one species which is known from two specimens. Most species in the subfamily Scorpaeninae have 24 vertebrae, but species of three genera within the subfamily have 25 vertebrae, *Idiastion*, *Phenacoscorpius*, and *Trachyscorpia* (25 or 26). *Idiastion* differs from *Trachyscorpia* in the shape of the pectoral fin, presence of a slit behind the fourth gill arch, pallid peritoneum, and in body shape. *Phenacoscorpius* is characterized by an incomplete lateral line, but is similar to *Idiastion* in most other features. These genera contain species which live offshore; and compared to such shallow-water genera as *Scorpaena* and *Scorpaenodes*, speciation has been limited.

### *Idiastion kyphos* Eschmeyer.

(See ESCHMEYER, 1965b, pp. 530-533, figs. 3-5, for a detailed treatment.)

*Idiastion kyphos* ESCHMEYER, 1965b, pp. 530-533, figs. 3-5 (type locality southeastern Caribbean Sea between Venezuela and Grenada, 11°40' N., 62°33' W., in 320-340 fathoms, Oregon station 5039).

ADDITIONAL MATERIAL. UMMIL no. 14016 (1, 53) off Venezuela, 11°46' N., 69°17' W., in 240 fathoms, Oregon station 4425.

REMARKS. The original description is modified by the additional specimen as follows. This specimen has 17 pectoral rays while the type has 18. The vertebrae also number 25 as in the type. The type has many split spines, while this smaller specimen, as expected, does not. Spines on the suborbital ridge are also numerous, with 5 on the suborbitals in line with 3 on the preorbital bone. As in the type the anterior preorbital spine is rounded and the posterior

one pointed. Gill rakers number 19 (18 in the type), 6 on the upper arch increasing in size to angle, 10 rakers plus 3 smaller rudiments on the lower arch. Most scales are rubbed off in the specimen. The body and head, as in the type, are pallid with a few scattered small dark specks on the fins. Other characters are as in the type. Measurements of the smaller specimen in percent standard length are: head 46; depth 38, orbit 15, snout 11, interorbital 6, jaw 22, predorsal 45, length pectoral fin 32, length pelvic fin 24, length caudal fin 21. The type was captured in 320–340 fathoms, while the second specimen was collected in 240 fathoms.

### Genus *Scorpaena* Linnaeus

*Scorpaena* LINNAEUS, 1758, p. 266 (type-species *Scorpaena porcus*, by subsequent designation, Bleeker, 1876, p. 295).

REMARKS. Currently the nominal genera *Sebastapistes* Gill and *Parascorpaena* Bleeker are included in *Scorpaena*, but the limits of the genus are broad and study on a world-wide basis is needed. Western Atlantic species were treated in detail earlier (Eschmeyer, 1965a).

DIAGNOSIS. Dorsal rays normally XII, 9 (7–10, 8 normal for some species), anal rays normally III, 5; pectoral rays 16–21, some rays branched, the branching usually compound in larger specimens; swimbladder absent, vertebrae 24; scales on body cycloid or ctenoid, cycloid in western Atlantic species, mostly ctenoid in eastern Atlantic; occipital pit usually present; palatine teeth present; no slit behind fourth gill arch; peritoneum pallid.

SPINATION. Preorbital bone with 1–4 spinous points over maxillary. Suborbital ridge with 0 to several spines. Supplemental preopercular spine usually present; first preopercular spine longest; second and third present; fourth and fifth present or virtually absent. Upper posttemporal spine usually present. Nasal spine rarely absent. Other spines present include the pre-, supra-, and postocular, tympanic (usually absent in *S. grandicornis*), parietal, nuchal, pterotic, sphenotic (usually as group of spines), lower posttemporal, supra-cleithral, and cleithral (rarely absent). A few small spinous points usually present on fourth suborbital (the postorbital spines of Ginsburg, 1953).

### *Scorpaena isthmensis* Meek and Hildebrand.

(See ESCHMEYER, 1965a, pp. 103–107, fig. 5, for a detailed treatment.)

*Scorpaena isthmensis* MEEK AND HILDEBRAND, 1928, pp. 842–843, pl. 80 (type locality Porto Bello, Panama).

#### ADDITIONAL REFERENCES.

*Scorpaena isthmensis*, CERVIGON, 1966, pp. 766–767, fig. 324 (description; Venezuela).

*Scorpaena bergi*, CALDWELL AND CALDWELL, 1964, p. 39 (misidentified; Aruba and Colombia).

DISTINGUISHING FEATURES. A moderate-sized species characterized by a spot on the spinous dorsal fin, no spinous points on the suborbital ridge, and pectoral ray count of usually 18–19.



ADDITIONAL INFORMATION. Vertebrae 24 in 8 specimens.

DISTRIBUTION. A coastal species known from Panama to Rio de Janeiro, Brazil. The species is evidently rare from Panama to Colombia; in *Pillsbury* operations during the summer of 1966, we took no specimens from Panama (at  $81^{\circ}31' W.$ ) to Cartagena, Colombia. The holotype is the only known specimen from west of about  $71^{\circ} W.$

### **Scorpaena bergii** Evermann and Marsh.

(See ESCHMEYER, 1965a, pp. 101–103, fig. 6a, for a detailed treatment.)

*Scorpaena bergii* EVERMANN AND MARSH, 1900, pp. 276–277, fig. 83 (type locality Mayagüez, Puerto Rico).

ADDITIONAL REFERENCES.

*Scorpaena bergii*, BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). BÖHLKE AND CHAPLIN, 1968, p. 646, fig. (description; Bahamas).

DISTINGUISHING FEATURES. A small species (to about 100 mm. in standard length) characterized by a spot on the spinous dorsal fin (sometimes poorly marked), one spine at the end of the suborbital ridge, and a pectoral ray count of 16–17.

ADDITIONAL MATERIAL. Two specimens in the Tropical Atlantic Biological Laboratory add two additional localities, *Silver Bay* station 3503 (Greater Inagua) and station 1220 (North Carolina).

ADDITIONAL INFORMATION. Vertebrae 24 in 8 specimens.

DISTRIBUTION. A clear-water species known from New York (outside normal range), North Carolina south to Florida, the Bahamas, Cozumel, Greater and Lesser Antilles, Dutch West Indies, and Bahia, Brazil.

### **Scorpaena petricola** Eschmeyer.

(See ESCHMEYER, 1965a, pp. 107–109, fig. 6b, for a detailed treatment.)

*Scorpaena petricola* ESCHMEYER, 1965a, pp. 107–109, fig. 6b (type locality off Brazil,  $1^{\circ}59' S.$ ,  $42^{\circ}05' W.$ , in 40 fathoms, *Oregon* station 4239).

REMARKS. A small species still known from the type material from off Brazil. The species is characterized by a generally pallid head and body and by the characters presented in the key.

ADDITIONAL INFORMATION. Vertebrae 24 in 9 specimens.

### **Scorpaena melasma** Eschmeyer.

(See ESCHMEYER, 1965a, pp. 109–111, fig. 6c, for a detailed treatment.)

*Scorpaena melasma* ESCHMEYER, 1965a, pp. 109–111, fig. 6c (type locality off Brazil,  $2^{\circ}10' S.$ ,  $41^{\circ}33' W.$ , in 36 fathoms).

ADDITIONAL INFORMATION. Vertebrae 24 in 1 specimen (paratype).

REMARKS. The species is still known only from the holotype and paratype collected off Brazil. The species is characterized by the combination of absence of a supplemental preopercular spine and presence of an occipital pit.

*Scorpaena brachyptera* Eschmeyer.

(See ESCHMEYER, 1965a, pp. 111–114, figs. 7a, b, for a detailed treatment.)

*Scorpaena brachyptera* ESCHMEYER, 1965a, pp. 111–114, figs. 7a, b (type locality off Venezuela, 10°50' N., 66°55' W., in 53 fathoms, *Oregon* station 4461).

## ADDITIONAL REFERENCE.

*Scorpaena brachyptera*, CERVIGNON, 1966, pp. 943–944 (description; Venezuela; three specimens from 30 fathoms; dorsal fin with 8 soft rays; pectoral fin rays 20/20).

ADDITIONAL MATERIAL. FLORIDA: UMML no. 18648 (1, 44) 25°02.5' N., 80°18.8' W., in 39–40 fathoms, *Gerda* station 600. PANAMA-COLOMBIA: UMML no. 22205 (1, 39) 9°33.8'–34.7' N., 78°36.2'–36.7' W., in 40–38 fathoms, *Pillsbury* station 422; UMML no. 22207 (1, 38) 9°31'–30.5' N., 79°51'–52.5' W., in 35–33 fathoms, *Pillsbury* station 430; UMML no. 22206 (1, 34) 9°43.7' N., 79°22.2' W., in 25 fathoms, *Pillsbury* station 428; UMML no. 22182 (1, 30) 9°37.5'–37' N., 78°54'–52.5' W., in 70–35 fathoms, *Pillsbury* station 330; UMML no. 22201 (1, 28) 9°45.1'–45.4' N., 76°09.1'–10.8' W., in 43–41 fathoms, *Pillsbury* station 392; UMML no. 22195 (1, 24) 9°45'–48' N., 76°12'–9.6' W., in 55–45 fathoms, *Pillsbury* station 372. VENEZUELA: USNM no. 201182 (1, 49) NE. part of Cariaco Trench, in 40 fathoms, vessel *Atlantis*; USNM no. 201180 (1, 38) 12°32' N., 82°25' W., in 85 fathoms, *Oregon* station 3577.

REMARKS. This species was described by me (1965a) from five specimens collected by the *Oregon* off Venezuela in 40–65 fathoms. The additional specimens plus the type specimens give the following ranges for counts and measurements. Dorsal fin with 12 spines and 8 (12 specimens), 7 (1), or 9 (1) soft rays. Anal fin with 3 spines and 5 soft rays. Pectoral fin with 19 (6) or 20 (8) rays. Vertebrae 24 in four specimens. Gill rakers 10–12; 3–4 (usually 4) on upper arch, 7–8 on lower arch with lower-most ones as rudiments. Measurements in percent standard length: head 47–51, depth 38–42, orbit 13–16, snout 10–13, interorbital 5–7, jaw 24–26, predorsal 41–46, pectoral fin 26–32, caudal fin 29–36. In the original description the nasal spine was reported as absent. In some of the additional specimens there is a tiny nasal spine, sometimes only on one side. The nasal bones are freely movable, while in most other species the nasal bones are firmly attached by cartilage and support a larger nasal spine.

The short pectoral fin was used as a key character (Eschmeyer, 1965a), but some of the additional specimens have proportionally longer pectoral fins than the types, so this character is abandoned.

All additional specimens have a large dermal flap on the eye between the transparent and opaque portions. Also, they have the flap under the end of the suborbital ridge, the long tentacles on some lateral-line scales, and at the posterior preorbital spine. The preocular tentacle in some of the specimens is about equal to the orbit diameter, while the supraocular tentacle is smaller; both of these tentacles are often absent.

The pigmentation of the additional specimens is about as in the types.

Additional color notes based on the small specimen from *Pillsbury* station 428 are as follows: upper inside half of pectoral fin yellow; head with red, dusky, and some yellow pigment; iris yellowish-red; anal fin mottled with red, more concentrated on anterior half and at end of fin.

The pigment behind the head is concentrated in a poorly defined blotch above the pectoral fin in some specimens. The large preorbital tab is dusky in some specimens to unpigmented in others.

**DISTRIBUTION.** The species is now known from Venezuela, Colombia, Panama, and Florida. The specimen from Florida was taken in a dredge on a rock-rubble bottom. My notes for the specimens from off Panama and Colombia show at least some were taken in sponge-rich areas. The depths of capture range from 25 to about 65 fathoms.

### *Scorpaena elachys* Eschmeyer.

(See ESCHMEYER, 1965a, pp. 114–116, fig. 7c, for a detailed treatment.)

*Scorpaena elachys* ESCHMEYER, 1965a, pp. 114–116, fig. 7c (type locality north of Puerto Rico, 18°15' N., 67°33' W., in 50 fathoms, *Silver Bay* station 5192).

#### ADDITIONAL REFERENCE.

*Scorpaena elachys*, MOE, and others, 1966, p. 81 (one specimen from west coast of Florida in Florida Board of Conservation collection).

**ADDITIONAL MATERIAL.** UMML no. 17322 (1, 37) 20°01' N., 71°39' W., in 29–24 fathoms, *Silver Bay* station 5149; UMML no. 16165 (5, 19–25) 14°53' N., 61°06' W., in 40 fathoms, *Oregon* station 5000; UMML no. 21776 (2, 21–30) 14°03.5' N., 61°02' W., in 22–45 fathoms, *Oregon* station 5051; UMML no. 22214 (1, 42) 24°49' N., 80°39' W., in 20–25 fathoms, *Gerda* station 753; UMML no. 22204 (1, 33) 9°24.8' N., 78°12.7' W., in 28 fathoms, *Pillsbury* station 417.

**REMARKS.** The species was known from five specimens. The additional specimens plus the types give the following ranges for counts and measurements (UMML no. 16165 not measured). Dorsal fin with 12 spines and 8 (3 specimens) or 9 (11 specimens) soft rays; anal fin with 3 spines and 5 (13) or 6 (1) soft rays; pectoral rays 16 (3, 2 with 17 on right) or 17 (11); head 48–51; depth 37–41; orbit 14–16; snout 11–13; interorbital 5–6; jaw 24–27; predorsal 41–45; pectoral fin 30–36; caudal fin 29–34. Vertebrae 24 in 10 specimens.

The additional specimens have a shorter caudal fin making this a poor character as used in the earlier key (Eschmeyer, 1965a). One specimen lacks nasal spines.

The coloration of the additional specimens is generally pallid as in the types. Most have some faint dusky pigment on the head and body, and some have a dusky smudge on the pectoral fin. The following is a description of the specimen taken by the vessel *Pillsbury* off Colombia. Body generally reddish; upper inside of pectoral a bright yellow; caudal with three bands of red, one at base,

middle, and at end; some yellow on soft dorsal and caudal, mixed with pink specks; anterior half of anal fin dark red, followed by specks in the middle portion, with dark red at distal end; pelvic fin and iris red. Dusky pigment most notably on the pectoral fin, between orbits, and under eye.

DISTRIBUTION. The species is now known from Puerto Rico, Dominican Republic, Martinique, Saint Lucia, Panama, and Florida. Depths of capture range from about 20 or 25 to 50 fathoms. Most captures have been by use of dredges.

### *Scorpaena albifimbria* Evermann and Marsh.

(See ESCHMEYER, 1965a, pp. 116–118, fig. 8, for a detailed treatment.)

*Scorpaena albifimbria* EVERMANN AND MARSH, 1900, pp. 275–276, fig. 82 (type locality off Culebra Island, Puerto Rico, in 15 fathoms, *Fish Hawk* station 6093).

#### ADDITIONAL REFERENCE.

*Scorpaena albifimbria*, BÖHLKE AND CHAPLIN, 1968, p. 648, illustration (description; Bahamas).

ADDITIONAL MATERIAL. The following specimens are from collections by Walter Starck during studies of the fauna of Alligator Reef; all are from Florida, Monroe County, vicinity of Alligator Reef Light in 15–95 feet. UMML no. 20089 (1, 16), UMML no. 18133 (2, 32–39), UMML no. 19251 (, 32), UMML no. 18970 (2, 39–40), and UMML no. 22221 (1, 12).

One uncataloged specimen at TABL of 28 mm. carries the following data: Saint Andrews Island, SW. cove, *Geronimo* Cruise 6, station 190, collected by Richards and Ramsay.

ADDITIONAL INFORMATION. Counts for the additional specimens are as follows: dorsal fin XII, 9 (11 specimens) and XII, 8 (1); anal III, 5 (11) and III, 4 (1); pectoral rays 21 + 21 (1), 21 + 20 (1), 20 + 20 (7), 20 + 19 (1), 19 + 19 (2). Vertebrae 24 in 10 specimens. The largest specimen known is only 51 mm. in standard length.

DISTRIBUTION. *Scorpaena albifimbria* is known from Florida, the Bahamas, Virgin Islands, Haiti, Puerto Rico, Curaçao, and Saint Andrews Island. It is a shallow-water species, occurring in depths from the shore to 17 fathoms.

### *Scorpaena grandicornis* Cuvier.

(See ESCHMEYER, 1965a, pp. 118–121, figs. 9a, b, for a detailed treatment.)

*Scorpaena grandicornis* CUVIER in Cuvier and Valenciennes, 1829, p. 309 (type locality Martinique and Puerto Rico).

#### ADDITIONAL REFERENCES.

*Scorpaena grandicornis*, DIAZ, 1893, p. 87 (Cuba). FOWLER, 1906, p. 104 (Florida Keys, sea wreck of the Marquesas shallows). BORODIN, 1934, p. 117 (listed; Port Antonio, Jamaica). FOWLER, 1950, p. 75 (one specimen; Cayo Largo, Cuba). MOE, and others, 1966, p. 81 (Florida specimens in collection of Florida Board of Conservation). RANDALL, 1968, p. 173, color fig. 195 (brief description; good figure of specimen from the Virgin Islands). BÖHLKE AND CHAPLIN, 1968, p. 647, illustration (description; Bahamas).

*Scorpaena quadricornis*, FOWLER, 1937b, p. 313 (Haiti; misspelled; name only).

*Scorpaena granicornis*, BULLIS AND THOMPSON, 1965, p. 53 (misspelled; collections by U. S. Fish and Wildlife Service exploratory fishing vessels).

**DISTINGUISHING FEATURES.** The white specks (less than about 0.5 mm. diameter) on a pale or tan background in the axil of the pectoral fin and absence of tympanic spine are diagnostic for this species.

**ADDITIONAL INFORMATION.** Vertebrae 24 in 8 specimens.

**DISTRIBUTION.** The species is widespread in the western Atlantic from Florida south to southern Brazil, including Bermuda. It is an inshore species.

### *Scorpaena plumieri* Bloch.

(See ESCHMEYER, 1965a, pp. 121-127, figs. 4a, b, c, for a detailed treatment.)

*Scorpaena plumieri* BLOCH, 1789, p. 234 (type locality Martinique).

CENTRAL ATLANTIC REFERENCES.

*Scorpaena scrofina*, GÜNTHER, 1868, p. 225 (listed; St. Helena). MELLISS, 1875, p. 105 (St. Helena; common in shallow water; common name Mail or Rock Gurnard). CUNNINGHAM, 1910, p. 115 (St. Helena). CLARK, 1913, p. 53 (St. Helena; several specimens; 249-305 mm. total length).

*Scorpaena plumieri*, GÜNTHER, 1881, p. 430 (Ascension). CADENAT AND MARCHAL, 1963, pp. 1287-1288, fig. 37 (specimens from Ascension; comparisons with other species; good figure).

ADDITIONAL WESTERN ATLANTIC REFERENCES. (See Eschmeyer, 1965a).

*Scorpaena plumieri*, STARKS, 1913, p. 64 (Natal, Brazil; live color description). BORODIN, 1934, p. 117 (listed; Fisher's Island, Florida). CALDWELL, 1963, p. 11 (Costa Rica). BULLIS AND THOMPSON, 1965, p. 54 (*Oregon* station 2348 and *Silver Bay* stations 438 and 2361). MOE, and others, 1966, p. 81 (specimens in Florida Board of Conservation collection). RANDALL, 1968, pp. 172-173, color fig. 194 (brief description; good figure). BÖHLKE AND CHAPLIN, 1968, p. 649, illustration (good description; Bahamas).

*Scorpaena rascacio*, DIAZ, 1893, p. 87 (Cuba; coloration; to 450 mm.).

*Scorpaena bufo?*, SCHOMBURGK, 1848, p. 667 (Barbados).

*Scorpaena brasiliensis*, SCHOMBURGK, 1848, p. 667 (misidentified; Barbados).

*Scorpaena albofasciata*, FOWLER, 1950, p. 82, fig. 21 (Old Providence Island, Bahamas; coloration; juvenile).

*Scorpaena plumieri plumieri*, CERVIGON, 1966, pp. 763-765, fig. 322 (description; Venezuela).

**DISTINGUISHING FEATURES.** The white spots or blotches on a black background in the pectoral-fin axil are diagnostic.

**DISTRIBUTION.** Currently treated as occurring in the eastern Pacific, western Atlantic, and at Saint Helena and Ascension. In the western Atlantic the species is common from the Atlantic coast of the United States to Rio de Janeiro, Brazil, in depths from the shore to about 30 fathoms.

**ADDITIONAL INFORMATION.** Vertebrae 24 in eight specimens.

**REMARKS.** The species is compared with the closely related *S. lacvis* from the eastern Atlantic under the account of *S. lacvis*.

Victor Sadowsky forwarded three specimens from Brazil which have the posterior preorbital spine split distally into two close-set spines. This has been observed in specimens from other areas but not with this frequency.

**Scorpaena brasiliensis** Cuvier.

(See ESCHMEYER, 1965a, pp. 127-132, figs. 9c, 10a, for a detailed treatment.)

*Scorpaena brasiliensis* CUVIER in Cuvier and Valenciennes, 1829, p. 305 (type locality Brazil).

## ADDITIONAL REFERENCES.

*Scorpaena brasiliensis*, BORODIN, 1934, p. 117 (listed; Sombrero Light, Florida). FOWLER, 1951, pp. 32-33 (Rio de Janeiro, Brazil). MOE AND MARTIN, 1965, p. 135 (Tampa Bay area, Florida). BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). MOE, and others, 1966, pp. 79-80 (specimens in Florida Board of Conservation collection). CERVIGON, 1966, pp. 762-763, fig. 321 (description; Venezuela). RANDALL, 1968, p. 173, color fig. 196 (brief description; figure of specimen from the Virgin Islands).

*Scorpaena colesi*, NICHOLS AND FIRTH, 1936, p. 1 (off Virginia).

**DISTINGUISHING FEATURES.** The species is distinguished from other species in the Western Atlantic by the combination of about 50-60 scale rows, brown spots usually in pectoral axil and along body to anal fin, usually 2 or 3 large brown spots behind the head, and upper posttemporal spine reduced or absent.

**ADDITIONAL INFORMATION.** Vertebrae 24 in nine specimens.

**DISTRIBUTION.** A common inshore species known from Virginia south to southern Brazil, including the Gulf of Mexico. Depths of capture range from the shore to about 50 fathoms.

**Scorpaena dispar** Longley and Hildebrand.

(See ESCHMEYER, 1965a, pp. 132-134, fig. 12b, for a detailed treatment.)

*Scorpaena dispar* LONGLEY AND HILDEBRAND, 1940, p. 246, fig. 12 (type locality Tortugas, Florida).

## ADDITIONAL REFERENCES.

*Scorpaena dispar*, BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). CERVIGON, 1966, pp. 945-946 (compiled; Venezuela).

**DISTINGUISHING FEATURES.** Characterized by presence of 3 preorbital spines, and coloration of black spots on a pallid background, especially on the caudal and pectoral fins.

**ADDITIONAL MATERIAL.** Specimens from the following stations were identified in the collection of the Tropical Atlantic Biological Laboratory: *Silver Bay* stations 1534, 1547, 2360, 3431, 5107, 5708, 5735, and *Oregon* station 3640.

**ADDITIONAL INFORMATION.** Vertebrae 24 in six specimens.

**DISTRIBUTION.** The specimens from *Silver Bay* stations 1547 and 5735 extend the range northward to Georgia and South Carolina. Other records include Florida, the Gulf of Mexico, Yucatan, Venezuela, and Brazil, in 20-65 fathoms.

**Scorpaena calcarata** Goode and Bean.

(See ESCHMEYER, 1965a, pp. 134-138, figs. 10b, c, for a detailed treatment.)

*Scorpaena calcarata* GOODE AND BEAN, 1882, pp. 422-423 (type locality Clear Water Harbor, Florida).

## ADDITIONAL REFERENCES.

*Scorpaena calcarata*, YERGER, 1961, p. 114 (Alligator Harbor, Florida). MOE AND MARTIN, 1965, p. 136 (Tampa Bay area, Florida). BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). MOE, and others, 1966, p. 80 (specimens in Florida Board of Conservation collection). CERVIGON, 1966, p. 944 (compiled; Venezuela).

ADDITIONAL MATERIAL. The *Pillsbury* collected specimens from off Panama and Colombia at the following stations: 330 (1 specimen), 333 (2), 362 (2), 365 (5), 366 (4), 367 (1), 368 (1), 370 (2), 371 (1), 378 (3), 379 (7), 380 (3), 411 (1), 430 (2), 433 (5), 435 (5), and 434 (4), in depths from about 20 to 40 fathoms (locality data for the *Pillsbury* stations appeared in Voss, 1966).

DISTINGUISHING FEATURES. Characterized by the absence of an occipital pit (very shallow pit in small specimens), narrow interorbital area, and absence of a supplemental preopercular spine.

ADDITIONAL INFORMATION. Vertebrae 24 in six specimens.

DISTRIBUTION. A coastal species found from the Carolinas to the Gulf of Mexico and south to Brazil.

***Scorpaena inermis* Cuvier.**

(See ESCHMEYER, 1965a, pp. 138-141, figs. 11a, b, for a detailed treatment.)

*Scorpaena inermis* CUVIER in Cuvier and Valenciennes, 1829, pp. 311-312 (type locality Martinique).

## ADDITIONAL REFERENCES.

*Scorpaena inermis*, BULLIS AND THOMPSON, 1965, p. 54 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). MOE, and others, 1966, p. 81 (specimens in Florida Board of Conservation collection). CERVIGON, 1966, p. 943 (description; Venezuela). BÖHLKE AND CHAPLIN, 1968, p. 645, illustration (description; coloration; good figure; Bahamas).

DISTINGUISHING FEATURES. A small species characterized by the absence of an occipital pit and absence of a supplemental preopercular spine, as in *Scorpaena calcarata*. The small mushroom-like tabs on the cornea (fig. 2c) are diagnostic.

ADDITIONAL MATERIAL. Specimens from the following stations were identified in the collection of the Tropical Atlantic Biological Laboratory: *Silver Bay* stations 2451, 3053, *Oregon* station 3638, and *Geronimo* station 210 (Cruise 6).

ADDITIONAL INFORMATION. Vertebrae 24 in six specimens.

DISTRIBUTION. A clear-water species known from Florida, the Bahamas, Yucatan, the Greater and Lesser Antilles, and the Dutch West Indies. The specimen from *Geronimo* Cruise 6 is from Saint Andrews Island. Depths of Capture range from the shore to about 40 fathoms.

***Scorpaena agassizii* Goode and Bean.**

(See ESCHMEYER, 1965a, pp. 141-144, figs. 11c, 12a, for a detailed treatment.)

*Scorpaena agassizii* GOODE AND BEAN, 1896, pp. 247-248, pl. 67, fig. 243 (type locality in error [corrected by Eschmeyer, 1965a, to 23°13' N., 89°10' W., *Blake* station 36]).

## ADDITIONAL REFERENCES.

*Scorpaena agassizii*, BULLIS AND THOMPSON, 1965, p. 53 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). MOE, and others, 1966, p. 70 (specimens in Florida Board of Conservation collection). CERVIGON, 1966, pp. 765-766, fig. 323 (description; Venezuela).

**DISTINGUISHING FEATURES.** This species is characterized by a large eye and elongate pectoral fin.

**ADDITIONAL INFORMATION.** Vertebrae 24 in six specimens and 23 in one specimen, the latter also with 8 soft-dorsal rays.

**DISTRIBUTION.** An offshore species known from the Atlantic and Gulf coasts of the United States, south to the Guianas in depths from about 25 to 150 fathoms.

**REMARKS.** Occurrence of this species at Bermuda appears to be based on the specimen reported by Barbour (1905, p. 129) which was dredged on the Challenger Bank in 40 fathoms. Mrs. Myvanwy Dick informs me that this specimen is not in the MCZ fish collection. It is possible that *S. agassizii*, which appears to be a continental species, does not occur at Bermuda. At the time of Barbour's writing it was thought that the type locality of *S. agassizii* was the mid-Atlantic east of Cuba, and this may have influenced Barbour's identification.

***Scorpaena normani* Cadenat.**

*Scorpaena canariensis* (not of Sauvage), NORMAN, 1935b, pp. 29-30, fig. 11 (in part; specimens from Angola only).

*Scorpaena normani* CADENAT, 1945, pp. 539-541, fig. 2 (type locality coast of Mauritania; referred Norman's specimens from Angola to this species; description good). CADENAT, 1950, p. 243 (brief description; Sénégal) p. 307 (listed). CADENAT, 1953, p. 1088, fig. 31 (name and figure). ROUX, 1957, p. 225 (brief description; area near Point Noire in 80-150 meters). POLL, 1959, pp. 184-187, fig. 67 (numerous specimens from 1°13' S. to 16°36' S. in about 60-260 meters; good description and figure). BLACHIE, 1962, p. 74 (listed). LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara-Mauritania). SANCHEZ, 1966, p. 157, illustration (compiled; Angola).

**MATERIAL EXAMINED.** Measurements and counts are based on all or part of the UMML specimens from the following Pillsbury stations in the Gulf of Guinea: station 45 (18, 76-124), 59 (2, 112), 232 (3, 97-120), 239 (2, 66-79), 241 (5, 46-72), 254 (2, 99-105), 259 (6, 65-79). Additional specimens from the Gulf of Guinea collected by the Pillsbury are from stations 236 (42 specimens), 237 (18), and 245 (42). (Locality data for Pillsbury stations are given in Voss, 1966.) The following specimens were collected by Bruce B. Collette (BBC) during Guinean Trawling Survey 1: CAS no. 24271 (1 specimen) Transect 14, station 5, 6°11' N., 10°54' W., in 70 meters, BBC 871; CAS no. 24269 (4) Transect 2, station 4, 11°32' N., 17°11' W., in 50 meters, BBC 982; CAS no. 24270 (1) Transect 6, station 6, 9°18' N., 15°32' W., in



100–108 meters, BBC 943; CAS no. 24268 (2) Transect 9, station 5, 7°50' N., 14°00' W., in 70 meters, BBC 919; USNM no. 203796 (2) Transect 13, station 4, 6°40' N., 11°23' W., in 50 meters, BBC 882; USNM no. 203794 (2) Transect 16, station 5, 5°24.5' N., 9°49' W., in 70 meters, BBC 854; USNM no. 203793 (1) Transect 10, station 6, 7°20' N., 13°23' W., in 100 meters, BBC 911; USNM no. 203797 (2) Transect 18, station 5, 4°32' N., 8°21'20" W., in 70 meters, BBC 841; USNM no. 203795 (2) Transect 8, station 7, 8°27' N., 14°23' W., in 180–200 meters, BBC 930. The following specimens from the Guinean Trawling Survey have been deposited at IFAN, Gorée, Sénégal: Transect 38, station 5 (1 specimen) 6°03.5' N., 4°16' W., in 70 meters; Transect 34, station 6 (1) 6°00.5' N., 1°34' E., in 100 meters; Transect 42, station 6 (2) 3°50' N., 6°05' E., in 100 meters. Additional specimens from the Guinean Trawling Survey were identified and returned to IFAN.

DESCRIPTION. Counts and measurements summarized in tables 1–10; body shape and coloration in figure 6c.

A small, mostly pale species with no occipital pit, chest naked, and with slightly ctenoid scales on the body. Dorsal fin with 12 spines and 9 (rarely 8 or 10) soft rays; penultimate dorsal spine short, about one-third the length of last; spinous dorsal fin characterized by deeply-cleft membranes between 3 or 4 anterior spines allowing anterior dorsal spines to point far forward. Pectoral rays usually 19, rarely 18 or 20, middle pectoral rays doubly branched; pectoral fin reaching to at least second anal spine. Gill rakers number 15–18, usually 16 or 17; upper arch with 5–6, 10–12 on lower arch; all rakers fairly short and spiny. Preorbital bone with 2 spines over maxillary, both point forward. Suborbital ridge usually with 4 spines, 1 on preorbital and 3 on suborbitals, spine on preorbital often absent or sometimes several points on lateral surface of preorbital; some specimens with spines double giving as many as 8 small points on suborbital ridge. Second preopercular spine small. Fourth and fifth preopercular spines well developed. Upper posttemporal spine usually small. Other spines as for the genus. Vertebrae 24 (six specimens). Scales on flanks slightly ctenoid, about 45 vertical scale rows. Pectoral-fin base and chest naked; most scales on head embedded. Occipital pit absent; slight depression present before each parietal spine. Pores at symphysis of lower jaw separate. Interorbital area with 2 well developed ridges which continue into the tympanic spines. Skin appendages on body poorly developed; supraocular tentacle about equal to orbit in small specimens, smaller or absent in larger specimens. Nasal flap and tab associated with posterior preorbital spine large, rest small or absent. Orbit larger than snout, ratio snout divided by orbit 0.7–0.9; orbit into head 2.0–3.6, interorbital width into orbit diameter 1.8–2.4. Second anal spine falling short of third when depressed.

Preserved specimens mostly pallid, with a few dark spots or specks on anterior lateral-line scales, base of dorsal spines, pectoral fin, and above pectoral

fin. Head with some inconspicuous dusky pigment. Smaller specimens with dusky pigment on fins. Color in life bright red with darker spots in position of dusky spots of preserved specimens; pectoral fin spotted with dark-red.

A small to moderate-sized species growing to about 155 mm. standard length.

COMPARISONS. *Scorpaena normani* belongs with the group of species which have the pectoral-fin base and chest naked. It differs from this group in having no occipital pit; the slight depressions before the parietals suggest that this is secondary. The pores at the symphysis of the lower jaw are separate. *Scorpaena canariensis* and *S. maderensis* similarly have no occipital pit but differ from *S. normani* in having the chest and pectoral-fin base scaled. The deeply-cleft membranes between the anterior dorsal spines are characteristic of specimens of *S. normani*.

DISTRIBUTION. The species is very common in the Gulf of Guinea. The northern limit of occurrence seems to be about Mauritania, where Cervigon (1960) reported one specimen. The species occurs south of the Gulf of Guinea to Angola. Depths of capture range from about 25 to 125 fathoms. Habitat is mud or sand bottom.

### *Scorpaena angolensis* Norman.

*Scorpaena angolensis* NORMAN, 1935b, p. 28, fig. 10 (type locality coast of Angola). CADENAT, 1945, pp. 546-548, fig. 6 (in part; description; specimens from Cape Verde Islands and coast of Mauritania [specimen from Príncipe Island possibly *S. annobonae*]; coloration of pectoral fin wrongly gives impression of *S. stephanica*). CADENAT, 1950, p. 243, fig. 179 (compiled; comparisons with other species; Sénégal). ROUX, 1957, p. 224 (brief description; area around Point Noire in 80-150 meters). POLL, 1959, pp. 184-187, fig. 67 (good description and figure; specimens from West Africa between 1°13' S. and 16°36' S., in depths from about 50 to 250 meters). CERVIGON, 1960, p. 94 (rare off Mauritania, captured at 20°30' N., in 35 meters). BLACHE, 1962, p. 74 (compiled). LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara-Mauritania). SANCHEZ, 1966, p. 156, fig. (compiled; Angola).

MATERIAL EXAMINED. MAURITANIA: IIP uncataloged (1, 137) off Mauritania, 20°30' N., in 35 meters. SÉNÉGAL: IFAN no. 5313 (1, 125) Gorée. GULF OF GUINEA: The following were collected by the vessel *Pillsbury*: UMML no. 21772 (2, 59-91) 5°10'-8' N., 00°25'-28' W., in 23 fathoms, station 23; UMML no. 21773 (2, 115-118) 5°07' N., 4°32'-36' W., in 23-21 fathoms, station 46; UMML no. 15771 (5, 83-101) and UMML no. 21774 (4, 82-115) 4°15' 12' N., 7°32'-35.5' W., in 25-42 fathoms, station 65. The following were collected by Bruce B. Collette (BBC) on Guinean Trawling Survey 1: CAS no. 24272 (7, 99-132) Transect 4, station 4, 10°23' N., 16°25' W., in 50 meters, BBC 964; CAS no. 24273 (3, 104-137) Transect 6, station 4, 9°24' N., 15°26' W., in 50 meters, BBC 946; USNM no. 203798 (2, 75-90) Transect 2, station 4, 11°32' N., 17°11' W., in 50 meters, BBC 982; USNM no. 203799 (2, 105-117) Transect 7, station 5, 9°03' N., 14°49' W., in 70-72 meters, BBC

936. Additional specimens from the Guinean Trawling Survey have been identified and deposited at IFAN, Gorée, Sénégal.

DESCRIPTION. Counts and measurements summarized in tables 1–10; body shape and coloration in figure 8b.

A moderate-sized species with a spot on the spinous dorsal fin, occipital pit present, pores at symphysis of lower jaw united, chest and pectoral-fin base naked, and slightly ctenoid scales on the body. Dorsal fin normally with 12 spines and 9 soft rays. Pectoral rays 17–19, usually 18, rays 2–8 to 10 branched, compound branching in largest specimens; pectoral fin reaches to about over first anal spine. Gill rakers including rudiments 14–17, upper arch with 4–6, lower 9–12, usually 5 + 10 or 11. Preorbital bone with 2 spines over maxillary in small specimens and 3 in the larger specimens, middle preorbital spine small and at base of first (absent in juveniles); first points mostly forward, third points down. Suborbital ridge almost always with no spines on preorbital bone and 3 spines on the suborbital bones, the first and second below ridges and third shortest. Second preopercular spine normal. Upper posttemporal spine present. Other spines as for the genus. Vertebrae 24 (five specimens). Scales on flanks ctenoid, about 40–46 vertical scale rows; head, pectoral-fin base, and chest naked. Occipital pit deep. Pores at symphysis of lower jaw united. Interorbital area deep, with two ridges poorly developed. Skin appendages well developed; supraocular tentacle usually less than  $\frac{1}{2}$  orbit diameter, larger in small specimens. Orbit diameter about equal to snout length or slightly larger than snout in small specimens, ratio snout divided by orbit 0.7–1.0; orbit into head 3.2 (smaller specimens) to 4.0; interorbital width into orbit diameter 1.8–2.6 (larger specimens tend to have lower values). Second anal spine usually falling slightly beyond third when depressed.

Coloration of preserved specimens as in figure 8b. Smaller specimens with more dark pigment on pectoral, pelvic, and anal fins. Spot on dorsal fin usually between spines 6 and 9, sometimes more restricted. Pigment of spots on caudal mostly confined to rays.

COMPARISONS. *Scorpaena angolensis* belongs in the group having the pectoral-fin base and chest naked. Like *S. lopppei*, *S. annobonae*, and *S. azorica*, the pores at the symphysis of the lower jaw are united. These four species are separated in the key and mentioned under the accounts of *S. lopppei*, *S. annobonae*, and *S. azorica*.

DISTRIBUTION. The species is known from Mauritania to Angola and is especially common in the Gulf of Guinea. Cadenat (1945, p. 547) records 3 specimens from the Cape Verde Islands. The species is considered mostly coastal in habitat, living on mud-sand bottom in depths from about 20 to 125 fathoms.

REMARKS. Cadenat's specimen from the island of Principe is tentatively referred to *S. annobonae*.

*Scorpaena stephanica* Cadenat.<sup>3</sup>

*Scorpaena scrofa*, CADENAT, 1937, p. 497 (specimens from Sénégal and Guinea, in 100–265 meters).

*Scorpaena stephanica* CADENAT, 1945, pp. 550–552, fig. 8 (type locality Mauritania; additional specimens from Sénégal and Guinea). CADENAT, 1950, p. 307 (listed). POLL, 1959, pp. 188–191, fig. 68 (description; specimens from West Africa between 9°31.5' N. to 13°05' S., in depths from about 50–200 meters). CERVIGON, 1960, pp. 93–94 (two specimens from off Mauritania at 21°50' N., in 90 meters). BLACHE, 1962, p. 74 (compiled). LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara-Mauritania). SANCHEZ, 1966, p. 158 (compiled; Angola).

*Scorpaena gaillardae* ROUX, 1954, pp. 470–472 (type locality French Equatorial Africa [probably near Point Noire]; one specimen 350 mm. total length). ROUX, 1957, pp. 225–228, 2 figs. on p. 368 (description; 150 meters, near Point Noire). BLACHE, 1962, p. 74 (compiled).

MATERIAL EXAMINED. UMML no. 15246 (1, 80) 4°23'–22' N., 7°06.5'–08.5' W., in 37 fathoms, *Pillsbury* station 64; UMML no. 22837 (3, 26–148) and UMML no. 16750 (2, 69–144) 4°23'–24' N., 8°05.5'–07.5' W., in 38 fathoms, *Pillsbury* station 68. The following specimens were collected by Bruce B. Collette (BBC) during Guinean Trawling Survey 1: CAS no. 24277 (5, 146–232) Transect 1, station 5, 12°03' N., 17°14' W., in 100 meters, BBC 994; USNM no. 203803 (2, 98–225) Transect 1, station 6, 12°06' N., 17°14' W., in 100 meters, BBC 995; USNM no. 203801 (4, 60–92) Transect 2, station 4, 11°32' N., 17°11' W., in 50 meters, BBC 982; CAS no. 24274 (1, 84) Transect 6, station 6, 9°18' N., 15°32' W., in 100–108 meters, BBC 943; USNM no. 203804 (2, 186–215) Transect 8, station 6, 8°28' N., 14°21' W., in 100 meters, BBC 929; USNM no. 203800 (4, 88–170) Transect 9, station 5, 7°50' N., 14°00' W., in 70 meters, BBC 919; CAS no. 24276 (5, 80–166) Transect 10, station 6, 7°20' N., 13°23' W., in 100 meters, BBC 911; CAS no. 24275 (1, 69) Transect 13, station 4, 6°40' N., 11°23' W., in 50 meters, BBC 882; USNM no. 203805 (2, 229–230) Transect 17, station 6, 4°40' N., 9°11' W., in 100 meters, BBC 849; USNM no. 203802 (1, 166) Transect 18, station 5, 4°32' N., 8°21'20'' W., in 70 meters, BBC 841. Additional specimens from the Guinean Trawling Survey have been deposited at IFAN, Gorée, Sénégal.

DESCRIPTION. Counts and measurements summarized in tables 1–10; body shape and coloration in figure 10b.

A large species with a spot on the spinous dorsal fin, occipital pit present, chest and pectoral-fin base naked, ctenoid scales on the body, and pores at symphysis of lower jaw separate. Dorsal fin normally with 12 spines and 9 soft rays. Pectoral rays 17–19, usually 18, rays 2–7 to 10 branched in specimens over about 60 mm. standard length; compound branching in larger specimens; pectoral fin usually reaching first anal spine. Gill rakers including rudiments usually 15–18, upper arch 4–6, lower arch 10–12, all short. Lower rakers

<sup>3</sup>See Addendum.

often as groups of spinules. Preorbital bone with 2 spines over maxillary in small specimens (to about 65 mm.) and 3 spines in larger specimens; middle spine small (absent in juveniles) and at base of first; first points forward, third points forward to down, middle spine variable in direction. Suborbital ridge usually with 3 or 4 spinous points, first on preorbital (sometimes absent). Second preopercular spine normal. Upper posttemporal spine present. Other spines as for the genus. Vertebrae 24 (eight specimens). Scales on sides ctenoid, 43–48 vertical scale rows. Head, pectoral-fin base, and chest naked. Occipital pit moderate to fairly shallow. Interorbital area with 2 ridges which end at the front of the occipital pit. Pores at symphysis of lower jaw separate. Skin appendages usually well developed. Supraocular tentacle usually smaller than orbit. Tentacle at posterior preorbital spine large. Small tentacles on maxillary. Orbit diameter larger than snout in small specimens to smaller than snout in larger specimens, ratio snout divided by orbit 0.8–1.2; orbit into head 3.1–4.4 (larger specimens tend to have higher values); interorbital width into orbit diameter 1.6–2.6. Second anal spine when depressed about equal to third in smaller specimens or shorter than third in larger specimens.

Coloration as in figure 10b. Smaller specimens with 5 saddle-shaped dark areas along back, one at beginning of dorsal fin, under middle dorsal spines, under posterior dorsal spines, below soft dorsal fin, and on caudal peduncle. In larger specimens these dark areas more diffuse, often poorly marked. Caudal fin, dorsal fin, and pectoral fins with dusky spots. Pelvic fins dusky in small specimens. Anal fin with poorly defined dusky spots in smaller specimens to clear in large specimens. Dorsal fin with black patch between about spines 6–7 to 10–11, sometimes restricted.

COMPARISONS. *Scorpaena stephanica* belongs with the group of species with the pectoral-fin base and chest naked. The species resembles *S. scrofa* in coloration, but lacks the tentacles on the lower jaw as in *S. scrofa*. Also, the species somewhat resembles *S. angolensis* but is most easily separated from it by having separate pores at the symphysis of the lower jaw. It is probably most closely related to *S. elongata*.

DISTRIBUTION. The species is known from coastal waters from Mauritania to Angola in depths from about 25 to 110 fathoms.

REMARKS. The figures shown by Roux (1957, p. 368) leave little doubt that *S. gaillardac* is a junior synonym of *S. stephanica*.

### *Scorpaena elongata* Cadenat.

*Scorpaena elongata* CADENAT, 1945, pp. 552–554, fig. 9 (type locality Cape Blanc, Mauritania; 5 specimens from about 100 meters, good description). CADENAT, 1950, pp. 242–243, fig. 180 (compiled) p. 307 (listed). BOUTIERE, 1958, p. 12, and following, pls. 2–3 (coast of Morocco in about 200–300 meters; specimens from 12–46 cm. total length; good photographs; notes on biology). BOUTIERE, 1959, pp. 406–407 (Banyuls, France; first from Mediterranean). CERVIGON, 1960, p. 94 (common off Mauritania). MAURIN,

1962, pp. 193-4, 197, 205-6 (collections in Mediterranean; depths of capture). LOZANO CABO, 1963, pp. 335, 345 (listed; Spanish Sahara—Mauritania).

**MATERIAL EXAMINED.** IIP uncataloged (2, 159-210) coast of Mauritania at 22° N., in 180 meters; CAS no. 24278 (2, 217-219) and USNM no. 204095 (2, 145-240) Transect 8, station 6, 8°28' N., 14°21' W., in 100 meters, BBC 929; UMML no. 23308 (2, 224-255) Transect 2, station 7, 11°25' N., 17°21' W., in 200 meters, BBC 985.

**DESCRIPTION.** Counts and measurements summarized in tables 1-10; body shape and coloration in figure 10a.

A moderate to large species with no dark spot on the spinous dorsal fin, occipital pit present, chest and pectoral-fin base naked, ctenoid scales on sides, and pores at symphysis of lower jaw separate. Dorsal fin normally with 12 spines and 9 soft rays. Pectoral rays 18-20, usually 19, rays 2-8 to 12 branched in specimens over about 150 mm. standard length; compound branching in large specimens; pectoral fin usually not reaching over first anal spine. Gill rakers including rudiments 13-16 in available specimens, 4-5 plus 9-11. Pre-orbital bone usually with 2 spines over maxillary; sometimes a small spine at base of anterior spine. Suborbital ridge with 3 or 4 spinous points, anterior one (on preorbital) sometimes absent. Upper posttemporal spine present. Second preopercular spine normal. Other spines as for the genus. Vertebrae 24 (two specimens). Scales on sides ctenoid, vertical scale rows about 45-50. Most of head naked; pectoral-fin base and chest naked. Occipital pit fairly shallow. Interorbital area with 2 ridges which end at the front of the occipital pit. Pores at symphysis of lower jaw small and separate. Skin appendages fairly well developed. Supraocular tentacle small, large flap associated with posterior preorbital spine, large flap at fourth and fifth preopercular spines. Orbit diameter larger than snout in small specimens to smaller than snout in large specimens, ratio snout divided by orbit 0.9-1.3; orbit into head 3.9-4.4, larger specimens with higher values; interorbital width into orbit diameter 1.5-2.1.

Coloration as in figure 10a. Soft-dorsal, anal, caudal, and pectoral fins usually with faint large spots or blotches of brown. Sometimes posterior part of spinous dorsal fin with brownish pigment, but not in a conspicuous spot. Most of the head brownish. Pigment on body usually concentrated in several large brownish blotches along the sides.

A fairly large species, largest available 255 mm. in standard length. Boutiere (1958, p. 78) had specimens to 460 mm. total length.

**COMPARISONS.** *Scorpaena clongata* belongs with the group of species with the pectoral-fin base and chest naked, and with the group of species having the pores at the symphysis of the lower jaw separate. The species is probably closest to *S. stephanica* and *S. scrofa*; *S. clongata* differs from *S. scrofa* in lacking the cutaneous tabs on the lower jaw and differs from *S. stephanica* in

having no black spot on the spinous dorsal fin, a shorter pectoral fin, and higher average number of pectoral rays.

**DISTRIBUTION.** The species is known from the Mediterranean Sea (Boutiere, 1959, and Maurin, 1962), and is common off Morocco and Mauritania (Boutiere, 1958, and Cervigon, 1960). The southernmost capture appears to be the specimen examined from 8°28' N. Depths of capture range from about 55 to 225 fathoms. The species appears to be an offshore continental species living on soft bottom.

### *Scorpaena scrofa* Linnaeus.

(A partial synonymy pertinent to the scope of the study. References without information in parentheses were not seen. Many references to this species are probably based on mis-identifications or mixed collections.)

*Scorpaena scrofa* LINNAEUS, 1758, p. 266 (type locality Mediterranean Sea). VALENCIENNES, 1835, p. 20. VALENCIENNES, 1836, p. 461. LOWE, 1840, p. 36 (Madeira; comparisons with *S. ustulata*). LOWE, 1843, p. 105, pl. 16 (Madeira; description). BONAPARTE, 1846, p. 62 (synonymy; mostly compiled; wrongly includes *S. notata*). GÜNTHER, 1860, pp. 108-110 (synonymy; brief description; specimens in British Museum). TROSCIHEL, 1866, p. 206. STEINDACHNER, 1865, p. 400 (listed; Santa Cruz, Teneriffe). STEINDACHNER, 1867, pp. 75-77. CAPELLO, 1867, p. 257 (rare; Portugal). GÜNTHER, 1880, p. 3 (listed; St. Vincent, Cape Verde Islands). MOREAU, 1881, pp. 310-315, fig. 116 (synonymy; description; distribution; *S. lutea* in synonymy). ROCHEBRUNE, 1883, p. 85. MEEK AND NEWLAND, 1885, pp. 394, 398 (brief synonymy; description in key; specimens from Venice). ?DAY, 1887, p. 342 (specimen from south coast of England; range). HILGENDORF, 1888, p. 207. VINCIGUERRA, 1890, p. 467. DÖDERLEIN, 1891, pp. 276-278 (lengthy synonymy; common names; *S. lutea* as variety; distribution). CARUS, 1893, p. 639. VIEIRA, 1894, p. 10. NOBRE, 1895, p. 230. VIEIRA, 1898, p. 31. PIETSCHMANN, 1906, p. 142. HOLT AND BYRNE, 1908, pp. 26-28, fig. (description compiled; figure from Lowe; unknown from British and Irish waters). SEABRA, 1911, p. 150. MURRAY AND HJORT, 1912, p. 407, fig. 298 (Cape Blanco in 39-77 meters). ROULE, 1919, p. 59 (south-west of St. Lucia, Cape Verde, in 17 meters). KOEFORD, 1927, p. 130 (brief description; *Michael Sars* stations 37 and 38 in 39 and 77 meters). NOBRE, 1928, p. 44, figs. 21-22. BORODIN, 1930, p. 58 (listed; Naples). GREGORY, 1933, p. 325, fig. 203 (osteology; after Allis, 1909). NOBRE, 1935, pp. 100-102, figs. 41-42 (synonymy of records from Portugal; description; distribution off Portugal). ?NORMAN, 1935a, p. 614 (specimens off England [locality seems unlikely]). FOWLER, 1936, pp. 922-924 (synonymy; description mostly compiled). VERRIER AND ESCHIER-DESRIVIERES, 1937, p. 126, and following (vision). CADENAT, 1945, pp. 548-550, fig. 7 (good description; comparisons). SPARTA, 1941b, pp. 203-205 (description of eggs and larvae). ?IRVINE, 1947, p. 203 (brief description; Ghana). CADENAT, 1950, p. 243 (distinguishing features; Sénégal) p. 307 (listed). CADENAT, 1953, p. 1057 (listed; West Africa; 13 specimens from 100 meters) p. 1088, fig. 32 (characterization; figure not showing tentacles on lower jaw; [*S. scrofa* variety probably *S. stephanica*]). BEN-TUVIA, 1953, p. 28 (listed; Israel). COLLINS, 1954, p. 31 (listed; Azores). SMITH, 1957a, pp. 51-52 (*S. natalensis* in synonymy; description; compared with specimens from Madeira and the Mediterranean Sea; Ascension Island in error; specimens from Algoa Bay to Durban in 30-50 fathoms). BOUTIERE, 1958, p. 12, and following (Morocco; life history notes). MAURIN, 1962, p. 176, and following (collections in Mediterranean). LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara-Mauritania).

*Scorpaena barbata* (not of Grey), LACÉPÈDE, 1802, p. 259.

*Scorpaena lutea* RISSO, 1810, p. 190 (type locality Nice).

?*Scorpaena natalensis* REGAN, 1906, p. 5, pl. 5 (type locality coast of Natal, South Africa).

NOMENCLATORIAL REMARKS. Pre-Linnaean names and additional references to this species may be found in Döderlein, 1891.

I am following Smith (1957a, pp. 51–52) in including *S. natalensis* in the synonymy of *S. scrofa*. I have no specimens from off South Africa. Smith could find no differences between specimens from South Africa and ones from the Mediterranean Sea and Madeira. Pillsbury and Geronimo operations in the Gulf of Guinea took no specimens of *S. scrofa*, and the Guinean Trawling Survey took none east of 17°14' W., nor does Poll (1959) report capture of specimens off West Africa. Irvine's (1947, p. 203) record from Ghana is probably based on specimens of *S. angolensis*. There appears, therefore, to be an interruption in the distribution, the specimens collected between the Cape and Natal forming an isolated population worthy of more study. In the light of additional material, Smith's suggestion that *S. angolensis* Norman was based on juvenile specimens of *S. scrofa* is incorrect. Other references to *S. natalensis* are given by Smith.

MATERIAL EXAMINED. MEDITERRANEAN SEA: USNM no. 48302 (1, 135) and USNM no. 48306 (1, 96) Bay of Naples, collected by Seth E. Meek; USNM no. 124430 (1, 211) Italy, presumed; AMNH no. 2955 (1, 152) Italy, market at Naples; AMNH no. 20555 (1, about 190) Italy, Gulf of Genoa, E. Tortonese, 1956; ANSP no. 12164–12166 (3) and USNM no. 2231 (1, 192) Mediterranean, C. L. Bonaparte collection. MADEIRA: ANSP no. 95589 (1, 156) Funchal market. SÉNÉGAL—PORTUGUES GUINEA: USNM uncataloged (2, 135–145) 12°06' N., 17°14' W., in 100 meters, GTS I, Transect 1, station 6, BBC 995.

DESCRIPTION. Counts and measurements summarized in tables 1–10; body shape and coloration in figure 9b, c.

A moderate to large species with a dark spot frequently present on spinous dorsal fin, occipital pit present, chest and pectoral-fin base naked, ctenoid scales on sides, pores at symphysis of lower jaw separate, and tentacles present on lower jaw under head. Dorsal fin normally with 12 spines and 9 soft rays. Pectoral rays 18–20, usually 19, rays 2–7 to 12 branched in specimens over about 100 mm. in standard length (Boutiere, (1953, p. 72) gives 14 branched rays in 1 specimen); compound branching in larger specimens; pectoral fin usually falling short of first anal spine. Gill rakers 14–17 including rudiments, 4–5 on upper arch, 10–12 on lower arch. Preorbital bone with 3–4 spinous points over maxillary in adults, second (at base of first) sometimes absent (juveniles probably with only 2 spines over maxillary). Suborbital ridge with 2–4 spinous points, first (on preorbital) frequently absent, third frequently as lump. Upper posttemporal spine present. Second preopercular spine normal. Other spines as for the genus. Vertebrae 24 (two specimens). Scales on sides



ctenoid, vertical scale rows number in middle forties. Most of head naked, or with embedded cycloid scales; pectoral-fin base and chest naked. Occipital pit moderate. Interorbital area with 2 ridges which end at the bases of the tympanic spines. Pores at symphysis of lower jaw small and separate. Supraocular tentacle usually small or absent. Numerous tentacles present on lower jaw, large skin flap associated with posterior preorbital spine, and flaps on fourth and fifth preopercle spines. (The following based on 7 specimens 96–211 mm. standard length.) Orbit smaller than snout, ratio snout divided by orbit 1.2–1.4; orbit into head 4.4–5.1, larger specimens with higher values; interorbital width into orbit diameter 1.5–1.7.

Coloration variable. Dorsal, caudal, anal, and pectoral fins blotched or mottled with brown. Distal part of pelvic fin usually dusky. Head and body brownish; smaller specimens with brown pigment in 5 poorly defined saddle-shaped patches along dorsal fin (similar to *S. stephanica*). Dorsal fin with black spot frequently present between spines 6–11 (fig. 9b), but usually more restricted or absent (fig. 9c).

A fairly large species, largest available specimen 211 mm. in standard length. Boutiere (1958, p. 78) reports specimens to 490 mm. total length.

COMPARISONS. *Scorpaena scrofa* belongs with the group of species which have the chest and pectoral-fin base naked, and pores at the symphysis of the lower jaw separate. The species is compared with *S. elongata* and *S. stephanica* under the account of *S. elongata*. *Scorpaena scrofa*, among those with ctenoid scales, is unique in having tentacles on the lower jaw; *S. scrofa* also usually has more preorbital spines (4 normally) versus 3 (rarely 4) or fewer.

DISTRIBUTION. The species occurs from England [questionable], throughout the Mediterranean, at Madeira, Cape Verde Islands, Canaries, and off Morocco south to about Sénégal. One record from Ghana (Irvine, 1947) probably represents *S. angolensis*. The most southern capture appears to be the specimens taken by the Guinean Trawling Survey at 12°06' N. (see Nomenclatural remarks). Depths of capture range from near shore to about 150 meters. Boutiere (1958, pp. 58–59) reports the species to be common off Morocco in rock, sand, and coral areas.

REMARKS. Although other species are fairly constant in presence or absence of a dark spot on the spinous dorsal, *S. scrofa* is more variable in this character, often lacking the spot. This species is the only one of the group with a naked chest that has tentacles on the lower jaw. These tentacles were found in all specimens. Cadenat (1953, p. 1057) lists a variety of *S. scrofa* from 100 meters which is probably *S. stephanica*.

### *Scorpaena laevis* Troschel.

*Scorpaena laevis* TROSCHER, 1866, p. 206 (type locality Cape Verde Islands). GUIMARÃES, 1884, p. 18 (St. Jago, Cape Verde Islands). OSORIO, 1890, p. 278 (listed; Cape Verde

Islands). OSORIO, 1894, p. 182 (listed; São Tome). OSORIO, 1898, p. 196 (listed; Cape Verde and Angola). FOWLER, 1936, pp. 927, 1307 (compiled). IRVINE, 1947, p. 204 (brief description; Ghana). ROUX, 1957, pp. 224-225 (brief description; one caught in rocks at Point Noire). BLACHE, 1962, p. 74 (compiled). CADENAT AND MARCHAL, 1963, p. 1289 (placed *S. senegalensis* in synonymy of *S. laevis*).

*Scorpaena plumieri*, CAPELLO, 1871, p. 200 (specimens from Mossamedes, Cape Verde Islands, and São Tome). OSORIO, 1906, p. 157. FOWLER, 1936, pp. 924-925 (USNM specimens from Madeira and Azores; description from American specimens). COLLINS, 1954, p. 30 (compiled from Fowler; listed; Azores). LOZANO CABO, 1961, p. 149 (compiled). BLACHE, 1962, p. 74 (compiled; doubtful in eastern Atlantic).

?*Scorpaena grandicornis*, CAPELLO, 1871, p. 200 (São Tome). FOWLER, 1936, pp. 926-927 (in part; synonymy; description of *S. grandicornis* from Puerto Rican specimens). LOZANO CABO, 1961, p. 147 (compiled). BLACHE, 1962, p. 74 (compiled; doubtful in eastern Atlantic).

*Scorpaena senegalensis* STEINDACHNER, 1881, p. 21, pl. 4 (type locality Rufisque, Sénégal). ROCHEBRUNE, 1883, p. 63 (compiled). OSORIO, 1898, p. 196 (listed; São Tome). OSORIO, 1909, p. 65 (compiled). FOWLER, 1919, pp. 214-215 (description; comparisons; Porto Grande, Cape Verde Islands). FOWLER, 1936, pp. 925-926, 1307 (synonymy; description of specimens from the Cape Verde Islands). IRVINE, 1947, p. 204 (brief description; Ghana). CADENAT, 1950, p. 243, fig. 178 (brief description; length to 35 cm.; Sénégal). CERVIGON, 1960, p. 94, fig. 55 (Mauritania; from 19° N. and 19°30' N.; brief description; figure good). LOZANO CABO, 1961, p. 147 (compiled). BLACHE, 1962, p. 74 (compiled).

MATERIAL EXAMINED. ANNOBÓN ISLAND: UMML no. 22218 (3, 44-61) shore station, 1°24' S., 5°37' E., Pillsbury station 273; UMML no. 22217 (1, 200) purchased from local fisherman, Pillsbury station 276. FERNANDO PÓO: UMML no. 22836 (3, 28-50) shore station, 3°45' N., 8°48' E., Pillsbury station 258. COASTAL GULF OF GUINEA: USNM uncataloged (1, 208) Tema Nungua, Ghana, Gilbert W. Bane no. 882; USNM uncataloged (1, 177) Takorad, Ghana, Gilbert W. Bane no. 789; USNM uncataloged (2, 120-216) GTS 1, Transect 10, station 2, 7°33.5' N., 13°19' W., in 30 meters, BBC 906; USNM uncataloged (1, 197) GTS 1, Transect 13, station 3, 6°41' N., 11°23' W., in 40 meters, BBC 881. The following from GTS 1 have been sent to Gorée: Transect 31, station 2n (1, 145) 5°18' N., 0°24' W., in 36 meters. Transect 32, station 1.2 (1, 220) 5°40' N., 0°13' E., in 22 meters.

DESCRIPTION. Counts and measurements summarized in tables 1-10; body shape and coloration in figure 11a, b.

A moderate to large species with cycloid scales and chest and pectoral-fin base scaled. Dorsal fin normally with 12 spines and 9 soft rays. Pectoral rays 19-20, rarely 18, rays 2-5 branched in a 60-mm. specimen and rays 2-12 to 15 branched in 200-mm. specimens; compound branching in larger specimens; pectoral fin reaching to about first anal spine as maximum. Preorbital bone with 2 spines over maxillary in juveniles and 3 in adults; sometimes double spine gives count of 4. Suborbital ridge with 0 to several points on preorbital and usually 3 points on suborbitals. Upper posttemporal spine present. Second preopercular spine normal. Other spines as for the genus. Vertebrae 24 (six

specimens). All scales cycloid. Vertical scale rows about 40–45. Pectoral-fin base, cheek, and chest scaled, these scales mostly embedded. Occipital pit deep. Interorbital area wide and deep, with poorly developed ridges. Pores at symphysis of lower jaw separate. Supraocular tentacle variable, some specimens with tentacle longer than orbit diameter; other tentacles also variable but usually well developed; tentacles are usually present under the head at the isthmus area and on the lower jaw. Orbit about equal to or smaller than the snout, ratio snout divided by orbit 1.0–1.3; orbit into head 4.1 (smaller specimens) to 5.2; interorbital width into orbit diameter 1.1–1.4.

Coloration variable, adults and juveniles differing markedly. Pigmentation of juveniles as in figure 11b. In juveniles, the axil of the pectoral fin is dark brown to black with some white specks or blotches (the *S. plumieri* pattern, see "Comparisons"). The brown blotches form on the inside of the pectoral fin at about 50 or 60 mm. standard length. Adults have the inside of the pectoral fin with large brown spots. The pigment on the body as shown in figure 11b is typical for specimens from about 40–80 mm., with the caudal peduncle being palest. (Smaller specimens possibly are almost entirely dark except for the white caudal peduncle as in *S. plumieri*.) Larger specimens are variable in coloration and this is largely related to habitat; they may be mostly pallid, (fig. 11a) as the Annobón specimen, to mainly brown as those from coastal areas. The dorsal fin is variously mottled with brown, sometimes a black spot is present at about the sixth to eighth dorsal spines.

COMPARISONS. *Scorpaena laevis* appears to have no close relative in the eastern Atlantic but is very closely related to *S. plumieri* from Ascension, St. Helena, the western Atlantic, and eastern Pacific. The coloration of juveniles is similar and no doubt led to the misidentification by Capello (1871) of eastern Atlantic specimens. The pigmentation of the body of adults is similar and shows about the same variation in intensity as related to habitat. As in *S. plumieri*, *S. laevis* appears to be common in rocky island areas and also occurs offshore in level-bottom coastal areas. One major difference exists between the two species, the pigmentation of the pectoral fin of adults (see Cadenat and Marchal, 1963, figs. 37–38). *Scorpaena plumieri* has the axil and lower inside of the pectoral fin black with large white spots or blotches, while adult specimens of *S. laevis* have the inside of the pectoral fin with large brown spots on a pallid background. It is assumed that the behavior involving the rolling forward of the pectoral fins, displaying the vivid coloration on the inside of the pectoral, is of much biological importance. This type of display has been shown for *S. plumieri* by Breder (1963, pp. 698–699, figs. 1–2). Compared to western Atlantic specimens of *S. plumieri* (Eschmeyer, 1965, tables 3–13), *S. laevis* is similar to *S. plumieri* in most measurements but appears to average shorter in some measurements associated with the head (jaw, predorsal, etc.). In a world treatment, subgeneric consideration should be given to the group of

species, including *S. plumieri* and *S. laevis*, which have high-set orbits, wide interorbitals, and the characteristic pit in front of the eye formed by an ascending process from the preorbital attaching to the prefrontal. The genus *Scorpaenopsis*, differing from *Scorpaena* in having no palatine teeth, appears superficially to be closely related to the *S. plumieri* group.

**DISTRIBUTION.** *Scorpaena laevis* is known from the Azores, Madeira, Cape Verde Islands, Mauritania, Sénégal, and the Gulf of Guinea south to Point Noire. It appears to be common about the islands of São Tome, Annobón, and Fernando Póo in the Gulf of Guinea. The species is unknown from the Mediterranean. The most common habitat appears to be rocky areas in shallow water, but the species was collected fairly regularly in the Gulf of Guinea in offshore level-bottom areas in depths to about 25 fathoms. Boutiere (1958) reported no captures off Morocco.

### *Scorpaena loppei* Cadenat.

*Scorpaena loppei* CADENAT, 1945, pp. 541-543, fig. 3 (type locality Gulf of Gascogne, in 200 meters; good description based on 33 specimens, 5 from off Rio de Oro). BOUTIERE, 1958, p. 12 and following (coast of Morocco in 80-100 meters; life-history notes). BOUTIERE, 1959, pp. 405-407 (region of Banyals, Mediterranean, in 70-120 meters).

**MATERIAL EXAMINED.** USNM no. 201148 (1, 55) Mediterranean, Bay of Naples, collected by S. E. Meek; ANSP no. 12177 (1, 59) Mediterranean, C. L. Bonaparte no. 89, J. B. Wilson.

**DESCRIPTION.** Counts and measurements summarized in tables 1-10. Crest on maxillary shown in figure 2e; body shape and coloration in figure 7c. (Information from Boutiere, 1958, is included.)

A small species with a dark spot on the spinous dorsal fin, occipital pit present, chest and pectoral-fin base naked, ctenoid scales on the side, pores at symphysis of lower jaw united, and a characteristic crest on the maxillary. Dorsal fin normally with 12 spines and 9 soft rays (last double). Pectoral fin with 18 rays (one specimen with 17 on 1 side, occasional specimens with 17 or 19 expected), rays 2 through 7-9 branched in larger specimens. Gill rakers including rudiments 14-16 in available specimens, 5 on upper arch, 9-11 on lower arch (Boutiere [p. 74] gives 7 or 8 on lower arch, not including rudiments). Preorbital bone with 2 spines over maxillary, first is very blunt, second is long and curved to rear (Cadenat, 1945, p. 543, states that there is only 1 preorbital spine; this undoubtedly refers to the posterior one). Suborbital ridge with 4 spinous points, first on preorbital. Upper posttemporal spine present. Second preopercular spine normal. Other spines as for the genus. Vertebrae 24 (one specimen). Scales on sides weakly ctenoid; vertical scale rows about 35-40. Chest, pectoral-fin base, and head naked. Occipital pit present. Interorbital area with 2 ridges. Pores at symphysis of lower jaw united. Tentacles on head and body moderate to poorly developed. Length of supraocular tentacle less than

orbit diameter. The following based on 2 specimens, 55–59 mm. in standard length: orbit slightly larger than snout, ratio snout divided by orbit 0.8–0.85; orbit into head 3.4–3.6; interorbital width into orbit diameter 1.9–2.1.

Available specimens much faded. Trace of dark spot on spinous dorsal fin between about spines 6–10, at distal half of fin. Dark pigment on body more concentrated in patches below spinous dorsal fin, between soft dorsal fin and anal fin, and on the posterior part of the caudal peduncle. Fins with traces of dusky pigment.

COMPARISONS. This species is characterized by the presence of a crest on the maxillary (fig. 2e). The species appears to be closely related to *S. annobonae* from Annobon Island, but *S. annobonae* lacks the crest on the maxillary. *Scorpaena annobonae* may also differ by normally having 10 rather than 9 soft dorsal rays (last ray double). These two species, plus *S. azorica* and *S. angolensis*, agree in having the pores at the symphysis of the lower jaw united.

DISTRIBUTION. The species was described from specimens collected in the Gulf of Gascogne in the Bay of Biscay and from specimens collected off the Spanish Sahara (Rio de Oro), both collections from about 200 meters. Boutiere (1958) reported eight specimens from off Morocco in about 100 meters, and in 1959 reported the species from the region of Banyuls in the Mediterranean at a depth of 120 meters. Of the two specimens I have examined from the Mediterranean, one extends the range to the Bay of Naples.

### *Scorpaena annobonae* Eschmeyer, new species.

(No literature applies to this species with the possible exception of the specimen from the Island of Principe identified as *S. angolensis* by Cadenat (1945, p. 547).)

MATERIAL EXAMINED. Holotype: UMML no. 22219 (1, 44) Annobon Island, 1°24' N., 5°38' E., in 5–26 fathoms, dredge, Pillsbury station 275 (haul 2).

DESCRIPTION. Counts and measurements summarized in tables 1–10; body shape and coloration in figure 8c.

Only a single small specimen known. A dark spot on the spinous dorsal fin, occipital pit present, chest and pectoral-fin base naked, ctenoid scales on the sides, and pores at symphysis of lower jaw united. Dorsal fin with 12 spines and 10 soft rays (last split). Pectoral fin with 18 rays, rays 2–7 branched, compound branching of some rays; pectoral fin long, reaching to over third anal spine. Gill rakers short, 5 + 9 including rudiments. First preorbital spine truncated, second longer and curved to rear. Suborbital ridge with 3 spines, only ridges on preorbital bone. Upper posttemporal spine present. Second preopercular spine normal. Other spines as for the genus. Vertebrae 24. Scales on sides weakly ctenoid, about 36–38 vertical scale rows. Chest, pectoral-fin base, and head naked. Interorbital area with 2 poorly developed ridges. Pores at symphysis of lower jaw united into one very large pore. Tentacles on head and body moderate; supraocular tentacle about two-thirds to about equal to orbit

diameter; other skin appendages at preocular spine, posterior preorbital spine, under suborbital ridge, at anterior nostril, on eye, lower preopercular spines, on a few scales behind the head, and on some lateral-line scales. Orbit about equal to snout, ratio snout divided by orbit 0.97; head divided by orbit 3.6; orbit diameter divided by interorbital width 2.3. Measurements not included in tables 3-9 in percent of standard length: length third dorsal spine 18, eleventh 8.4, twelfth 15; length first anal spine 10, second 21, third 17; length pectoral fin 36; length pelvic fin 29; length caudal fin 33.

Coloration as in figure 8c. Spot on spinous dorsal fin between spines 7 and 9.

COMPARISONS. Like *Scorpaena loppei*, *S. azorica*, and *S. angolensis*, *S. annobonae* has the two pores at the symphysis of the lower jaw united. The species differs from *S. azorica* and *S. angolensis* in body shape, particularly in having a longer head and deeper body. It is possible that *S. annobonae* will normally have 10 soft dorsal rays rather than 9 as in the other three species. *Scorpaena annobonae* appears closest to *S. loppei* in spination, but differs in lacking the crest on the maxillary. Based on the presence of five branched pectoral rays at 44 mm. standard length, *S. annobonae* is a very small species probably not exceeding 100 mm. standard length.

DISTRIBUTION. Known definitely only from the holotype from Annobón Island in the Gulf of Guinea in 5-26 fathoms.

REMARKS. Cadenat (1945, p. 547), under the account of *S. angolensis*, listed one specimen from Principe which possibly is a specimen of the new species. He states that it has the deepest body of his specimens. There is little else in his account, however, that would suggest *S. annobonae*.

The mouth is open wide in the holotype; this affects some measurements slightly. The truncated anterior preorbital spine may not be the usual condition.

ETYMOLOGY. The name is based on the type locality.

### *Scorpaena maderensis* Valenciennes.

(A partial synonymy pertinent to the scope of the study. References without information in parentheses were not seen; some references to this species are probably based on misidentifications or mixed collections.)

*Scorpaena maderensis* VALENCIENNES, in Cuvier and Valenciennes, 1833, p. 463-465 (type locality Madeira). NORMAN, 1935b, p. 31 (synonymy; *S. rubellio* correctly included; good description from specimens of 62-140 mm. total length in British Museum). TORCHIO, 1962b, pp. 141-144, figs. 1-2 (two from Straits of Messina in 15 fathoms; figures good).

*Sebastes maderensis*, LOWE, 1840, p. 36 (mentioned). LOWE, 1843, pp. 177-182, pl. 25 (described as "new species" but with *Scorpaena maderensis* in synonymy; description; habitat; life-history notes; Madeira). GÜNTHER, 1860, p. 102 (brief description; specimens in British Museum from Madeira). STEINDACHNER, 1867, pp. 71-73. CAPELLO, 1867: 256 (rare; Portugal). VINCIGUERRA, 1883, pp. 611-612 (Madeira and Salvage Is.). CARUS, 1893, p. 639. COLLETT, 1896, p. 15. COLLETT, 1897, pp. 4-5 (mostly compiled distribution). ROULE, 1907, pp. vi, xvi. JAQUET, 1907, p. 2, and following (comparisons;

scales, suborbital bones, otoliths, and teeth figured; Nice). SEABRA, 1911, p. 150. CLINGNY, 1912, p. 73. FAGE, 1918, p. 102. NOBRE, 1935, pp. 98-100 (mostly compiled; *Scorpaena maderensis* Valenciennes in synonymy; synonymy; Portugal).

*Scorpaena rubellio* JORDAN AND GUNN, 1898, pp. 344-345 (type locality Canary Islands).

*Scorpaena maderensis*, CADENAT, 1945, pp. 558-561, fig. 11 (good description; specimen; from Cape Verde Islands; figure good).

**NOMENCLATURE REMARKS.** Considerable confusion existed in the early literature over the use of the names "*maderensis*" and "*madurensis*." Valenciennes first described this species as *Scorpaena maderensis* (misspelling the species name). Lowe subsequently described the species as a "new species" under the name *Sebastes maderensis*, with *Scorpaena maderensis* of Valenciennes in synonymy. Most earlier authors wrongly credited the species to Lowe. Subsequently, Goode and Bean (1896) described a new species from Madeira as *Helicolenus maderensis*, which Fowler (1936, p. 917) wrongly attributed to Valenciennes under the name "*madurensis*." Since *Helicolenus maderensis* Goode and Bean is a junior synonym of *H. dactylopterus*, the use of the emended spelling for Valenciennes' "*madurensis*" (hence "*maderensis*") for the present species of the genus *Scorpaena* causes little confusion. The description by Lowe as *Sebastes maderensis* was merely a redescription as a new combination and with emended spelling.

**MATERIAL EXAMINED.** AZORES: USNM no. 94484 (4, about 92-100, poor condition) Terceira, collector Trelease. MADEIRA: USNM no. 94513 (1, 96) de Noronha. MEDITERRANEAN: USNM no. 196334 (6, 41-88) Beirut, Lebanon, A.U.B. Beach, H. H. Shoemaker and class, 10 October 1959, tide pool.

**DESCRIPTION.** Counts and measurements summarized in tables 1-10; body shape and coloration in figure 10c.

A fairly small species with no conspicuous dark spot on the spinous dorsal fin, no occipital pit, chest and pectoral-fin base scaled, slightly ctenoid scales on sides, and pores at symphysis of lower jaw separate. Dorsal fin normally with 12 spines and 9 soft rays (last double). Pectoral rays 15-16 (one with 17 on one side), rays 3 to 5 or 6 usually branched in larger specimens; no compound branching in available specimens; pectoral fin not reaching first anal spine in available material. Gill rakers including rudiments 15-18, usually 16-17; usually 5 on upper arch. Preorbital bone with two large spines over maxillary, the first pointing forward, the second to rear. Lateral surface of preorbital bone with a strongly developed ridge ending in a knob anteriorly (one specimen with ridge interrupted at middle and ending in a spine posteriorly). Suborbitals with 2 spinous points, one behind eye at end of long ridge, followed by second at end of short ridge just in front of preopercle. Upper posttemporal spine present. First preopercular spine short, second more slender than third. Cleithrum with 2 spines. Other spines as for the genus. Vertebrae 24 (six specimens). Scales on sides weakly ctenoid, vertical scale rows about 52-56; lateral-line scales

usually 25 + 2. Chest and pectoral-fin base with mostly cycloid scales, those on chest mostly embedded; most of head naked. Occipital pit absent. Two ridges on posterior part of interorbital area. Pores at symphysis of lower jaw separate and small. Skin appendages poorly developed; supraocular tentacle short, less than  $\frac{1}{2}$  orbit diameter; a few tentacles on lower preopercular spines, on eye, on some lateral-line scales, and on some body scales along sides, the ones on body often white in color. Orbit diameter about equal to snout, ratio snout divided by orbit 0.9–1.1; orbit into head 3.5–4.0; interorbital width into orbit diameter 2.1–2.6.

Coloration of a small specimen in figure 10c. Color variable; most conspicuous feature the small white specks in pectoral-fin axil and on body near pectoral fin. Dorsal fin blotched with brown, no dark spot. Pectoral fin with elongate dark spots, most pigment confined to rays. Pelvic fins spotted to faintly dusky. Soft dorsal fin with brown blotches or spots, more concentrated on anterior portion. Anterior part of caudal peduncle pale, followed by dark which runs on to caudal fin, this dark area usually in two large dark bars joined at center. A large, wide vertical bar across caudal fin at center formed by elongate spots on caudal rays; this vertical bar usually followed by paler spots near distal end of fin. Head and body dark with some pale areas, brown pigment more concentrated between soft dorsal fin and anal fin. Head brown, mottled with white. Anal fin with some brown pigment at base, at middle of fin, and a few brown spots near distal end of fin.

A fairly small species, probably not exceeding 150 mm. in standard length; largest available specimen 100 mm.; Norman (1935a) had specimens to 140 mm. total length.

COMPARISONS. *Scorpaena maderensis*, *S. canariensis*, and *S. normani* are the only species of *Scorpaena* in the eastern Atlantic which lack an occipital pit. *Scorpaena normani* has the chest and pectoral base naked, while *S. maderensis* and *S. canariensis* are the only two of the group of species of *Scorpaena* with ctenoid scales on the sides which have the chest scaled. *Scorpaena canariensis* is apparently still known only from the type; but was redescribed well by Cadenat (1945, pp. 556–558). Cadenat distinguished *S. maderensis* and *S. canariensis* on several characters, most notably the two preorbital spines in *S. canariensis* both point forward, while the posterior spine in *S. maderensis* points sharply to the rear; also, *S. maderensis* has two cleithral spines on each side while *S. canariensis* has one. Two western Atlantic species (*S. calcarata* and *S. inermis*) also lack an occipital pit, but from the shape of the interorbital bone and other features they do not seem particularly closely related to *S. canariensis* and *S. maderensis* or *S. normani*.

DISTRIBUTION. *Scorpaena maderensis* is known from several localities in the Mediterranean Sea, and from the Azores, Madeira, Cape Verde Islands, and Canary Islands. It is an inshore species.



**Scorpaena canariensis** (Sauvage).

*Sebastes (Sebastichthys) canariensis* SAUVAGE, 1878, p. 117, pl. 1, figs. 1-2 (type locality Canary Islands).

*Pontinus canariensis*, GOODE AND BEAN, 1896, p. 255 (compiled description).

*Scorpaena canariensis*, CADENAT, 1945, pp. 556-558, fig. 10 (redescribed from type).

REMARKS. This species is apparently still known only from the holotype. The type was redescribed by Cadenat (1945). *Scorpaena canariensis* is distinguished from the other two eastern Atlantic species lacking an occipital pit in the key and under the account of *S. maderensis*. Counts and some measurements from Cadenat (1945) are entered in the tables.

**Scorpaena mellissii** Günther.

*Scorpaena mellissii* GÜNTHER, 1868, p. 225, pl. 19 (type locality Saint Helena). MELLISS, 1875, pp. 104-105, pl. 19, fig. 6 (Saint Helena; common name Sand or Deepwater Gurnard; not considered good as food; figure poor). CLARK, 1913, p. 53 (Saint Helena; one of 285 mm. total length).

*Scorpaena laevis* (not of Troschel), FOWLER, 1936, p. 927 (wrongly included *S. mellissii* in synonymy; description of *S. mellissii* from Günther).

*Scorpaena mellissi*, CADENAT AND MARCHAL, 1963, pp. 1288-1289 (distinguished from *S. laevis*) p. 1305 (listed).

MATERIAL EXAMINED. BMNH no. 1867.10.8.6 (1, 202, type of *S. mellissii*) Saint Helena, collected by Melliss.

DESCRIPTION (Based on the type). Counts and some measurements in tables 1-10.

A fairly large species with small cycloid scales, occipital pit present, and chest and pectoral-fin base scaled.

Dorsal fin with 12 spines and 9 soft rays. Pectoral rays 20, rays 2-12 or 13 branched; pectoral fin reaching to over anal fin. Gill rakers at least 15 on side counted, 5 on upper arch, 10 on lower arch but with an abnormal space between some rakers. Preorbital bone with 3 spines over maxillary, middle one nearer first. Suborbital ridge with 2 or 1 indistinct spinous points and many ridges (much variability expected). Upper posttemporal spine present. Other spines as for the genus. Scales small and cycloid; vertical scale rows about 68 or 70; lateral-line scales 25 + 2. Chest and pectoral-fin base scaled. Occipital pit moderate.

Günther gives the color as follows (see also his plate 19): body nearly uniformly brownish gray; head with numerous brown dots; and dorsal, caudal, and pectoral rays accomplished by series of small brown spots. (The small brown spots which occur along the sides of the rays of these fins are still visible, but the body coloration has mostly faded.)

COMPARISONS. This species appears to have no close relative in the eastern Atlantic and shows closer ties with western Atlantic species, all of which have cycloid scales and the chest and pectoral-fin base scaled. At the same time,

there is no western Atlantic species which appears particularly closely related.

DISTRIBUTION. Known only from Saint Helena.

*Scorpaena azorica* Eschmeyer, new species.

MATERIAL EXAMINED. Holotype: USNM no. 94463 (1, 98) Terceira, Azores, collected by William Trelease, 1894.

DESCRIPTION. Counts and some measurements summarized in tables 1-10; body shape and coloration in figure 8a.

A species with no black spot on the spinous dorsal, occipital pit present, chest and pectoral-fin base naked, ctenoid scales on the sides, and pores at the symphysis of the lower jaw united. Dorsal fin with 12 spines and 9 soft rays (last double). Pectoral fin with 18 rays, rays 2-7 branched; compound branching of some pectoral rays; pectoral fin reaching to about over the first anal spine. Gill rakers including rudiments 15-16, all fairly short; 5 on upper arch, 8 on ceratobranchial and 2-3 on hypobranchial. Preorbital bone with 4 (5) spines over maxillary, first points forward, two smaller spines on plane with first, posterior spine larger and pointing down and slightly to rear (this spine double on right side). Suborbital ridge with 3 spines, none on preorbital, first below center of eye, second at end of ridge which passes above first spine, third between second suborbital spine and supplemental preopercular spine. Upper posttemporal spine present. Other spines as for the genus (pteric spine and upper posttemporal spine double on right side). Interorbital ridges present, diverging anteriorly and posteriorly. Vertebrae 24. Scales on sides ctenoid, vertical scale rows about 44; lateral-line scales about 23 + 1. Chest, pectoral-fin base, and head naked. Occipital pit well developed. A single large pore at the symphysis of the lower jaw. Skin appendages poorly developed; supraocular tentacle short, less than  $\frac{1}{2}$  orbit diameter; no skin flaps on lower jaw. Orbit diameter about equal to snout, ratio snout divided by orbit 0.9; orbit into head 3.6; interorbital width into orbit diameter 1.9. Additional measurements (see tables 3-9) in percentage of standard length; pectoral fin 33, pelvic fin 29, both reaching to about first anal spine; third dorsal spine 17 (broken slightly at tip), eleventh 10, twelfth 14; length first anal spine 11, second 20, third 18, second and third anal spines ending at about the same point when depressed.

Coloration as in figure 8a. All fins spotted with brown; caudal fin with numerous scattered brown spots, pigment mostly confined to membranes. Some brown spots on head on lighter brown background. An indication of brown spots on sides and in pectoral axil. Pigment on body appears slightly darker between soft dorsal fin and anal fin.

COMPARISONS. Only one specimen in fairly soft condition is available, but the characters which distinguish the species are clear-cut. The new species falls in the group of species which have the pores at the symphysis of the lower jaw united into a single large pore. It also belongs with those having ctenoid scales

on the body, and with the chest, pectoral-fin base, and most of the head naked. Of the species, *S. loppci*, *S. annobonae*, *S. angolensis*, and *S. azorica*, which have the single pore, *S. loppci* has a unique crest on the maxillary. The other two species can be easily separated from *S. azorica* on the basis of coloration.

DISTRIBUTION. Known only from the holotype collected in the Azores.

ETYMOLOGY. The name is based on the type locality.

### *Scorpaena notata* Rafinesque.

(A partial synonymy pertinent to the scope of the study. References without information in parentheses were not seen. Some references to this species are probably based on misidentifications or mixed collections.)

*Scorpaena notata* RAFINESQUE, 1810, p. 33 (type locality Sicily; poor description). FOWLER, 1936, pp. 920-922 (treated as senior synonym of *S. ustulata* Lowe). COLLINS, 1954, p. 30 (*S. ustulata* in synonymy; listed; Azores). MAURIN, 1962, p. 176, and following (collections in Mediterranean Sea). LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara—Mauritania).

*Scorpaena ustulata* LOWE, 1840, p. 36 (type locality Madeira). GÜNTHER, 1860, pp. 110-112 (description mostly from Lowe's notes). ROCHEBRUNE, 1883, p. 63. BELLOTTI, 1888, p. 213, pl. 4a, fig. 1. BELLOTTI, 1891, p. 118. DODERLEIN, 1891, pp. 282-283 (description; synonymy; *S. notata* included in synonymy; comparisons; distribution). COLLETT, 1896, p. 10, pl. 4, fig. 15 (Strait of Pico-fayal, Azores). PELLEGRIN, 1905, p. 138 (listed). PELLEGRIN, 1906, p. 44 (Cape Blanc and Nouakchott). PIETSCHMANN, 1906, pp. 142-143 (mostly compiled). PELLEGRIN, 1907, p. 95. MURRAY AND HJORT, 1912, p. 408 (off Cape Blanco, 39-214 meters). PELLEGRIN, 1913, p. 117 (listed; Mauritania). PELLEGRIN, 1914, p. 81. ?VAILLANT *in* Roule, 1919, p. 133 (37°57' N., 29°15' W., in 200 meters). FOWLER, 1923, p. 34 (listed; Funchal, Madeira). CHABANAUD AND MONOD, 1926, p. 285 (Cape Blanco; compiled). SPARTA, 1941b, pp. 205-206 (description of eggs and larvae). CADENAT, 1945, pp. 545-546, fig. 5 (*S. teneriffae* in synonymy; description). ?BEN-TUVIA, 1953, p. 28 (Israel; one specimen of 88 mm.; found in 120 fathoms). COLLIGNON AND ALONCLE, 1960, p. 25 (food).

?*Scorpaena barbata* (Gronovius) GRAY, 1854, p. 116 (type in Gronovius collection, BMNH 1853.11.12.8 [Wheeler (1958, p. 237) treated this as *Scorpaena* sp., pectoral rays 17, not *S. scrofa*]).

*Scorpaena teneriffae* JORDAN AND GUNN, 1898, p. 345 (type locality Canary Islands).

MATERIAL EXAMINED. MEDITERRANEAN SEA: UMML no. 22840 (1, 49) Spain, near Algeciras, rocky point near S. end of Getares Beach in 0-8 feet, WAS-MED-1; UMML no. 8508 (1, 49) Spain, about ½ miles S. of Getares Beach near Algeciras, in 2-10 feet, WAS-MED-3; UMML uncataloged (1, 50) Spain, WAS-MED-11, data lost; USNM no. 48299 (1, 111), USNM no. 48305 (1, 100), USNM no. 48301 (1, 115), USNM no. 48303 (1, 110), USNM no. 48300 (2, 95-111), USNM no. 48304 (1, 83), and USNM no. 18344 (1, 62) Bay of Naples, collected by Seth E. Meek; ANSP no. 12162 (1) and USNM no. 40051 (1) Messina, Italy; ANSP no. 12167-76 (10) Mediterranean, C. L. Bonaparte no. 89, J. B. Wilson; AMNH no. 1699 (1) Max Collection; AMNH no. 1668 (2) Mediterranean. MADEIRA: ANSP no. 86850 (1, 135) Funchal market.

DESCRIPTION. Counts and measurements summarized in tables 1-10; body shape and coloration in figure 7a, b.

A moderate-sized species with a black spot on the spinous dorsal fin, occipital pit present, chest and pectoral-fin base naked, ctenoid scales on the sides, and pores at symphysis of lower jaw separate but close together. Dorsal fin normally with 12 spines and 9 soft rays (last split). Pectoral fin with 17-19 rays, usually 18; rays 2 to 7-8 branched in specimens over about 80 mm. in standard length; compound branching of some rays; pectoral fin reaching to about over first anal spine. Gill rakers including rudiments 15-18; 4-6, usually 5, on upper arch; 8-9 on ceratobranchial, and 2-3 on hypobranchial. Preorbital bone usually with 3 spines over maxillary (probably only 2 in very small specimens), middle one small and at base of first; posterior spine points down and slightly back. Lateral surface of preorbital bone with 1 or (usually) 2 ridges. Suborbital ridge with 3 spinous points, first below eye, second at end of ridge which runs under eye, third before supplemental preopercular spine. Upper posttemporal spine present. Preopercular spines well developed. Other spines as for the genus. Vertebrae 24 (four specimens). Scales on body ctenoid; vertical scale rows about 43-46; lateral-line scales usually 23 + 1. Chest, pectoral-fin base, and head naked. Occipital pit present. Interorbital ridges present, ending at occipital pit. Pores at symphysis of lower jaw separate but close together, about 1 pore diameter or less apart. Skin appendages moderately developed; supraocular tentacle short, less than  $\frac{1}{2}$  orbit diameter, and usually branched distally; small skin flaps associated with preorbital, parietal, preocular, and preopercular spines, on eye, below suborbital ridge, on snout above maxillary, and on some lateral-line scales; nasal flap large. Orbit diameter slightly larger than snout length, ratio snout divided by orbit 0.8-0.9; orbit into head 3.2-3.7; interorbital width into orbit diameter 2.0-2.8.

Coloration of preserved specimens (fig. 7a, b) brown on tan or pallid background. A large black spot at about midheight of spinous dorsal fin between about spines 6-8 to 10-11. Other fins mottled, blotched, or spotted with dark brown. Anal fin often with brown pigment more concentrated in vertical bar at about middle of fin. Sides brownish, darkest between soft dorsal fin and anal fin, followed by pale caudal peduncle. Head brownish with darker brown blotches.

A moderate-sized species, largest available specimen 135 mm. in standard length. Boutiere (1958, p. 78) had specimens to 200 mm. total length, or about 150 mm. standard length.

COMPARISONS. *Scorpaena notata* belongs with the group of species having the pectoral-fin base and chest naked. In most measurements and counts *S. notata* seems fairly close to the group of species having the pores at the symphysis of the lower jaw united, and in *S. notata* the pores are close together.

**DISTRIBUTION.** The species occurs in the Mediterranean Sea and adjacent parts of the Atlantic. It has been reported from Madeira, the Azores, and Cape Verde Islands. The southern limit of distribution appears to be about Sénégal. Boutiere (1958, pp. 57-58) reported the species as common in rocky littoral habitats off Morocco. It occurs commonly with *S. porcus*.

### *Scorpaena porcus* Linnaeus.

(A partial synonymy pertinent to the scope of the study. References without information in parentheses were not seen. Many references to this species are probably based on mis-identifications or mixed collections.)

*Scorpaena porcus* LINNAEUS, 1758, p. 226 (type locality Mediterranean Sea and Atlantic Ocean). RISSO, 1810, pp. 187-188 (description; [varieties may refer to *S. notata* and *S. maderensis*]). RISSO, 1826, p. 370 (compiled). CUVIER in Cuvier and Valenciennes, 1829, p. 330. VALENCIENNES, 1835, p. 20. VALENCIENNES, 1836, p. 462. DEKAY, 1842, p. 58 (compiled). BONAPARTE, 1846, p. 62 (listed). GÜNTHER, 1860, pp. 107-108 (synonymy; brief description; specimens in British Museum). STEINDACHNER, 1865, p. 400 (Santa Cruz and Tenerife, Canary Islands). CAPELLO, 1867, p. 256 (compiled). STEINDACHNER, 1867, p. 676. BEAN, 1879, p. 23 (specimens from eastern Atlantic in United States National Museum). MOREAU, 1881, pp. 315-316 (description; synonymy). JORDAN AND GILBERT, 1882, p. 681 (compiled). VINCIGUERRA, 1883, p. 611 (one from Canary Islands). MEEK AND NEWLAND, 1885, pp. 394-395, 398-399 (description in key; specimens from Venice; brief synonymy). VINCIGUERRA, 1890, p. 478. DODERLEIN, 1891, pp. 279-281 (description; lengthy synonymy). VINCIGUERRA, 1893, p. 313. CARUS, 1893, p. 640. NOBRE, 1895, p. 230. PIETSCHMANN, 1906, p. 142 (brief description). SEABRA, 1911, p. 150. ROULE, 1919, p. 59 (one small specimen from the Azores in 20 meters). TUMA, 1926, pp. 484-485, 1 pl. NOBRE, 1928, p. 45. BORODIN, 1934, p. 117 (listed Mediterranean specimens). ?NORMAN, 1935a, p. 613 (specimen from off England [locality seems unlikely]). NOBRE, 1935, p. 102 (Portugal; *S. ustulata* wrongly included). FOWLER, 1936, pp. 919-920 (synonymy; description from Mediterranean specimens). FORTUNATOVA, 1940, pp. 242-247 (food and feeding). SPARTA, 1941a, pp. 109-115 (reproduction; descriptions of eggs and larvae). ANDRIASHEV, 1944a, pp. 56-60 (mode of feeding). ANDRIASHEV, 1944b, p. 323, and following (structure and function of pharyngeal apparatus). CADENAT, 1945, pp. 543-545, fig. 4 (description; *S. porcus* from New York in error). VINOGRADOV, 1948, pp. 705-707 (moulting). BEN-TUVIA, 1953, p. 28 (Israel). COLLINS, 1954, p. 30 (listed; Azores). COLLIGNON AND ALONCLE, 1960, pp. 24-25 (food). BEN-TUVIA, 1962, p. 143 (one from stomach of *Thunnus thynnus* caught off Cyprus).  
 ?*Cottus massiliensis* FORSKAL, 1775, p. 24 (no type locality; description poor).  
 ?*Scorpaena fasciata* COSTA, 1850, p. 3, pl. 4.

**MATERIAL EXAMINED.** ANSP no. 12131-62 (32 specimens) Mediterranean Sea, C. L. Bonaparte no. 88, J. B. Wilson, no other data. BLACK SEA: ANSP no. 100028 (1) Rumania, at Sulina. LEBANON: USNM no. 201147 (1, 58) Beirut, A.U.B. Beach, in tide pool, H. H. Shoemaker and class. ITALY: USNM no. 48298 (3, 39-40) Bay of Naples, Seth E. Meek; AMNH no. 1853 (2) Naples. MAJORCA: AMNH no. 9163 (1) and AMNH no. 9164 (1) Alcudia Bay, R. C. Murphy. SPAIN: USNM no. 10181 (2, about 115-139) Gibraltar, Vienna Museum; UMML no. 8509 (1, 97) near Algeciras, about ½ mile S. of Getares Beach, in 2-10 feet; UMML no. 22841 (1, 101) Santa Pola, in 2-8

feet; UMMML uncataloged (3, 40-70), (1, 102), (1, 93), and (2, 41-97) all collected by Walter Starck off Spain, data lost.

DESCRIPTION. Counts and measurements summarized in tables 1-10; body shape and coloration in figure 9a.

A moderate-sized species with no conspicuous black spot on the spinous dorsal fin (except some juveniles), an occipital pit present, chest and pectoral-fin base naked, small emarginate scales on sides, and pores at symphysis of lower jaw tiny and separate. Dorsal fin normally with 12 spines and 9 soft rays (last double). Pectoral rays 16-18, usually 17 or 16; rays 2 to 7-10 branched in adults; compound branching of some rays in largest specimens; pectoral fin reaching to about second anal spine as maximum. Gill rakers including rudiments usually 16-18, 5-6 on upper arch, usually 8 on ceratobranchial, and 3-5 small rudiments on hypobranchial. Preorbital bone usually with 2 spinous points over maxillary forming about a right angle; posterior spine pointing down to slightly forward. Suborbital ridge with 2 or 3 spinous points; first below ridge which runs under eye, second sometimes present at end of this ridge, and third just before supplemental preopercular spine. Upper posttemporal spine present. Other spines as for the genus. Vertebrae 24 (five specimens). Scales on sides small, emarginate, with parallel sides; vertical scale rows usually about 65-70. Chest, pectoral-fin base, and head naked; usually fleshy, skin loosely clinging to body about chest and pectoral-fin base and on head. Occipital pit well developed. Interorbital ridges present, diverging at rear. Pores at symphysis of lower jaw small and separate. Skin appendages well developed; supraocular tentacle usually about equal to orbit diameter; no skin flaps on lower jaw; small dermal flaps associated with preorbital, preocular, parietal, nuchal, and preopercular spines; other tentacles at anterior nostril, below suborbital ridge, on eye, opercle flap, some body scales, and some lateral-line scales. Orbit diameter usually slightly larger than snout, ratio snout divided by orbit 0.7-1.0 (higher ratio in larger specimens); orbit into head 3.3-4.0; interorbital width into orbit diameter 1.6-2.5.

Coloration of preserved specimens as in figure 9a. Some small specimens (less than about 50 mm, standard length) with faint dark spot on spinous dorsal fin at about spines 8 or 9, absent in available larger specimens. Fins variously mottled or spotted with brown. Three usually well marked vertical bars on caudal fin, at base, middle, and distal end. Caudal peduncle pale. Pigment on body brownish with some paler areas; darkest between soft dorsal fin and anal fin. Lower sides of body and pectoral-fin axil with brown spots. Head brown, variegated and blotched with white.

A moderate-sized species, largest available specimen about 140 mm, in standard length. Boutiere (1958, p. 78) examined specimens from 80 to 130 mm, total length.

COMPARISONS. *Scorpaena porcus* is unique, among those species in the

eastern Atlantic with the chest and pectoral-fin base naked, in having emarginate, small scales; the others have ctenoid scales. Its affinities appear to be with the short-snouted species which have the pores at the symphysis of the lower jaw united, but the pores in *S. porcus* are well separated. The small scale size appears to be secondary. In coloration the species resembles the sympatric species *S. notata*, but larger specimens of *S. porcus* usually lack a black spot on the spinous dorsal fin and have brown spots in the pectoral-fin axil; the two species are easily distinguished by the scale size, about 65 or 70 vertical scale rows for *S. porcus* versus fewer than 50 for *S. notata*.

**DISTRIBUTION.** The species occurs in the Mediterranean Sea and adjacent parts of the Atlantic in shallow water. The southern limit of distribution appears to be off Sénégal. It is a littoral species common among rocks.

### Genus *Scorpaenodes* Bleeker

*Scorpaenodes* BLEEKER, 1857, p. 371 (type-species *Scorpaena polylepis* Bleeker, by monotypy; no description). ESCHMEYER, Calif. Acad. Sci., Occ. Paper no. 76, pp. 2-4 (synonymy; description; two new species; nominal genera added to synonymy).

**REMARKS.** The genus *Scorpaenodes* is treated in detail in another paper (Eschmeyer, 1969). The following nominal genera are tentatively included in the synonymy of *Scorpaenodes*: *Sebastopsis* Gill, 1862; *Sebastopsis* Sauvage, 1873; *Hypomacrus* Evermann and Seale, 1907; *Sebastella* Tanaka, 1917; *Metzlaaria* Jordan, 1923; *Parascorpaenodes* Smith, 1957; and *Paronescodes* Smith, 1958.

**DIAGNOSIS.** Dorsal rays XIII, 8-10, usually 9; anal rays III, 4-5 usually 5; pectoral rays 15-20, some rays branched; procurent caudal rays spinous; swim bladder present; vertebrae 24; occipital pit absent; scales on body ctenoid; head usually scaly; teeth on vomer; teeth absent on palatines; small slit present or absent behind fourth gill arch; peritoneum pale.

**SPINATION.** Preorbital bone with two rounded lobes over maxillary, sometimes as broad spinous points. Suborbital ridge with one row of spines and in some species one or more spines below the main spinous ridge. Supplemental preopercular spine usually present; first preopercular spine longest; second present, small in some species; third present; fourth and fifth present to virtually absent. Upper posttemporal spine absent in some species. Nasal spine absent in some species. Two ridges usually present between orbits, sometimes ending in spines (coronal spines of Smith, 1957a, but not of other authors). Tympanic (frontal) spines far to sides; also two small additional spines on frontal bones near midline sometimes present (postfrontal spines of Smith (1957) and coronal spines of Matsubara (1943)). Small spine on extrascapular bone sometimes present. A few small spinous points usually present behind orbit on fourth suborbital bone. Other spines present include the preocular, supraocular, postocular, parietal, nuchal, sphenotic (usually as group of small points), lower

posttemporal, opercular, supracleithral, and cleithral. Double spines or spurious small spinous points occasionally present.

***Scorpaenodes tredecimspinus* (Metzelaar).**

*Scorpaena tredecimspinosa* METZELAAR, 1919, p. 146, fig. 44 (type locality Aruba and Bonaire Islands, Dutch West Indies; cotype USNM no. 160660; [see lectotype designation below]).

*Metzelaaria tredecimspinosa*, JORDAN, 1923, p. 209 (misspelled; type of new genus *Metzelaaria*). JORDAN, EVERMANN, AND CLARK, 1930, p. 370 (compiled).

*Scorpaenodes floridae* HILDEBRAND in Longley and Hildebrand, 1940, p. 251, figure 14 (type locality south of Tortugas, Florida, in 45 fathoms; holotype USNM no. 108875, paratype USNM no. 108876). GINSBURG, 1953, pp. 41-42 (redescribed from types; thought to be synonym of *S. tredecimspinus*). BRIGGS, 1958, p. 294 (compiled range).

*Scorpaenodes tredecimspinus*, GINSBURG, 1953, pp. 40-41 (description based on cotype; compared with *S. caribbaeus* and *S. floridae*; misspelled).

*Scorpaenodes tredecimspinus*, BÖHLKE AND CHAPLIN, 1968, p. 650, illustration (description; coloration; Bahamas).

LECTOTYPE DESIGNATION. There are two species of *Scorpaenodes* in the western Atlantic, and Metzelaar (1919) apparently had both in his original description of [*Scorpaena*] *tredecimspinus* based on four specimens. Metzelaar's description and figure fit *Scorpaenodes caribbaeus* the best; however, the cotype in the United States National Museum (USNM no. 160660), which was treated by Ginsburg (1953, pp. 40-41), represents the other species. Another nominal species, *Scorpaenodes floridae* Hildebrand (in Longley and Hildebrand, 1940) also represents this second species. Ginsburg (1953) suggested that *S. tredecimspinus* and *S. floridae* were probably the same species. Designation of Metzelaar's figured specimen [= *caribbaeus*] would cause considerable confusion, since *S. tredecimspinus* would then replace *S. caribbaeus* and also make *S. floridae* valid. Therefore, the cotype in the United States National Museum (USNM no. 160660) is designated as the lectotype of Metzelaar's *S. tredecimspinus*. The two valid western Atlantic names are *S. caribbaeus* for the species with a high pectoral-ray count and *S. tredecimspinus* (with *S. floridae* a synonym) for the species with the lower pectoral-ray count.

MATERIAL EXAMINED. FLORIDA: USNM no. 108875 (1, 38, holotype of *S. floridae*) and USNM no. 108876 (1, 45, paratype of *S. floridae*) south of Tortugas in 45 fathoms; UMML no. 12346 (1, 23) 29°09' N., 80°12' W., in 36-40 fathoms, *Silver Bay* station 4419; UMML no. 17454 (1, 22) 24°33'-32' N., 83°09'-15' W., in 37 fathoms, *Gerda* station 564. The following are from Monroe County, Florida, available depths 15 to 100 feet, most from vicinity of Alligator Reef: UMML no. 3469 (1, 31), UMML no. 18942 (1, 20), UMML no. 19232 (4, 26-42), UMML no. 20091 (1, 25), UMML no. 19386 (2, 30-40), UMML no. 10861 (1, 24), UMML no. 11416 (1, 29), UMML no. 5703 (1, 31), UMML no. 22215 (1, 32), and UMML no. 4230 (1, 27). BAHAMAS: UMML no. 17320 (1, 31) 26°34' N., 76°52.5' W., in 30-32 fathoms, *Silver Bay* station



4710; UMMML no. 1718 (1, 39) Andros. HONDURAS: UMMML no. 12350 (1, 32) 15°56' N., 81°12' W., in 15 fathoms, *Oregon* station 3618. PANAMA: UMMML no. 22270 (1, 28) 9°14.6'–13.5' N., 80°21.8'–22.8' W., in 26–27 fathoms, *Pillsbury* station 434. VENEZUELA: UMMML no. 17299 (1, 36) 11°06' N., 62°40' W., in 30 fathoms, *Oregon* station 5033; UMMML no. 17318 (1, 29) 14°02' N., 61°00' W., in 9–13 fathoms, *Oregon* station 5058; UMMML no. 17307 (2, 21–30) and UMMML no. 16299 (1, 19) 14°02.5' N., 61°01' W., in 13–16 fathoms, *Oregon* station 5059. DUTCH WEST INDIES: USNM no. 160660 (1, 41, lectotype of *S. tredecimspinosus*) Bonaire Island. LOS ROQUES (VENEZUELA): UMMML no. 15341 (2, 24–42) S. island Dos Mosquises, DdeS no. 468. DOMINICA: Several lots are present in the United States National Museum collected by Victor G. Springer during the Smithsonian Institution Dominica Survey.

DESCRIPTION. Counts and measurements summarized in tables 1–10; body shape and coloration in figure 11c.

A small species. Dorsal fin with 13 spines and 9, rarely 8, soft rays. Pectoral fin with 17 (16–18) rays; rays 2–3 to 7–8 branched in specimens over about 35 mm. standard length. Gill rakers short, 4–6 on upper arch, 7–9 on ceratobranchial, and 2–4 often indistinct rudiments on hypobranchial; total usually 17–18 (15–19). Suborbital ridge usually with 2 (1–3) spinous points, one under eye (sometimes absent) and one at end of ridge; sometimes ridge on preorbital bone ends in a spine giving a count of 3. (The lectotype of *S. tredecimspinosus* (3) and the types of *S. floridac* (1 at end) are exceptions to the usual count of 2.) No spine or spines below main ridge of spines on suborbitals. Interorbital spines and the 2 additional spines (coronal) on the frontals near the midline often absent. Other spines as for the genus. Vertebrae 24 (6 specimens). Vertical scale rows about 40–45. Orbit larger than snout, ratio snout divided by orbit 0.6–0.8 (larger specimens tend to have higher values); orbit into head 2.7–3.6 (larger specimens tend to have higher values); interorbital width into orbit diameter 1.9–3.4 (larger specimens tend to have lower values).

Coloration usually as in figure 11c, with faint dusky pigment on head and body against a pallid background. Specimens from shallower depths with more brown pigment. Pectoral, anal, caudal, and dorsal fins faintly spotted with brown or mostly clear. Black spot at end of spinous dorsal fin usually well marked. Coloration of smallest specimens about that of largest specimens.

COMPARISONS. *Scorpaenodes tredecimspinosus* differs from *S. caribbacus* in having a lower pectoral-ray count (16–17, rarely 18 versus 18–20), in having no spines under the spinous suborbital ridge, no slit behind the fourth gill arch, usually 2 rather than 3–5 spinous points on the suborbital ridge, and in coloration. *Scorpaenodes caribbacus* grows to a larger size and is most common in very shallow water.

DISTRIBUTION. The species is widespread in the tropical western Atlantic. Specific localities include Florida, the Bahamas, Dominica, Honduras, Panama,

Venezuela, Dutch West Indies, and Los Roques. The species usually occurs at deeper depths than *S. caribbaeus*. Depths of capture range from about 25 to 270 feet. *Scorpaenodes caribbaeus* has been taken from the shore to about 60 feet. Habitat is usually coral or rocky areas.

### *Scorpaenodes caribbaeus* Meek and Hildebrand.

*Scorpaenodes caribbaeus* MEEK AND HILDEBRAND, 1928, p. 847, pl. 82 (type locality Toro Point, Panama Canal Zone). GINSBURG, 1953, pp. 38-40 (synonymy; description based on type specimens; comparisons). ROBINS, 1957, p. 272 (new Florida record; brief description). CERVIGNO, 1966, pp. 759-760, fig. 320 (description; Los Roques, Venezuela). RANDALL, 1968, p. 173, fig. 197 (brief description; excellent color figure). BÖHLKE AND CHAPLIN, 1968, p. 651 (distinctive features; coloration; good drawing; Bahamas).

*Scorpaenodes russelli* BEEBE AND TEE-VAN, 1928, p. 189, fig. (type locality Port-au-Prince Bay, Haiti). SPRINGER AND BULLIS, 1956, p. 91 (Arcas Cay; listed). MEAD, 1958, p. 134 (holotype from New York Zoological Society to USNM no. 170573).

*Scorpaenodes triacanthus* PARR, 1930, p. 115, fig. 30 (type locality Cat Island, Bahamas).

**MATERIAL EXAMINED.** FLORIDA: In the UMML collection 33 lots from the vicinity of Alligator Reef, plus 8 lots from Yellow Reef (E. of Elliot Key), Ajax Reef, Long Reef, Biscayne Bay, and Lower Matecumbe Key. Depths of capture from shore to 60 feet, sizes from about 15 to 85 mm. standard length. BAHAMAS: In the UMML collection 11 lots from the following localities: Pigeon Cay, Bimini, Andros Island, Water Cay, Exuma Chain (Compass Cay, Oyster Cay and Cave Cay), Riding Rock Light, and Green Turtle Cay. Sizes range from about 9 to 60 mm. standard length. Depths of capture are from the shore to about 35 feet. Pectoral-ray counts for 76 additional specimens (16-78 mm.) from various localities in the Bahamas were supplied by James E. Böhlke. HAITI: UMML no. 6184 (1, 38) St. Marc Bay, 10-30 feet, CRR-Caribbean-2; UMML no. 7464 (1, 52) St. Marc Bay; USNM no. 170573 (1, 67, holotype of *S. russelli*) Port-au-Prince Bay, Haiti. VIRGIN ISLANDS: UMML no. 3740 (2, 35-74), UMML no. 4277 (1, 69), UMML no. 4899 (2, 53-58), UMML no. 14964 (1), and UMML no. 8204 (1, 54) all from Saint John. YUCATAN (CARIBBEAN)-PANAMA: UMML no. 9713 (1, 24) Cozumel Island; UMML no. 9347 (2, 48-49) and UMML no. 9296 (3, 44-60) Banco Chinchorro; UMML no. 9405 (1, 59) and UMML no. 9461 (1, 30) Lighthouse Reef; UMML no. 9848 (2, 11-12), UMML no. 10313 (4, 50-58), UMML no. 9853 (1, 34), and UMML no. 9577 (2, 36-45) Turneffe Island; USNM no. 81619 (1, 64, holotype of *S. caribbaeus*) Toro Point, Panama Canal Zone. DOMINICA: Several lots are present in the United States National Museum collected by Victor G. Springer during the Smithsonian Institution Dominica Survey. VENEZUELA, LOS ROQUES: UMML no. 13017 (2, 52-59) and UMML no. 22022 (1, 55) S. island of Dos Mosquises; USNM no. 179287 (6, 16-44) Los Canquises.

**DESCRIPTION.** Counts and measurements summarized in tables 1-10; body shape and coloration in figure 12a.

A colorful, moderate-sized species growing to about 85 mm. standard length. Dorsal fin with 13 spines and 9, rarely 8, soft rays. Pectoral fin usually with 19 (18–20) rays, rays 2–3 to 8–9 branched in specimens over about 45 mm. standard length. Gill rakers short, 5–8 on upper arch, 8–9 on ceratobranchial, and 0–4 often indistinct rudiments on hypobranchial; total 14–19. Suborbital ridge with 2–5, usually 4, spinous points; first on preorbital (sometimes absent), second under eye, third near posterior end, and fourth at end. A second group or row of 1 or 2 to 6 spines below main spinous ridge (fig. 2a). Spines at end of interorbital ridges and 2 close-set (coronal) spines on frontal bones near midline usually present, especially in larger specimens. Other spines as for the genus. Vertebrae 24 (4 specimens) or 23 (1). Vertical scale rows 40–45. Orbit diameter larger than snout length, ratio snout divided by orbit 0.7–0.9 (larger specimens with higher values); orbit into head 3.0–3.8 (larger specimens with higher values); interorbital width into orbit diameter 1.9–2.7 (larger specimens with lower values).

Coloration variable. Body and head variously spotted and blotched with brown (fig. 12a). Posterior portion of spinous dorsal fin with dark pigment concentrated in a poorly defined blotch. Most fins spotted with brown, pelvic fins usually slightly dusky. Pectoral fins with 1 to 3 brown bands in smaller specimens, band at base the largest; bands breaking up into spots in larger specimens. Pigment on soft dorsal fin and anal fin usually more concentrated on anterior half of fin. Caudal peduncle pale in specimens under about 30 mm. to spotted in larger specimens.

COMPARISONS. See account of *Scorpaenodes tredecimspinosus* for comparisons.

DISTRIBUTION. The species appears to be widespread in the western Atlantic in clear-water rocky or coral habitats. Specific localities include Florida, Bahamas, Haiti, Virgin Islands, Arcas Cay, Cozumel Island, islands off British Honduras, Dutch West Indies, and Los Roques. Depths of capture range from the shore to 60 feet.

### *Scorpaenodes africanus* Pfaff.

*Scorpaenodes africanus* PEAFF, 1933, pp. 311–314, fig. 13 (type locality Dakar, Sénégal). NORMAN, 1935b, p. 21 (compiled). FOWLER, 1936, p. 1360 (listed). CADENAT, 1946, pp. 321–323 (description; GORÉE, Sénégal). CADENAT, 1950, p. 245 (briefly compared with *S. elongatus*; 60–90 mm.; Sénégal) p. 307 (listed).

MATERIAL EXAMINED. ANNOBÓN: UMMML no. 22220 (2, 32.5–33) 1°24' S., 5°38' E., dredge in 5–26 fathoms, Pillsbury station 275 (haul 2). SÉNÉGAL: IFAN no. 50-933 (1, 50) Gorée, Delais collection, 13 September 1950; IFAN no. 50-867 (1, about 41) Delais collection, 28 August 1950; IFAN no. 58-184 (1, 50) Gorée, 13 November 1958; IFAN no. 55-4466 (1, 36) Gorée, J. Cadenat, 30 December 1955.

DESCRIPTION. Measurements and counts summarized in tables 1-10; body shape and coloration in figure 12b, c.

Dorsal fin with 13 spines and 9 (8 in one specimen) soft rays. Pectoral rays 17-19. Gill rakers including rudiments about 15-17, 5-6 on upper arch, 8-9 on ceratobranchial, and 2 to several poorly defined rudiments on hypobranchial. Suborbital ridge with 2 spinous points, one under the eye and one at end of ridge. No spine or spines below main ridge of spines on suborbitals. Interorbital spines and the 2 additional spines (coronal) on the frontals near the midline often absent. Supplemental preopercular spine usually present. Other spines as for the genus. Vertebrae 24 (three specimens, one with 23 also with 8 soft dorsal rays). Vertical scale rows about 45. Orbit larger than snout, ratio snout divided by orbit 0.7-0.8; orbit into head 3.0-3.5; interorbital width into orbit diameter 2.4-3.2.

Coloration of specimens from Annobón in figure 12c. Specimens from Sénégal darker brown (fig. 12b). All specimens with soft dorsal, caudal, anal, and pectoral fins spotted with brown; sometimes the pelvic fins also spotted. Smaller specimens with pigment on spinous dorsal fin concentrated as a poorly defined spot at the end of the fin.

REMARKS. The specimens from Annobón Island appear to be referable to *S. africanus*, a species known from Sénégal. The two specimens from Annobón are paler in body pigmentation, but this is probably due to capture at a deeper depth. The four specimens from Sénégal and the two from Annobón agree fairly well in measurements and counts.

COMPARISONS. This species differs from *S. clongatus* in that it lacks the second row of spines on the suborbitals. In this character and in coloration, *S. africanus* is closely related to the western Atlantic species *S. tredecimspinosus*; the western Atlantic form averages fewer pectoral rays (17 or 16, rarely 18, versus 17-19). *Scorpaenodes africanus* differs from the Mediterranean species *S. arenai* in coloration and in having fewer spines on the suborbital ridge (2 versus 4-6).

### **Scorpaenodes arenai** Torchio.

*Scorpaenodes arenai* TORCHIO, 1962a, pp. 112-116, fig. 1, pl. 17 (type locality Straits of Messina; good description and illustrations).

REMARKS. No specimens are available for study. The description and figures as given by Torchio are good. The species is compared with *S. clongatus* and *S. africanus* under the account of *S. africanus*.

DESCRIPTION. (Adapted from Torchio, 1962a.) Dorsal fin with 13 spines and 9 soft rays. Pectoral rays 17-19. Lower arch with 6-8 gill rakers (possibly not including rudiments on hypobranchial). Suborbital ridge with 4-6 spinous points. No spine or spines below main ridge of spines on suborbitals. Interorbital spines and the two additional spines (coronal) on the frontals near the

midline absent(?). Supplemental preopercular spine usually present. Other spines as for the genus. Vertical scale rows about 50.

Coloration as given by Torchio shows bars on the body below the middle and end of the spinous dorsal fin, between the soft dorsal fin and anal fin, and at base of caudal fin. A dark blotch is present near the end of the spinous dorsal fin.

### **Scorpaenodes elongatus** Cadenat.

*Scorpaenodes elongatus* CADENAT, 1949, pp. 665-666, fig. (type locality Sénégal). CADENAT, 1950, p. 245 (compared briefly with *Scorpaenodes africanus*; to 150 mm.; Dakar, Sénégal). BLACHE, 1962, p. 74 (listed; wrongly includes *Scorpaena elongata* in synonymy).

MATERIAL EXAMINED. IFAN no. 1176 (1, 87) collected at Gorée, Sénégal, 10 June 1964.

DESCRIPTION. (Information from Cadenat, 1949, included.) Dorsal fin with 13-14 spines and 9-10 soft rays. Pectoral rays 18-19. Five gill rakers on upper arch and 8 on lower arch. Suborbital ridge with 4 spinous points; 1 or 2 additional spines below suborbital spinous ridge. Interorbital spines present. Spines (coronal) at midline on frontals present (?) or absent. Supplemental preopercular spine present. Other spines as for the genus. Vertical scale rows about 45-50. Orbit slightly smaller than snout, ratio snout divided by orbit 0.9 (in specimen examined); orbit into head 3.7; interorbital width into orbit diameter 1.8.

Body and head with some brown pigment on a pale background. Anal fin, soft dorsal fin, caudal fin, and pectoral fins spotted with brown. No conspicuous black spot near the end of the spinous dorsal fin.

COMPARISONS. This species differs from the other species of *Scorpaenodes* in the eastern Atlantic in having a more elongate body. It differs from *S. africanus* in that it has the extra spines below the main row of suborbital spines. In body shape and coloration *S. elongatus* is similar to the eastern Pacific species *S. xyris*.

DISTRIBUTION. The species is known only from the coast of Sénégal.

### Subfamily SEBASTINAE

This subfamily has been treated by Matsubara (1943) who used osteological characters. He recognized only four genera, *Sebastes*, *Sebastiscus*, *Helicolenus*, and *Hozukius*, splitting the large genus *Sebastes* into 10 subgenera.

The most important subfamilial characters are that the second suborbital bone is more or less T-shaped, tapering posteriorly, and the suborbital sensory canal is complete, passing through the third, fourth, and fifth suborbital bones. An important event in scorpaenid evolution appears to be the attachment of the second suborbital bone to the preopercle, thus forming a strong suborbital stay, and this step occurred in the subfamily Sebastinae as presently recognized. In

the genera *Sebastes* and *Sebastiscus* the second suborbital bone does not reach the preopercle, while in *Helicolenus* and *Hozukius* the second suborbital bone attaches to the preopercle. Differences between the genera are given by Matsubara (1943, p. 175).

There is growing evidence (see Freihofer, 1963; Quast, 1965) that the mail-cheeked fishes are an artificial assemblage. I have to date only touched on osteology of scorpionfishes but have had occasion to refer to Matsubara's work frequently. Using information provided by Matsubara and other sources, it seems likely that authors Freihofer and Quast are correct. By the time the suborbital stay is developed within the family Scorpaenidae, the fishes possessing a developed stay do not appear to be suitable ancestors for such groups as the cottids and hexagrammids. Matsubara's suggestion (1943, p. 161) that the cottids evolved from a *Setarches*-like ancestor was shown to be unlikely (Eschmeyer and Collette, 1966, p. 353). It is uncertain if other groups can be united with the scorpaenids on the basis of other characters; the suborbital stay, however, seems to have evolved more than once.

The species of the genus *Sebastes* (including *Sebastodes*) bear live young, but there is much question whether species of the genus *Helicolenus* are live-bearers (see Krefft, 1961). I have been unable to locate pre-extrusion larvae in gravid females of *H. dactylopterus* from the Atlantic. If species of the genus *Helicolenus* are oviparous, perhaps they should not be included in the same subfamily as species of *Sebastes*, as there are some morphological differences also.

### Genus *Helicolenus* Goode and Bean

*Helicolenus* GOODE AND BEAN, 1896, p. 248 (type species *Scorpaena dactyloptera* Delaroche, by original designation). MATSUBARA, 1943, pp. 258-259, 261 (osteological description based on the species occurring about Japan). GINSBURG, 1953, p. 30 (Atlantic forms).

DIAGNOSIS. Dorsal rays usually XII, 12 (XI-XIII, 10-14); anal rays normally III, 5 (II-III, 4-6); pectoral rays 16-21; swimbladder absent, but muscle bands present; vertebrae usually 25; no occipital pit; palatine teeth present; no slit behind fourth gill arch; chest, pectoral-fin base, cheek, maxillary, and occiput scaled; peritoneum mostly black; second suborbital bone tapering posteriorly and truncated at attachment to preopercle; third through fifth suborbital bones present, housing suborbital sensory canal.

SPINATION. Preorbital bone with rounded lobes over maxillary. First suborbital bone without spines; second with 1 or no spines. Nasal spine present. Preocular, supraocular, and postocular spines low. Tympanic spines far to sides. Pterotic spine low, sometimes covered with scales. Parietal spine longer than nuchal spine. Coronal spine absent. Cleithral spine absent. Supplemental preopercular spine absent. Second preopercular spine longest, first about equal to third, fourth and fifth moderate. Other spines present include the sphenotic, upper and lower posttemporal, and supracleithral.

**SPECIES.** The species of the genus *Helicolenus* are poorly understood and several species have been erroneously referred to it. Some differences mentioned in the literature for the different species have resulted from varied methods of counting and measuring, particularly counts of gill rakers and scales, and from changes in proportional measurements with growth.

Two species are recognized in the Atlantic Ocean: *Helicolenus dactylopterus* and *H. tristanensis*, the latter confined to Tristan da Cunha. *Helicolenus dactylopterus* includes two subspecies. Another species occurring about Japan (*H. hilgendorfi*) is doubtfully distinct from *H. dactylopterus* and has been synonymized with it by some authors. *Helicolenus dactylopterus* rounds the tip of South Africa, but no specimens are known from the northern Indian Ocean. A fourth species occurs at New Zealand and Australia (*H. papillosus*, with *H. percooides* and *H. maccullochi* apparent synonyms). A fifth species, *H. lengenrichi*, occurs in the eastern Pacific off Peru and Chile. The species described from Hawaii in this genus (*Helicolenus rufescens* Gilbert, 1905; holotype USNM no. 51628, examined) is not a species of *Helicolenus* but belongs rather to the subfamily Scorpaeninae. *Helicolenus microphthalmus* Norman, 1935, described from two specimens supposedly from the Yorkshire coast of England, was placed in the synonymy of the Oriental species *Sebastiscus marmoratus* by Wheeler and Eschmeyer (1968). The locality data for the specimens used by Norman are suspect.

**ATLANTIC SPECIES.** Of the two species of *Helicolenus* occurring in the Atlantic, one is confined to Tristan da Cunha (*H. tristanensis*) and the other (*H. dactylopterus*), is widespread. The population of *H. dactylopterus* occurring off Uruguay and Argentina stands apart from the other populations in some measurements and appears more isolated in distribution; this population is treated as the subspecies *H. dactylopterus lahillei*. The subspecies *H. dactylopterus* is recognized as composed of 4 populations: (1) Northeastern Atlantic and Mediterranean, (2) Gulf of Guinea, (3) South Africa, and (4) northwestern Atlantic from Venezuela to Nova Scotia. The three populations in the eastern Atlantic show gradients in several characters, the population in the Gulf of Guinea being intermediate between specimens from the northeastern Atlantic and from South Africa; presumably the characters will show a smooth gradient when material is available from intermediate localities. A more comprehensive study is needed, however.

### ***Helicolenus dactylopterus* (Delaroche).**

A partial synonymy pertinent to the scope of the study. References without information in parentheses were not seen. Entries are listed separately for the four populations of the subspecies "*dactylopterus*" and for the subspecies "*lahillei*."

*Helicolenus dactylopterus dactylopterus.*

## POPULATION 1. NORTHEASTERN ATLANTIC AND MEDITERRANEAN

- ?*Scorpaena malabarica* SCHNEIDER in Bloch and Schneider, 1801, p. 194.
- Scorpaena dactyloptera* DELAROCHE, 1809, p. 337, pl. 22, fig. 9 (type locality Barcelona). RISSO, 1810, pp. 186–187 (description; Nice). RISSO, 1826, p. 369 (compiled). GÜNTHER, 1889a, p. 417 (new to British fauna; several specimens from 250 fathoms). GÜNTHER, 1889b, p. 6 (larvae taken by *Challenger* off the Cape Verde Islands). SMITT, 1892, p. 154, fig. 43 (description; synonymy; good figure). SIM, 1893b, pp. 204–206 (correction of misidentification (Sim, 1893a) as *Sebastes norvigicus*). NELSON AND CLARKE, 1893, p. 81 (one from North Sea; compared with *Sebastes viviparus*). CLARKE, 1893, pp. 94–101, pl. 2 (description; distribution; synonymy; one specimen from North Sea). HOWSE, 1894, p. 174 (one specimen from off Norway). HOLT AND CALDERWOOD, 1895, p. 409, pl. 52, fig. 1. HOLT AND BYRNE, 1908, pp. 9–20, pl. I (good description; color in life; numerous specimens from Ireland; summary of distribution). NYBELIN, 1948, p. 85 (one specimen of 90 mm. from 35°34' N., 6°32' W., in 409 meters; counts). WENT, 1953, p. 107 (one specimen from Dingle Bay, Ireland, in 50 fathoms; rare within 100 fathoms).
- Sebastes imperialis* CUVIER in Cuvier and Valenciennes, 1829, p. 167. LOWE, 1843, p. 177, pl. 24 (description; Madeira). BONAPARTE, 1846, p. 62 (listed; "*Sciaena*" *malabarica* Schneider questionably in synonymy; *Scorpaena dactyloptera* in synonymy). CAPELLO, 1867, p. 255 (*Sebastes dactylopterus* in synonymy; Portugal). CAPELLO, 1881, p. 11. OSORIO, 1895, p. 260 (listed; Mattosinhos, Portugal).
- Sebastes kuhlii* (not of Bowdich), VALENCIENNES, 1835, pl. 2, fig. 1.
- Sebastes dactylopterus*, GÜNTHER, 1860, p. 99 (brief description; specimens in British Museum). MOREAU, 1881, pp. 317–321, fig. 117 (description; synonymy; Mediterranean specimens). VAILLANT, 1888, pp. 368–370 (description; otoliths; specimens from Gulf of Gasconne, coast of Spain, Morocco, Canary Islands, Soudan, Cape Verde, and Azores). CARUS, 1893, p. 638. NOBRE, 1895, p. 230. COLLETT, 1896, p. 12. VIEIRA, 1898, p. 32. ROULE, 1907, p. xv. JAQUET, 1907, p. 1, and following, figs. (comparisons; scales; otoliths; teeth). KOEFORD, 1927, p. 130 (10 specimens; *Michael Sars* station 21, 35°31' N., 6°35' W., in 535 meters). NOBRE, 1935, pp. 95–96 (synonymy; description; Portugal; not fig. 40).
- Sebastes norvigicus* (not of Ascanius), SIM, 1893a, p. 47 (misidentified).
- Helicolenus dactylopterus*, GOODE AND BEAN, 1896, pp. 249–250 (description; compared with *H. maderensis*). VAILLANT, in Roule, 1919, p. 132 (*Princesse-Alice* stations 866 and 899). NORMAN, 1935a, p. 612 (mostly compiled; one specimen from 5 fathoms [depth probably wrong]). NORMAN, 1935b, pp. 24–25 (synonymy; description). FOWLER, 1936, pp. 916–917, fig. 386 (synonymy; description from Mediterranean specimens). COLLINS, 1954, p. 30 (compiled). ANDRIYASHEV, 1954, pp. 339–340, figs. 191–193 (brief synonymy; description; comparisons with *Sebastes*). BEN-TUVIA, 1962, p. 143 (11 specimens from off Cyprus; dorsal and anal ray counts). MAURIN, 1962, p. 172, and following (collections in Mediterranean Sea and adjacent Atlantic; depth distribution). LOZANO CABO, 1963, pp. 335, 345 (listed; Spanish Sahara-Mauritania).
- Sebastes dactyloptera*, JAQUET, 1906, pp. 1–6, pl. 1 (abnormal anal fin in three specimens).
- Helicolenus maderensis* GOODE AND BEAN, 1896, pp. 250–252 (in part; Madeira only; type restricted by Ginsburg, 1953, p. 35, to western Atlantic). FOWLER, 1936, pp. 917–918 (confused with *Scorpaena maderensis*; description from Goode and Bean, 1896).
- Scorpaena (Helicolenus) dactylopterus*, FAGE, 1918, p. 102.
- Helicolenus dactylopterus dactylopterus*, GINSBURG, 1953, p. 32 (description; specimens from



Norway, Azores, Bay of Naples, and Genoa; comparisons with specimens from NW. and SW. Atlantic).

POPULATION 2. GULF OF GUINEA

*Helicolenus dactylopterus*, POLL, 1959, pp. 173-175, fig. 63 (description; good figure; West Africa, 1 from 7°16' S., 4 from 10°45' S., and 1 from between 0° and 17° S.). BLACHE, 1962, p. 74 (listed).

POPULATION 3. SOUTH AFRICA

*Sebastes maculatus* CUVIER in Cuvier and Valenciennes, 1829, p. 343 (type locality South Africa). GÜNTHER, 1860, p. 101 (compiled). GILCHRIST, 1902, p. 119 (compiled).

*Sebastichthys maculatus*, SAUVAGE, 1891, p. 290 (description; Madagascar).

*Helicolenus maculatus*, BARNARD, 1927, pp. 907-908 (brief description; False Bay, Agulhas Bank to Natal, in 50-300 fathoms). FOWLER, 1934, p. 482 (description; one specimen of 218 mm. from Natal). DAVIES, 1949, pp. 26-29 (South Africa; 50-300 fathoms; abundant about 200 fathoms; food; spawn probably in November). SMITH, 1949 (also later editions), p. 369, pl. 83, no. 1034 (brief description; from Walfish Bay to Natal, in 30-300 fathoms). SMITH, 1957b, pp. 86-87, pl. 6, fig. 2 (description; *H. lahillei* [wrongly thought by Smith to be from Angola] doubtfully distinct).

*Helicolenus dactylopterus*, SANCHEZ, 1966, p. 153, illustration (compiled; Angola).

POPULATION 4. ATLANTIC COAST OF THE UNITED STATES, GULF OF MEXICO  
AND THE CARIBBEAN SEA

*Scorpaena dactyloptera*, JORDAN AND GILBERT, 1882, p. 679 (specimens from off Chesapeake Bay). GARMAN, 1896, p. 79 (off Sand Key Light in 105 fathoms).

*Sebastoplus dactylopterus*, GOODE AND BEAN, 1883, p. 214 (one specimen from *Blake* station 311, 39°59.5' N., 70°12' W., in 143 fathoms).

*Helicolenus maderensis* GOODE AND BEAN, 1896, pp. 250-252, pl. 68, fig. 244 (in part; western Atlantic specimens only [restricted by Ginsburg 1953, p. 35, lectotype from *Fish Hawk* station 897, 37°25' N., 74°18' W., in 158 fathoms, USNM no. 26627]). EVERMANN AND KENDALL, 1900, p. 88 (compiled Florida record). BIGELOW AND WALSH, 1925, p. 313, fig. 148 (compiled). NORMAN, 1935b, p. 25 (off Long Island, New York). LONGLEY AND HILDEBRAND, 1941, p. 165 (brief description; color; Tortugas, Florida, in 100-300 fathoms).

*Helicolenus dactylopterus*, EVERMANN AND KENDALL, 1900, p. 88 (compiled Florida record). BIGELOW AND SCHROEDER, 1953, pp. 437-438, fig. 224 (compared with *Sebastes marinus*; color; area about Gulf of Maine in 68-240 fathoms). SPRINGER AND BULLIS, 1956, p. 90 (Gulf of Mexico collections by the vessel *Oregon*). MUSICK, 1966, p. 877 (distribution in Gulf of Maine; one from 32 fathoms).

*Helicolenus thelmae* FOWLER, 1937a, p. 300, fig. 5 (type locality near Gulf Stream off Cape May, New Jersey).

*Helicolenus dactylopterus maderensis*, GINSBURG, 1953, p. 33-35 (compared with other subspecies; specimens from Massachusetts to Gulf of Mexico).

*Helicolenus dactylopterus thelmae*, BRIGGS, 1958, p. 294 (compiled range).

*Helicolenus dactylopterus lahillei*.

*Helicolenus dactylopterus*, LAHILLE, 1913, pp. 5-7, pl. 2 (description; Province of Buenos Aires, in 250 meters). FOWLER, 1917, p. 5 (name only; Argentina). DEVINCENZI, 1924, pp. 249-250 (synonymy; Uruguay).

*Helicolenus lahillei* NORMAN, 1937, p. 124, fig. 68 (type locality coasts of Uruguay and northern Argentina). DE BUEN, 1950, p. 120 (compiled).

*Helicolenus uruguayensis* FOWLER, 1943, pp. 326–329, figs. 18–19 (type locality off Uruguay; holotype ANSP no. 70325; paratypes (2) ANSP nos. 70326–7). DE BUEN, 1961, p. 120 (three specimens; 60 miles ESE. of Lobos Island in 67 meters).

*Helicolenus dactylopterus lahillei*, GINSBURG, 1953, p. 36 (good description; compared with specimens from northeastern and northwestern Atlantic).

#### MATERIAL EXAMINED.

*Helicolenus dactylopterus dactylopterus*. POPULATION 1. NORTHEASTERN ATLANTIC AND MEDITERRANEAN SEA: IIP uncataloged (2, 122–128) Mauritania, collected by F. Cervigon; USNM no. 188491 (4, 182–250) Azores, San Miguel, collected by Bruce B. Collette; ANSP no. 12208-11 (3, 63–192, soft condition) Mediterranean, through J. B. Wilson. POPULATION 2. GULF OF GUINEA: UMML no. 21771 (4, 51–83) 4°56' N., 5°01' W., in 180–270 fathoms, Pillsbury station 51; UMML no. 15615 (23, 43–98) 4°38' N., 9°20' W., in 170–200 fathoms, Pillsbury station 73. The following are from *Geronimo* Cruise 2: USNM uncataloged (2, 34–92) 3°02' S., 9°21' E., in 300 meters, station 220; USNM uncataloged (1, 180) and TABL uncataloged (1, 42) 1°26.4' S., 8°24' E., in 400 meters, station 199. TABL uncataloged (2, 185–195) 1°57' S., 8°47' E., in 400 meters, station 205. TABL uncataloged (1, 30) and (4, 65–82) 2°31' S., 8°51' E., in 300 meters, station 213. POPULATION 3. SOUTH AFRICA: USNM uncataloged (1, 163) 25°32' S., 33°24' E., in 450–455 meters, *Anton Bruun* Cruise 8, station 396b; ANSP no. 55316 (1, 164) Natal, Durban, collector W. H. Bell-Marley. POPULATION 4. ATLANTIC COAST OF THE UNITED STATES, GULF OF MEXICO AND THE CARIBBEAN SEA: FLORIDA STRAITS. The following specimens are from the Straits of Florida between 79°59' W. to 83°37' W. and 24°21' N. to 25°41' N.; depths of capture are from 200–300 fathoms; all are in the UMML collection: no. 20799 (2, 125–134) *Gerda* station 766; no. 12385 (1, 136) *Gerda* station 66; no. 13730 (2, 128–153) *Oregon* station 4373; no. 16192 (2, 128–159) *Oregon* station 4340; no. 16202 (5, 104–151) *Oregon* station 4339; no. 16219 (18, 88–185) *Oregon* station 4341; no. 13973 (27, 60–124) *Oregon* station 4353; no. 16190 (5) *Oregon* station 4523. NORTHERN GULF OF MEXICO: UMML no. 16168 (2, 101–158) 29°12' N., 86°42' W., in 225 fathoms, *Oregon* station 4073. VENEZUELA: UMML no. 14015 (2, 84–88) 11°46' N., 69°17' W., in 240 fathoms, *Oregon* station 4425; UMML no. 14019 (1, 89) 10°55' N., 67°01' W., in 230 fathoms, *Oregon* station 4456; UMML no. 16208 (1, 210) 11°26' N., 68°25' W., in 280 fathoms, *Oregon* station 4432; UMML no. 13507 (1, 212) 11°46' N., 69°15' W., in 240 fathoms, *Oregon* station 4417; UMML no. 14269 (1, 322) 11°49' N., 69°24' W., in 300 fathoms, *Oregon* station 4412. Additional specimens are present in the UMML fish collection.

*Helicolenus dactylopterus lahillei*. ANSP no. 70325 (1, 226) and nos. 70326–7 (2, 178–179) holotype and two paratypes of *H. uruguayensis*, Uruguay, L. P.

Barattini, 1935; USNM no. 86697 (1, 164) and no. 86698 (1, 170) Uruguay, Pesca de Albuda, H. M. Smith.

DESCRIPTION. (See also the generic Diagnosis and Spination.) Measurements and counts summarized in tables 11-15; coloration in figure 13a, b.

Dorsal fin normally with 12 spines (11-13) and 12 or 11 (14-10) soft rays (last double). Anal fin normally with 3 spines and 5 soft rays (last double). Pectoral rays most frequently 19 (16-21). Gill rakers well developed, 7-9 on upper arch, 16-21 on lower arch, varying with geographic area (table 12). Spination as for the genus. Presence or absence of a spine on the suborbitals variable, possibly showing some variation with geography. Vertebrae usually 25. Scales ctenoid; vertical scale rows about 55-80, varying with geography. Chest, cheek, and maxillary usually scaled; snout and ventral part of head usually naked; no tentacles on head or body. Buccal cavity and peritoneum black, usually fades to brown in preservative. Symphyseal knob on lower jaw poorly developed. Some measurements, especially those showing differences between the different populations, are given in the tables.

Coloration variable. Smaller specimens (fig. 13b) with black pigment near end of spinous dorsal fin. Pigment on body in bands in smaller specimens. Preserved larger specimens with bands or diffuse dusky markings (fig. 13a). In life specimens have bands of red along the sides, these frequently retained as brown pigment in preservative; bands located as follows: below anterior dorsal spines, below middle dorsal spines, below posterior dorsal spines (about spines 9-11), and two below the soft dorsal fin joining at about the lateral line, plus one at the base of the caudal fin.

POPULATION DIFFERENCES. Counts of fin rays (table 11) do not appear to vary significantly; there is some indication that the pectoral-ray counts are higher in the Gulf of Guinea among specimens from the eastern Atlantic. The southern specimens in the northwestern Atlantic average slightly higher than specimens from more northern areas as shown by comparing my counts for pectoral rays (mostly specimens from Tortugas and Venezuela) with those of Ginsburg (mostly specimens from the northern Gulf of Mexico and the Atlantic coast of the United States).

Counts of gill rakers (table 12) vary geographically, with an increase in number of gill rakers in the eastern Atlantic from lowest counts in the north-eastern Atlantic to highest counts for specimens from South Africa. The specimens in the northeastern Atlantic have about the same gill-raker count as those from the northwestern Atlantic.

Some measurements vary with geography. Specimens from the southwestern Atlantic (*H. d. lahillei*) clearly average a smaller head (table 13), smaller orbit (table 14), wider interorbital space (table 15) and shorter jaw (table 15). Evaluation of smaller variations in counts and measurements within and between

the populations of *H. d. dactylopterus* awaits a more thorough treatment using more specimens and analysis by size groups.

The vertical scale rows are somewhat difficult to count and frequently some scales are missing, but the scale size does vary geographically. The scales are smallest in specimens of *H. d. lahillei*, the vertical scale rows usually numbering in the low to middle seventies. Scale rows usually number in the middle sixties in specimens from the northwestern Atlantic, and in the upper sixties in the northeastern Atlantic and Gulf of Guinea. My specimens from South Africa lack some scales but have about 55-60 vertical scale rows, the range given by Smith (1957, p. 86).

The presence or absence of a spine on the suborbitals needs further study. Ginsburg (1953, p. 35) used the usual absence of a spine on the suborbital in eastern Atlantic specimens as the chief differentiating character between the eastern and northwestern Atlantic populations, and he felt the differences to be of subspecific magnitude. Only one specimen of the 7 he examined from the northeastern Atlantic had a spine (one side) on the suborbital, the other 6 having none. In my 9 specimens from this area, 2 had a spine of lump on both sides, 6 had a spine on 1 side and 2 lacked spines on both sides. I got roughly the same ratio for 5 specimens from off the east coast of the United States: 1 had both spines, 1 had none, and 3 lacked spines. The absence of a spine or presence on only one side appears to be more frequent in larger specimens. Counts for specimens from the Florida Straits (those less than 125 mm. standard length in parentheses) are 46 (18) with both spines, 3 (6) with 1, and 1 (0) with none. In specimens from the Gulf of Guinea (mostly under 125 mm.) 29 had spines on both sides, 8 on one side, and 1 with none. Both specimens examined from off South Africa lack spines, and Smith (1957b, p. 87) says the suborbital spine is usually absent.

**DISTRIBUTION AND ECOLOGY.** The subspecies *H. d. lahillei* is restricted to the coasts of Argentina and Uruguay. The subspecies *H. d. dactylopterus* is found from Venezuela north to Nova Scotia and in the eastern Atlantic from Norway south to the southern tip of South Africa.

The usual depth range inhabited by the species is from about 100 to 300 fathoms. Shallowest captures appear in higher latitudes; Musick (1966, p. 877) reports one from 32 fathoms in the Gulf of Maine. Went (1953, p. 107) lists one from 50 fathoms off Ireland and states that the species is rare within 100 fathoms; Smith (1949) gives the depth range as 30 to 300 fathoms off South Africa. Specimens examined from Florida and Venezuela were all from about 200-300 fathoms; Longley and Hildebrand (1941, p. 165) list the range as 100-300 fathoms off Tortugas, Florida.

The species is a general predator which feeds on both pelagic and benthic organisms. Davies (1949, pp. 26-29) reported that, in South African waters,

*Myctophum humboldti* and other pelagic organisms formed a part of the diet, but benthic fishes and crustaceans composed most of the diet.

### **Helicolenus tristanensis** Sivertsen.

*Helicolenus tristanensis* SIVERTSEN, 1946, pp. 17-19, fig. 12, pl. 1, fig. 1, and pl. 6, figs. 3-4 (type locality Tristan da Cunha, in 40-50 meters).

DESCRIPTION. (No specimens are available for study, but the description and photographs as given by Sivertsen are good. The description below is taken from Sivertsen.)

Dorsal fin with 12 spines and 12-14 soft rays (possibly 11-13 soft rays if the last double element is counted as 1). Anal fin with 3 spines and 5 soft rays (last double). Pectoral fin with 18-19 rays, first 1 or 2 simple, next 8-9 branched, lower 8-9 simple with distal half of rays free; middle rays slightly prolonged. Gill rakers on lower arch 19-20. The spination appears to agree well with that described for the genus; no spine is shown on the suborbitals. Scales ctenoid; vertical scale rows about 70-80; tubed lateral-line scales 28-30. Chest, cheeks, and maxillary scaled. Buccal cavity and peritoneum black. Body with numerous small dark brown spots, somewhat confluent on the back and more widely spaced on sides, with belly pale. Dorsal fin, especially lower half, with numerous irregularly-spaced small brown spots. Some red in life. Sivertsen gives the following measurements (p. 17), "Depth  $3\frac{1}{8}$ - $3\frac{3}{8}$ , length of head  $2\frac{1}{2}$ - $2\frac{3}{5}$  in length of body. Eye  $3\frac{1}{5}$ - $3\frac{3}{5}$  in length of head. Snout  $\frac{3}{4}$ , interorbital width about  $\frac{1}{2}$  diameter of eye."

COMPARISONS. *Helicolenus tristanensis* is closest to *H. dactylopterus lahillei* from Uruguay and Argentina in some measurements, particularly in having a relatively small orbit, wide interorbital in relation to the orbit, and small orbit in relation to the snout length. Also, these two species agree in having small scales on the body, smaller than specimens of *H. dactylopterus* from other areas of the Atlantic. Sivertsen (p. 17) shows the middle pectoral rays elongate; this occurs in specimens of *H. dactylopterus*, but not to the extent shown by specimens of *H. tristanensis*. *Helicolenus tristanensis* differs most notably in coloration; the intense spotting of *H. tristanensis* is lacking in *H. dactylopterus*. In coloration *H. tristanensis* is closest to *H. papillosus*, a species occurring at Australia and New Zealand.

DISTRIBUTION. The species is known only from Tristan da Cunha, apparently only from the original description based on three specimens caught at a depth of 40-50 meters.

### Genus **Sebastes** Cuvier

Only the single species occurring in the South Atlantic is treated in detail. Three North Atlantic species are now usually recognized, *S. marinus*, *S. viviparus* and *S. mentilla*. A recent comprehensive treatment of the North Atlantic species

(Templeman, 1959) serves as a guide to the literature and provides information to distinguish the species. Matsubara (1943, p. 179) gives a detailed description for the genus based on osteological characters.

### *Sebastes capensis* (Gmelin).

*Perca dorso monopterygio* GRONOVIVS, 1763, pp. 88, 293.

*Scorpaena capensis* GMELIN, 1788, pp. 1219–1220 (original description from Gronovius).

*Scorpaena africana* LACÉPÈDE, 1802, p. 266 (new name; *S. capensis* in synonymy).

*Sebastes capensis*. CUVIER in Cuvier and Valenciennes, 1829, p. 341. QUOY AND GAIMARD, 1834, pp. 690–691, pl. 11, fig. 3 (Cape of Good Hope). SMITH, 1849, pl. 22, fig. 1, plus 2 pp. (figure adequate; description with some errors, for example anal soft rays 5; fig. 2 and description of *S. maculatus* also this species). GÜNTHER, 1860, pp. 96–97 (synonymy; specimens in British Museum). GILCHRIST, 1902, p. 119 (compiled).

*Sebastes maculatus* (not of Cuvier), SMITH, 1849, pl. 22, fig. 2, plus 2 pp. (figure of *S. capensis*; description probably of specimen of different size than in fig. 1 of *S. capensis*).

*Perca atra* GRONOVIVS in Gray, 1854, p. 113.

*Sebastodes capensis*, JORDAN AND EVERMANN, 1898, p. 1833 (synonymy; description from Günther; state probably differs from *Sebastodes oculatus* from Chile).

*Sebastichthys capensis*, ?SAUVAGE, 1891, pp. 289–290 (Madagascar). NORMAN, 1935b, p. 57 (Tristan da Cunha; one of 340 mm. by hand-line in 40 meters; no description; also obtained at Gough Island by vessels *Scotia* and *Quest*). SIVERTSEN, 1946, pp. 19–21, figs. 13–14 (Tristan da Cunha; good description from specimens of 170–370 mm. total length; one larva questionably included). DAVIES, 1949, p. 26 (shallow water on west coast of South Africa in 12–150 fathoms; common name Jacoperver). SMITH, 1949 (also later editions), p. 372, pl. 85 (brief description; 20–150 fathoms; from Cape to Saldanha Bay; taken on lines, also along shore in rocky areas in False Bay; color plate). WHEELER, 1958, pp. 238–239, pl. 32 (holotype of *S. capensis* a dried skin from the Gronovius Collection; description; plate good; wrongly states 12 dorsal spines).

**NOMENCLATORIAL REMARKS.** Wheeler (1958) was able to locate the holotype of *Scorpaena capensis* in the Gronovius Collection housed in the British Museum; this specimen formed the basis of the description by Gronovius (1763), Gmelin (1788), and Gronovius in Gray (1854).

The species *Sebastes oculatus* (Cuvier, 1833) which occurs from the coast of Chile to the Falkland Islands is doubtfully distinct from *S. capensis* (see Distribution and Remarks).

**MATERIAL EXAMINED.** BMNH no. 1935.5.2.176 (1, 280) Tristan da Cunha, *Discovery* station 4, hand-line in 40 meters.

**DESCRIPTION.** (Based on one specimen and information given by Sivertsen, 1946, pp. 19–21.) Body shape and coloration in figure 13c.

Dorsal fin with 13 spines and 13–14 soft rays (last double). Anal fin with 3 spines and 6 soft rays (last double). Pectoral rays 18–19, lower 9–10 simple. Gill rakers including rudiments 9 + 19–20; longest rakers near angle, about  $\frac{1}{2}$  length of gill filaments and  $\frac{1}{4}$ – $\frac{1}{3}$  orbit diameter. Vertebrae 26. Preorbital bone with rounded lobes over maxillary. No spines on suborbital bones. Spines absent include the coronal, nuchal, pterotic, and sphenotic. Nasal spines well

developed. Preocular and postocular spines present; supraocular spine present on left and absent on right in specimen examined. Tympanic spines low. Parietal spines long. Upper posttemporal spine well developed; lower posttemporal spine small. Upper 3 preopercular spines elongate, fourth blunt, fifth very blunt. Supracleithral spine broad. Cleithrum rounded, without sharp spine. Opercular spines well developed. Knob present at symphysis of lower jaw. Ridges between orbits low, concave between. Scales ctenoid, vertical scale rows about 75, difficult to count because of numerous smaller accessory scales; lateral line with 36–43 tubed scales. Branchiostegal membranes and upper and lower jaws naked. Interorbital area and isthmus scaled.

Measurements in percent standard length for the specimen examined are as follows (upper jaw will not close completely): Head 43; depth 36; orbit 10; snout 11; interorbital width 5.5; jaw 21; predorsal 38; first anal spine 7; second anal spine 14; third anal spine 12; dorsal spines short, longest dorsal spine (fourth) 10, twelfth 6, thirteenth 8; pelvic fin 21, falling just short of vent; pectoral fin long, 28, extending past vent; caudal fin truncate, least length 17; orbit into snout 1.1; interorbital width into orbit diameter 1.8; orbit into head 4.3. Useful measurements given by Sivertsen are as follows: Head 2.4–2.6 in length of body; eye 3.5 (smaller specimens) to 4.9 (larger specimens) in length of head; snout 1.2 (smaller specimens) to 0.9 (larger specimens) in eye diameter; interorbital width 0.5–0.75 of eye diameter.

Other characters which are useful in distinguishing *S. capensis* from other species in this subfamily (see Phillips, 1957; and Matsubara, 1943) are as follows. Anus situated well in advance of anal-fin origin. End of maxillary extends almost to below rear of orbit. Terminal profile of anal fin with an anterior slant. Lower jaw extends slightly beyond upper jaw with mouth closed. The base of the cranium (parasphenoid) relatively flat (in the sense of Matsubara, 1943). Second suborbital bone long, tapering to a point, and almost reaching the preopercle.

The coloration is described by Smith (1849), J. L. B. Smith (1949), and by Barnard (1927). Barnard says the color is red, shading to orange below; several silvery-white or pinkish irregular spots on the sides above the lateral line; fins red; membrane of spinous dorsal fin mottled with brown; iris golden. The coloration of the preserved specimen (fig. 13c) agrees with that described by Norman (1937, pp. 122–123) for a specimen of *S. ocellatus* from Chile, with an indication of pale areas on the sides located in the same areas as shown schematically by Norman (1937, fig. 67). This also agrees with the pale areas shown by Smith (1849, fig. 1) and J. L. B. Smith (1949, pl. 85) for specimens of *S. capensis* from South Africa. The upper part of the back is dark between the pale areas.

**DISTRIBUTION AND REMARKS.** The present species may be shown to occur from Chile, south through the Straits of Magellan, and east to the Falkland

Islands, Tristan da Cunha, and the southwestern tip of South Africa. Steindachner (1881) first suggested that *S. ocellatus* from Chile was a synonym of *S. capensis*. Norman (1937, pp. 122–123) compared specimens of both species and found only a slight difference in the length of the dorsal spines; a difference which may be related to size of specimens. Some additional species described from the Pacific coast of South America are also doubtfully distinct from *S. ocellatus*; for example, Norman (1937, p. 122) suggested that *S. chilensis* Steindachner was doubtfully distinct from *S. ocellatus*, and that *S. darwini* Cramer was closely related, but he had no specimens of *S. darwini*. De Buen (1960) included *S. jennynsi* Abbott in synonymy of *S. ocellatus*. Additional study is needed.

### Subfamily SETARCHINAE

(See ESCHMEYER AND COLLETTE, 1966, for a detailed treatment.)

**DIAGNOSIS.** Lateral line a continuous trough covered by thin membranous scales; scales small and cycloid; cranium thin and cavernous, bones weakly ossified; second suborbital bone uniformly broad or gradually becoming wider posteriorly, never T-shaped, and without spines in adults; third and fourth suborbital bones absent; no fleshy appendages on head or body; vertebrae 24.

**REMARKS.** The subfamily Setarchinae has been treated on a world-wide basis by Eschmeyer and Collette (1966). This small subfamily contains three genera and four species; two of the genera, *Ectreposebastes* and *Setarches*, are each represented by a species which occurs on both sides of the Atlantic.

### Genus *Setarches* Johnson

*Setarches* JOHNSON, 1862, p. 177 (type species *Setarches güntneri*, by monotypy). ESCHMEYER AND COLLETTE, 1966, pp. 355–356 (redefined genus; included *Bathysebastes*, *Lythrichthys*, and *Scorpaenella* in synonymy; two species recognized: *Setarches longimanus* from the Indo-Pacific and *S. güntneri* from the western Pacific, Indian, and Atlantic Oceans).

**DIAGNOSIS.** Dorsal rays normally XII, 9–10; anal rays III, 5 (juveniles with 2 spines); pectoral rays 20–25; alimentary canal black; swimbladder present.

### *Setarches güntneri* Johnson.

(See ESCHMEYER AND COLLETTE, 1966, pp. 357–365, for a detailed treatment.)

*Setarches güntneri* JOHNSON, 1862, pp. 177–179 (type locality Madeira).

#### ADDITIONAL REFERENCES.

- Setarches parmatius*, EVERMANN AND KENDALL, 1900, p. 88 (compiled Florida records).  
 LONGLEY AND HILDEBRAND, 1941, pp. 166–167 (brief description; Tortugas, Florida).  
 BRIGGS, 1958, p. 294 (compiled Florida records). BULLIS AND THOMPSON, 1965, p. 54 (collections by U. S. Fish and Wildlife Service exploratory fishing vessels). MOE, and others, 1966, p. 81 (specimens in Florida Board of Conservation collection).  
*Setarches güntneri*, LOZANO Y REY, 1943 [Not seen.]. BLACHE, 1962, p. 74 (compiled).  
*Setarches remiger*, FOWLER, 1949, p. 107 (listed).  
*Setarches güntneri*, LOZANO CABO, 1963, p. 345 (listed; Spanish Sahara-Mauritania).



CORRECTION OF EARLIER MISTAKE. Eschmeyer and Collette (1966, p. 360, table 2) wrongly give the anal soft rays as 4 (four specimens), 5 (154) and 6 (95); the number of specimens with 6 soft rays should have been 1 rather than 95.

DISTINGUISHING FEATURES. The two Atlantic species of the subfamily are easily separated from species of other subfamilies by the characteristic trough-like lateral line and the reduced ossification. *Setarches guentheri* differs from *Ectreposebastes imus* in having 20–25 pectoral rays, rather than 20 or fewer, having the orbit diameter about equal to the interorbital width, rather than about twice the interorbital, and in having normally 5 rather than 6 soft rays in the anal fin.

DISTRIBUTION. The species was treated by Eschmeyer and Collette (1966) as occurring from Hawaii west to the western Atlantic, with some geographic variation in counts and measurements. In the western Atlantic the species is widely distributed from 39°57' N. to northern Brazil. In the eastern Atlantic the species is known from Madeira, the Cape Verde Islands, Morocco, and throughout the Gulf of Guinea south to South Africa. Depths of capture are from about 125 to 380 fathoms.

### Genus *Ectreposebastes* Garman

*Ectreposebastes* GARMAN, 1899, p. 53 (type-species *Ectreposebastes imus* Garman, by monotypy). ESCHMEYER AND COLLETTE, 1966, pp. 366–367 (redefined genus; placed in subfamily Setarchinae; a single species occurring in the eastern Pacific and western and eastern Atlantic).

DIAGNOSIS. Dorsal rays usually XII, 9; anal rays usually III, 6 (2 spines in juveniles); pectoral rays 18–20; stomach often with some black pigment, but intestine and pyloric caeca pale; swimbladder absent or rudimentary; body soft and flabby in life.

### *Ectreposebastes imus* Garman.

(See ESCHMEYER AND COLLETTE, 1966, pp. 367–371, fig. 4, for a detailed treatment.)

*Ectreposebastes imus* GARMAN, 1899, pp. 53–55, pls. 8, 9, and 71, fig. c (type locality Galápagos Islands, 384 fathoms, *Albatross* station 3403).

#### ADDITIONAL REFERENCE.

*Ectreposebastes* sp., BULLIS AND THOMPSON, 1965, p. 53 (*Oregon* station 1940; listed).

ADDITIONAL MATERIAL. UMML no. 22838 (1, 158) *Oregon* station 5233 and UMML no. 22839 (1, 65) *Oregon* station 5234, both from 29°54.5' N., 80°10' W., in 190 fathoms, 40-foot shrimp trawl.

DISTINGUISHING FEATURES. See this section under the account of *Setarches guentheri*.

DISTRIBUTION. Eschmeyer and Collette (1966) recorded this species from the eastern Pacific at the Galápagos Islands and off Peru, in the western Atlantic off the Mississippi Delta, Honduras, Colombia, and Puerto Rico, and in the

eastern Atlantic from Sierra Leone to Cameroun. The additional specimens listed above are the first from the Atlantic coast of the United States. Depths of capture range from about 150 to 400 fathoms, with some specimens taken in midwater trawls.

In a mimeographed United States Fish and Wildlife Service cruise report (23 May 1968) for *Townsend Cromwell* cruise 36, it was reported that a total of 223 specimens tentatively identified as *Ectreposebastes imus* were taken in two shrimp trawl hauls south of Honolulu, Hawaii, in 325–350 fathoms. Through correspondence with Paul J. Struhsaker, the identification has been verified. This amazing capture at Hawaii suggests that the species may be circumtropical in distribution and should be looked for in the western Pacific and Indian Ocean.

#### SPECIATION AND ZOOGEOGRAPHY OF ATLANTIC SCORPIONFISHES

The scorpaenid fishes of the Atlantic Ocean belong for the most part to the more generalized subfamilies, and the majority of the species are referable to the subfamily Scorpaeninae. Most Atlantic species are in genera with a world-wide distribution, but some genera are restricted to the Atlantic.

The most primitive Atlantic scorpionfishes are in the subfamily Sebastinae, especially the genus *Sebastes* (following Matsubara's broad definition of the genus, 1943). The North Pacific appears to be the origin and center of speciation of *Sebastes*; the genus has not been successful in other areas. The family Scorpaenidae, represented mostly by species of *Sebastes*, contains more species than any other fish family occurring off California (Phillips, 1957, p. 9). Despite numerous species at this and more northern latitudes, crossing of the tropical region in the eastern Pacific has been difficult for these fishes. Jordan and Evermann (1898, pp. 1832–1833) thought that species of the genus *Sebastes* (= *Sebastes*) would prove numerous in temperate waters off South America, but this has not proved to be so, and it is doubtful if more than a few species occur there. The single species *Sebastes capensis* in the South Atlantic (Tristan da Cunha and the southwest tip of South Africa) is closely related (doubtfully distinct) to *S. oculatus*, a species occurring from Chile to the Falkland Islands; the occurrence at Tristan da Cunha and South Africa apparently resulted from movement eastward with the prevailing currents. The presence of three species of the genus *Sebastes* in the extreme North Atlantic is most easily explained by a trans-Arctic movement. Two of the remaining genera of the subfamily Sebastinae, *Sebastes* and *Hozukius*, occur in the western Pacific; the genus *Helicolenus* is represented in all oceans.

The two species of the subfamily Setarchinae present in the Atlantic Ocean occur widely elsewhere. *Setarches guntheri* was treated (Eschmeyer and Collette, 1966) as occurring from Hawaii west to the western Atlantic. *Ectreposebastes imus* is known from the eastern Pacific, Hawaii, and both sides of the

Atlantic. Two additional species of this subfamily are confined to the Indo-West Pacific.

The remainder of the Atlantic scorpionfishes are treated as belonging to the subfamily Scorpaeninae. Several genera are represented in the Indo-Pacific and some are restricted to the Atlantic, but our knowledge of Indian Ocean scorpionfishes, particularly those living at deeper depths, is poor. Three genera occurring in the Atlantic are world-wide in distribution, *Scorpaenodes*, *Scorpaena*, and *Pontinus*; *Scorpaenodes* is best represented in the Indian and western Pacific oceans where the species are particularly common on reefs; *Scorpaena* and *Pontinus* are best represented in Atlantic and eastern Pacific waters. The genus *Phenacoscopus* is known from one species in the western Atlantic and three species in the Indian and Pacific oceans. *Neomerinthe* (two in the western Atlantic and one tentatively included from the eastern Atlantic), *Trachyscorpia* (one common to both sides of the Atlantic and one at Tristan da Cunha) and *Idiastion*<sup>3</sup> (one western Atlantic species) are so far known only from the Atlantic. About five or six additional genera of the subfamily are not represented in the Atlantic Ocean.

In summary, the following species are represented on both sides of the Atlantic: *Setarches guentheri*, *Ectreposebastes imus*, *Helicolenus dactylopterus dactylopterus*, and *Trachyscorpia cristulata* (questionably as two subspecies).

The mid-Atlantic has been an effective barrier to species of the shallow-water tropical genera *Scorpaena* and *Scorpaenodes*. *Scorpaena plumieri* is unusual in occurring in the western Atlantic, at Saint Helena and Ascension, and in the eastern Pacific; *Scorpaena laevis* in the eastern Atlantic is closely related to *S. plumieri*. No other Atlantic species of *Scorpaena* appears to have a particularly close Atlantic relative in other than the same geographical area. Most of the eastern Atlantic species of the genus *Scorpaena* have ctenoid scales; exceptions are *S. laevis* derived from the *S. plumieri*-type, and *S. mellissii* from Saint Helena. The emarginate scales of *S. porcus* seem to be derived from ctenoid scales. Most Indian and western Pacific species also have ctenoid scales, while western Atlantic species all have cycloid scales. Among the eastern Atlantic species, one group has the pectoral-fin base, chest, and most of the head naked; some Indo-Pacific species share this character. A sub-group of eastern Atlantic species (*Scorpaena annobonae*, *S. azorica*, *S. loppci*, and *S. angolensis*) is unique in having the pores at the symphysis of the lower jaw united.

Some of the species of *Scorpaena* in the tropical and temperate eastern Pacific appear closely related to the western Atlantic species (for example, *Scorpaena russula* is closely related to the western Atlantic species *S. calcarata* and *S. inermis*; *S. plumieri* occurs in both areas). Other eastern Pacific species

<sup>3</sup> See Addendum.

have uncertain affinities, but the presence of cycloid scales favors relationship to western Atlantic species.

South Africa and the mid-Pacific have been effective barriers limiting the less generalized shallow-living, warm water scorpaenids of such groups as the subfamily Pteroinae, Apistinae, Minoinae, Pelorinae, and Synancejinae to the Indian and western Pacific oceans.

#### SUMMARY

The systematics of the fishes of the family Scorpaenidae occurring in the Atlantic Ocean are treated. Two new species of the genus *Scorpaena* and one new species of the genus *Pontinus* are described from the eastern Atlantic. One new subgenus of the genus *Trachyscorpia* is described and the species "*capensis*" Gmelin referred to it. *Pontinus pollux* Poey is thought to be a junior synonym of *P. castor* Poey; hence, *Neomerinthe hemingwayi* is reinstated as a valid species rather than a junior synonym of *P. pollux*. *Pontinus nematophthalmus* (Günther) replaces *P. macrolepis*. *Scorpaena folgori* Postel and Roux is not a species of *Scorpaena* and is referred to the genus *Neomerinthe*.

Besides one western Atlantic species of uncertain validity, 57 species in 11 genera occur in the Atlantic Ocean. The treatment of eastern Atlantic species is most complete for those species occurring in the Gulf of Guinea, but all eastern Atlantic species are included. Western Atlantic species receiving most attention are those not included in my previous papers. Species of the genus *Sebastes* occurring in the North Atlantic are not treated in detail, but *Sebastes capensis*, known from the South Atlantic, is included. Keys are provided for identification and some of the species are figured. Descriptions and synonymies are given. Information provided for species studied in my previous papers is abbreviated, but in some cases additional information is given. Also, in some cases information on species occurring in other oceans is included (for example, species of *Pontinus* and *Helicolenus*).

Speciation and zoogeography of Atlantic scorpionfishes are discussed.

#### ADDENDUM

After the manuscript was submitted, a collection from Angola was received including specimens of two species worthy of brief mention at this time. They were collected by George C. Miller on the U. S. Bureau of Commercial Fisheries vessel *Undaunted* and have been deposited in the collection of the California Academy of Sciences. The species of scorpionfishes occurring from Angola south to South Africa clearly deserve additional study.

*Idiastion* species.

MATERIAL EXAMINED. CAS no. 24401 (2, 77-86) off Angola, Kunene River transect, 17° 18'S., 11° 24'E., in 229-274 meters, *Undaunted* cruise 6801, station 68-266, 24 March 1968.

REMARKS. These two specimens are the first of the genus *Idiastion* from the

eastern Atlantic. They are very similar to specimens of *Idiastion kyphos*, the western Atlantic species. Whether the eastern Atlantic specimens represent *I. kyphos* or whether they are a subspecies of *I. kyphos* or a new species, awaits a more thorough study. (The specimens "key" to the genus *Scorpaena* in part B of the key and to *Idiastion kyphos* in part A of the key.) The description of *I. kyphos* as given for the western Atlantic specimens fits the two eastern Atlantic specimens well. The pectoral rays in the two eastern Atlantic specimens number 18 and 19 rather than 17 and 18.

#### *Scorpaena* species.

MATERIAL EXAMINED. CAS no. 24426 (3, 174–186) off Angola, 16°20.2'S., 11°42.5'E., in 56 meters, *Undaunted* cruise 6801, station 68-249, 18 March 1968.

REMARKS. These three specimens appear to represent a new species closely related to *Scorpaena stephanica* and other species which have the pectoral-fin base and chest unscaled, the pores at the symphysis of the lower jaw separate, and scales on the flanks slightly ctenoid. The three specimens would be identified as *S. stephanica* in the key. They differ from *S. stephanica* mainly in coloration, but some morphological differences are also present. In body shape and some measurements (especially the short predorsal-fin length), the specimens resemble *S. angolensis*. In *S. angolensis* there is but a single pore at the symphysis of the lower jaw; in *Scorpaena* species the pores at the symphysis of the lower jaw are separated by about 1 or 2 pore diameters in two specimens and are almost united (probably not normal) in the third specimen. The occipital pit in the three specimens is deeper than in *S. stephanica* and about as deep as in *S. angolensis*. Both *S. stephanica* and *S. angolensis* were collected off Angola during the cruise which resulted in the collection of *Scorpaena* species.

The coloration of the specimens is as follows. Body and head mostly brownish above and lighter below. Anal fin, pelvic fins, and lower half of caudal fin with pale spots on a dusky background. Soft dorsal fin and upper half of caudal fin with brown spots. Spinous dorsal fin with a black patch between spines 6 or 7 to 9 or 10. Inside of pectoral fin also slightly dusky with paler large spots or with light brown spots surrounded by whitish ring on a more dusky background.

Counts and measurements (in percent standard length) are as follows: Dorsal rays XII,9 (one with XII,7); anal rays III,5; pectoral rays 18; vertical scale rows about 40–45; gill rakers 5 + 9–11, including rudiments. Head length 43–44 percent; body depth 32–33; orbit diameter 10; snout length 11–12; interorbital width 4.4–5.6; jaw length 19–21; predorsal-fin length 31–33; pectoral fin length 33–36; pelvic fin length 25–28, fin reaching to about first anal spine; caudal fin length 31–36.

*Scorpaena* species is not likely to be *Scorpaena gaillardae* Roux, which is here treated as a synonym of *S. stephanica*. *Scorpaena* species appears to differ from *S. stephanica* (including *S. gaillardae*) in having a shorter pectoral fin, shorter predorsal-fin length, deeper occipital pit, different coloration (especially on the

pectoral, pelvic, anal, and caudal fins), black spot on the spinous dorsal fin at midheight of fin membranes rather than on the distal two-thirds. Roux (1957) did not report *S. stephanica* from off the coast of Africa (near Point Noire), but on the basis of my material it should be common there; this also favors the view that *S. gaillardae* is a synonym of *S. stephanica*. Roux (1957) mentions a crest on the maxillary in *S. gaillardae*; he probably was referring to the shallow crest which occurs in *S. stephanica* and some other species, including *Scorpaena* species.

TABLE 1. Frequency distributions of number of dorsal rays in Atlantic scorpionfishes of the subfamilies Scorpaeninae and Setarchinae.

Species	Spines					Soft rays <sup>1</sup>				
	11	12	13	14	7	8	9	10	11	
<i>Pontinus longispinis</i>										
Northern population	—	47	—	—	—	—	46	1	—	—
Southern population	—	49	—	—	—	—	49	—	—	—
<i>P. helena</i>	—	2	—	—	—	—	1	1	—	—
<i>P. castor</i>	—	12	—	—	—	—	1	10	—	—
<i>P. nematophthalmus</i>	—	61	—	—	—	4	57	—	—	—
<i>P. rathbuni</i>	1	40	—	—	—	2	38	—	—	—
<i>P. accraensis</i>	2	66	—	—	—	1	67	—	—	—
<i>P. leda</i>	—	27	1	—	—	1	27	—	—	—
<i>P. kuhlii</i>	—	9	—	—	—	—	9	—	—	—
<i>P. nigropunctatus</i>	—	2	—	—	—	—	2	—	—	—
<i>Neomerinthe hemingwayi</i>	—	34	—	—	—	—	1	33	—	—
<i>N. beanorum</i>	—	61	—	—	—	4	57	—	—	—
<i>N. folgori</i> <sup>2</sup>	—	2	—	—	—	—	—	—	—	2
<i>Trachyscorpia cristulata</i>										
Western Atlantic	—	20	—	—	—	2	18	—	—	—
Eastern Atlantic <sup>3</sup>	—	xx	—	—	—	4	5	—	—	—
<i>T. capensis</i> <sup>4</sup>	—	—	1	—	—	x	1	—	—	—
<i>Idiastion kyphos</i>	—	2	—	—	—	—	2	—	—	—
<i>Phenacoscorpius nebris</i>	—	10	—	—	—	—	10	—	—	—
<i>Scorpaena petricola</i>	—	12	—	—	—	—	12	—	—	—
<i>S. melasma</i>	—	2	—	—	—	—	2	—	—	—
<i>S. brachyptera</i>	—	12	—	—	1	10	1	—	—	—
<i>S. elachys</i>	—	14	—	—	—	3	11	—	—	—
<i>S. grandicornis</i>	—	37	—	—	—	—	38	—	—	—
<i>S. brasiliensis</i>	—	32	3	—	—	1	32	—	—	—
<i>S. bergii</i>	—	21	—	—	—	—	21	—	—	—
<i>S. isthmensis</i>	2	48	—	—	—	—	50	—	1	—
<i>S. albifimbria</i>	—	9	—	—	—	2	7	—	—	—
<i>S. inermis</i>	—	16	—	—	3	13	—	—	—	—
<i>S. calcarata</i>	—	53	—	—	1	3	48	1	—	—
<i>S. dispar</i>	—	43	—	—	—	2	41	—	—	—
<i>S. agassizii</i>	1	50	—	—	—	1	50	—	—	—
<i>S. plumieri</i>										
Western Atlantic	—	28	—	—	—	—	28	—	—	—
Central Atlantic	—	2	—	—	—	—	2	—	—	—

TABLE 1. (Continued)

Species	Spines				Soft rays <sup>1</sup>				
	11	12	13	14	7	8	9	10	11
<i>S. normani</i>	—	39	—	—	—	1	37	1	—
<i>S. angolensis</i>	—	26	—	—	—	—	26	—	—
<i>S. stephanica</i>	—	31	—	—	—	1	30	—	—
<i>S. elongata</i>	—	8	—	—	—	2	6	—	—
<i>S. scrofa</i>	—	11	—	—	—	—	11	—	—
<i>S. laevis</i>	—	14	—	—	—	—	14	—	—
<i>S. loppci</i>	—	2	—	—	—	—	2	—	—
<i>S. annobonae</i>	—	1	—	—	—	—	—	1	—
<i>S. azorica</i>	—	1	—	—	—	—	1	—	—
<i>S. maderensis</i>	—	11	—	—	—	—	11	—	—
<i>S. canariensis</i> <sup>2</sup>	—	1	—	—	—	—	1	—	—
<i>S. mellissii</i>	—	1	—	—	—	—	1	—	—
<i>S. notata</i> <sup>3</sup>	—	19	—	—	—	—	19	—	—
<i>S. porcus</i>	—	21	—	—	—	—	21	—	—
<i>Scorpaenodes caribbaeus</i>	—	—	23	1	—	—	24	—	—
<i>S. tredecimspinosus</i>	—	—	30	—	—	6	24	—	—
<i>S. africanus</i>	—	—	6	—	—	1	5	—	—
<i>S. arena</i> <sup>4</sup>	—	—	5	—	—	—	5	—	—
<i>S. elongatus</i> <sup>5</sup>	—	—	1	2	—	—	2	1	—
<i>Setarches guentheri</i>									
Western Atlantic	—	66	—	—	—	19	47	—	—
Eastern Atlantic	3	63	3	—	—	25	48	—	—
<i>Ectreposebastes imus</i> <sup>6</sup>	—	36	—	—	—	—	5	32	—

<sup>1</sup> Last double<sup>2</sup> Includes holotype, Postel and Roux, 1964.<sup>3</sup> From Boutiere, 1958.<sup>4</sup> Smith (1949) gives soft rays as 8/9.<sup>5</sup> From Cadenat, 1945.<sup>6</sup> One with 9 spines and 7 soft rays.<sup>7</sup> From Torchio, 1962.<sup>8</sup> From Cadenat (1959) in part.<sup>9</sup> Includes eastern Pacific.TABLE 2. Frequency distributions of number of pectoral rays (left side) in Atlantic scorpionfishes of the subfamily Scorpaeninae.<sup>1</sup>

Species	Pectoral rays									
	15	16	17	18	19	20	21	22	23	24
<i>Pontinus longispinis</i>										
Northern population	—	6	177	9	—	—	—	—	—	—
Southern population	—	—	26	23	—	—	—	—	—	—
<i>P. helena</i>	—	—	—	—	1	1 <sup>2</sup>	—	—	—	—
<i>P. castor</i>	—	—	15	—	—	—	—	—	—	—
<i>P. nematophthalmus</i>	3	67 <sup>3</sup>	1	—	—	—	—	—	—	—
<i>P. rathbuni</i>	—	1	58	5	—	—	—	—	—	—
<i>P. accraensis</i>	—	6	128	5	—	—	—	—	—	—
<i>P. leda</i>	—	—	5	23	—	—	—	—	—	—
<i>P. kuhlii</i>	—	—	8	1	—	—	—	—	—	—
<i>P. nigropunctatus</i>	—	—	—	2	—	—	—	—	—	—
<i>Neomerinthe hemingwayi</i>	—	5 <sup>4</sup>	44	—	—	—	—	—	—	—
<i>X. beanorum</i>	—	2	64	1	—	—	—	—	—	—

TABLE 2. (Continued)

Species	Pectoral rays									
	15	16	17	18	19	20	21	22	23	24
<i>N. folgori</i> <sup>2</sup>	—	—	2	—	—	—	—	—	—	—
<i>Trachyscorpia cristulata</i>										
Western Atlantic	—	—	—	—	—	—	—	3 <sup>12</sup>	26	5
Eastern Atlantic <sup>3</sup>	—	—	—	—	—	—	3	6	1	—
<i>T. capensis</i> <sup>4</sup>	—	—	—	—	—	x	x	x	x	—
<i>Idiastion kyphos</i>	—	—	1	1	—	—	—	—	—	—
<i>Phenacoscorpius nebris</i>	—	8	2	—	—	—	—	—	—	—
<i>Scorpaena petricola</i>	—	—	2	10	—	—	—	—	—	—
<i>S. melasma</i>	—	—	—	—	—	—	2	—	—	—
<i>S. brachyptera</i>	—	—	—	—	6	8	—	—	—	—
<i>S. clachys</i>	—	3	11	—	—	—	—	—	—	—
<i>S. grandicornis</i>	—	—	4	76	11	—	—	—	—	—
<i>S. brasiliensis</i>	—	1 <sup>11</sup>	1	16	122	19	—	—	—	—
<i>S. bergii</i>	—	6	44	—	—	—	—	—	—	—
<i>S. isthmensis</i>	—	1	2	44	3	—	—	—	—	—
<i>S. albifimbria</i>	—	—	—	—	6	13	2	—	—	—
<i>S. inermis</i>	—	—	—	—	5	22	1	—	—	—
<i>S. calcarata</i>	—	—	—	1	31	171	32	—	—	—
<i>S. dispar</i> <sup>5</sup>	—	—	13	30	11	—	—	—	—	—
<i>S. agassizii</i>	—	—	—	1	12	120	13	—	—	—
<i>S. plumieri</i>										
Western Atlantic	—	—	—	2	45	44	5	—	—	—
Central Atlantic	—	—	—	—	—	2	2	—	—	—
<i>S. normani</i>	—	—	—	3	32	5	—	—	—	—
<i>S. angolensis</i>	—	—	2	24	—	—	—	—	—	—
<i>S. stephanica</i>	—	—	1	26	2	—	—	—	—	—
<i>S. elongata</i>	—	—	—	1	6	—	—	—	—	—
<i>S. scrofa</i>	—	—	—	2 <sup>9</sup>	8	1 <sup>9</sup>	—	—	—	—
<i>S. laevis</i>	—	—	—	1 <sup>9</sup>	8	3	—	—	—	—
<i>S. loppei</i>	—	—	—	2 <sup>15</sup>	—	—	—	—	—	—
<i>S. annobonae</i>	—	—	—	1	—	—	—	—	—	—
<i>S. azorica</i>	—	—	—	1	—	—	—	—	—	—
<i>S. maderensis</i>	5	6 <sup>13</sup>	—	—	—	—	—	—	—	—
<i>S. canariensis</i> <sup>6</sup>	—	1	—	—	—	—	—	—	—	—
<i>S. mellissii</i>	—	—	—	—	—	1	—	—	—	—
<i>S. notata</i>	—	—	1	19 <sup>12</sup>	—	—	—	—	—	—
<i>S. porcus</i>	—	9	12	—	—	—	—	—	—	—
<i>Scorpaenodes caribbaeus</i>	—	—	—	17	60	4	—	—	—	—
<i>S. tredecimspinosus</i>	—	4	24	2	—	—	—	—	—	—
<i>S. africanus</i>	—	—	1	3	1	—	—	—	—	—
<i>S. arenaf</i>	—	—	x	x	x	—	—	—	—	—
<i>S. elongatus</i> <sup>7</sup>	—	—	—	2	1	—	—	—	—	—

1 Counts by Ginsburg (1953, p. 14) for western Atlantic species included.

2 Includes holotype, Postel and Roux, 1964.

3 From Bontiere, 1958.

4 From Smith, 1949.

5 One with 14 on left and 18 on right.

6 From Cadenat, 1945.

7 From Torchio, 1962.

8 From Cadenat (1949) in part.

9 19 on right side.

10 16 on right side.

11 3 with 17 on right.

12 1 with 21 on right.

13 18 on right.

14 1 with 17 on right.



TABLE 3. Frequency distributions of orbit diameter expressed as percent standard length in available Atlantic scorpionfishes of the subfamily Scorpaeninae, except western Atlantic species of the genus *Scorpaena*.<sup>1</sup>

Species	8	9	10	11	12	13	14	15	16	Size range mm S. L.
<i>Pontinus longispinis</i>										
Northern population	—	—	—	1	26	15	4	1	—	31-171
Southern population	—	—	1	3	8	18	12	3	2	52-205
<i>P. helena</i>	—	—	—	—	1	1	—	—	—	186-203
<i>P. castor</i>	—	—	1	3	6	2	—	—	—	25-256
<i>P. nematophthalmus</i>	—	—	—	—	3	21	14	10	2	29-132
<i>P. rathbuni</i>	—	—	—	4	7	17	10	2	—	38-197
<i>P. accraensis</i>	—	—	—	4	16	33	69	13	3	50-170
<i>P. leda</i>	—	—	—	—	—	7	14	6	1	71-163
<i>P. kuhlii</i>	—	—	5	2	—	1	—	—	—	146-230
<i>P. nigropunctatus</i>	—	1	—	1	—	—	—	—	—	193-272
<i>Neomerinthe hemingwayi</i>	2	16	13	2	—	—	—	—	—	102-315
<i>N. beanorum</i>	—	—	2	6	7	11	9	—	—	33-154
<i>N. folgori</i>	—	1	—	—	—	—	—	—	—	340
<i>Trachyscorpia cristulata</i> <sup>2</sup>	—	—	—	1	2	7	5	2	3	62-352
<i>T. capensis</i>	—	—	—	—	—	1	—	—	—	320
<i>Idiastion kyphos</i>	—	—	—	—	—	—	1	1	—	53-105
<i>Phenacoscopus nebris</i>	—	—	—	—	—	2	1	—	—	46-84
<i>Scorpaena normani</i>	—	—	—	—	3	12	9	1	—	47-124
<i>S. angolensis</i>	—	—	—	6	8	10	2	—	—	59-137
<i>S. stephanica</i>	—	1	7	9	9	4	1	1	—	60-225
<i>S. elongata</i>	—	—	4	3	1	—	—	—	—	145-255
<i>S. scrofa</i>	—	1	6	—	—	—	—	—	—	96-211
<i>S. laevis</i>	—	5	4	5	—	—	—	—	—	28-220
<i>S. loppei</i>	—	—	—	—	1	1	—	—	—	55-59
<i>S. annobonae</i>	—	—	—	—	—	—	1	—	—	44
<i>S. azorica</i>	—	—	—	1	—	—	—	—	—	98
<i>S. maderensis</i>	—	—	1	4	2	—	—	—	—	41-96
<i>S. mellissii</i>	—	1	—	—	—	—	—	—	—	202
<i>S. notata</i>	—	—	—	2	1	4	2	—	—	62-115
<i>S. porcus</i>	—	—	—	2	3	6	—	—	—	39-102
<i>Scorpaenodes caribbaeus</i>	—	—	—	—	4	5	5	7	—	35-82
<i>S. tredecimspinosus</i>	—	—	—	—	2	1	6	3	—	24-45
<i>S. africanus</i>	—	—	—	—	—	2	1	1	1	33-50
<i>S. elongatus</i>	—	—	—	1	—	—	—	—	—	88
<i>S. arena</i> <sup>3</sup>	—	—	1	—	3	1	—	—	—	52-75

<sup>1</sup> Larger specimens tend to have proportionally smaller orbits.

<sup>2</sup> Western Atlantic only.

<sup>3</sup> Calculated from data given by Torchio (1962, p. 115).

TABLE 4. Frequency distributions of snout length expressed as percent standard length in Atlantic scorpionfishes of the subfamily Scorpaeninae, except western Atlantic species of the genus *Scorpaena*.<sup>1</sup>

Species	9	10	11	12	13	14	15	16	17
<i>Pontinus longispinis</i>									
Northern population	—	1	17	20	9	—	—	—	—
Southern population	1	2	14	18	11	2	—	—	—
<i>P. helena</i>	—	—	—	—	—	2	—	—	—
<i>P. castor</i>	—	—	—	—	2	8	1	—	1
<i>P. nematophthalmus</i>	—	1	16	30	3	—	—	—	—
<i>P. rathbuni</i>	—	—	16	21	2	1	—	—	—
<i>P. accraensis</i>	—	1	15	59	33	24	3	—	—
<i>P. leda</i>	—	3	16	7	2	—	—	—	—
<i>P. kuhlii</i>	—	—	—	3	4	1	—	—	—
<i>P. nigropunctatus</i>	—	—	—	—	—	1	—	—	—
<i>Neomerinthe hemingwayi</i>	—	—	—	1	18	14	—	—	—
<i>N. beanorum</i>	—	—	—	6	26	5	1	—	—
<i>N. folgori</i>	—	—	—	—	—	—	—	1	—
<i>Trachyscorpia cristulata</i> <sup>2</sup>	—	7	13	—	—	—	—	—	—
<i>T. capensis</i>	1	—	—	—	—	—	—	—	—
<i>Idiastion kyphos</i>	—	—	1	1	—	—	—	—	—
<i>Phenacoscorpius nebris</i>	—	—	—	1	—	2	—	—	—
<i>Scorpaena normani</i>	—	15	9	1	—	—	—	—	—
<i>S. angolensis</i>	—	18	8	—	—	—	—	—	—
<i>S. stephanica</i>	—	7	18	7	—	—	—	—	—
<i>S. elongata</i>	—	—	1	4	3	—	—	—	—
<i>S. scrofa</i>	—	—	—	2	5	—	—	—	—
<i>S. laevis</i>	—	5	7	2	—	—	—	—	—
<i>S. plumieri</i>	—	—	—	1	3	—	—	—	—
<i>S. loppei</i>	—	1	1	—	—	—	—	—	—
<i>S. annobonae</i>	—	—	—	—	1	—	—	—	—
<i>S. azorica</i>	—	1	—	—	—	—	—	—	—
<i>S. maderensis</i>	—	—	3	4	—	—	—	—	—
<i>S. mellissii</i>	—	—	—	—	1	—	—	—	—
<i>S. notata</i>	—	2	7	—	—	—	—	—	—
<i>S. porcus</i>	1	5	4	—	—	—	—	—	—
<i>Scorpaenodes caribbaeus</i>	—	8	11	1	—	—	—	—	—
<i>S. tredecimspinosus</i>	4	6	2	—	—	—	—	—	—
<i>S. africanus</i>	—	3	1	1	—	—	—	—	—
<i>S. elongatus</i>	—	—	—	—	1	—	—	—	—
<i>S. arenar</i> <sup>3</sup>	—	—	3	2	—	—	—	—	—

<sup>1</sup> Size ranges of specimens measured as in table 3.

<sup>2</sup> Western Atlantic specimens only.

<sup>3</sup> Calculated from data given by Torchio (1962, p. 115).

TABLE 5. Frequency distributions of head length expressed as percent standard length in available Atlantic scorpionfishes of the subfamily Scorpaeninae, except western Atlantic species of the genus *Scorpaena*.<sup>1, 2</sup>

Species	40	41	42	43	44	45	46	47	48	49	50	51
<i>Pontinus longispinis</i>												
Northern population	2	5	16	14	6	4	—	—	—	—	—	—
Southern population	—	—	1	5	8	12	13	3	5	—	—	—
<i>P. helena</i>	—	—	—	—	—	—	—	—	1	1	—	—
<i>P. eastor</i>	—	—	—	—	—	1	1	5	1	2	—	1
<i>P. nematophthalmus</i>	—	—	—	—	8	8	12	13	6	2	—	—
<i>P. rathbuni</i>	—	—	2	2	11	12	9	3	1	—	—	—
<i>P. accarensis</i>	—	—	—	2	12	19	43	28	24	7	—	—
<i>P. leda</i>	—	—	—	—	2	2	2	4	8	2	6	2
<i>P. kuhlii</i>	—	—	—	—	—	5	2	—	1	—	—	—
<i>P. nigropunctatus</i>	—	—	—	—	—	1	—	1	—	—	—	—
<i>Neomerinthe hemingwayi</i>	—	—	1	—	8	13	8	2	1	—	—	—
<i>N. beanorum</i>	—	—	—	—	1	1	11	6	10	8	1	—
<i>N. folgori</i>	—	—	—	—	—	—	—	—	—	1	—	—
<i>Trachyscorpia cristulata</i> <sup>3</sup>	—	—	—	—	—	—	2	3	10	5	—	—
<i>T. capensis</i>	—	—	—	—	1	—	—	—	—	—	—	—
<i>Idiastion kyphos</i>	—	—	—	—	—	—	1	—	1	—	—	—
<i>Phenacoscorpius nebris</i>	—	—	—	—	—	—	2	—	1	—	—	—
<i>Scorpaena normani</i>	—	2	4	12	2	5	—	—	—	—	—	—
<i>S. angolensis</i>	—	—	3	7	8	5	3	—	—	—	—	—
<i>S. elongata</i>	—	—	—	—	—	4	2	2	—	—	—	—
<i>S. stephanica</i>	—	—	3	9	8	9	2	1	—	—	—	—
<i>S. scrofa</i>	—	—	—	—	2	2	2	1	—	—	—	—
<i>S. laevis</i>	—	—	—	4	1	6	2	1	—	—	—	—
<i>S. lopppei</i>	—	—	—	—	2	—	—	—	—	—	—	—
<i>S. annobonae</i>	—	—	—	—	—	—	—	—	1	—	—	—
<i>S. azorica</i>	—	1	—	—	—	—	—	—	—	—	—	—
<i>S. maderensis</i>	1	3	2	1	—	—	—	—	—	—	—	—
<i>S. mellissii</i>	—	—	1	—	—	—	—	—	—	—	—	—
<i>S. notata</i>	—	1	1	3	3	1	—	—	—	—	—	—
<i>S. porcus</i>	—	—	—	2	3	2	2	1	—	—	—	—
<i>Scorpaenodes caribbaeus</i>	—	—	1	3	5	7	4	1	—	—	—	—
<i>S. tredecimspinosus</i>	1	2	4	3	2	—	—	—	—	—	—	—
<i>S. africanus</i>	—	—	1	1	2	—	1	—	—	—	—	—
<i>S. elongatus</i>	—	—	—	1	—	—	—	—	—	—	—	—
<i>S. arenai</i> <sup>4</sup>	—	1	1	2	1	—	—	—	—	—	—	—

<sup>1</sup> Larger specimens tend to have proportionally smaller heads.

<sup>2</sup> Size range as in table 3.

<sup>3</sup> Western Atlantic only.

<sup>4</sup> From Torchio (1962, p. 115).

TABLE 6. Frequency distributions of body depth expressed as percent standard length in Atlantic scorpionfishes of the subfamily Scorpaeninae, except western Atlantic species of the genus *Scorpaena*.<sup>1</sup>

Species	28	29	30	31	32	33	34	35	36	37	38	39	40	41
<i>Pontinus longispinis</i>														
Northern population	—	5	14	14	10	3	1	—	—	—	—	—	—	—
Southern population	1	1	10	9	21	4	1	—	—	—	—	—	—	—
<i>P. helena</i>	—	—	—	—	—	—	—	1	—	1	—	—	—	—
<i>P. castor</i>	—	—	—	1	5	2	3	—	—	—	—	—	—	—
<i>P. nematophthalmus</i>	—	—	—	1	4	9	8	13	11	3	1	—	—	—
<i>P. rathbuni</i>	—	—	1	2	4	7	12	5	6	1	2	—	—	—
<i>P. accraensis</i>	—	—	—	3	17	17	20	10	3	—	—	—	—	—
<i>P. leda</i>	—	—	—	—	1	—	5	4	2	8	5	3	—	—
<i>P. kuhlii</i>	—	—	—	—	—	—	1	4	2	1	—	—	—	—
<i>P. nigropunctatus</i>	—	—	—	—	—	1	—	1	—	—	—	—	—	—
<i>Neomerinthe hemingwayi</i>	3	6	7	9	5	1	—	—	—	—	—	—	—	—
<i>N. beanorum</i>	—	2	11	12	7	5	—	—	—	—	—	—	—	—
<i>N. folgori</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—
<i>Trachyscorpia cristulata</i> <sup>2</sup>	—	—	—	—	1	2	11	4	2	—	—	—	—	—
<i>T. capensis</i>	—	—	—	—	—	1	—	—	—	—	—	—	—	—
<i>Idiastion kyphos</i>	—	—	—	—	—	—	—	—	—	—	1	1	—	—
<i>Phenacoscorpius nebris</i>	—	—	—	—	—	—	—	1	—	1	—	—	1	—
<i>Scorpaena normani</i>	—	—	—	—	—	—	3	8	7	1	5	1	—	—
<i>S. angolensis</i>	—	—	—	—	—	3	5	7	4	3	4	—	—	—
<i>S. elongata</i>	—	—	—	1	4	1	1	1	—	—	—	—	—	—
<i>S. stephanica</i>	—	—	3	—	4	7	9	2	3	1	—	—	—	—
<i>S. scrofa</i>	—	—	—	—	—	—	1	1	2	1	1	1	—	—
<i>S. laevis</i>	—	—	—	—	—	1	4	2	2	1	3	—	—	—
<i>S. loppei</i>	—	—	—	—	—	1	—	—	—	1	—	—	—	—
<i>S. annobonae</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>S. azorica</i>	—	—	—	—	—	—	—	—	—	1	—	—	—	—
<i>S. maderensis</i>	—	—	—	—	—	1	3	2	—	—	1	—	—	—
<i>S. mellissii</i>	—	—	—	1	—	—	—	—	—	—	—	—	—	—
<i>S. notata</i>	—	—	—	—	—	—	—	—	—	2	2	3	1	1
<i>S. porcus</i>	—	—	—	—	—	—	—	—	1	1	3	3	1	1
<i>Scorpaenodes caribbaeus</i>	—	—	—	—	—	—	—	3	6	7	2	1	2	—
<i>S. tredecimspinosus</i>	—	—	—	—	—	—	1	1	4	2	2	1	1	—
<i>S. africanus</i>	—	—	—	—	—	—	1	1	1	—	1	1	—	—
<i>S. elongatus</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—
<i>S. arenai</i> <sup>3</sup>	—	—	—	—	1	—	—	1	1	—	—	2	—	—

<sup>1</sup> Size range as in table 3.

<sup>2</sup> Western Atlantic only.

<sup>3</sup> Calculated from data given by Torchio (1962: 115).

TABLE 7. Frequency distributions of interorbital width expressed as percent standard length in Atlantic scorpionfishes of the subfamily Scorpaeninae, except western Atlantic species of the genus *Scorpaena*.<sup>1</sup>

Species	2.0 3.0	3.1 3.5	3.6 4.0	4.1 4.5	4.6 5.0	5.1 5.5	5.6 6.0	6.1 6.5	6.6 7.0	7.1 7.5	7.6 8.0	8.1 8.5	8.6 9.0	9.1 9.5
<i>Pontinus longispinus</i>														
Northern population	—	1	21	21	4	—	—	—	—	—	—	—	—	—
Southern population	—	4	27	16	—	—	—	—	—	—	—	—	—	—
<i>P. helena</i>	—	—	—	—	2	—	—	—	—	—	—	—	—	—
<i>P. castor</i>	—	4	5	3	—	—	—	—	—	—	—	—	—	—
<i>P. nematophthalmus</i>	—	—	20	26	4	—	—	—	—	—	—	—	—	—
<i>P. rathbuni</i>	—	3	19	17	1	—	—	—	—	—	—	—	—	—
<i>P. accraensis</i>	—	1	29	37	2	—	—	—	—	—	—	—	—	—
<i>P. leda</i>	—	—	1	8	18	2	—	—	—	—	—	—	—	—
<i>P. kuhlii</i>	—	—	5	3	—	—	—	—	—	—	—	—	—	—
<i>P. nigropunctatus</i>	—	—	—	—	2	—	—	—	—	—	—	—	—	—
<i>Neomerinthe hemingwayi</i>	—	—	—	—	15	17	1	—	—	—	—	—	—	—
<i>N. beanorum</i>	—	—	5	24	9	—	—	—	—	—	—	—	—	—
<i>N. folgori</i>	—	—	—	—	—	1	—	—	—	—	—	—	—	—
<i>Trachyscorpia cristulata</i> <sup>2</sup>	—	—	—	1	5	7	4	3	—	—	—	—	—	—
<i>T. capensis</i>	1	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Idiastion kyphos</i>	—	—	—	—	—	1	1	—	—	—	—	—	—	—
<i>Phenacoscorpius nebris</i>	—	—	1	—	1	1	—	—	—	—	—	—	—	—
<i>Scorpaena normani</i>	—	—	—	—	—	—	6	10	7	2	—	—	—	—
<i>S. angolensis</i>	—	—	—	—	1	11	13	2	—	—	—	—	—	—
<i>S. stephanica</i>	—	—	—	—	1	8	13	4	3	1	—	—	—	—
<i>S. elongata</i>	—	—	—	—	—	1	3	4	—	—	—	—	—	—
<i>S. scrofa</i>	—	—	—	—	—	1	2	4	—	—	—	—	—	—
<i>Scorpaena laevis</i>	—	—	—	—	—	—	—	—	3	4	1	1	4	1
<i>S. plumieri</i> <sup>3</sup>	—	—	—	—	—	—	—	—	1	1	2	—	—	—
<i>S. loppei</i>	—	—	—	—	—	—	—	2	—	—	—	—	—	—
<i>S. annobonae</i>	—	—	—	—	—	—	1	—	—	—	—	—	—	—
<i>S. azorica</i>	—	—	—	—	—	—	1	—	—	—	—	—	—	—
<i>S. maderensis</i>	—	—	—	3	4	—	—	—	—	—	—	—	—	—
<i>S. mellissii</i>	—	—	—	—	1	—	—	—	—	—	—	—	—	—
<i>S. notata</i>	—	—	—	—	5	1	3	—	—	—	—	—	—	—
<i>S. porcus</i>	—	—	—	—	—	2	2	4	1	—	1	—	—	—
<i>Scorpaenodes caribbaeus</i>	—	—	—	—	—	4	10	7	—	—	—	—	—	—
<i>S. tredecimspinosus</i>	—	—	—	1	1	5	2	3	—	—	—	—	—	—
<i>S. africanus</i>	—	—	—	—	3	2	—	—	—	—	—	—	—	—
<i>S. elongatus</i>	—	—	—	—	—	—	—	1	—	—	—	—	—	—

<sup>1</sup> Size range as in table 3.

<sup>2</sup> Western Atlantic only; larger specimens with higher values.

<sup>3</sup> Saint Helena and Ascension only.

TABLE 8. Frequency distributions of jaw length expressed as percent standard length in Atlantic scorpionfishes of the subfamily Scorpaeninae, except western Atlantic species of the genus *Scorpaena*.<sup>1</sup>

Species	19	20	21	22	23	24	25	26	27
<i>Pontinus longispinis</i>									
Northern population	7	29	11	—	—	—	—	—	—
Southern population	—	—	10	30	2	—	—	—	—
<i>P. helena</i>	—	—	—	—	1	—	1	—	—
<i>P. castor</i>	—	—	—	6	6	—	—	—	—
<i>P. nematophthalmus</i>	—	—	3	25	15	6	—	—	—
<i>P. rathbuni</i>	1	7	15	14	3	—	—	—	—
<i>P. accraensis</i>	—	—	—	13	21	13	1	—	—
<i>P. leda</i>	—	—	—	1	4	6	5	11	1
<i>P. kuhlii</i>	—	—	1	6	1	—	—	—	—
<i>P. nigropunctatus</i>	—	—	—	—	1	—	—	—	—
<i>Neomerinthe hemingwayi</i>	—	10	18	5	—	—	—	—	—
<i>N. beanorum</i>	—	3	7	11	6	1	—	—	—
<i>N. folgori</i>	—	—	—	—	1	—	—	—	—
<i>Trachyscorpia cristulata</i> <sup>2</sup>	—	—	—	3	13	4	—	—	—
<i>T. capensis</i>	—	—	—	1	—	—	—	—	—
<i>Idiastion kyphos</i>	—	—	—	1	—	1	—	—	—
<i>Phenacoscorpius nebris</i>	—	—	—	1	2	—	—	—	—
<i>Scorpaena normani</i>	—	1	9	14	1	—	—	—	—
<i>S. angolensis</i>	1	8	10	6	1	—	—	—	—
<i>S. stephanica</i>	—	1	4	15	7	4	—	—	—
<i>S. elongata</i>	—	—	—	6	2	—	—	—	—
<i>S. scrofa</i>	—	—	1	4	2	—	—	—	—
<i>S. laevis</i>	1	4	6	3	—	—	—	—	—
<i>S. plumieri</i> <sup>3</sup>	—	—	—	2	1	—	—	—	—
<i>S. loppei</i>	—	—	—	1	—	1	—	—	—
<i>S. annobonae</i>	—	—	—	—	—	—	1	—	—
<i>S. azorica</i>	1	—	—	—	—	—	—	—	—
<i>S. maderensis</i>	—	2	3	1	1	—	—	—	—
<i>S. mellissii</i>	—	—	—	1	—	—	—	—	—
<i>S. notata</i>	—	3	4	2	—	—	—	—	—
<i>S. porcus</i>	—	3	4	3	—	—	—	—	—
<i>Scorpaenodes caribbaeus</i>	—	—	—	5	8	8	—	—	—
<i>S. tredecimspinosus</i>	—	—	—	—	—	4	3	4	1
<i>S. africanus</i>	—	—	—	1	1	1	2	—	—
<i>S. elongatus</i>	—	1	—	—	—	—	—	—	—

<sup>1</sup> Size ranges as in table 3.

<sup>2</sup> Western Atlantic specimens only.

<sup>3</sup> Saint Helena and Ascension only.

TABLE 9. Frequency distributions of predorsal-fin length expressed as percent standard length in Atlantic scorpionfishes of the subfamily Scorpaeninae, except western Atlantic species of the genus *Scorpaena*.<sup>1</sup>

Species	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
<i>Pontinus longispinis</i>																
Northern population	—	—	—	—	—	2	14	22	4	3	1	—	—	—	—	—
Southern population	—	—	—	—	—	—	6	4	12	16	6	4	—	—	—	—
<i>P. helena</i>	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—
<i>P. castor</i>	—	—	—	—	—	—	—	—	—	—	4	4	1	2	1	—
<i>P. nematophthalmus</i>	—	—	—	—	—	1	8	9	9	12	7	2	1	—	—	—
<i>P. rathbuni</i>	—	—	—	—	1	3	8	8	11	6	3	—	—	—	—	—
<i>P. accraensis</i>	—	—	—	—	—	2	5	6	20	25	7	5	—	—	—	—
<i>P. leda</i>	—	—	—	—	—	1	2	1	6	5	9	3	—	—	—	—
<i>P. kuhlii</i>	—	—	—	—	—	—	—	2	2	1	3	—	—	—	—	—
<i>P. nigropunctatus</i>	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
<i>Neomerinthe hemingwayi</i>	—	—	—	—	—	—	3	9	15	6	—	—	—	—	—	—
<i>N. beanorum</i>	—	—	—	—	—	—	—	1	3	4	12	7	1	—	—	—
<i>N. folgori</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Trachyscorpia cristulata</i> <sup>2</sup>	—	—	—	—	—	—	—	—	—	1	3	9	6	—	1	—
<i>T. capensis</i>	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
<i>Idiastion kypbos</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Phenacoscorpius nebris</i>	—	—	—	—	—	—	—	—	1	—	—	1	1	—	—	—
<i>Scorpaena normani</i>	—	2	3	4	5	6	4	—	1	—	—	—	—	—	—	—
<i>S. angolensis</i>	1	4	6	5	6	4	—	—	—	—	—	—	—	—	—	—
<i>S. stephanica</i>	—	—	—	4	9	7	8	3	—	—	—	—	—	—	—	—
<i>S. elongata</i>	—	—	—	—	—	—	3	3	2	—	—	—	—	—	—	—
<i>S. scrofa</i>	—	—	—	—	—	—	3	2	2	—	—	—	—	—	—	—
<i>S. laevis</i>	—	—	—	—	—	8	2	3	1	—	—	—	—	—	—	—
<i>S. plumieri</i> <sup>3</sup>	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—
<i>S. loppei</i>	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—
<i>S. annobonae</i>	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
<i>S. azorica</i>	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>S. maderensis</i>	—	—	1	1	4	1	—	—	—	—	—	—	—	—	—	—
<i>S. notata</i>	—	—	1	—	2	3	3	—	—	—	—	—	—	—	—	—
<i>S. porcus</i>	—	—	—	—	1	3	3	1	1	1	—	—	—	—	—	—
<i>Scorpaenodes caribbaeus</i>	—	—	—	—	—	—	—	—	—	5	5	5	4	2	—	—
<i>S. tredecimspinosus</i>	—	—	—	—	—	—	1	—	3	3	4	1	—	—	—	—
<i>S. africanus</i>	—	—	—	—	—	—	—	—	1	1	1	1	1	—	—	—
<i>S. elongatus</i>	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—

<sup>1</sup> Size ranges as in table 3.

<sup>2</sup> Western Atlantic specimens only.

<sup>3</sup> Saint Helena and Ascension.

TABLE 10. Frequency distributions of total gill rakers including rudiments on the first arch of central and eastern Atlantic scorpionfishes of the subfamily Scorpaeninae.

Species	13	14	15	16	17	18	19	20	21	22
<i>Pontinus accraensis</i> <sup>1</sup>	—	—	—	—	6	14	26	6	—	—
<i>P. leda</i> <sup>1</sup>	—	—	—	—	1	9	9	4	1	—
<i>P. kuhlii</i> <sup>1</sup>	—	—	—	—	—	—	2	4	2	1
<i>P. nigropunctatus</i> <sup>1</sup>	—	—	—	—	—	1	1	—	—	—
<i>Xcomerlinthe folgori</i> <sup>2</sup>	—	—	—	—	—	—	—	1	—	—
<i>Scorpaena normani</i>	—	—	1	13	7	3	—	—	—	—
<i>S. angolensis</i>	—	3	11	4	3	—	—	—	—	—
<i>S. stephanica</i>	—	—	3	14	4	3	—	—	—	—
<i>S. elongata</i>	1	—	2	2	—	—	—	—	—	—
<i>S. scrofa</i>	—	1	3	6	—	—	—	—	—	—
<i>S. laevis</i>	1	8	2	—	—	—	—	—	—	—
<i>S. plumieri</i>	—	1	—	—	—	—	—	—	—	—
<i>S. loppet</i>	—	1	—	1	—	—	—	—	—	—
<i>S. annobonae</i>	—	1	—	—	—	—	—	—	—	—
<i>S. azorica</i>	—	—	1	1	—	—	—	—	—	—
<i>S. maderensis</i>	—	—	2	5	3	1	—	—	—	—
<i>S. mellissii</i>	—	—	1	—	—	—	—	—	—	—
<i>S. notata</i>	—	1	1	12	2	2	—	—	—	—
<i>S. porcus</i>	—	—	—	1	9	12	—	—	—	—
<i>Scorpaenodes africanus</i> <sup>1</sup>	—	—	1	2	2	—	—	—	—	—

<sup>1</sup> Rudiments on hypobranchial frequently difficult to count.

TABLE 11. Frequency distributions of number of dorsal rays and pectoral rays in specimens of *Helicolenus dactylopterus* from the Atlantic Ocean.

	Dorsal spines			Dorsal soft rays					Pectoral rays			
	11	12	13	10	11	12	13	14	17	18	19	20
<i>Helicolenus d. dactylopterus</i>												
Northern Atlantic												
Eschmeyer	—	9	—	—	—	8	1	—	—	1	8	—
Ginsburg, 1953	—	7	—	—	—	7	—	—	—	—	6	1
Boutiere, 1958	—	—	—	—	10	151	18	1	—	8	79	6
Ben-Tuvia, 1962	—	9	2	—	3	8	—	—	—	—	—	—
Gulf of Guinea	—	38	1	—	4	33	2	—	—	—	25	13
South Africa <sup>1</sup>	—	2	—	—	—	2	x <sup>1</sup>	—	—	—	2	x <sup>1</sup>
Northwestern Atlantic												
Eschmeyer	—	80	—	—	8	69	2	—	1 <sup>ii</sup>	1	77 <sup>1</sup>	—
Ginsburg, 1953	2	174	4	1	28	144	6	—	2	29	142	8
Eschmeyer (Venezuela)	—	6	—	—	—	5	1	—	—	3	3	—
<i>Helicolenus d. lahillei</i>												
Ginsburg, 1953 <sup>2</sup>	—	8	1	—	1	7	1	—	—	1	8	—

<sup>1</sup> J. L. B. Smith (1949) gives dorsal rays as XII, 12-13; pectoral rays as 19, rarely 20.

<sup>2</sup> I have re-examined 5 of these specimens.

<sup>i</sup> 19 on right.

<sup>ii</sup> 18 on right in some specimens.



TABLE 12. Frequency distributions of number of gill rakers in specimens of *Helicolenus dactylopterus* from the Atlantic Ocean.

	Upper arch			Lower arch						Total							
	7	8	9	16	17	18	19	20	21	23	24	25	26	27	28	29	30
<i>Helicolenus d. dactylopterus</i>																	
Northeastern Atlantic <sup>1</sup>																	
Eschmeyer	6	3	—	—	5	4	—	—	—	—	5	1	3	—	—	—	—
Ginsburg, 1953	6	1	—	1	3	3	—	—	—	1	3	2	1	—	—	—	—
Gulf of Guinea																	
	—	15	12	—	4	19	4	—	—	—	—	1	15	9	2	—	—
South Africa <sup>2</sup>																	
	—	—	2	—	—	—	x	1	1	—	—	—	—	—	—	1	1
Northwestern Atlantic																	
Eschmeyer	25	47	—	1	47	24	—	—	—	1	18	35	18	—	—	—	—
Ginsburg, 1953	58	60	5	7	66	50	—	—	—	6	38	43	32	4	—	—	—
Eschmeyer (Venezuela)	2	4	—	1	4	1	—	—	—	1	1	3	1	—	—	—	—
<i>Helicolenus d. lahillei</i>																	
Southwestern Atlantic																	
	—	4	1	—	—	2	3	—	—	—	—	—	—	2	2	1	—

<sup>1</sup> Boutiere (1958) gives gill rakers as 12 or 13 on the lower arch, but he counted only the ceratobranchial; this would be equivalent to about 17 or 18 on the lower arch.

<sup>2</sup> Smith (1957b) lists gill rakers as 8 + 1, 19-20.

TABLE 13. Frequency distributions of head length and body depth expressed as percent standard length in specimens of *Helicolenus dactylopterus* from the Atlantic Ocean.

	Head length							Body depth							Size range mm. S. L.	
	37	38	39	40	41	42	43	29	30	31	32	33	34	35		36
<i>Helicolenus d. dactylopterus</i>																
Northeastern Atlantic																
	—	—	—	1	3	3	1	—	—	—	—	2	3	2	—	63-250
Gulf of Guinea																
	—	1	2	3	9	5	3	—	3	5	6	5	3	1	—	30-195
South Africa																
	—	—	—	1	1	—	—	—	—	—	—	2	—	—	—	163-164
Northwestern Atlantic																
Atlantic United States																
	—	—	1	5	2	—	1	—	—	—	2	3	—	2	2	40-231
Tortugas, Florida																
	—	—	2	12	17	11	2	—	1	3	12	14	9	5	—	60-185
N. Gulf of Mexico																
	—	—	—	—	1	—	1	—	—	—	1	1	—	—	—	101-158
Venezuela																
	—	—	—	1	3	2	—	—	1	—	—	2	3	—	—	84-322
<i>Helicolenus d. lahillei</i>																
Southwestern Atlantic																
	1	2	1	1	—	—	—	1*	1*	—	—	—	2	—	1	164-226

\* Shrunken specimens.

TABLE 14. Frequency distributions of orbit diameter and snout length expressed as percent standard length in specimens of *Helicolenus dactylopterus* from the Atlantic Ocean.<sup>1</sup>

	Orbit diameter <sup>2</sup>							Snout length			
	11	12	13	14	15	16	17	8	9	10	11
<i>Helicolenus d. dactylopterus</i>											
Northeastern Atlantic	—	—	3	3	2	1	—	1	7	1	—
Gulf of Guinea	—	—	2	11	7	1	2	4	16	2	1
South Africa	—	—	—	—	2	—	—	2	—	—	—
Northwestern Atlantic											
Atlantic United States	—	—	3	4	—	2	—	4	4	1	—
Tortugas, Florida	—	—	5	17	11	6	5	13	28	3	—
N. Gulf of Mexico	—	—	—	2	—	—	—	—	1	1	—
Venezuela	—	—	1	2	—	3	—	2	3	1	—
<i>Helicolenus d. lahillei</i>											
Southwestern Atlantic	1	3	1	—	—	—	—	3	2	—	—

<sup>1</sup> Size ranges as in table 13.<sup>2</sup> Smaller specimens average a proportionally larger orbit.TABLE 15. Frequency distributions of interorbital width and jaw length expressed as percent standard length in specimens of *Helicolenus dactylopterus* from the Atlantic Ocean.<sup>1</sup>

	Interorbital width <sup>2</sup>					Jaw length					
	3.1- 3.5	3.6- 4.0	4.1- 4.5	4.6- 5.0	5.1- 5.5	18	19	20	21	22	23
<i>Helicolenus d. dactylopterus</i>											
Northeastern Atlantic	—	3	3	3	—	—	—	2	4	2	—
Gulf of Guinea	1	1	14	3	1	—	—	7	13	3	—
South Africa	—	—	—	2	—	—	—	1	1	—	—
Northwestern Atlantic											
Atlantic United States	—	—	4	5	—	—	1	5	2	1	—
Tortugas, Florida	—	5	30	9	—	—	—	10	22	11	1
N. Gulf of Mexico	—	—	2	—	—	—	—	—	2	—	—
Venezuela	—	4	1	—	—	—	—	1	4	1	—
<i>Helicolenus d. lahillei</i>											
Southwestern Atlantic	—	—	1	4	1	2	3	—	—	—	—

<sup>1</sup> Size ranges as in table 13.<sup>2</sup> Larger specimens tend to have proportionally narrower interorbital widths.

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