

SMITHSONIAN MISCELLANEOUS COLLECTIONS  
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ISAAC GINSBURG  
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(PUBLICATION 4106)

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## INTRODUCTION

The present state of the taxonomy of the western Atlantic scorpaenids leaves much to be desired. The literature is filled with inadequate original or supplementary descriptions of species, containing many unessential details of little or no practical use for the correct determination of the species, while the critical characters that distinguish the species often are not considered adequately. I found it well-nigh impossible to identify and distinguish the species properly by the use of current accounts. One of the main factors that operate to bedevil the taxonomist who conscientiously tries to identify his specimens is the undue multiplication by past authors of the number of fictitious species. Such untenable "species" have been established, in large measure, as a result of failure to elaborate properly, or even to take into consideration, the intraspecific range of variability of taxonomic characters, or their change with growth which, in the scorpaenids, is considerable. The multiplication of names that have been proposed for scorpaenid species that have no existence in fact is as confusing as the grouping of two or more closely related species under one name that has entered into the literature of other families.

As a result of this study it was found necessary to reduce to synonymy here for the first time 18 names that have been proposed for supposedly new species, all except one within the past 40 years. The type specimens of 13 of these nominal species have been examined and compared. The other five names are placed in synonymy on the basis of the original descriptions. Three of these descriptions include unique specific characters that indicate their proper placement with assurance, while the other two do not include enough details to make certain their position until the original specimens are reexamined. Where a name is reduced to synonymy the reasons for doing so are discussed under the accounts of the several species concerned.

One doubtful species, *Scorpaenodes floridae*, is here tentatively treated. One specimen, the proper placement of which is doubtful,

is described under *Scorpaena albifimbria*. Also, no specimens of *Pontinus corallinus* Miranda Ribeiro are available for study, as noted under the account of that genus. Three species and subspecies not occurring in the western Atlantic, two European and one from the American Pacific coast, are here treated in order to compare them with their near western Atlantic relatives.

It is of interest and value to compare the results of this study with my recent (1951) revision of the western Atlantic tonguefishes, *Symphurus*. Of the 14 species of *Symphurus* distinguished, 6 proved to be new. On the other hand, 23 scorpaenid species are here distinguished from the same faunal region, and not a single new species has been found, while 17 names established in comparatively recent years are reduced to synonymy. The difference in the results obtained is readily explicable by the difference in the subject matter. The species of *Symphurus* are very similar in general appearance, and most species are hardly distinguishable on sight. It is only after an accurate determination of the numbers of fin rays and scales is made, aided by other characters of lesser importance, that the species become distinguishable properly. This is at least one of the reasons why relatively so many species remained undescribed. Scorpaenid species, on the other hand, are subject, to an extraordinary extent, to a wide range of intraspecific individual variability and growth changes. As a consequence, individual variants, or specimens representing different growth stages of the same species, have been erroneously described as distinct species. The difference in the taxonomic treatment hitherto afforded these two families furnishes an enlightening commentary on current taxonomic methods.

For an adequate account of western Atlantic scorpaenids, a study of the specimens in the National Museum is indispensable. The national collection includes the types of 26 valid or nominal species that have been described, 22 of which are holotypes, the other 4 cotypes or paratypes. What is just as important, in a number of species the specimens in the collection are of sufficient extent to serve as a basis for the determination, with a measure of satisfaction, of the intraspecific range of variability of important specific characters, or the determination of growth changes in such characters. I was fortunate in being able to study this valuable scorpaenid collection from the western Atlantic, and this paper is based largely on this collection. I also examined types and other specimens in the American Museum of Natural History, Bingham Oceanographic Collection, New York Zoological Society, Academy of Natural Sciences of Philadelphia, University of Michigan Museum of Zoology, and the Chicago Natural

History Museum. I am deeply grateful to the authorities of all these institutions for the privilege of studying their material.

The illustrations accompanying this paper were drawn by Mrs. Mildred H. Carrington.

The family Scorpaenidae has been considered hitherto a difficult group from a taxonomic viewpoint, and it is particularly so when current accounts are used for the purpose of identifying the species. By way of illustration of existing uncertainties and errors in the taxonomy of the species concerned, I found about half of the many lots of specimens in the National Museum were either misidentified or identified as to genus only, some of them bearing even an erroneous generic identification. The number of names proposed during the last 40 years, which it was found necessary to reduce to synonymy, as discussed above, is remarkable. However, after determining intra-specific variability and growth changes the difficulties largely disappear, and scorpaenid fishes are then not more difficult to distinguish than species in many another family. In some respects they are easier to distinguish, because the spinous armature of the head furnishes valuable generic and specific characters, as discussed below, that are not present in other families. Characters common to the genera and species here treated are as follows.

## SYSTEMATIC DESCRIPTIONS

### Family SCORPAENIDAE

Elongate, moderately deep to rather slender, moderately to well compressed. Snout short to rather long. Eye medium to large, smaller to larger than snout. Interorbital differing with the species from subequal to eye to one-third the eye. Upper jaw with a broad notch at the symphysis slightly to well developed, tip of lower jaw fitting into the notch; lower jaw with an external knob near its end, slightly to well developed; notch and knob hardly perceptible in individual variants of some species. Mouth of medium extent, moderately inclined, terminal, the jaws subequal, the lower very slightly projecting to very slightly included. Maxillary of moderate length, ending under anterior margin of pupil to under posterior margin of eye or a little behind. Teeth in jaws on vomer and palatines, except palatine teeth lacking in *Scorpaenodes*; small, subequal or inner teeth in jaws slightly enlarged in some species; those in jaws in narrow bands of medium width, those on vomer and palatines differing from one row to bands of medium width. Opercle with 2 spinous points, not extending beyond its margin; the 2 spines forming tips of divergent ridges in most

species, the ridges faint or absent in some species. Head with spines occupying definite positions. (The spines and their nomenclature being of much taxonomic importance are treated separately below.) Upper outer corner of interopercle and lower outer corner of subopercle ending in an acute angle or rather sharp spinous point as an individual variation in some species. Cheek with a lengthwise bony stay extending from preorbital to preopercle forming a ridge externally, usually bearing spinous points (hereafter designated as the suborbital ridge). Gill opening wide, branchiostegal membranes forming a slight fold under eye. No gill slit on inner side of fourth arch or a small slit present. Pseudobranchiae well or moderately developed. Gill rakers in most species short, broad, comparatively few, those at both ends of arch very short, tubercle-like, the gill rakers grading very gradually into the tubercles or a rather indefinite line of demarcation between them, rather well delimitable in some species. Various appendages on head, body, and also upper part of eyeball, varying from rather long, stout tentacles on upper margin of orbit to short, broad tabs and slender filaments, their development varying widely and to a large extent dependent on individual variability; also governed by average species differences, only of limited value for the definitive distinction of the species. Lateral line normal except in *Setarches parmatius* (see account of this species). Scales ctenoid or cycloid, in 40-110 transverse rows; body scaled all over, including chest and fleshy pectoral base (more or less embedded in latter two situations in some species, sometimes not visible at the surface); head partly or almost wholly scaled; caudal and pectoral moderately scaled at their base; dorsal and anal moderately or slightly scaled at their base in some species; fins otherwise scaleless. Dorsal typically or predominantly with 12, 13, or 15 spines, depending on the genus, the number of variants from the predominating counts very few, except in *Sebastes*; with 7-15 soft rays; first three spines rapidly graduated, fourth spine usually longest in most species, slightly longer than third or fifth, sometimes third or fifth slightly longer than fourth as a slight average specific difference or as an individual variation (except in *Pontinus longispinis* and in the males of *Neomerinthe beanorum* the third spine notably prolonged beyond the others), thence decreasing in length to penultimate; last spine considerably or moderately longer than penultimate, emargination of fin between last two spines moderate or pronounced, depending on the species. Anal with 3 spines; normally with 5 rays, the number of variants from the normal very few, except with 7-10 rays in *Sebastes marinus*; first spine much shorter than second; third varying between moderately longer or



shorter than second. Outer ventral angle under lower pectoral angle differing a little both ways, its end reaching anal origin or falling short of vent. Pectoral with 15-24 rays, the upper 4-10 rays, except uppermost 1-3, branched, the lower ones unbranched, more or less thickened and free at their tips, or all unbranched (in *Pontinus*); end of fin on a vertical differing from moderately in front of anal base to a little behind, its shape differing to some extent with the genus (see fig. 4). Caudal rounded or slightly emarginate.

#### SOME TAXONOMIC CHARACTERS, THEIR DEFINITION AND METHODS OF STUDY

*Spines on head.*—The distribution and development of the spines on the head constitute valuable specialized characters that aid in the distinction of the species and genera of this family. This is in addition to the taxonomic characters generally employed in ichthyology for the distinction of species and genera, such as the nature and extent of the dentition; counts of fin ray supports, gill rakers and scales; the shape and extent of the fins and parts of the head and body; proportional measurements; etc. As a consequence, scorpaenid genera and species are potentially distinguishable with greater ease and adequacy than those in some other families of fishes. One of the main reasons this has not proved to be so hitherto and the resultant unsatisfactory state of scorpaenid taxonomy at present is the general lack of a uniform nomenclature in designating the various spines, which often makes it virtually impossible to correlate accounts by different authors, or to understand adequately the precise structure of the species from the description given by any one author. To overcome this difficulty, the nomenclature of the spines as used in this paper is hereafter stated and the relative positions of the different spines are illustrated in figures 1 and 2, which represent *Scorpaena plumieri*. This species has been selected for illustration because it is a widespread species which is not uncommon, and it has the full complement of the important spines possessed by the species here treated, with the exception of the inter-orbital spines that, among these species, are present only in *Scorpaenodes*. In the species figured, a so-called spine is often not a spine in the true sense of the word—that is, it is not a slender bony structure with a sharp point. It is rather a blunt point at the summit of a flat, somewhat shelflike bony projection. However, the real spinelike projections and the broad, blunt projections are evidently homologous, and all are hereafter spoken of as spines. The nomenclature here used for the spines follows.

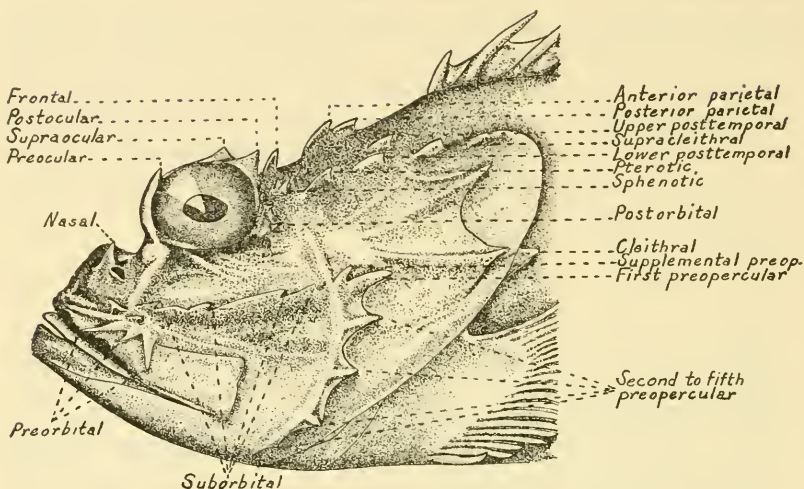


Fig. 1.—Side view of the head of *Scorpaena plumieri* showing the spines and their nomenclature as used in this paper. Semidiagrammatic. Drawn by Mildred H. Carrington.

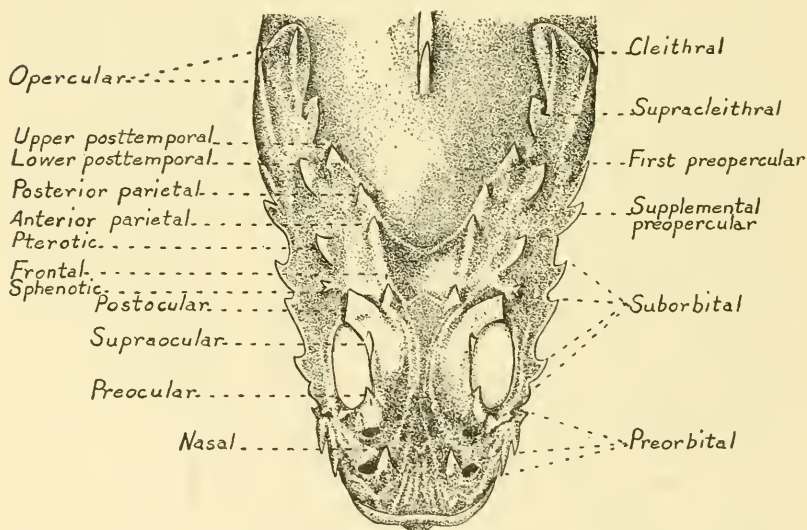


Fig. 2.—Dorsal aspect of the head of *Scorpaena plumieri* shown in figure 1. Drawn by Mildred H. Carrington.

**NASAL:** A spine located dorsad of the nostrils, nearer to one or the other nostril or equally distant from the two. It is present in all the species here treated, but its extent of development differs with the species. The presence of this spine is not further mentioned under the accounts of the genera and species, except where its degree of development is unusual.

**PREOCULAR, SUPRAOCULAR, POSTOCULAR:** Three spines on the upper orbital rim, one approximately over the anterior margin of the pupil; the posterior two much closer to each other than to the anterior one, placed approximately over the posterior margin of the pupil. The preocular is present in all the species here treated; the supraocular and postocular are present in all except *Setarches parmatius*. Therefore, the presence of these spines is not especially mentioned under the accounts of the other genera and species.

**INTERORBITAL:** Two spinous points on interorbital space, each at the end of a ridge, one on each side of the midline. These spines are present only in *Scorpaenodes* and are not further mentioned under the accounts of the other genera and species.

**PARIETAL, ANTERIOR AND POSTERIOR:** The parietal ridge is placed a little to the side of the middorsal line, between the eye and the dorsal origin and a little nearer the eye. It is split into two parts, both ending in spines, except in *Sebastes marinus* and *Setarches parmatius* in which it is entire, ending in a single spinous point. The two spines are hereafter designated as the anterior and posterior parietal, the anterior one lacking in the two exceptional species mentioned.

**FRONTAL:** A spine placed at a short distance behind postocular; in front of and in a line with parietal ridge, or nearly in a line with postocular and somewhat laterad of parietal ridge. This spine is present in all species except *Setarches parmatius*, and disappears with growth in *Scorpaena grandicornis*.

**SPHENOTIC:** A comparatively small spine or spinule directly behind eye at a moderate distance below frontal. It is often bifid, or it consists of a group of spinules or asperities. It is subject to considerable intraspecific individual variation and is of only secondary importance in classification.

**PTEROTIC:** When present it is usually in the form of a ridge ending in a spinous point, placed at a moderate distance behind the sphenotic.

**POSTTEMPORAL, UPPER AND LOWER:** Two spinous points, one above the other, at a rather short distance in front of angle formed by the attachment of the opercle to the side. Often each forms the end point of a ridge. Both are subject to considerable intraspecific individual variability in some species.

**SUPRACLEITHRAL:** Placed at the upper angle of the gill opening. It is usually a blunt bony angle rather than a spine. In *Scorpaenodes* the exposed part of the supracleithrum is long, tapering, and ends in a sharp point.

In the species of *Scorpaena*, on the dorsal aspect of the head behind the eyes, the above spines in general are arranged in three somewhat irregular lengthwise rows; an inner row near the midback including the frontal and anterior and posterior parietal; an outer row approximately through the upper margin of the pupil consisting of the sphenotic, pterotic, and lower posttemporal; a row in between comprising the upper posttemporal and supracleithral. In *S. calcarata* the arrangement differs somewhat, and it is not altogether the same in other species of *Scorpaena*. In species of other genera the arrangement does not always quite follow the pattern outlined above.

**POSTORBITAL:** A spinule, entire or bifurcate or doubled, or a group of spinules or asperities, or one or more small tuberosities placed on a horizontal approximately through middle of eye and behind it. This is subject to a good deal of individual variability and is not of much importance in classification.

**CLEITHRAL:** A projection on the cleithrum in a position a little above the pectoral base, with a blunt apex or ending in a rather sharp spinous point. This projection is subject to change with growth, at least in some species. It is of moderate importance in distinguishing some of the species.

**SUBORBITAL:** The suborbital ridge, that is, the ridge on the "bony stay" on the cheek, has 0-7 spinous points, the number differing with the species, but also varying intraspecifically to a considerable extent. The ridge and its spines also change markedly with growth in some species. (See accounts of *Pontinus castor* and *Neomerinthe pollux*.)

**PREORBITAL:** The preorbital bone has a number of radiating ridges two or three of which end in free spinous points at its outer margin. Another free spinous point is sometimes present in a line with the suborbital row of spines and is hereafter included in the count of that row.

Two scales on the lateral line directly behind the supracleithral spine have well-developed ridges which often end in spinous points or nearly so. Homologically these are not spines and are not considered as such. The anterior one of the two scales forms the starting point of the scale count as recorded in this paper.

The terminology of the spines outlined above follows that of the bones of which they are a part, except the spines on the upper rim of the orbit, on the interorbital, and that behind the middle of the

eye which it seems best to designate according to their position, namely, preocular, supraocular, postocular, interorbital, and postorbital. (For illustrations and descriptions of scorpaenid skulls, see Gregory 1933, pp. 241 and 323.) Previous attempts have been made by authors to introduce a uniform system of nomenclature for the spines, two of the later ones being by Schultz (1943, p. 168, fig. 14) and by Clemens and Wilby (1949, pp. 16-18, fig. 8). The nomenclature here adopted is in the main a combination of that used by previous authors with the introduction of some modifications in detail. It is hoped that the nomenclature here proposed will contribute toward the final adoption of a general uniform system of nomenclature to be used for the family as a whole.

*Preopercular spines.*—The spinous structure of the preopercular margin furnishes valuable taxonomic characters. The preopercle has a basic 5-spined pattern, and modifications within this basic pattern are of importance in distinguishing the genera and species. In *Sebastes* and *Helicolenus* the second spine is the longest, in *Setarches* the upper three spines are subequal or nearly so, while in the other five genera the first spine is the longest. In *Neomerinthe* and *Pontinus* the second spine is present or absent depending on the species and on intraspecific individual variability in some species. The fourth and fifth spines are sharply marked in some species and much reduced and variable or virtually absent in others. The presence or absence of a supplementary spine or spur attached to the first spine is sometimes a fairly good specific character. It is also important to bear in mind that the supplementary spine is homologically not the first spine as discussed below under the account of *Scorpaena plumieri mystes*. Specific and generic differences in the outline of the posterior margin of the preopercle are shown in figure 3.

In two species at least, *Pontinus longispinis* and *P. rathbuni* (see accounts of these), the spines on the preopercle of juveniles, about 20-30 mm. specimens examined, differ markedly from that in the larger specimens, the upper three spines in general being of approximately the same size, similar to that of grown specimens of *Setarches parmatius*. This growth change is important, as the relative size of the spines is here used as a major character in the division of the genera.

*Dorsal fin.*—The penultimate dorsal spine is shorter than the last and the dorsal fin is emarginate between the spinous and soft parts or rather between the last two spines. The extent of emargination differs in degree among the different species, with all gradations between the extremes. Therefore, for descriptive purposes and in

the formulas at the head of the accounts of the different species, the dorsal is treated as though it formed a single fin, although in the more extreme species it might as well be treated as consisting of two fins.

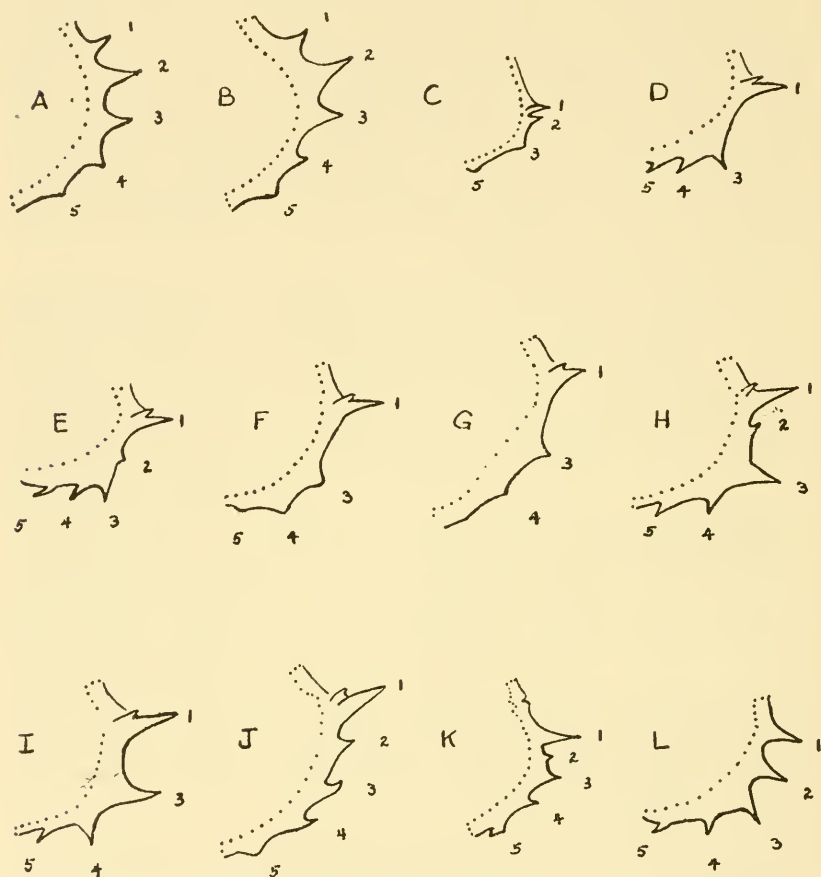


Fig. 3.—Preopercular outline of scorpaenid species: A, *Sebastes marinus*. B, *Helicolenus maderensis*. C, *Scorpaenodes caribbaeus*. D, *Neomerinthe beanorum*, usual condition, second spine absent. E, *Neomerinthe beanorum*, variant showing a very moderate second spine. F, *Neomerinthe pollux*. G, *Pontinus castor*. H, *Pontinus longispinis*, usual condition, a small second spine present. I, *Pontinus longispinis*, a variant lacking second spine. J, *Trachyscorpia cristulata*. K, *Scorpaena calcarata*, second spine usually present and small as figured, sometimes absent. L, *Setarches parmatius*. Drawn by Mildred H. Carrington.

The number of spines constitutes a generic character of some value, typically being 12 or 13, depending on the genus, with comparatively few variants from the typical (table 1), except in *Sebastes* in which the modal number is 15 and the variants from that count are com-

TABLE I.—Frequency distribution of the number of dorsal spines and dorsal and anal rays in western Atlantic scorpenoids and three others

Species and subspecies	Dorsal spines						Dorsal rays									Anal rays							
	11	12	13	14	15		7	8	9	10	11	12	13	14	15	4	5	6	7	8	9	10	
<i>Sebastes marinus</i> .....				6	62										8				46	17	4	1	
<i>Helicolenus dactylopterus</i> .....	7										7								7				
“ <i>maderensis</i> .....	2	174	4						1	28	144	6							2	179			
“ <i>lahillei</i> .....	8	1								1	7	1								9			
<i>Scorpaenodes caribbaeus</i> .....		3						2												2			
“ <i>tridacimspinosus</i> .....		1							1											1			
“ <i>floridae</i> .....			2						1											2			
<i>Pontinus macrolepis</i> .....	4								4											4			
“ <i>longispinus</i> .....	79								77	2										79			
“ <i>rathbuni</i> .....	1	27							26	2										28			
“ <i>castor</i> .....	4									4										4			
<i>Neomecinthe pollux</i> .....	14									16										16			
“ <i>beatiorum</i> .....	6									6										6			
<i>Trachyscorpia echinata</i> .....	1																			1			
“ <i>cristulata</i> .....	13								1	12										13			
<i>Scorpaena inermis</i> .....	18																			18			
“ <i>calcarata</i> .....	3	204	1						3	14	1									3	200	5	
“ <i>agassizi</i> .....	103	1								4	100									2	104		
“ <i>brasiliensis</i> .....	125	2								3	124									1	125	2	
“ <i>grandicornis</i> .....	65	2								2	64	1								3	64		
“ <i>bergi</i> .....	1	37								1	37									38			
“ <i>albifimbria</i> .....	1																			1			
“ <i>dispar</i> .....	1	15								2	14									16			
“ <i>plumieri</i> .....	67									2	65									67	2		
“ <i>mystes</i> .....	12									12										1	11		
“ <i>microlepis</i> .....	1																			1			
<i>Setarches parnatus</i> .....	40									11	30									1	41		

paratively more numerous. The number of soft rays in most species is also remarkably constant as compared with species in other families; and it is of some value, in a more limited way, as a specific and generic character. The last two rays, which are closely approximated at their bases and appear to be the two main branches of a ray that is split to its base, have been counted as one ray in both the dorsal and anal.

*Anal fin.*—The number of anal spines, 3, is virtually constant. In routine counts made during this investigation on 1,139 specimens, only 2 differed from the normal count of 3. In one specimen each of *Pontinus longispinis* and *P. rathbuni*, out of 79 and 28 examined of those two species, respectively, the first short anal spine is missing. The number of rays is nearly always 5, the number of variants being comparatively few (table 1), except in *Sebastes marinus* which has 7 to 10 rays. The relative length of the second and third spine is of moderate importance as a specific character:

*Development of third anal spine.*—An important point that has a bearing on the classification of fishes in general was observed on two specimens, 24-25 mm., of *Pontinus longispinis* (155999-155300).<sup>1</sup> The third anal fin support is flexible and partly jointed for some distance at its distal end. In the next size examined of the same species, 30 mm., the third anal spine is as in the adult. This developmental phenomenon was heretofore well known in the species of *Mugil*. I have also observed it in the family Haemulonidae, in the species of *Orthopristes*, *Haemulon*, and *Bathystoma*. This noteworthy development, therefore, seems to be widespread in fishes. As the number of anal spines, 1, 2, or 3, is sometimes used as a family character, it is of interest to know that it depends on ontogenetic development in families of fishes which are otherwise widely divergent in the scheme of classification.

In specimens examined of *Pontinus rathbuni*, *Scorpaena calcarata*, and *S. agassizi*, 18-22 mm., the third anal spine is as in the adult. *P. rathbuni* is a smaller species than *longispinis* and this developmental change probably occurs at a smaller size. In the species of *Scorpaena*, on the other hand, it is possible that the third anal spine is as in the adult to begin with.

*Pectoral fin.*—The pectoral shape differs with the genus to a certain extent, although this character is not altogether stable because of the irregularity in the relative contraction or expansion of the interradiial membrane in preserved specimens, which influences the shape of the

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<sup>1</sup> Numbers of specimens examined are U. S. National Museum catalog numbers unless otherwise indicated.



fin. Nevertheless, allowing for this difficulty of the subject matter and for a considerable latitude in accounting for specific differences and

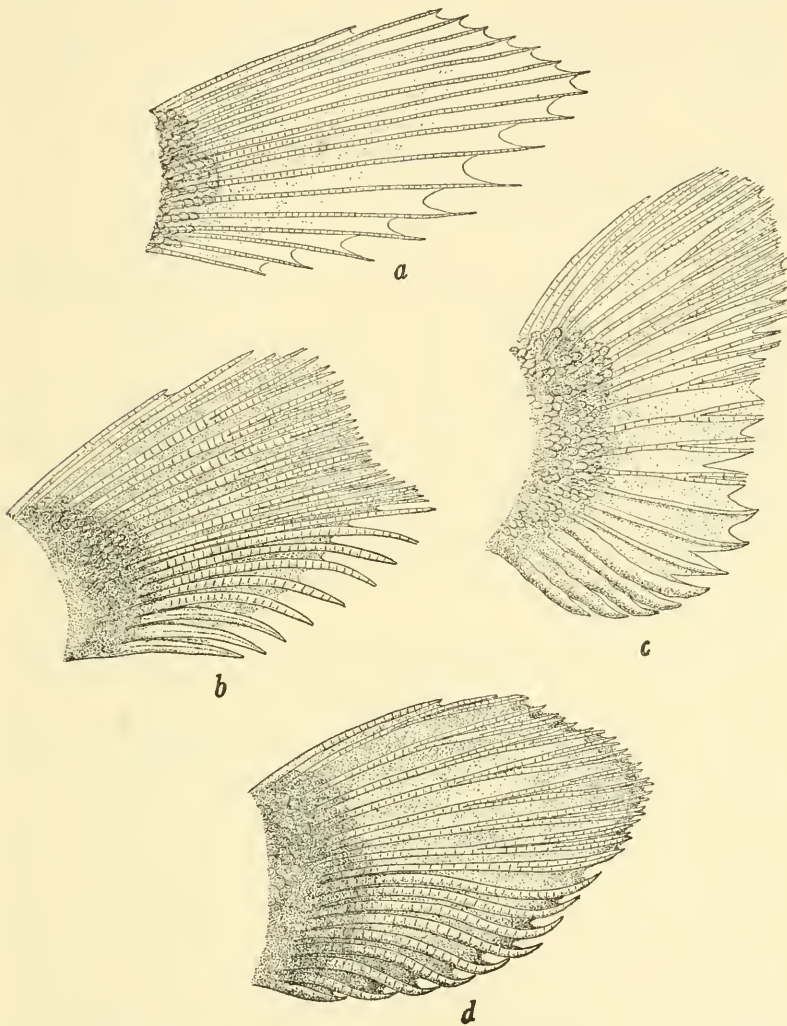


Fig. 4.—Pectoral fins of four scorpaenid species. The shape of the pectoral fin is generic to some extent. *a*, *Pontinus longispinis*; *b*, *Helicolenus maderensis*; *c*, *Trachyscorpia cristulata*; *d*, *Scorpaena grandicornis*. Drawn by Mildred H. Carrington.

intraspecific variability, this character still has some generic value. The pectorals of four genera are illustrated in figure 4.

One genus, *Pontinus*, is separable from the others here treated by having all the pectoral rays unbranched. The number of pectoral rays

is, on the whole, of considerable importance as a specific character (table 2), although related species often overlap in this count.

*Scales.*—The structure of the scales, cycloid or ctenoid, appears to be of considerable value as a generic character and it is here so used. This character was inadequately treated heretofore. Jordan and Evermann (1898, p. 1759), in their key to the genera, use the structure of the scales on top of the head, ctenoid or cycloid, as a character in separating *Helicolenus* from *Scorpaena*. This character as used by the authors cited is unsatisfactory for this purpose and was the cause of some misapprehension by later authors in the treatment of the species. By the use of the structure of the scales on the body as a generic character the species fall into what seem to be natural groups. In the species with cycloid scales, which are here placed in the genus *Scorpaena*, the scales on the dorsal aspect extend only to opposite the parietal ridge; the occiput, interorbital, and snout being scaleless. The other genera here treated, excepting the highly specialized *Setarches*, have ctenoid scales on the body and the ctenoid scalation on the dorsal aspect extends to opposite the posterior part of the eye. On the greater part of the top of the head, on the interorbital and snout, the scalation in the species of these genera differs in its extent and structure with the species, from being scaled with weakly ctenoid or cycloid scales to being nearly scaleless.

The scale counts here given refer to the number of vertical rows above the lateral line, beginning with the row which is partly or wholly just behind the supraclithral spine, and ending at the caudal base. The two scales in the lateral line directly behind the supraclithral spine are more or less ridged and sometimes rather spinous. The rows standing over these two modified scales are included in the count. Usually the rows deviate somewhat from the vertical, running slightly forward or backward, often in different parts of the same specimen. Very often the scales are somewhat irregularly arranged instead of being alined in clear-cut rows, and in such cases the number of vertical rows counted is a rather rough approximation instead of being precise. However, by using throughout the same method of counting, the figures obtained yield fairly regular frequency distributions, and the scale count is useful as a specific character. The number of modified scales in the lateral line is much less than the number of vertical rows above it, does not differ much as between related species, and is not of much importance as a specific character.

*Gill rakers.*—In the Scorpaenidae the gill rakers on the outer gill arch usually gradually decrease in size from the angle forward or upward, and in most species it is not possible to draw a consistent line

between the gill rakers and the so-called rudiments or tubercle-like outgrowths. On the other hand, the tubercles are generally well defined, except that in some species, toward the anterior part of the lower limb, they are not sharply marked in individual variants. On the whole, the combined number of gill rakers and tubercles is deter-

TABLE 2.—Frequency distribution of the number of pectoral rays in western Atlantic scorpaenids and three others

Species and subspecies	Distribution									
	15	16	17	18	19	20	21	22	23	24
<i>Sebastes marinus</i> .....	..	..	..	13	51	4	..	..	..	..
<i>Helicolenus dactylopterus</i> .....	..	..	..	..	6	1	..	..	..	..
“ <i>maderensis</i> .....	..	..	2	29	142	8	..	..	..	..
“ <i>lahillei</i> .....	..	..	..	1	8	..	..	..	..	..
<i>Scorpaenodes caribbaeus</i> .....	..	..	..	2	4	..	..	..	..	..
“ <i>tridecimspinosus</i> .....	..	..	2	..	..	..	..	..	..	..
“ <i>floridae</i> .....	..	..	4	..	..	..	..	..	..	..
<i>Pontinus macrolepis</i> .....	1	3	..	..	..	..	..	..	..	..
“ <i>longispinis</i> .....	..	1	73	2	..	..	..	..	..	..
“ <i>rathbuni</i> .....	..	..	21	1	..	..	..	..	..	..
“ <i>castor</i> .....	..	..	4	..	..	..	..	..	..	..
<i>Neomerinthe pollux</i> .....	..	..	16	..	..	..	..	..	..	..
“ <i>beanorum</i> .....	..	..	6	..	..	..	..	..	..	..
<i>Trachyscorpia echinata</i> .....	..	..	..	..	..	1	..	..	..	..
“ <i>cristulata</i> .....	..	..	..	..	..	..	..	1	9	3
<i>Scorpaena inermis</i> .....	..	..	..	..	4	13	1	..	..	..
“ <i>calcarata</i> .....	..	..	..	1	23	152	29	..	..	..
“ <i>agassizi</i> .....	..	..	..	..	10	84	10	..	..	..
“ <i>brasiliensis</i> .....	..	..	1	13	95	19	..	..	..	..
“ <i>grandicornis</i> .....	..	..	4	56	7	..	..	..	..	..
“ <i>bergi</i> .....	..	5	32	1	..	..	..	..	..	..
“ <i>albifimbria</i> .....	..	..	..	..	1	..	..	..	..	..
“ <i>dispar</i> .....	..	..	2	9	4	..	..	..	..	..
“ <i>plumieri</i> .....	..	..	..	2	38	26	3	..	..	..
“ <i>mystes</i> .....	..	..	..	..	..	12	..	..	..	..
“ <i>microlepis</i> .....	1	..	..	1	..	..	..	..	..	..
<i>Setarches parmatius</i> .....	..	..	..	..	..	..	..	3	27	12

minable with a fair or high degree of precision, except for the relatively few individual variants noted. Therefore, the combined number of gill rakers and tubercles is given under each species in the formula and the text and also in tables 2-4, as this count yields the best results in adequately distinguishing the species and genera of this family. *Setarches parmatius* forms an exception in regard to the relative development of gill rakers and tubercles and these structures are discussed separately under the account of that species.

In counting the gill rakers the one at the angle is included in the count of the lower limb.

*Gill slit behind fourth arch.*—The presence or absence of a small slit behind the fourth gill arch is of some generic or specific value. This character does not constitute an absolute difference. In *Pontinus* the slit is either altogether open or it is bridged over at its outer side

TABLE 3.—Frequency distribution of the combined number of gill rakers and tubercles on the upper limb of western Atlantic scorpaenids and three others

Species and subspecies	Distribution						
	3	4	5	6	7	8	9
<i>Helicolenus dactylopterus</i> .....	..	..	..	..	6	1	..
“ <i>maderensis</i> .....	..	..	..	..	58	60	5
“ <i>lahillei</i> .....	..	..	..	..	2	7	..
<i>Scorpaenodes caribbaeus</i> .....	..	..	..	1	3	2	..
“ <i>tridecimspinosus</i> .....	..	..	2	..	..	..	..
“ <i>floridae</i> .....	..	1	3	..	..	..	..
<i>Pontinus macrolepis</i> .....	..	..	..	..	3	1	..
“ <i>longispinus</i> .....	..	..	..	25	20	..	..
“ <i>rathbuni</i> .....	..	..	1	11	8	1	..
“ <i>castor</i> .....	..	..	..	..	3	1	..
<i>Neomerinthe pollux</i> .....	..	..	..	15	1	..	..
“ <i>beanorum</i> .....	..	..	..	6	..	..	..
<i>Trackyscorpia echinata</i> .....	..	..	1	..	..	..	..
“ <i>crisulata</i> .....	..	..	..	13	..	..	..
<i>Scorpaena inermis</i> .....	1	13	4	..	..	..	..
“ <i>calcarata</i> .....	1	74	65	..	..	..	..
“ <i>agassizi</i> .....	..	6	62	5	..	..	..
“ <i>grandicornis</i> .....	..	6	36	24	1	..	..
“ <i>brasiliensis</i> .....	..	116	12	..	..	..	..
“ <i>bergi</i> .....	6	32	..	..	..	..	..
“ <i>albifimbria</i> .....	..	..	1	..	..	..	..
“ <i>dispar</i> .....	..	..	15	..	..	..	..
“ <i>plumieri</i> .....	..	5	59	2	..	..	..
“ <i>mystes</i> .....	..	1	10	..	..	..	..
“ <i>microlepis</i> .....	..	..	1	..	..	..	..
<i>Setarches parmatius</i> .....	..	..	..	6	36	..	..

with a thin, easily torn membrane. In *Scorpaenodes* its presence appears to differ with the species, judged by the very few specimens examined. Moreover, this character is not easy to apply in practice. In examination it often requires some pressure to move the fourth arch sufficiently to expose and examine its line of attachment, and an artificial slit might be made in doing so.

*Appendages of skin.*—The species of this family have soft appendages of skin in various stages of development that may be designated

as tentacles, filaments, or tabs, depending on their relative length or thickness. They are often situated at the base of the various spines on the head, along the course of the lateral line, on the upper part of the eyeball, or irregularly scattered on the head and body. These appendages have been used often as taxonomic characters in distinguishing species or even genera and are sometimes used in keys. How-

TABLE 4.—Frequency distribution of the combined number of gill rakers and tubercles on the lower limb of western Atlantic scorpaenids and three others

Species and subspecies	Distribution													
	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>Helicolenus dactylopterus</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>maderensis</i> .....	..	..	..	..	..	..	..	..	..	..	..	7	66	50
“ <i>lahillei</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	2	6
<i>Scorpaenodes caribbaeus</i> .....	..	..	..	..	3	..	2	1	..	..	..	..	..	..
“ <i>tridecimspinosus</i> ..	..	..	..	..	2	..	..	..	..	..	..	..	..	..
“ <i>floridae</i> .....	..	..	..	..	..	4	..	..	..	..	..	..	..	..
<i>Pontinus macrolepis</i> .....	..	..	..	..	..	..	1	3	..	..	..	..	..	..
“ <i>longispinis</i> .....	..	..	..	..	..	..	8	28	8	1	..	..	..	..
“ <i>rathbuni</i> .....	..	..	..	..	..	..	12	8	1	..	..	..	..	..
“ <i>castor</i> .....	..	..	..	..	..	..	..	..	3	1	..	..	..	..
<i>Neomerinthe pollux</i> .....	..	..	..	1	2	4	9	..	..	..	..	..	..	..
“ <i>beanorum</i> .....	..	..	..	4	2	..	..	..	..	..	..	..	..	..
<i>Trachyscorpia echinata</i> .....	..	..	..	..	..	..	..	1	..	..	..	..	..	..
“ <i>crustulata</i> .....	..	..	..	..	..	..	..	13	..	..	..	..	..	..
<i>Scorpaena inermis</i> .....	1	12	5	..	..	..	..	..	..	..	..	..	..	..
“ <i>calcarata</i> .....	..	2	20	78	38	2	..	..	..	..	..	..	..	..
“ <i>agassizi</i> .....	..	..	6	23	39	5	..	..	..	..	..	..	..	..
“ <i>brasiliensis</i> .....	..	..	7	98	23	..	..	..	..	..	..	..	..	..
“ <i>grandicornis</i> .....	..	1	5	43	18	..	..	..	..	..	..	..	..	..
“ <i>bergi</i> .....	..	2	7	25	4	..	..	..	..	..	..	..	..	..
“ <i>albifimbria</i> .....	..	..	..	..	..	1	..	..	..	..	..	..	..	..
“ <i>dispar</i> .....	..	..	..	..	7	7	1	..	..	..	..	..	..	..
“ <i>plumieri</i> .....	..	..	3	14	29	17	3	..	..	..	..	..	..	..
“ <i>mystes</i> .....	..	..	..	1	6	4	..	..	..	..	..	..	..	..
“ <i>microlepis</i> .....	..	..	..	..	..	1	..	..	..	..	..	..	..	..
<i>Setarches parmatus</i> .....	..	..	..	..	3	8	6	13	7	5	..	..	..	..

ever, their use as distinguishing characters has been exaggerated hitherto with misleading results. They are generally so variable intra-specifically that in only a few instances can they be used constructively in distinguishing related congeneric species. On the whole, it would serve best the advancement of scorpaenid taxonomy not to put undue emphasis on these structures as taxonomic characters.

The following examples might be briefly cited in regard to the use of these structures as taxonomic characters. The tentacle between the

TABLE 5.—Frequency distribution of the combined total number of gill rakers and tubercles of western Atlantic scorpaenids and three others

Species and subspecies	Distribution																	
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
<i>Helicolenus dactylopterus</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>maderensis</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>lahillei</i> .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
<i>Scorpaenodes caribbaeus</i> .....	..	..	..	..	..	..	1	2	..	..	3	..	..	..	..	..	..	..
“ <i>tridecimspinosus</i> .....	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>floridae</i> .....	..	..	..	..	..	1	3	..	..	..	..	..	..	..	..	..	..	..
<i>Pontinus macrolepis</i> .....	..	..	..	..	..	..	..	..	..	..	1	2	1	..	..	..	..	..
“ <i>longispinis</i> .....	..	..	..	..	..	..	..	..	5	20	13	7	..	..	..	..	..	..
“ <i>rathbuni</i> .....	..	..	..	..	..	..	..	..	8	5	7	..	..	..	..	..	..	..
“ <i>castor</i> .....	..	..	..	..	..	..	..	..	..	..	..	2	2	..	..	..	..	..
<i>Neomeriithe pollux</i> .....	..	..	..	..	..	1	2	4	8	1	..	..	..	..	..	..	..	..
“ <i>beanorum</i> .....	..	..	..	..	..	4	2	..	..	..	..	..	..	..	..	..	..	..
<i>Trachyscorpia ciliolata</i> .....	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
“ <i>cristulata</i> .....	..	..	..	..	..	..	..	..	..	13	..	..	..	..	..	..	..	..
<i>Scorpaena inermis</i> .....	2	8	7	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>calcarata</i> .....	..	2	16	48	47	26	1	..	..	..	..	..	..	..	..	..	..	..
“ <i>agassizi</i> .....	..	..	1	8	20	38	4	2	..	..	..	..	..	..	..	..	..	..
“ <i>brasiliensis</i> .....	..	..	6	90	30	2	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>grandicornis</i> .....	..	..	2	7	24	26	8	..	..	..	..	..	..	..	..	..	..	..
“ <i>bergi</i> .....	1	2	10	21	4	..	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>albifimbria</i> .....	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>dispar</i> .....	..	..	..	..	..	7	7	1	..	..	..	..	..	..	..	..	..	..
“ <i>plumieri</i> .....	..	1	3	14	29	15	4	..	..	..	..	..	..	..	..	..	..	..
“ <i>mystes</i> .....	..	..	..	2	5	4	..	..	..	..	..	..	..	..	..	..	..	..
“ <i>microlepis</i> .....	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
<i>Setarches parnatus</i> .....	..	..	..	..	..	..	5	7	6	13	7	4	..	..	..	..	..	..



supraocular and postocular spines is on the average better developed in *Scorpaena grandicornis* than in *S. plumieri*; but in frequent individual variants of *plumieri* it is nearly as well developed as in most specimens of *grandicornis*, while in other variants it is hardly developed. The same situation is also found in comparing other pairs of species. On the other hand, the relative development of the tentacles at the supraocular spine is of some value in separating *grandicornis* from *bergi* and *albifimbria* and it is so used in the key here given, as an addition to other characters.

*Measurements.*—Proportional measurements given in the body of the report, the key, and the tables, are expressed as a percentage of the standard length. The methods used in obtaining some of the measurements here given are as follows.

In some thick-skinned species it is difficult to determine externally the point of articulation of the middle pectoral rays, and the precise length of such rays could not be well determined. Therefore, measurements of the pectoral given hereafter were made from the point of articulation of the upper rays to the posterior apical point of the fin, that is, to the end of the ray extending farthest backward. The given measurement deviates somewhat from that of the longest ray.

The eye measurement here given refers to the greatest horizontal diameter of the ridge surrounding the eye. This measurement is most nearly susceptible of approaching accuracy. The size of the eyeball is subject to a great deal of individual variability in these species. In preserved specimens of the same species the eyeball fills the orbit or even bulges out of its limits, or it is variably shrunken within the orbit. These individual differences are most probably caused partly by some of the specimens having been brought up from rather deep water, and partly by preservation. At any rate, the size of the eyeball is not accurately determinable, and the term "eye" as used in this paper is synonymous with orbit.

The head was measured from its anterior margin, at the side of the notch when the latter is well developed, to its posteriormost point on its flexible marginal part. The depth was measured at the ventral base.

#### KEY TO THE GENERA AND SPECIES

- 1a. Lateral line normal, consisting of a series of modified channeled scales. Supraocular and postocular spines present. Spinous and soft part of dorsal more or less connected. Scales ctenoid, when cycloid (in *Scorpaena*) not more than 76.



- 2a. Second preopercular spine longest, the first more or less shorter. (The relative size of the preopercular spines is different in juveniles, of some species at least; see above.)
- 3a. Dorsal spines usually 15, sometimes 14. Anal rays 7-10. Scales 87-110; accessory scales profuse except in small specimens (only species having accessory scales). Parietal ridge typically entire. Gill rakers 32-38 altogether. Pectoral rounded posteriorly, roughly wedge-shaped.  
*Sebastes marinus* (p. 26)
- 3b. Dorsal spines normally 12, infrequently 11 or 13. Anal rays normally 5, rarely 4. Scales 60-79, without accessory scales. Parietal ridge divided into two parts. Total number of gill rakers 23-27. Pectoral broad, distal edge of its upper half emarginate; the lower rays thick, well separated distally (fig. 4b).....*Helicolenus* (p. 30)
- 4a. Suborbital ridge usually without a spine. Scales 66-73. Maxillary 21.5-22.5. Interorbital 2.9-3.2 times in eye (for size of specimens measured see under subspecies). Eastern Atlantic and Mediterranean.  
*Helicolenus dactylopterus dactylopterus* (p. 32)
- 4b. Suborbital ridge usually with a spine.
- 5a. Scales 60-71. Maxillary 20.0-22.5. Interorbital 2.1-3.4 times in eye. East coast of the United States.  
*Helicolenus dactylopterus maderensis* (p. 33)
- 5b. Scales 68-79. Maxillary 18.5-20.5. Interorbital 1.9-2.7 times in eye. Atlantic coast of South America.  
*Helicolenus dactylopterus lahillei* (p. 36)
- 2b. First preopercular spine longest.
- 6a. Dorsal spines normally 13. Palatine teeth absent. Interorbital spinous points present or obsolescent. Scales ctenoid, 40-42. (Only genus lacking palatine teeth, having spinous points on interorbital, and normally having 13 dorsal spines).....*Scorpaenodes* (p. 37)
- 7a. Suborbital ridge with 4-5 spinous points and 2 points in a line below main row. Gill rakers and tubercles on upper limb 6-8 in combined number. Pectoral rays 18-19. Interorbital ridges and spines well developed. Upper posttemporal spine small. Interorbital and snout rather well scaled.....*Scorpaenodes caribbaeus* (p. 38)
- 7b. Suborbital ridge with 1-3 spinous points and no secondary row of spines below main row. Gill rakers and tubercles on upper limb 4-5. Pectoral rays 17. Interorbital ridges and spinous points moderate or obsolescent. Upper posttemporal absent. Interorbital and snout very sparsely scaled.
- 8a. Suborbital ridge with 3 spinous points.  
*Scorpaenodes triddecimspinosus* (p. 40)
- 8b. Suborbital ridge with 1 spinous point, at its end.  
*Scorpaenodes floridae* (p. 41)

- 6b. Dorsal spines normally 12. Palatine teeth present. No spinous points on interorbital.
- 9a. Scales ctenoid; occiput scaled. Occipital pit absent.
- 10a. Pectoral not broad, irregularly wedge-shaped; with 15-18 rays. A small slit behind fourth gill arch, sometimes bridged over by a thin membrane in individual variants of *Pontinus*.
- 11a. All pectoral rays unbranched (only genus having all such rays in pectoral). Total number of gill rakers and tubercles 18-22.....*Pontinus* (p. 42)
- 12a. Snout short or moderate 12.6-14.4; eye 1.3 times in snout as a maximum, differing to a little larger than snout. Second preopercular spine normally present, except in some individual variants of *longispinis*. Dorsal rays usually 9, rather infrequently 10.
- 13a. Pectoral rays 15-16. Spines on suborbital ridge 3. Eye 12.9-15.4; interorbital 3.1-3.6 times in eye. Scales 45.....*Pontinus macrolepis* (p. 44)
- 13b. Pectoral rays usually 17, infrequently 18, rarely 16. Spines on suborbital ridge usually 4, occasionally 3. Eye 11.0-13.6; interorbital 2.3-3.2 times in eye.
- 14a. Third dorsal spine notably prolonged, except in specimens less than 115 mm. Scales 47-51. Depth 28-34 in specimens 51-174 mm. First preorbital spine usually directed downward or slightly forward. Tentacle at supraocular spine short and slender or absent. Typically spotted.  
*Pontinus longispinis* (p. 45)
- 14b. Third dorsal spine not notably prolonged. Scales 43-48. Depth 33-39 in specimens 55-145 mm. First preorbital spine usually directed sharply backward. Tentacle at supraocular spine thick, broad, and rather long. Typically shaded or light-colored, spots usually absent; sometimes a few small spots; pectoral in small specimens with an elongate dusky smudge.  
*Pontinus rathbuni* (p. 47)
- 12b. Snout notably long, 16-16.5; eye 1.4-1.6 times in snout. Second preopercular spine absent. Dorsal rays 10. Pectoral rays 17. Spines on suborbital ridge 3, except in large fish. Scales 50-54.....*Pontinus castor* (p. 49)
- 11b. Pectoral having 1 or 2 uppermost rays unbranched, next 5-8 rays branched, lower 7-10 rays unbranched; total number of rays 17. Total number of gill rakers and tubercles 15-19. Second pre-

- opercular spine usually absent in the larger specimens, sometimes present in *beanorum*. Sub-orbital ridge with 3-4 spines.....*Ncomerlinthe* (p. 51)
- 15a. Scales 62-68. Dorsal rays 10. Upper post-temporal spine absent. Fourth preopercular spine obtuse, not antrorse; fifth poorly developed or obsolescent.....*Ncomerlinthe pollux* (p. 53)
- 15b. Scales 41-46. Dorsal rays 9. Upper posttemporal spine present. Fourth and fifth preopercular spines sharply pointed, antrorse.  
*Ncomerlinthe beanorum* (p. 56)
- 10b. Pectoral broad, not wedge-shaped, the longest rays a little below upper margin, its posterior edge slightly emarginate (fig. 4c), with 20-24 rays. No slit behind fourth gill arch.....*Trachyscorpia* (p. 57)
- 16a. Head 43.5 (in one specimen 433 mm.). Pectoral rays 20. Body and head spotted. Eastern Atlantic.....*Trachyscorpia echinata* (p. 59)
- 16b. Head 47.5-48.0 (in 2 specimens 319-400 mm.; for measurements of other specimens see text). Pectoral rays 22-24. Without spots. Western Atlantic.....*Trachyscorpia cristulata* (p. 61)
- 9b. Scales cycloid, 41-76; occiput not scaled. Occipital pit present, except in *inermis* and *calcarata* (the only genus containing species with a pit).....*Scorpaena* (p. 63)
- 17a. Preorbital spinous points 2.
- 18a. Occiput somewhat broadly depressed, without a definite pit. First preopercular spine without a supplemental spine.
- 19a. Inverted, mushroom-shaped, whitish figures extending downward from base of ocular tentacles at lengthwise boundary between upper opaque and lower transparent parts of cornea (these figures sometimes absent in smaller specimens; see account of species). First preopercular spine extending about half the distance or less from its base to opercular margin. Dorsal rays modally 8, varying 7-9. Combined number of gill rakers and tubercles on lower limb modally 7, varying 6-8. Interorbital 3.6-4.3 (in 5 specimens 71-89 mm.; for other sizes see species account). Without a definite spot behind head; caudal with 2 cross bands.  
*Scorpaena inermis* (p. 65)
- 19b. Short, oblong, whitish areas extending downward on transparent part of cornea sometimes present, more often absent. First preopercular spine usually extending for more than half the distance from its base to opercular margin. Dorsal rays modally 9, varying 8-10. Com-

- binced number of gill rakers and tubercles on lower limb modally 9, varying 7-11. Interorbital 4.6-6.5 (in 5 specimens 65-75 mm.). Usually with a dark spot a little behind head, sometimes faint or imperceptible; caudal usually without cross bands, sometimes a faint trace of such bands.....*Scorpaena calcarata* (p. 68)
- 18b. Occiput with a well-developed pit (rather shallow in *Microlepis*), except in young specimens. First preopercular spine with a supplemental spine or spur (often very small and infrequently virtually absent in *brasiliensis*).
- 20a. Eye notably large, snout 1.4-1.6 times in eye (1.5-2.2 in small fish). Pectoral long, 44.0-48.5 in the larger specimens, reaching to over end of anal or nearly so (34.5-35.0 in two specimens 31-36 mm.). In the larger specimens chest notably wrinkled in a cerebriform manner and scales on chest very deeply embedded, appearing scaleless at the surface. Posterior preorbital spine notably well developed. Scales 43-53.....*Scorpaena agassizi* (p. 71)
- 20b. Eye moderately large, snout 0.9-1.3 in eye. Pectoral 29.5-37.0 in the larger specimens, reaching to over base of third anal ray as a maximum (28-34 in small fish). Chest with an even surface and normally scaled. Posterior preorbital spine moderate or small.
- 21a. Scales 50-62. With a characteristic and rather unique color pattern, region at inner pectoral angle with small dark spots against a lighter background and side usually with 2, often 3 or 4, dark blotches, color pattern sometimes obscure. Upper posttemporal spine often absent.....*Scorpaena brasiliensis* (p. 74)
- 21b. Scales 42-49.
- 22a. Frontal spine absent in large specimens, notably small in the smaller specimens. Region at inner pectoral angle with light, small spots against a darker background. Tentacle at supraocular spine notably large.....*Scorpaena grandicornis* (p. 77)
- 22b. Frontal spine well developed. Without light spots at pectoral axil. Tentacle at supraocular spine small to well developed, sometimes large in individual variants of *bergi*. Small species.
- 23a. Depth 35.5-41.5 (in 37 specimens 33-92 mm.). Combined number of gill rakers and tubercles on upper limb usually 4, often 3. Body with light and

- dark shades; spinous dorsal with a blotch, better marked in faded specimens. Pectoral rays modally 17, often 16, infrequently 18. . . . . *Scorpaena bergi* (p. 79)
- 23b. Depth 43.5. Combined number of gill rakers and tubercles on upper limb 5. Body very moderately shaded; fins almost uniformly light-colored. Pectoral rays 19. (One specimen 43 mm. examined.) . . . . . *Scorpaena albifimbria* (p. 82)
- 17b. Preorbital with 3 free spinous points (except in specimens of *plumieri* under 65 mm.; such small specimens being separable from the other species by the distinctive color pattern of *plumieri* and the combination of its structural characters as given under its account).
- 24a. Scales 42-49. Occipital pit large, comparatively rather deep except in small and very large specimens. Upper posttemporal spine rather well developed. Frontal spine nearly in a line with parietal ridge.
- 25a. Without a pit under eye. Eye larger than interorbital. Almost plain-colored. Head and anterior part of body rather well compressed.  
*Scorpaena dispar* (p. 84)
- 25b. A pit under anterior margin of eye, just over suborbital ridge (not definitely formed in specimens under 60 mm.). Eye smaller than interorbital. Region at inner lower pectoral angle black with whitish spots (white spots not well marked in small specimens); body spotted and mottled with light and dark areas. Head and anterior part of body notably tumescent.  
*Scorpaena plumieri* (p. 86)
- 26a. Occipital pit often elongate and fairly deep; small dark spots on lower part of body absent or rather sparse. Atlantic.  
*Scorpaena plumieri plumieri* (p. 88)
- 26b. Occipital pit often oblong and rather shallow; small spots on lower part of body more often present and frequently rather numerous. Pacific. . . . . *Scorpaena plumieri mystes* (p. 92)
- 24b. Scales 76. Occipital pit small and shallow. Upper posttemporal spine slight. Frontal spine placed laterad of parietal ridge. . . . . *Scorpaena microlepis* (p. 95)
- 1b. Lateral line unusually modified, consisting of a continuous ditchlike depression roofed over by a membranous cover without channeled scales. Supraocular, and postocular spines absent. Dorsal virtually forming two separate fins. Scales cycloid and small, 88-103. Upper 3 preopercular spines subequal or nearly so. . . . . *Setarches barmatus* (p. 97)

Genus **SEBASTES** Cuvier

*Sebastes* CUVIER, Règne animal, ed. 2, vol. 2, p. 166, 1829 (two species included, *norvegicus* and *dactylopterus*, genotype by later designation).

*Sebastes* BLEEKER, Versl. Akad. Amsterdam, vol. 9, p. 294, 1876 (*Sebastes norvegicus* Cuvier and Valenciennes, designated as genotype).

*Comparison*.—Among the western Atlantic scorpaenids this genus is nearest *Helicolenus*, and the differences between them are discussed under that genus. The generic characters are included below under the description of the one western Atlantic species of *Sebastes*.

**SEBASTES MARINUS** (Linnaeus)

*Perca marina* LINNAEUS, Systema naturae, ed. 10, vol. 1, p. 290, 1758 (Norway, Italy).

*Sebastes fasciatus* STORER, Proc. Boston Soc. Nat. Hist., vol. 5, p. 31, 1854 (Provincetown, Mass.).

*Sebastes marinus* JORDAN and EVERMANN (in part), U. S. Nat. Mus. Bull. 47, p. 1760, pl. 268, fig. 653, 1898 (include 2 species according to the given distribution and synonymy).—BIGELOW and WELSH, Bull. U. S. Bur. Fish., vol. 40, pt. 1, p. 304, figs. 141-147, 1925 (general account, including life history).

D.XIV-XV 13-15. A.III 7-10. P.18-20. Sc.87-110. GR.9-11+23-27.

*Description*.—Eye large and interorbital rather wide (proportional measurements differing with population; see below). Maxillary ending at a point under pupil. Knob on chin becoming notably prolonged and tapering in large specimens. Palatine teeth present. No slit behind fourth gill arch. Gill rakers long in comparison with the other scorpaenids here treated; 9-11 on upper limb; 23-27 on lower limb, including one short, stumpy, tubercle-like outgrowth often present at anterior end of arch; 32-38 in total number. Occiput flat, without a pit. Parietal ridge long, usually continuous, ending in a single point, sometimes a second moderate spinous point a little in front of posterior spine; frontal spine in a line with postocular, placed laterad of parietal ridge; upper posttemporal ridge and spine rather well developed, lower posttemporal spinous point slight or moderate, not preceded by an external ridge; sphenotic, pterotic, and postorbital spines absent; preorbital with 2 moderate free spinous points; suborbital ridge slight, short, confined to part of cheek behind eye, without a spinous point; cleithrum with a moderate spinous point or a slight blunt projection. First preopercular spine moderately smaller than second, third subequal to first, fourth and fifth smaller but rather well developed in comparison with some other species. Subopercle very often with a moderate spinous point at its lower posterior corner,

interopercle very often with a similar spine at its upper posterior corner, in juxtaposition to like spine on subopercle, sometimes a second spinous point on subopercle at a short distance above spine at angle (the 1 or 2 spines at lower part of subopercle present in addition to the 2 opercular spines on its upper part, characteristic of the family). Tentacles or flaps absent. Scales rather small, 87-110, ctenoid, with very small supplementary scales except in small specimens; snout, maxillary, mandible, soft area between mandibles, and branchiostegals partly scaled; rest of head almost completely scaled; fins moderately scaled. Penultimate dorsal spine about five-sixths as long as last; longest dorsal spine subequal to postorbital part of head or slightly shorter. Second anal spine subequal in length to third. Ventral about reaching anus, its outer angle placed moderately behind lower pectoral angle. Pectoral reaching a vertical a little behind end of ventral, its posterior margin rounded or somewhat wedge-shaped, the middle rays longest; usually its upper 2 rays unbranched, sometimes upper 1 or 3 rays unbranched, next 7-13 rays branched, lower 5-10 rays unbranched. Caudal emarginate.

Measurements of 6 American specimens 200-361 mm.; 2, 3, and 1 from samples A, B, and C, respectively (for origin of samples see below): caudal 21.0-22.5, ventral 20.0-23.5, pectoral 29.0-31.5, depth 35.5-39.5, head 36.5-39.0, maxillary 17.0-18.7, snout 8.2-9.9, eye 11.9-13.0, interorbital 7.2-8.1; snout 1.2-1.5 and interorbital 1.5-1.7 times in eye.

Measurements of 3 European specimens 258-395 mm. (sample D): caudal 21.0-22.5, ventral 20.5-24.0, pectoral 26-29, depth 33.5-34.5, head 37-38, maxillary 17.1-18.2, snout 9.7-10.4, eye 10.1-11.8, interorbital 7.7-8.4; snout 1.0-1.2 and interorbital 1.2-1.4 times in eye.

Color of preserved specimens examined a nearly uniform yellowish or golden, probably faded after long immersion in preservative. It is said to be of an orange or red color in life with some irregular dark shadings on head and back.

*Development.*—The pectoral rays are damaged in many small specimens examined. As far as determinable they appear to begin to branch at about 100 mm. The accessory scales begin to appear at about 120 mm.; they are very few in the smaller specimens and become very profuse with growth.

*Specimens examined.*—For the purpose of analyzing intraspecific population differences the specimens examined have been divided into four composite samples as follows.

Sample A: Taken off Long Island, N. Y., between latitudes 39° 49' and 40° 05' N., and longitudes 68° 48' and 71° 10' W., in 144

to 420 fathoms; 10 specimens 288-359 mm., in 9 constituent samples (31614, 31679-81, 31683, 31714-16, 35493).

Sample B: Taken on the coast of New England, from off Nantucket Island, Mass. (lat.  $41^{\circ} 25' 30''$  N., long.  $69^{\circ} 01'$  W.) to Eastport, Maine; 44 specimens 40-364 mm., in 20 constituent samples (5374, 13850, 21814, 23264, 31539, 31567-8, 33381, 43078, 46075, 46079, 46084, 74117, 83928-9, 88463, 89019, 120984, 125419, 143784). Depth records are available for 9 of the 20 constituent samples and range 35-105 fathoms.

Sample C: Taken from off Cape Sable, Nova Scotia, to off St. Johns, Newfoundland, in 78-215 fathoms; 11 specimens 76-264 mm., in 7 constituent samples (21003, 33389, 38089, 46077, 84499, 84503, 134326).

Sample D: Three specimens 258-395 mm.; 2 from Bergen, Norway (17435), 1 from the North Sea (39732); no depth data available.

*Comparison.*—This species differs from all other western Atlantic scorpaenids as follows. The dorsal spines number 14-15. The scales are small, and it has numerous accessory scales. The gill rakers are more numerous. The count of all three characters is discontinuous as compared with the other species. It differs from its eastern Atlantic congener, *Sebastes viviparus*, in the more numerous scales, 87-110 instead of 76-82 in 4 specimens of *viviparus* examined. The latter also averages lower numbers of anal and pectoral rays, but these counts evidently overlap widely.

*Populations.*—While the samples examined indicate considerable differences between the local populations, the specimens are not numerous enough to draw taxonomic conclusions with anything approaching finality. These differences, as presented in tables 6-8, and the given measurements, are here briefly discussed.

Samples B and C from the western Atlantic show a significant difference in the number of dorsal rays as compared with the 3 eastern Atlantic specimens; 13 or 14 rays in 52 western Atlantic specimens as compared with 15 rays in the 3 eastern specimens. This might suggest a possible divergence of subspecies or even species magnitude. However, sample A, which was taken in deeper water off Long Island, is intermediate, having 14 or 15 dorsal rays.

The anal ray and scale counts average highest in sample A; those of the pectoral rays average lowest in sample B; those of the gill rakers on the lower limb average highest in sample C. However, the extents of divergence of these characters are evidently of low degree, below the subspecies level.



Differences in proportional measurements are contrasted above between the 3 European specimens examined and 6 American specimens of nearly comparable size. The 3 European specimens average a slenderer body, longer pectoral and snout, and smaller eye. The greatest divergence appears to be in the depth and eye measurements which were therefore determined for all available nearly comparable

TABLE 7.—*Frequency distribution of the number of dorsal spines and dorsal, anal, and pectoral rays in *Sebastes marinus*, segregated by population as delimited in the text*

Population	Dorsal spines		Dorsal rays			Anal rays				Pectoral rays		
	14	15	13	14	15	7	8	9	10	18	19	20
Sample A . . . . .	1	9	..	5	5	..	5	4	1	..	9	1
Sample B . . . . .	4	40	22	20	..	40	4	..	..	13	30	1
Sample C . . . . .	1	10	5	5	..	5	6	..	..	..	9	2
Sample D . . . . .	..	3	..	..	3	1	2	..	..	..	3	..

TABLE 8.—*Frequency distribution of the number of gill rakers on the first gill arch in *Sebastes marinus*, segregated by population*

Population	Upper limb			Lower limb					Total both limbs							
	9	10	11	23	24	25	26	27	32	33	34	35	36	37	38	
Sample A . . . . .	2	7	1	1	3	3	3	..	1	1	2	2	4	..	..	
Sample B . . . . .	4	24	13	3	12	16	7	3	..	4	11	9	11	6	..	
Sample C . . . . .	2	8	1	..	..	6	3	2	..	..	1	6	2	1	1	
Sample D . . . . .	..	2	1	1	..	1	1	..	..	1	..	1	..	1	..	

TABLE 9.—*Frequency distribution of the number of scales in *Sebastes marinus*, segregated by population, the classes grouped by intervals of three*

Population	Distribution									
	87	90	93	96	99	102	105	108	111	
Sample A . . . . .	..	1	..	1	4	1	2	1	..	
Sample B . . . . .	1	3	7	5	5	1	..	..	1	
Sample C . . . . .	..	1	..	3	1	..	..	..	..	
Sample D . . . . .	..	1	1	1	..	..	..	..	..	

specimens with the following result: depth 33.6-34.5 and eye 10.1-11.8 percent of the standard length in 3 European specimens 258-395 mm., as compared with 35.2-39.4 and 11.7-13.3 percent, respectively, in 20 American specimens of all populations 200-361 mm. These differences might possibly form a basis for the subspecific or specific distinction of the American and European populations; but the specimens examined are too few to enable me to draw definite conclusions.

Genus **HELICOLENUS** Goode and Bean

*Helicolenus* GOODE and BEAN, Oceanic ichthyology, p. 248, 1895 (genotype *Scorpaena dactyloptera* De la Roche by original designation).

*Helicolenus* is in a way intermediate between *Sebastes* and *Scorpaena*, agreeing with either genus in some characters and differing in others. It agrees with *Sebastes* in having the first preopercular spine shorter than the second, in having ctenoid scales, in the extent of scalation, and in lacking tentacles, and nearly agrees in the spinous armature of the head. *Helicolenus* lacks accessory scales which are present in *Sebastes*. The two genera differ further in the number of dorsal spines, anal rays, and gill rakers. The normal or usual number of dorsal spines is 12 in *Helicolenus* and 15 in *Sebastes*. The number of anal rays is almost constantly 5 in *Helicolenus*, while in *Sebastes* the number differs with the species and varies with the individual, the range being 6-10. The gill rakers are less numerous and not so well developed in *Helicolenus*. *Helicolenus* agrees with *Scorpaena* in normally having 12 dorsal spines and 5 anal rays, and differs from the latter in having the first preopercular spine shorter than the second, ctenoid scales, and an emarginate caudal. In general, the spinous armature of the head is not well developed in *Helicolenus* and the gill rakers better developed, as compared with *Scorpaena*. The degree of development and number of gill rakers in *Helicolenus* are rather intermediate between *Sebastes* and *Scorpaena*. *Helicolenus* differs from both genera in the shape and structure of its pectoral fin. The generic characters are included below in the description of the one species here treated.

**HELICOLENUS DACTYLOPTERUS** (De la Roche), *sensu lato*

D.(XI) XII (XIII) (10) 11-13. A.III (4) 5. P.17-20. Sc.60-79. GR.7-9+16-19.

*Description*.—Eye larger than snout. Interorbital width approximately a third to a half the eye diameter. Maxillary ending approximately under anterior margin of pupil. Palatine teeth present. No slit on inner side of fourth gill arch. Gill rakers comparatively rather slender, of moderate length at angle, rather gradually decreasing in size both ways, those at both ends short, sometimes one or two at either end very short, tubercle-like; total number of gill rakers and tubercles 7-9+16-19, 23-27 in combined number. Occiput flat, without a pit. Parietal ridge divided into two unequal parts, the anterior

part long, both parts ending in spinous points; frontal spine placed laterad of parietal ridge, in a line with postocular; upper and lower posttemporal spines rather closely approximated; sphenotic and pterotic spines placed rather low, approximately on a lengthwise line through upper margin of pupil; sphenotic spine short and blunt or represented by a mere bony knob or absent; pterotic rather narrow and pointed or absent; postorbital absent; preorbital without definite spinous points, two slight or moderate blunt knobs instead; suborbital ridge with one slight or moderate point, or smooth; cleithrum without a spinous point or projection. Second preopercular spine longest, reaching about halfway to opercular margin or a little farther; first spine distinctly shorter than second, subequal to or slightly longer than third, without a supplementary spine; fourth and fifth spines moderate. Upper outer corner of interopercle often ending in a blunt angle or spinous point. Without tentacles or tabs. Scales ctenoid, 60-79; nape, opercle, and cheek virtually all scaled; interopercle partly scaled; interorbital scaled for a short distance posteriorly, its greater part scaleless; snout scaleless; maxillary partly scaled, infrequently the scales few and nearly embedded (such variants appearing scaleless on superficial examination). Dorsal typically with 12 spines; penultimate spine about four-fifths as long as last spine or slightly longer; longest dorsal spine subequal to postorbital part of head. Ventral having its outer angle a little behind lower pectoral angle, about reaching anus, varying slightly both ways. Pectoral usually having upper 2 rays unbranched, next 8-10 branched, lower 7-9 unbranched, total number of rays 17-20; the lower unbranched rays notably thickened, their distal ends detached from one another for nearly half their length; posterior margin of upper half of fin a nearly straight, slightly inclined line; the fin reaching backward approximately to a vertical through end of ventral. Caudal very moderately emarginate.

Ground color yellowish or golden; upper part of body, for a variable distance, with dark, irregular, partly anastomosing or confluent markings, the dark pigment mostly confined to margin of scales; these dark markings or shadings absent in most specimens examined (probably disappearing in preservative); posterior and greater part of mouth cavity and inner face of gill cover black or dusky, dark color especially marked on roof of cavity, sometimes the dark color hardly appreciable in specimens long in preservative. In recently preserved specimens the color in the mouth cavity is a deep bluish black.

The smaller specimens of *maderensis* have a dorsal spot as de-

scribed under that subspecies. Smaller specimens of the other two subspecies are not available for comparison.

*Subspecies.*—The samples of this species examined are divisible into three major allopatric populations according to the following geographic regions: (1) eastern Atlantic and Mediterranean, (2) western north Atlantic, (3) Atlantic coast of South America; and are hereafter treated as subspecies, *dactylopterus*, *maderensis*, and *lahillei*, respectively. The subspecies differ in the relative frequency of occurrence of a spine on the suborbital ridge, in the scale count, and in some proportional measurements as stated and discussed under their accounts. In some proportional measurements *dactylopterus* and *lahillei* represent the extremes while *maderensis* is intermediate. The interorbital has the greatest average width in *lahillei* and the narrowest in *dactylopterus*. The proportional numerical value of the ventral, pectoral, depth, head, maxillary, and eye measurements average highest in *dactylopterus* and lowest in *lahillei*.

#### HELICOLENUS DACTYLOPTERUS DACTYLOPTERUS (De la Roche)

*Scorpaena dactyloptera* DE LA ROCHE, Ann. Mus. Hist. Nat. Paris, vol. 13, pl. 22, fig. 2, 1809 (Barcelona).

*Helicolenus dactylopterus* NORMAN, *Discovery Reports*, vol. 12, p. 24, 1935 (summarizes distribution; compares with the American *maderensis* and other species).

D.XII 12. A.III 5. P.19-20. Sc.66-73. GR.7-8+16-18.

*Description.*—Spine on suborbital ridge usually absent, sometimes present (on one side in 1 out of 7 specimens). Scales 66-73 (in 5).

Measurements of 6 specimens 197-325 mm.: caudal 25.5-28.0, ventral 22-26, pectoral 30.5-33.0, depth 33.0-36.5, head 40-45, maxillary 21.5-22.5, snout 9.0-11.0, eye 13.5-14.2, interorbital 4.4-4.7; snout 1.2-1.5 and interorbital 2.9-3.2 times in eye.

*Specimens examined.*—Bergen, Norway (17434). Azores (23302, 94491). Bay of Naples (48329). Genoa (29783, 124422). Received from Paris Museum, without a definite locality (42086). Total examined, 7 specimens 192-395 mm., the largest from Norway.

*Comparison.*—This subspecies differs from the other two here treated in usually lacking a spine on the suborbital ridge. It possibly averages a longer head, maxillary, pectoral and ventral, larger eye, narrower interorbital, fewer gill rakers, and more pectoral rays. The scale count is rather intermediate between *maderensis* and *lahillei*.

**HELICOLENUS DACTYLOPTERUS MADERENSIS** Goode and Bean

*Helicolenus maderensis* GOODE and BEAN (in part), Oceanic ichthyology, p. 250, pl. 68, fig. 244, 1895 (plate labeled *dactylopterus*, but legend to plate, on page 15\*, labeled *maderensis*; for restriction of name see below).—NORMAN, *Discovery Reports*, vol. 12, p. 25, 1935 (off Long Island, N. Y.).—LONGLEY and HILDEBRAND, Carnegie Inst. Washington Publ. 535, p. 165, 1941 (Tortugas, Fla.).

*Helicolenus thelmae* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 89, p. 300, fig. 5, 1937 (near Gulf Stream off Cape May, N. J.).

D.(XI)XII(XIII) (10) 11-13. A.III (4) 5. P.(17) 18-20. Sc.60-71. GR.7-9+16-18.

*Description*.—Spine on suborbital ridge usually present, often absent (see below for frequencies). Scales 60-71 (counted in 38 specimens; scalation incomplete in most specimens examined and number of scales not definitely determinable in such specimens).

Measurements of 12 Atlantic specimens 185-278 mm., including the lectotype, and 2 specimens 152-162 mm., the holotype and paratype of *H. thelmae*: caudal 25.5-27.5 (25.5-26.5), ventral 21-24 (23-24.5), pectoral 25.5-31.0 (28.5), depth 32-37 (35-36), head 38.5-43.5 (39.5), maxillary 20-22 (20), snout 9.6-11.1 (8.9-9.5), eye 11.7-13.7 (13.0-13.2), interorbital 4.6-5.7 (4.6-4.7); snout 1.1-1.3 (1.4-1.5) and interorbital 2.1-2.7 (2.8) times in eye. The same measurements of 5 Gulf of Mexico specimens 195-238 mm. fall within the range of the above large specimens, except as follows: pectoral 28.0-31.5, maxillary 21.0-22.5, eye 13.4-14.7, interorbital 4.2-5.3; snout 1.4 and interorbital 2.6-3.4 times in eye.

Small specimens with a dark spot on dorsal between seventh or eighth and eleventh spines; the spot beginning to disappear at about 100 mm., often well marked in specimens up to 150 mm., and a more diffuse spot sometimes persisting up to 200 mm.

*Specimens examined*.—In the U. S. National Museum, 177 specimens in 54 constituent samples. The great majority were taken by the *Albatross* and the *Fish Hawk* at a number of stations. The geographic range of these specimens is from off Cape Cod, Mass. (41° 49' N., 65° 49' 30" W.; 143291) to off Tortugas, Fla.; and off Egmont Key and Cape San Blas, Fla., and the Mississippi Delta in the Gulf of Mexico. Besides the preceding large sample the following 4 specimens were examined. About 70 miles southeast of Cape May, N. J. (A.N.S.P. 68261 and 68262, the holotype and paratype, respectively, of *H. thelmae*). Off Massachusetts Bay (U.M.M.Z. 157066; lat. 42° N., long. 68° W., 85-95 fathoms, fishing boat *Mary and Josephine*; U.M.M.Z. 157067; lat. 42° 20' N., long. 68° 50' W., 106

fathoms, fish boat *Bonaventure*). The last specimen constitutes the northernmost record. The recorded vertical range is 70-373 fathoms. Total examined, 181 specimens 29-444 mm., the largest from off Long Island, N. Y. (21824).

*Populations*.—According to the measurements given above, the Gulf population of this subspecies differs from that of the Atlantic in averaging a larger eye and narrower interorbital. The frequency of occurrence of a spinous point on the suborbital ridge in the Gulf population, judged by the 5 specimens examined, seems to be not much different than in the Atlantic population.

*Lectotype*.—In the original account of *maderensis* only western Atlantic localities are enumerated for the specimens examined. However, the authors state that the same species occurs in Madeira, and they cite the account of *Sebastes imperialis* of Lowe as referring to their *maderensis*. Their account, consequently, is a composite one, referring to more than one subspecies, and it becomes necessary to restrict the use of the name *maderensis*. Therefore, U.S.N.M. No. 26627 is hereby designated as the lectotype. It is one of Goode and Bean's original specimens, apparently the one figured, and its data are as follows: *Fish Hawk* station 897, lat. 37° 25' N., long. 74° 18' W., off Hog Island, Va., 158 fathoms, 200 mm. As restricted, the name *maderensis* is inappropriate for a common fish living off the east coast of the United States; but all the original specimens came from this region.

*Comparison*.—Norman and also Longley (cited above) treat the western Atlantic *maderensis* as of specific rank. Norman states that *maderensis* differs from *dactylopterus* in having a smaller eye, in constantly having a spine on the suborbital ridge, in the less deeply concave interorbital, and possibly in having a little larger scales. Longley distinguishes *maderensis* from *dactylopterus* by its smaller eye and by its having a spine on the suborbital ridge. However, an examination of more extensive samples than those available to the above authors lead to the following conclusions.

The depth of the interorbital concavity is largely a matter of individual variability and can hardly be used as a specific character. The difference in the size of the eye does seem to have some value, 13.5-14.2 in 6 European specimens, and 11.7-13.7 in 12 specimens of comparable size from the Atlantic coast of the United States. However, when the measurements of the eye of the 17 specimens are arranged in order of magnitude, 3 European and 2 American Atlantic specimens intergrade, which indicates a degree of divergence of less than

subspecies magnitude. Moreover, in 5 comparable specimens from the Gulf of Mexico the eye measurement is 13.4-14.7, very nearly the same as in the European specimens. It is evident that the size of the eye differs with the minor population and cannot be used even in subspecific division. The scales in 5 European specimens number 66-73, while in 38 American fish the range is 60-71, and this difference also is obviously below the subspecies level.

The difference showing the greatest divergence apparently refers to the spinous point on the suborbital ridge, but this character also intergrades considerably. Of 181 specimens examined from the western Atlantic, 124 have a spinous point on both sides, 41 have the spine on one side only, and 16 lack a spine on both sides. The percentages of these three categories of specimens in the entire composite sample are: 69, 23, and 9, respectively. Of 7 European specimens examined only one has a spinous point on one side only. In the absence of an adequate sample from Europe, to express the extent of divergence in numerical terms, the number of observations, which is twice the number of specimens, may be used as a base. Of 362 observations on western Atlantic specimens, 73, or 20.17 percent, are zero and 289 are 1; while the corresponding observations on European specimens are 13 and 1, respectively, that is, the intergrading observation is 7.14 percent of the sample. The index of intergradation then is 14, and concomitantly the index of divergence is 86 (Ginsburg, 1938), which is not more than of subspecies magnitude, and the populations are so treated here.

*Synonymy.*—The 2 types of *thelmae* were examined and their data included in this account. The holotype has a blunt projection in the normal position of the spinous point on the suborbital ridge. It is included in the above enumeration with the specimens having a spine, as the development of this spine shows all degrees of difference from a sharp point to a blunt projection. In the paratype the interorbital ridge is smooth on both sides as in 15 other individual variants of *maderensis*. The two types seemingly lack scales on the maxillary, while *dactylopterus*, *sensu lato*, including *maderensis*, normally has such scales. However, the scales in *maderensis* and the two other subspecies are more or less deciduous. Other specimens of *maderensis* examined seemingly lack scales on the maxillary. Besides, the holotype of *thelmae* shows faint traces on the right maxillary of scales having been present. In measurements, counts, the presence of a diffuse dorsal spot, and other characters, the two types of *thelmae* agree with the common *maderensis* and there is no question that they belong to this subspecies.

## HELICOLENUS DACTYLOPTERUS LAHILLEI Norman

*Helicolenus lahillei* NORMAN, *Discovery Reports*, vol. 16, p. 124, fig. 68, 1937 (coasts of Uruguay and northern Argentina).

*Helicolenus uruguayensis* FOWLER, *Proc. Acad. Nat. Sci. Philadelphia*, vol. 95, p. 326, figs. 18, 19, 1943 (off Uruguay).

D.XII-XIII 11-13. A.III 5. P.18-19. Sc.68-79. GR.7-8+17-19.

*Description*.—Spinous point on suborbital ridge usually present, sometimes absent (of 9 specimens examined, 7 have a spine on both sides and 2 lack it on one side only). Scales 68-79 (in 4).

Measurement of 9 specimens 208-290 mm.: caudal 25-29, ventral 20-23, pectoral 27.0-30.5, depth 32.0-35.5, head 37.0-41.5, maxillary 18.5-20.5, snout 8.5-10.0, eye 11.4-13.0, interorbital 4.6-6.2; snout 1.2-1.5 and interorbital 1.9-2.7 times in eye.

The shadings on the body, as described under the account of *dactylopterus*, *sensu lato*, is usually somewhat better developed in *lahillei* than in the other two subspecies in the preserved specimens examined.

*Specimens examined*.—Off Río de la Plata, lat. 36° S., long. 54° W., 50 meters, F. Filippone (85509, 290 mm.). Five specimens 208-252 mm. obtained in Uruguay during 1921-22, probably in the Montevideo market, by Hugh M. Smith (86696-86700, inclusive). Uruguay (A.N.S.P. 70325, the holotype 286 mm., and A.N.S.P. 70326-7, two paratypes 227-229 mm., of *uruguayensis*).

*Comparison*.—This subspecies, like *maderensis*, usually has a spine on the suborbital ridge. It differs in having a higher scale count, 68-79 instead of 60-71. While the specimens with a fairly complete scalation examined are not enough to determine the precise degree of divergence, it is apparently not greater than subspecies magnitude. This subspecies differs from the other two in proportional measurements also, as stated under the account of the species and as may be gathered by comparing the measurements here given for the three subspecies. In measurements also *lahillei* is nearest *maderensis*.

*Nomenclature and synonymy*.—The three types of *uruguayensis* were examined and their data are included in this account, but the types of *lahillei* were not examined. Fowler, in describing his *uruguayensis*, calls attention to some discrepancies in Norman's account of *lahillei*, based mainly on a comparison of his specimens with Norman's published figure. However, allowing for imperfections that nearly always are found in pen-and-ink drawings of fish, and taking Norman's account of *lahillei* in its entirety, it is evident that it refers to the subspecies here described, which seems to be common on the coast of Uruguay.



Genus **SCORPAENODES** Bleeker

*Scorpaenodes* BLEEKER, Nat. Tijdschr. Ned. Ind., vol. 13, p. 371, 1857 (genotype *Scorpaenodes polylepis* (Bleeker) = *Scorpaena polylepis* Bleeker by monotypy; name merely listed, no description).

*Definition.*—Eye moderately larger than snout. Interorbital one-half the eye diameter or moderately narrower. Maxillary ending under middle or posterior margin of eye. Palatine teeth absent (the only one of the present genera lacking palatine teeth). Small slit behind fourth gill arch present or absent. Gill rakers moderate at angle becoming very short, tubercle-like at ends of first gill arch; tubercles well separated and individually countable in the few specimens examined; gill rakers and tubercles combined 4-8+10-13, or 15-20 in total number. Occiput flat, without a pit. Interorbital with two bilaterally placed ridges, one on both sides of midline, slightly or well developed, ending in a spinous point, or the point virtually absent; parietal ridge divided into subequal parts, both ending in spinous points; frontal spine nearly alined with postocular, placed laterad of parietal ridge; lower posttemporal present, upper one present or absent; sphenotic and postorbital spines inconspicuous, in form of a group of a few slight spinules, asperities, or tuberosities; pterotic large or small; pterotic, lower posttemporal and supracleithral spines almost on same lengthwise line; preorbital with two broad, lobelike projections, without spinous points; suborbital ridge well developed, its spinous points differing widely with the species; supracleithral spinous point notably long, tapering, and sharp; cleithrum with a moderate tapering projection, sharply pointed or rather blunt. Preopercle having first spine longest, supplemental spine varying with the individual, present or absent (sometimes varying on both sides of same specimen); second spine placed near first spine; third spine in form of a rather broad projection without a sharp point; fourth and fifth spines virtually absent or slightly developed. Tentacles and other appendages comparatively few. Scales 40-42, ctenoid on body, occiput, opercle, and cheek; mostly cycloid on chest and fleshy pectoral base; opercle, and cheek to about under middle of eye nearly all scaled; interorbital, snout, and maxillary scaled or nearly scaleless; interopercle scaleless. Dorsal spines 13; emargination between spinous and soft parts rather well developed, penultimate spine two-fifths to seven-tenths as long as last spine; longest dorsal spine shorter than postorbital part of head. Second anal spine longer than third. Ventral reaching anus or a little short, its outer angle placed under lower pectoral angle. Pectoral nearly wedge-shaped, the longest rays near

its middle, reaching a vertical through beginning of anal or a little short; with 17-19 rays, upper 5-7, except uppermost 1 or 2, branched. Caudal rounded.

*Pectoral rays and gill rakers.*—As the number of available western Atlantic specimens belonging to *Scorpaenodes* are very few, the pectoral rays and the gill rakers, being of importance in distinguishing the species, have been counted on both sides of every specimen and all the counts entered in the tables and in the accounts of the species. The gill-raker count differs rather widely on both sides of the type of *russelli*, 10 on the lower limb of the right side, 13 on the left.

*Comparison.*—*Scorpaenodes* differs from all other known western Atlantic scorpaenid genera in lacking palatine teeth and normally having 13 dorsal spines.

*Speciation.*—Five western Atlantic species of *Scorpaenodes*, namely, *tridecimspinosus*, *caribbaeus*, *russelli*, *triacanthus*, and *floridae*, have been successively described from time to time by different authors. In most instances the successive new species were established on the basis of published accounts, rather than by direct comparison of specimens. I examined and compared directly a cotype of *tridecimspinosus*, the holotype and a paratype of *floridae*, and the holotypes of the other three species. This study has shown that *caribbaeus*, *russelli*, and *triacanthus* are based on specimens of the same species which is different from *tridecimspinosus*; while the two types of *floridae* are doubtfully different specifically from *tridecimspinosus*. That is, based on a direct comparison of the types, not more than three species of *Scorpaenodes* are now known from the western Atlantic, one of which is doubtfully distinct. The species are compared below in some detail under their accounts.

#### SCORPAENODES CARIBBAEUS Meek and Hildebrand

*Scorpaenodes caribbaeus* MEEK and HILDEBRAND, Publ. Field Mus. Nat. Hist., zool. ser., vol. 15, pt. 3, p. 847, pl. 82, September 1928 (Toro Point, Canal Zone).

*Scorpaenodes russelli* BEEBE and TEE-VAN, Zoologica, vol. 10, No. 1, p. 189, fig., December 1928 (Port au Prince, Haiti).

*Scorpaenodes triacanthus* PARR, Bull. Bingham Oceanogr. Coll., vol. 3, art. 4, p. 115, fig. 30, 1930 (Cat Island, Bahamas).

D.XIII 9. A.III 5. P.18-19. Sc.41-42. GR.6-8+10-13.

*Description.*—Eye a little larger than snout. Interorbital about two-fifths the eye. Maxillary ending under middle of eye. Small slit behind fourth gill arch present. Most spines on head, including the interorbital ridges and spinous points, well developed; lower post-

temporal well developed, upper one small or absent; an extra spinous point about midway between posterior parietal and lower posttemporal ridges (latter spine bifid on right side of type of *caribbaeus* and absent on left side of type of *triacanthus*; an extra small spinous point a little way below posterior parietal ridge on right side of type of *caribbaeus*); pterotic spine notably well developed; suborbital ridge with 4 or 5 spinous points; 2-4 other points on a line parallel to main ridge and at a very short distance below it, placed under anterior part of eye (on right side of type of *caribbaeus* an extra spinous point over main ridge slightly behind a vertical through posterior margin of eye). Small tentacles or tabs placed at some of the spines on the head, including the supraocular spine, and along the course of the lateral line. Interorbital, snout, and cheek under anterior part of eye with very small nonimbricate scales; maxillary for a moderate extent along its upper part with similar small scales present or absent. Penultimate dorsal spine about two-thirds as long as last spine. Ventral reaching anus or falling slightly short. Pectoral reaching a vertical through base of first anal spine or falling slightly short; its upper 2 rays unbranched, next 6-7 rays branched, lower 9-11 rays unbranched.

Measurements of 2 specimens 63.5-68.7 mm. in standard length, the caudals damaged, and 1 specimen 48 mm. or 36.5 mm. in standard length: caudal (32.5), ventral 26 (31), pectoral 31.5 (35.5), depth 37.5-39.0 (39.5), head 44-45 (47.5), maxillary 21-23 (24.5), snout 11.8-13.2 (12.3), eye 13.8-14.2 (14.8), interorbital 5.5-5.8 (7.4); snout 1.1-1.2 (1.2) and interorbital 2.4-2.6 (2.0) times in eye.

Rather dark brownish above, somewhat lighter below; dorsal dark, the pigment somewhat more concentrated between eighth and ninth and twelfth spines, without a definite spot; pectoral, soft dorsal, and caudal with small spots; no other distinctive color marks.

*Development.*—The preceding account is based in large part on two specimens 63.5-68.7 mm. in standard length (the holotypes of *caribbaeus* and *russelli*, respectively). A considerably smaller specimen, 36.5 mm. in standard length (the holotype of *triacanthus*), differs from the two larger specimens as follows. The very small scales on the snout and interorbital are as yet undeveloped, but some tiny papillae are present, which are seemingly destined to become scales. The maxillary about reaches to under posterior margin of eye. The suborbital and pterotic spinous points are not as well developed. The caudal peduncle is abruptly lighter. The pectoral and, to a lesser extent, the soft dorsal, anal, and caudal have a dark area near their base, and the small spots on the fins are much fewer. Differences in some proportional measurements are indicated above. All these differ-

ences are readily ascribable to growth changes. There are no well-marked specific differences such as distinguish scorpaenid species. It is therefore concluded that the holotype of *triacanthus* is a small specimen of *caribbaeus*, although a complete series is not available to trace growth changes more definitely.

*Specimens examined*.—Toro Point, Canal Zone (81619, holotype of *caribbaeus*, 63.5 mm. in standard length). Port au Prince Bay, Haiti (N.Y.Z.S. 7207, holotype of *russelli*, 68.7 mm. in standard length). Cat Island, Bahamas (B.O.C. 2533, holotype of *triacanthus*, 48 mm.). The type of *caribbaeus* is an abnormal specimen having the soft fins malformed, apparently a result of either an injury at some past time in life or a derangement during development. Therefore, its soft dorsal and anal counts and the ventral measurement is not included in the account of the species. But the dorsal and anal spines, the scalation, the shape of the body and head, and the spinous armature of the latter are evidently normal.

*Comparison*.—This species differs from *tridecimspinosus* in a number of characters, as follows. Some spinous points are present under the anterior main part of the suborbital ridge. The interorbital ridges are better developed and they end in well-developed spinous points. The pectoral rays and the gill rakers on the upper limb are more numerous. The minute scalation on the snout and interorbital is better developed. It has a small slit behind the fourth gill arch.

*Synonymy*.—A direct comparison of the types of *russelli* and *caribbaeus* shows without a doubt that both specimens belong to the same species. Its presumed specific differences given in the original description of *russelli*, based on a comparison with rather inadequate accounts of previously established species, do not hold, or the differences are based on individual variation.

*S. triacanthus* was established chiefly because it was supposed that it has 3 opercular spines. However, an examination of the type shows that it has only 2 spines in the opercle, like the other species of its family. Apparently the supracleithral spine was assumed to be a third opercular spine. The type of *triacanthus* is evidently a half-grown specimen of *caribbaeus* as discussed above.

#### SCORPAENODES TRIDECIMSPINOSUS (Metzlaar)

*Scorpaena tridecimspinosus* METZLAAR, Rapp. Vissch. Kol. Curaçao, edited by J. Boeke, vol. 2, pt. 1, p. 146, fig. 44, 1919 (Aruba and Bonaire Islands, D.W.I.).

D.XIII 9. A.III 5. P.17. Sc.4I. GR.5+10.

*Description*.—Eye rather large, moderately larger than snout. Interorbital slightly less than half the eye. Maxillary ending under poste-

rior margin of eye. No slit behind fourth gill arch. Interorbital ridges slight, not ending in definite spinous points; upper posttemporal absent; pterotic small; suborbital ridge with three moderate spinous points. A foliar tentacle at base of supraocular spine, much expanded for its distal and greater part, digitated; a similar narrower tentacle at lower posterior corner of preorbital bone; a moderate elongate tentacle at postocular spine; a foliar sessile tentacle on eyeball nearly over anterior margin of pupil; a similar larger tentacle attached to posterior rim of anterior nostril; small tentacles at other spines on head. Anterior and greater part of interorbital, snout, and cheek under anterior part of eye with numerous papillae, some of them in form of tiny scalelike structures; no scales on maxillary. Penultimate dorsal spine about half as long as last spine. Ventral falling a little short of anus. Pectoral a little short of a vertical through first anal spine; its upper ray unbranched, next 6 or 7 rays (differs on both sides of same specimen) branched, lower 9 or 10 rays unbranched, notably thickened.

Measurements of one specimen 42.8 mm. in standard length, the caudal damaged: ventral 27.5, pectoral 30, depth 36, head 44.5, maxillary 25.5, snout 12.6, eye 14, interorbital 6.8; snout 1.1 and interorbital 2.1 times in eye.

Brownish, nearly uniform, slightly and irregularly shaded; a broad transverse whitish area under pupil to maxillary; dark pigment somewhat more concentrated at posterior part of spinous dorsal; pectoral and soft dorsal with small, rather faint brownish spots. The figure of the species published by Metzlaar shows rather sharply contrasting light and dark shades with 2 dark, broad cross areas on posterior part of body and caudal peduncle.

*Specimen examined*.—Bonaire Island, D.W.I. (160660, cotype of *tridecimspinus*).

*Comparison*.—This species is compared with *caribbaeus* and *floridae* under their accounts.

#### SCORPAENODES FLORIDAE Hildebrand

*Scorpaenodes floridae* HILDEBRAND, Carnegie Inst. Washington Publ. 517, p. 251, fig. 14, 1940 (Tortugas, Fla.).

D.XIII 8-9. A.III 5. P.17. Sc. about 40-41. GR.4-5+11.

*Description*.—Eye rather large, snout about four-fifths the eye diameter. Interorbital width equaling one-half the eye or a little narrower. Maxillary ending under posterior margin of eye. No slit behind fourth gill arch. Interorbital ridges slight or moderate, their

spinous points moderate or virtually absent; lower posttemporal moderate, upper one absent; pterotic spine very moderate; suborbital ridge with one moderate spinous point, at its posterior end. A moderate, elongate tentacle at base of supraocular spine; a similar smaller tentacle at posterior lower angle of preorbital; a foliar sessile tentacle on eyeball nearly over anterior margin of pupil; tentacle at anterior nostril moderately expanded distally; very small tentacles or tabs at preocular and some other spines on the head. Anterior and greater part of interorbital, snout, and cheek under anterior part of eye with very small, nonimbricate, widely spaced scales and some papillae; no scales on maxillary. Penultimate dorsal spine about two-fifths as long as last spine. Ventral about reaching anus. Pectoral reaching to over base of first or second anal spine; its upper 1 or 2 rays unbranched, next 5-7 rays branched, lower 9-10 rays unbranched.

Measurements of 2 specimens 51-58 mm.: caudal 28-29, ventral 27-30, pectoral 34.5, depth 38.0-39.5, head 44-45, maxillary 25, snout 10.9-11.2, eye 13.1-14.2, interorbital 6.6; snout 1.2-1.3 and interorbital 2.0-2.2 times in eye.

The two specimens examined almost uniformly yellowish, apparently faded; a trace of brown pigment between the eighth or ninth and eleventh dorsal spines suggesting the possible normal presence of a spot in that position.

*Specimens examined*.—South of Tortugas, Fla., 45 fathoms (108875, the holotype; 108876, the paratype).

*Comparison*.—It is doubtful whether *floridae* represents a valid species, distinct from *tridecimspinosus*. The two type specimens of *floridae* differ from the paratype of *tridecimspinosus* examined as follows. The suborbital ridge has only 1 spinous point, instead of 3. The interorbital ridges and spines are somewhat better developed. The tentacles on the head, especially those at the supraocular spine, the preorbital bone, and the anterior nostril, are not as well developed. However, judged by intraspecific variability of some other scorpaenid species, it seems possible that an examination of an adequate sample of *tridecimspinosus* will show that the differences outlined above are nothing more than differences between individuals of the same species.

#### Genus PONTINUS Poey

*Pontinus* POEY, Memorias sobre la historia natural de la Isla de Cuba, vol. 2, p. 172, 1860 (genotype *Pontinus castor* Poey by monotypy, the only other species, *pollux*, included in original account being a *species inquirendae*).—JORDAN and GILBERT, U. S. Nat. Mus. Bull. 16, p. 673, 1883 (*Pontinus castor* Poey designated genotype).

*Definition.*—Eye subequal to snout or smaller, except in *macrolepis* varying to larger than snout. Interorbital about a third to half the eye. Maxillary ending under middle to under posterior margin of eye. Palatine teeth present. A small slit behind fourth gill arch, either open altogether or bridged over its outer side by a thin, easily torn membrane. Upper limb with 3-6 end gill rakers short, tubercle-like, but individually readily distinguishable and countable; lower limb with 3-6 tubercles at end, some of them only slightly raised above surface of arch or much expanded lengthwise along arch, sometimes difficult to distinguish individually; combined number of gill rakers and tubercles 5-8+12-15, or 18-22 altogether. Occipital region flat, without a pit. Nasal spine small or well developed. Parietal ridge divided into two parts, both ending in spines, the anterior part somewhat longer; frontal spine in a line with postocular, placed a little laterad of parietal ridge; upper posttemporal very small or absent, lower posttemporal well developed; sphenotic in form of 2 parallel, transverse rows of small spinous points, growing smaller downward, 1 to 6 points in a row; pterotic ridge and spine well developed; a ridge between sphenotic and frontal spine fairly developed or slight; postorbital in form of a group of slight asperities, or very slight tubercle-like projections, or absent; preorbital with 2 free spinous points, the posterior better developed than anterior and directed backward, smaller anterior spine directed downward or backward depending on the species; suborbital ridge well developed, typically with 3 or 4 spinous points; spinous point on cleithrum moderate or rather well developed. First preopercular spine longest, supplemental spine usually present, sometimes absent as an individual variation; second spine smaller than third or absent, distance between first and third spines characteristically a nearly straight transverse line, the third spine marking a comparatively sharp turn in direction of preopercular margin downward and forward; fifth spine variable, well developed or absent. Tentacles sparsely developed. Scales ctenoid, 42-54; opercle and nape all scaled; cheek nearly all scaled posteriorly, naked or incompletely scaled under anterior part of eye; interorbital scaled posteriorly, scaled or naked for its larger part anteriorly; snout more or less scaled or scaleless; interopercle with a few scales posteriorly; maxillary scaleless. Dorsal typically with 12 spines; with 9 or 10 rays, depending on the species; penultimate spine about two-thirds to five-sixths as long as last spine; shape of spinous dorsal differing with the species. Second anal spine notably longer than third, except moderately so in *castor*. Ventral reaching anus or falling slightly short, its outer angle

under lower pectoral angle or slightly more forward. Pectoral irregularly wedge-shaped, the longest rays near its middle, usually falling short of a vertical through base of first anal spine, often about reaching this vertical; usually with 17 or 16 rays, depending on the species, all unbranched. Caudal truncate, slightly rounded, or very moderately emarginate.

*Comparison.*—This genus differs from the other western Atlantic scorpaenid genera in having all pectoral rays unbranched. It is most nearly related to *Neomerinthe*, as discussed under that genus.

*Western Atlantic species.*—Four western Atlantic species of *Pontinus* are here treated. A fifth species has been described, namely, *Pontinus corallinus* Miranda Ribeiro (1915, p. 4, photo); but no specimens are available for study. The general aspect of the published photograph of *P. corallinus* rather agrees with *Pontinus macrolepis*; but Miranda Ribeiro ascribes to his fish 6 gill rakers and 4 rudiments on the lower limb, and 2 and 4, respectively, on the upper limb. The combined number of gill rakers and rudiments on the lower limb and the total combined number on both limbs is less than in the four species of *Pontinus* here treated (compare with tables 4 and 5).

#### PONTINUS MACROLEPIS Goode and Bean

*Pontinus macrolepis* GOODE and BEAN, Oceanic ichthyology, p. 257, pl. 69, fig. 247 (off Yucatan).—EVERMANN and MARSH, Bull. U. S. Fish. Comm., vol. 20, pt. 1, p. 280, col. pl. 43, (1899) 1902 (Mayagüez Harbor, Puerto Rico).

D.XII 9. A.III 5. P.15-16. Sc.45. GR.7-8+12-13.

*Description.*—Eye a little larger than snout or subequal to it. Interorbital less than a third the eye diameter. Maxillary ending under posterior margin of pupil or a little behind. Nasal spine well developed; upper posttemporal spine small, sometimes absent; preorbital spines well developed, the anterior one directed backward; suborbital ridge usually with 3 spinous points, sometimes 4. Second preopercular spine present, placed nearer first than third spine; fifth spine very moderate or absent. A tentacle at supraocular spine usually present, slender or moderately thick, short or long; a short tentacle at preocular and posterior preorbital spine present or absent. Scales on cheek mostly ctenoid, those on anterior part of chest and pectoral base mostly cycloid; snout and greater part of interorbital scaleless. Third dorsal spine longest, subequal to postorbital part of head, moderately longer than fourth, thence gradually decreasing; penultimate spine about five-sixths as long as last spine. (Caudal damaged in the 4



specimens examined, its shape not definitely determinable.) Preserved specimens examined about uniformly yellowish, without color marks.

Measurements of 4 specimens 51-137 mm.: caudal 25-27, ventral 25.5-27.5, pectoral 27.5-30.5, depth 32.5-35.5, head 45-47, maxillary 22-24, snout 12.9-13.2, eye 12.9-15.4, interorbital 4.0-4.7; snout 1.0-1.2 and interorbital 3.1-3.6 times in eye.

*Specimens examined*.—Off Cozumel Island, Mexico (39324, the type). Off Havana, Cuba (100381). Off Anegada Island, Virgin Islands (117879). Mayagüez Harbor, Puerto Rico (126131). Total examined, 4 specimens 51-137 mm., taken in 122-224 fathoms.

*Comparison*.—This species has 15-16 pectoral rays instead of 17-18 in its three congeners (rarely 16 in *longispinis*, see table 1). The eye averages larger than in the three other species. It nearly agrees with *rathbuni* and *longispinis* and differs from *castor* in having the snout a little shorter than or subequal to the eye. Like *castor* it has 3 spinous points on the suborbital ridge, while *rathbuni* and *longispinis* usually have 4.

#### PONTINUS LONGISPINIS Goode and Bean

*Pontinus longispinus* GOODE and BEAN, Oceanic ichthyology, p. 258, pl. 68, fig. 246, 1895 (off Cape San Blas, Fla.).

D.XII 9 (10). A.III 5. P.(16) 17 (18). Sc.47-51. GR.6-7+12-15.

*Description*.—Eye a little smaller than or subequal to snout. Interorbital about a half to a third the eye diameter. Maxillary ending under middle of eye or posterior margin of pupil. Nasal spine small; upper posttemporal spine usually present, small, pointed or blunt, sometimes absent; preorbital spines well developed, the anterior one usually directed downward or slightly forward; suborbital ridge usually with 4 spinous points, the anterior one sometimes absent. Second preopercular spine in the larger specimens (see below) usually very small, often absent on one or both sides; fifth preopercular spine small but sharp. Tentacle at supraocular spine very slender and small or absent, of moderate length and slender in small specimens (skin partly destroyed in most specimens examined and this statement based on fragmentary data). Scales on cheek, chest, pectoral base, interorbital, and snout mostly ctenoid; interorbital and snout incompletely scaled for their greater part, scales on anterior part of snout minute. First dorsal spine about two-thirds as long as second. Third spine prolonged in specimens over 90-110 mm.; becoming notably long in large specimens, longer than postorbital part of head, nearly twice as long as second spine, reaching base of eighth to tenth spine when depressed.

Fourth spine a little longer than second; gradually decreasing in length from fourth backward; penultimate spine about three-quarters as long as last spine; in small specimens about 100 mm. or smaller, third spine only a little longer than fourth, the spines gradually decreasing in length from third to penultimate spine. Caudal very moderately emarginate with the upper rays slightly longer than lower.

Measurements of 5 specimens 123-178 mm.: caudal 25.5-28.5, ventral 23-25, pectoral 27-29, depth 31.5-33.0, head 41-45, maxillary 19.5-21.5, snout 12.6-13.1, eye 11.8-13.6, interorbital 4.3-5.0; eye 0.9-1.1 times in snout, and interorbital 2.4-3.1 times in eye. Two specimens 215-220 mm.: pectoral 29.5-30.0, depth 28.0-31.5, head 40.5-42.5, eye 11.5-12.1, snout 13.4; eye 1.0-1.3 times in snout, interorbital 2.1-2.7 times in eye; other measurements falling within range of variation of smaller specimens.

Ground color light yellowish; upper two-thirds of body with irregularly scattered small brownish spots, their number very variable, sometimes rather profuse, sometimes nearly confined to a row along course of lateral line or nearly absent; small, rather diffuse spots on caudal and dorsal, also variable in number. Small specimens, about 45 mm. or less, with a large dark blotch between sixth or seventh and ninth or tenth dorsal spines; otherwise not spotted.

*Development.*—In very small specimens, 24-30 mm., the upper 3 preopercular spines are in general approximately equal. With growth, the second and third spines become shorter in relation to the first. With further growth, the second spine decreases in length; it becomes smaller than the third at about 60 mm.; and is very small or altogether absent on one or both sides in larger specimens. (The development of the third anal spine is discussed above under the family account.)

*Specimens examined.*—Off the following localities: Bull Island, S. C. (151867). Savannah, Ga. (91403). Melbourne (155299), Tortugas (117144-5 and 117149-50), Cape San Blas (U.S.N.M. Nos. 39322-3, types; 46094, 155296, 155298, 157539), Pensacola (155295, 155297), and Santa Rosa Island (157540-1), Fla. Mississippi Delta (155287-90, inclusive) and Point au Fer (155291), La. Padre Island, Tex. (155292-4, inclusive; 157542). Total examined, 79 specimens 24-220 mm., the largest from off Tortugas. Available depth records range 40-142 fathoms. This is apparently a rather common species offshore. The majority of the specimens examined were collected by the *Pelican* and the *Oregon*.

*Comparison.*—This species differs from its three western Atlantic congeners in having the third dorsal spine notably prolonged, generally

in specimens over 100 mm. It is structurally nearest *rathbuni* with which it is compared under the account of the latter.

PONTINUS RATHBUNI Goode and Bean

*Pontinus rathbuni* GOODE and BEAN, Oceanic ichthyology, p. 255, pl. 68, fig. 245, 1895 (off Cape Hatteras, N. C.).

D.(XI) XII 9 (10). A.III 5. P.17 (18). Sc.43-48. GR.5-8+12-14.

*Description.*—Body averaging deep. Eye a little smaller than or subequal to snout. Interorbital equaling one-third the eye diameter or a little broader, sometimes slightly narrower. Maxillary ending nearly under posterior margin of eye or a little short. Nasal spine well developed; upper posttemporal spine absent or slightly developed; preorbital spines well developed, the anterior one usually directed sharply backward; suborbital ridge with 4 spinous points (a fifth point observed in one specimen). Second preopercular spine present; fourth and fifth spines directed downward or slightly backward; the fifth smaller than fourth, sometimes obsolescent. A thick, broad, moderately long tentacle at supraocular spine, sometimes forked distally and ending in two expanded lobes; shorter, slenderer tentacles at preocular, preorbital, and preopercular spines present or absent. Scales on cheek, chest, pectoral base, interorbital and snout mostly ctenoid; interorbital and snout scaled for their greater part, but scalation not continuous, more or less interrupted, leaving irregular, variable, bare spaces. Third dorsal spine longest, subequal to postorbital part of head; fourth slightly shorter or subequal to third, thence rather rapidly graduated, growing smaller backward; penultimate spine about three-fifths as long as last spine. Caudal truncate.

Measurements of 5 specimens 120-180 mm.: caudal 24.5-27.0, ventral 24.5-27.5, pectoral 27.0-29.5, depth 33.5-39.0, head 43-45, maxillary 22-23, snout 12.8-14.4, eye 11.0-13.2, interorbital 3.9-4.9; eye 1.0-1.3 times in snout and interorbital 2.3-3.2 times in eye.

Specimens of comparatively recent preservation having body irregularly shaded with dusky, especially on its upper part, against a yellowish background; some small dusky spots irregularly spaced along course of lateral line; caudal with some small, faintly dusky spots, sometimes well marked along edge of fin. Specimens long in preservative plain yellowish without shadings or spots. Small specimens, about 40 mm. or less, with a dusky smudge between sixth and ninth dorsal spines; pectoral with an irregular, elongate, dusky, smudged area at its middle and near its base, persisting up to about 60 mm., and as a slight trace up to about 125 mm.

*Development.*—The small specimens examined, although most of them not in good condition, suggest that the development of the spines on the preopercle is similar to that described above for *longispinis*.

*Specimens examined.*—From off the following localities: Cape Charles (157567; lat. 37° 07' 40" N., long. 74° 35' 40" W.) and Cape Henry (120995), Va. Cape Hatteras (39325, the holotype; 84521, 101522, 143055) and Cape Lookout (144573), N. C. Bull Island, S. C. (151866). Palm Beach (153124), Vaca Key (153125), Key West (72985, 73257, 143123), and Ten Thousand Islands (C.N.H.M. 46216), Fla. Dauphin Island, Ala. (47643). Total examined, 28 specimens 19-180 mm., the largest from off Bull Island. Recorded depths range 49-122 fathoms. While not rare offshore this species evidently is not as common as *longispinis*, especially in the Gulf whence only 2 small specimens 58-72 mm. were examined.

TABLE 10.—Frequency distribution of the body depth in *Pontinus longispinis* and *P. rathbuni*, expressed as a percentage of the standard length and segregated into size groups

Species	Standard length in mm.	Distribution											
		28	29	30	31	32	33	34	35	36	37	38	39
<i>longispinis</i> .....	148-174	1	1	3	2	4	..	1	..	..	..	..	..
<i>longispinis</i> .....	95-146	..	1	8	13	12	7	..	..	..	..	..	..
<i>rathbuni</i> .....	96-145	..	..	..	..	..	1	1	2	2	3	..	1
<i>longispinis</i> .....	51- 93	..	1	3	1	2	7	1	..	..	..	..	..
<i>rathbuni</i> .....	55- 83	..	..	..	..	..	..	1	3	1	..	..	..
<i>longispinis</i> .....	21- 36	..	..	..	..	..	3	2	1	..	..	..	..
<i>rathbuni</i> .....	18- 37	..	..	..	..	..	..	3	3	3	1	1	..

*Comparison.*—This species is nearest *longispinis* structurally. The larger specimens, those over 110 mm. or so, are readily separable by the length of the third dorsal spine which is conspicuously prolonged in *longispinis*. This species has a deeper body than *longispinis* (table 10), which is useful in separating specimens over 65 mm., but the two species intergrade somewhat in this character, and it becomes of only slight value in specimens under 50 mm. The direction of the first preorbital spine is of some specific value; it is directed backward in *rathbuni* and typically downward or slightly forward in *longispinis*. The tentacle at the supraocular spine which is usually conspicuously longer and stouter in *rathbuni* than in *longispinis*, is a moderately useful character for separating small as well as large specimens.

The scale count appears to be lower in *rathbuni*, and the caudal is approximately truncate, instead of moderately emarginate. However,

these two characters are not of much practical value, because of the state of preservation of most specimens. The scales are missing in large areas or over the greater extent of the body in the large majority of the specimens examined and their number not ascertainable with precision (that is why so few specimens of these two species are entered in table 6). Also, the caudal is frayed in many of the specimens examined and its normal shape not definitely determinable.

Differences in proportional measurements between the two species may be gathered by comparing their accounts giving measurements of five specimens of each in about the same size range. The greatest divergence is shown by the body depth and this measurement is further analyzed in table 10.

Small specimens do not have their specific characters developed to a sufficient extent to be distinguished as readily as large specimens. The most striking distinguishing character, the relative length of the third dorsal spine, does not develop until the fish reach a length of about 100 mm., more or less. The distinguishing specific characters are even less marked in specimens under 50 mm. The latter specimens are distinguishable by the presence of a dusky smudge on the pectoral of *rathbuni*, and the shape of the tentacle at the supraocular spine which is usually longer and broader in *rathbuni*. The anterior spinous point on the suborbital ridge develops at a somewhat smaller size in *rathbuni*. When placed side by side small specimens of *rathbuni* appear deeper-bodied, although this difference does not show well in measurements.

#### PONTINUS CASTOR Poey

*Pontinus castor* POEY, Memorias sobre la historia natural de la Isla de Cuba, vol. 2, p. 173, July 1860 (Cuba).

*Sebastes nematophthalmus* GUNTHER, Catalogue of fishes in the British Museum, vol. 2, p. 99, 1860 (West Indies, see discussion below; Gray's preface dated June 1, 1860, and volume very likely published after July).

*Pontinus microlepis* BEAN, Proc. Biol. Soc. Washington, vol. 25, p. 125, 1912 (Bermuda).

D.XII 10. A.III 5. P.17. Sc.50-54. GR.7-8+14-15.

*Description*.—Eye about two-thirds as long as snout. Interorbital about one-third the eye diameter. Maxillary ending approximately under posterior margin of pupil. Nasal spine small; upper post-temporal spine small or absent; preorbital spinous points poorly developed, the anterior one blunt or very slightly projecting; suborbital ridge with 3 stubby spinous points. Supplemental preopercular spine a blunt projection (absent on one side in one specimen); second preopercular spine absent, fifth slightly developed or virtually absent at the

surface. A variably long, slender tentacle at base of supraocular spine (absent on one side in two specimens, very long, about reaching dorsal origin on one side in one of these specimens); shorter, broader tentacles at preocular spine and lower preopercular spines present or absent. Scales on cheek, chest, anterior part of pectoral base, and interorbital mostly cycloid; snout and interorbital with small isolated groups of small cycloid scales, naked for their greater part. Fourth dorsal spine longest, thence gradually decreasing to penultimate, or fourth to sixth subequal; penultimate spine about three-fourths as long as last; longest dorsal spine a little shorter than snout and considerably shorter than postorbital part of head. Second anal spine moderately longer than third. (Caudal more or less damaged in the specimens examined, form of its posterior margin not definitely de-

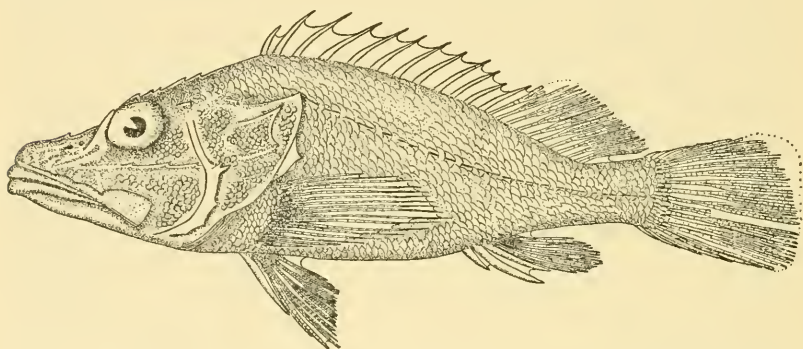


Fig. 5.—*Pontinus castor*, 228 mm., U.S.N.M. No. 74113, the holotype of *P. microlepis*, off Bermuda. Drawn by Mildred H. Carrington.

terminable.) Uniformly yellowish all over without color marks in preserved specimens.

The above description is drawn from 3 specimens 171-228 mm. in the U. S. National Museum. One specimen examined in the Chicago Natural History Museum, 324 mm., but not directly compared, has the eye relatively smaller in relation to the snout and interorbital and the suborbital ridge is nearly smooth, having one slightly raised tubercle-like projection.

Measurements of 1 specimen 324 mm. and 3 specimens 171-228 mm.: caudal about 24.5 (23.5-26.5), ventral 22.5 (24.5-25.0), pectoral 26.5 (29.0-31.5), depth 34 (31.5-34.0), head 51 (48-49), maxillary 23 (22.5-23.0), snout 17.2 (16.0-16.5), eye 9.7 (10.4-11.3), interorbital 4.2 (3.4-4.0); eye 1.8 (1.4-1.6) times in snout, interorbital 2.3 (2.7-3.1) times in eye.

*Specimens examined*.—Cuba (29554, 37566; transmitted by Poey). Bermuda (74113, holotype of *microlepis*, fig. 5; C.N.H.M. 48526,

324 mm.). Total examined, 4 specimens 171-324 mm. The specimen listed last was taken at 90 fathoms; no depth records are available for the others.

*Comparison.*—In general appearance *castor* differs markedly, by its long snout, from its three congeners here treated. It further differs from those three species in having 10 dorsal spines, instead of a normal count of 9, and a greater number of scales. The second preopercular spine is absent, while in the other three species it is present, except in individual variants of *longispinis*.

*Nomenclature and synonymy.*—Two of the three specimens examined in the National Museum were received from Poey and are entered in the catalog as *castor*. Consequently, the present identification of *castor* is evidently appropriate. The type of *microlepis* belongs to the same species and its data are included in this account.

Gunther's *S. nematophthalmus* is possibly a composite species. Two specimens are listed: a stuffed specimen, size not stated, the locality of which is given as Île de France with a question mark, and one specimen 6 inches 7 lines, about 167 mm., from the West Indies. The given description apparently refers to the latter specimen, in large part at least. As the two specimens might belong to two species, the name *S. nematophthalmus* is formally restricted to the West Indies specimen which is hereby designated as the lectotype. Gunther's description, as far as it goes, fairly agrees in general with the specimens of *castor* examined and *nematophthalmus* is very likely based on a specimen of this species. Judged by the description, the body depth of Gunther's specimen appears to be somewhat greater and the head moderately shorter than in the four specimens examined, but the differences do not appear to be significant and might be accounted for by differences in method. Besides, Gunther does not give the standard and caudal length of his specimen, and the above comparison of measurements is made by assuming that its caudal is 25 percent of the standard length. These differences may not hold when the standard length of Gunther's specimen is actually determined and the same methods of measurements are used as in this investigation.

#### Genus NEOMERINTHE Fowler

*Neomerinthe* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 41, 1935 (genotype *Neomerinthe hemingwayi* Fowler = *Pontinus pollux* Poey by original designation).

*Definition.*—Eye smaller than snout. Interorbital one-third to two-thirds the eye, depending on the species. Maxillary reaching approxi-

mately to under middle of eye. Palatine teeth present. A small slit behind last gill arch. Gill rakers moderate at angle; upper limb with 2-5 end gill rakers short, tubercle-like but individually readily distinguishable and countable; lower limb with 1-5 tubercles at end, some of them only slightly raised above surface of arch or much expanded lengthwise along arch, sometimes difficult to distinguish individually. Combined number of gill rakers and tubercles 6-7+9-12. Occipital region flat, without a pit. Parietal ridge divided into two subequal parts, each part ending in a spine; frontal spine directly behind postocular, the two placed on a line distinctly laterad of parietal ridge; upper posttemporal spine small or absent, lower posttemporal spine and ridge well developed; sphenotic spine very small, placed close to orbital rim; pterotic spine and ridge well developed; an extra ridge between frontal and sphenotic spines, and one or two ridges below parietal ridge not as well developed; postorbital spine absent; preorbital with 2 free spinous points, the posterior spine larger, broader and directed backward; suborbital ridge well developed with 3-5 spinous points (ridge becoming serrate in large specimens of *pollux*; see under its account); cleithral spine present. First preopercular spine longest, moderate in size but sharp, with a supplemental spine; second spine usually absent, when present in individual variants small in size. A rather broad tentacle at base of posterior preorbital spine, very variable in form, digitated or fimbriated, often divided into two or three main stems; smaller tentacles variably present at other spines on head; a fimbriated or entire tentacle at anterior nostril; no other tentacles. Scales ctenoid, except on pectoral base and chest ctenoid or cycloid; opercle and cheek almost all scaled; interopercle and maxillary partly scaled; interorbital and snout with or without scales. Dorsal typically with 12 spines; with 9 or 10 rays, depending on the species; penultimate spine about two-thirds to three-quarters as long as last. Second anal spine longer than third. Ventral reaching anus or falling short, its outer angle a little in front of lower pectoral angle. Pectoral irregularly wedge-shaped, the middle rays longest; with 5-8 branched rays; total number of rays constantly 17 in specimens examined. Caudal moderately rounded.

*Comparison.*—This genus agrees with *Scorpaena* in having palatine teeth, branched pectoral rays, the first preopercular spine longest, and 12 dorsal spines. It differs in having ctenoid scales; in the greater extent of scalation, the shape of the pectoral, and the position of the ventral. In the structure of the scales and their extent it about agrees with *Trachyscorpia*, and is compared with the latter under its ac-



count. It further differs from *Scorpaena*, *Trachyscorpia*, *Helicolenus*, and *Sebastes* in having a small and well-defined slit behind the last gill arch. On the whole, *Neomerinthe* is nearest *Pontinus*. The shape of the preopercle and its spinous armature is about the same in both genera. The second preopercular spine is small or absent in both. The two western Atlantic species with a prolonged third dorsal spine belong, one each, to these two genera, *Neomerinthe beanorum* and *Pontinus longispinis*. The pectoral shape and its number of rays and the nature and extent of scalation are nearly the same in both genera. They differ chiefly in that some of the pectoral rays are branched in *Neomerinthe* and all are unbranched in *Pontinus*.

#### NEOMERINTHE POLLUX (Poey)

*Pontinus pollux* POEY, Memorias sobre la historia natural de la Isla de Cuba, vol. 2, p. 174, 1860 (Cuba).

*Neomerinthe hemingwayi* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 87, p. 41, fig., 1935 (about 70 miles southeast of Cape May, N. J.; deep water).

*Neomerinthe tortugae* HILDEBRAND, Carnegie Inst. Washington Publ. 517, p. 247, fig. 13, 1940 (Tortugas, Fla.).

D.XII 10. A.III 5. P.17. Sc.62-68. GR.6-7+9-12.

*Description*.—Snout long and eye comparatively small, eye about three-quarters the snout length in medium-sized specimens, about one-half the length in large fish. Interorbital rather wide, about two-thirds the eye diameter in the larger specimens. Upper posttemporal spine absent, except in the young (see below); suborbital spinous points usually 4, sometimes 3 or 5; in large specimens (3 specimens 420-465 mm.) suborbital spines becoming greatly reduced in size and the ridge becoming serrate, the gross effect being a moderately serrate ridge, the serration somewhat interrupted; cleithral spine comparatively sharp. Second preopercular spine absent except in the young; third and fourth spines rather broad, the third somewhat larger, fifth spine virtually absent at surface. Most scales on chest and pectoral base ctenoid, rather weakly so; area on occiput limited by posterior part of parietal ridge and frontal spine with very small ctenoid scales, similar scales extending on interorbital, snout, anterior part of cheek, and partly on maxillary and premaxillary (small scales often absent in irregular patches in preserved specimens, probably deciduous); interopercle partly scaled. Penultimate dorsal spine about two-thirds as long as last spine; longest dorsal spine subequal to snout, shorter than postorbital part of head. Ventral about reaching anus in the smaller specimens, falling considerably short in large fish. Pectoral falling more or less short of a vertical through base of first anal spine;

uppermost 1 or 2 rays unbranched, next 6-7 rays branched, lower 8-9 unbranched.

Measurements of 3 specimens 250-420 mm., including the holotypes of *hemingwayi* and *tortugae*, and 2 specimens 136-152 mm.: caudal 23.5-24.5 (25.5), ventral 21.5-24.0 (26.0-26.5), pectoral 23.5-26.0 (28.0-28.5), depth 29.5-31.0 (34), head 45-46 (44-45), maxillary 20.5-21.5 (in all 5), snout 13.7-16.0 (13.2-14.8), eye 7.7-9.0 (10.3-10.8), interorbital 5.3-5.7 (5.6-5.9), eye 1.6-1.9 (1.3-1.4) in snout, interorbital 1.5-1.6 (1.8-1.9) in eye.

Ground color straw yellow to brownish with a somewhat reddish tinge; irregularly marked with large diffuse blotches and small spots; 1 blotch above and in juxtaposition to the lateral line under base of sixth to eighth dorsal spines, 1 or 2 blotches behind it but placed below lateral line and touching it; a series of diffuse smaller blotches at dorsal base; a somewhat curved bar directly in front of dorsal; small dark spots irregularly and variably scattered on body, head and fins including underside of pectoral and its fleshy base, except ventral plain yellowish. Intensity of markings described variable, often faint, sometimes hardly perceptible.

*Development.*—A small specimen, 53 mm., has the pectoral rays unbranched (some of the rays damaged), and it shows slightly the second preopercular and upper posttemporal spines.

*Specimens examined.*—Off the following localities: about 70 miles southeast of Cape May, N. J. (A.N.S.P. 63482, holotype of *hemingwayi*, 322 mm.). Cape Lookout, N. C. (152084). Bull Island, S. C. (151884). Tortugas (108871 and 108872, the holotype and 2 paratypes, respectively, of *tortugae*), Cape San Blas (144575, *Albatross*; 155336, *Pelican*; C.N.H.M. 46218, *Oregon*), St. Joseph Point (157557, *Oregon*), and Santa Rosa Island (157558, *Oregon*), Fla. Mississippi Delta, La. (155334-5, *Pelican*; C.N.H.M. 46217, *Oregon*). Gulf of Mexico (125716, no definite locality). Total examined, 16 specimens 53-465 mm., the largest from off Bull Island. Available depth records for 10 of the 14 constituent samples range 26-112 fathoms. Evidently this species is not uncommon offshore.

The spinous part of the dorsal in the type specimen of *hemingwayi* is evidently abnormal, having the second and third spines missing. It has the stump of a spine on the midback placed over the supracleithral spine. After some interval, the rest of the spinous dorsal consists of 9 spines the relative lengths of which are about the same as in normal specimens of this species. The first of the normally formed spines is placed over the posterior upper corner of the opercle.

Although the interval on the midback between the stump and the first fully formed spine is partly scaled over with imbricated scales, it is evident from the positions and relative lengths of the spines that this condition is a malformation probably due to an injury earlier in life in which the second and third spines were lost. In other characters and color this specimen agrees with the normal specimens of this species. A similar abnormality in a specimen of *Scorpaena agassizi* is described under that species.

*Comparison.*—This species is readily distinguishable from the other western Atlantic scorpaenids by the combination of its fin ray, scale, and gill-raker counts and its other generic and specific characters. It is compared with its congener, *beanorum*, under the account of that species. It agrees with *Pontinus castor* in having 10 dorsal rays, and nearly agrees in the spinous armature of the preopercle and the rather long snout.

*Nomenclature and synonymy.*—The types of *Neomerinthe hemingwayi* and *N. tortugae* have been examined. They belong to the same species and the data derived from the types are included in this account.

The type of *Pontinus pollux* Poey does not seem to be in existence now. Judged by the circumstances and known facts, it seems reasonably safe to conclude that Poey's specimen also belonged to the species here treated. According to the findings here reported only two species normally have 10 dorsal rays, this species and *Pontinus castor*, and Poey gives this count in the original descriptions of his *P. castor* and *P. pollux*. That Poey used the same method of counting the rays as employed in this paper, that is, counting the last 2 approximated rays as one, is proved by the count of *P. castor* in which Poey's count agrees with that here determined for 4 fish that included 2 specimens which were presumably identified by him. The number of pectoral rays, 17, as determined for 14 specimens examined of this species also agrees with that given by Poey. Also, in his description of *P. pollux* Poey compares it largely with *P. castor* stating that it is very near that species in shape. This is significant. There really is a striking resemblance between our species and *P. castor* in the shape of the body, head, and snout, and any student having specimens of both species before him would naturally be led to compare them at length. Furthermore, Poey's description of the differences between *P. castor* and his *P. pollux* in the suborbital and preorbital spinous points agrees fairly well with that between this species and *P. castor*. There are some minor discrepancies. Poey fails to mention the dark or dusky

spots or shadings shown by this species; but the color is highly variable, some specimens examined having very faint shadings. Also, according to his description Poey's *P. pollux* had a narrower interorbital than our specimens, and the maxillary did not extend so far backward. However, such discrepancies are found in other descriptions by Poey and they do not seem of much significance. All in all, the probability is high that the not uncommon species here described is the same as Poey's *P. pollux* and it is here designated accordingly.

#### NEOMERINTHE BEANORUM (Evermann and Marsh)

*Pontinus beanorum* EVERMANN and MARSH, Bull. U. S. Fish Comm., vol. 20, pt. 1, p. 279, fig. 85 (1899) 1902 (San Juan Harbor, Puerto Rico).

D.XII 9. A.III 5. P.17. Sc.41-46. GR.6+9-10.

*Description*.—Eye moderately smaller than snout. Interorbital rather narrow, one-third the eye diameter or slightly wider. Upper posttemporal spine very small; ridge between frontal and sphenotic spines well developed, projecting, forming with side of head an inverted troughlike recess; a similar and smaller trough directly below parietal ridge; suborbital spines 3 or 4; cleithral spinous projection rather short and blunt. Second preopercular spine usually absent or a slight trace present, sometimes fairly shown; lower 3 spines narrow and sharp, the third directed downward and slightly backward or forward, fourth and fifth more or less antrorse. Most scales on chest and pectoral base cycloid; occipital area limited by posterior part of parietal ridge and frontal spine with scales of moderate size; maxillary and interopercle with very few scales or none; interorbital and snout scaleless. Third dorsal spine in male prolonged, rising above normal distal outline of fin; subequal to postorbital part of head in male, to snout in female; penultimate dorsal spine about three-quarters as long as last spine. Ventral falling moderately short of anus. Pectoral about reaching a vertical through base of first anal spine; its upper 2 rays unbranched, next 5-8 rays branched, lower 7-10 rays unbranched.

Measurements of 6 specimens 118-163 mm.: caudal 27.0-30.5, ventral 22.5-24.5, pectoral 29.0-30.5, depth 29.0-32.5, head 44-47, maxillary 21.5-22.0, snout 13.7-14.6, eye 11.4-12.8, interorbital 3.9-4.5; eye 1.1-1.3 in snout, interorbital 2.6-3.1 in eye.

Ground color of preserved specimens reddish yellow or olivaceous, upper part of body and head shaded with dusky irregular areas; spinous dorsal with a lengthwise row of smoke-colored blotches placed on posterior interradiial membranes; soft dorsal, upper part of caudal, and upper posterior part of pectoral with small, diffuse, dark spots.

*Specimens examined*.—San Juan Harbor, Puerto Rico, 91 fathoms, *Fish Hawk* (49534, the holotype); off Puerto Rico, 80-180 fathoms, *Caroline Station 35* (117877). Total examined, 6 specimens 118-163 mm.

*Comparison*.—This species differs chiefly from *pollux*, its known western Atlantic congener, in having fewer scales and 9, instead of 10, dorsal rays. The gill rakers are fewer on the average. The scalation on the head is somewhat less extensive. The eye is larger, the snout shorter and the interorbital narrower than in *pollux*.

#### TRACHYSCORPIA, new genus

*Genotype*.—*Scorpaena cristulata* Goode and Bean.

*Definition*.—Eye subequal to snout or a little larger. Interorbital about half the eye or a little narrower. Maxillary ending under posterior margin of pupil or a little behind. Palatine teeth present. No slit behind fourth gill arch. Gill rakers short, those at ends of arch very short, tubercle-like but individually distinguishable and readily countable; in medium numbers, 5-6+13. Occipital region with a slight, broad depression, without a definite pit. Spines on head well developed; parietal ridge divided into two parts, both ending in a spine; frontal spine not alined with parietal ridge, nearly in a line with postocular spine; upper posttemporal spine absent, lower one rather well developed; sphenotic spine small, single, usually with 1 or a small group of spinules or asperities or slight tuberosities below it; pterotic ridge and spine well developed; postorbital in form of a slight tuberosity or a group of slight asperities or absent; preorbital with 2 free moderate points, sharp or rather blunt; suborbital ridge notably well developed, with 6-7 spinous points. First preopercular spine longest, with a supplemental spine; second spine subequal to or shorter than third, placed nearer to first spine; fifth spine slightly indicated or obsolescent. Tentacles and filaments sparsely developed. Scales ctenoid, 57-67; except those on chest, fleshy pectoral base, and interorbital weakly ctenoid or cycloid, partly embedded; on dorsal aspect scales extending to opposite postocular spine; posterior and smaller part of interorbital scaled, its anterior and greater portion partly scaled or nearly scaleless; opercle nearly all scaled; cheek largely scaled to a variable point opposite pupil, except narrow area directly above and below suborbital ridge scaleless; maxillary and interopercle scantily scaled or naked; snout virtually scaleless; fins moderately or well scaled on a variable proximal area, except spinous dorsal and ventral. Dorsal normally with 12 spines; with 8-9 rays (see also below, counts

recorded in the literature for *echinata*); rather deeply emarginate, penultimate spine about one-half to two-thirds as long as last spine; longest dorsal spine subequal to snout or a little longer. Anal with 3 spines and 5 rays; second spine subequal to third or a little longer. Ventral falling considerably short of anus, its outer angle close to lower pectoral angle. Pectoral broad and rather short with 11-13 branched rays, or 20-24 altogether, about reaching a vertical through anus; upper rays, third to fifth or seventh rays subequal and longest, thence gradually decreasing in size; lower rays thickened and their ends free for a short distance. Caudal truncate or slightly rounded.

*Comparison.*—The two species, *cristulata* and *echinata*, comprising this genus form a group that differs markedly from the other species here placed in *Scorpaena* as follows. The scales are strongly ctenoid, the head is much more extensively scaled and the pectoral shape is different. The ventral is placed close to the pectoral, instead of at some distance behind it. Correlated with these differences, the gill raker, pectoral ray, and scale counts fall near the upper limits of the range of *Scorpaena*.

The two species agree with *Helicolenus* in having ctenoid scales and nearly agree in the extent of scalation on the head. They differ in having the first preopercular spine longest, in the position and length of the ventral, and the pectoral shape. The spinous armature on the head of *Helicolenus* is not as well developed, as it usually lacks the sphenotic and pterotic spines and the suborbital keel has only one weak spinous point or none.

*Trachyscorpia* agrees with *Neomerinthe* in having ctenoid scales and the extent of squamation, and the armature of the head in the two genera is not trenchantly different. It differs in the shape of the pectoral which also has more numerous rays, in the position of the ventral, and in lacking a slit behind the fourth gill arch.

On the whole, *Trachyscorpia* is perhaps nearest *Osorioia* Fowler (1938, p. 63), agreeing with it in having ctenoid scales and nearly agreeing in the pectoral shape and other characters. *Osorioia* differs in having a shallow occipital pit and in lacking scales on the head, occiput, chest, and pectoral base.

I am establishing this new scorpaenid genus with a measure of reluctance. Many scorpaenid genera have been proposed in scattered studies, and the task remains of correlating properly and determining the relationship between the proposed genera by a revision of the family on a world-wide basis. It would, therefore, seem imprudent to add still another generic name to the long list of genera that have been proposed in a number of papers and that still remain undigested.

Nevertheless, the two species studied form a related group that does not seem to fit in well with any of the genera that have been proposed so far, and no choice remains but to propose a distinct genus to include these two species.

#### TRACHYSCORPIA ECHINATA (Koehler)

*Scorpaena echinata* KOEHLER, Résultats scientifiques de la campagne du *Caudan* dans le Golfe de Gascogne, in Ann. Univ. Lyon, 1896, p. 478, pl. 27, figs. 4-6 (lat. 45° 57' N., long. 6° 21' W.; Bay of Biscay; 1,410 meters).—NORMAN, *Discovery Reports*, vol. 12, pt. 1, p. 32, 1935 ("southwest of Ireland and in the Bay of Biscay").

*Scorpaena cristulata* KOEHLER (not Goode and Bean), op. cit., p. 524 (states in footnote that *echinata* the same as *cristulata*; specimens apparently not compared).—HOLT and BYRNE, Fisheries of Ireland Scientific Investigations, 1906, No. 5, p. 20, pl. 2, 1908 (off southwest Ireland, 250-800 fathoms).

D.XII 8. A.III 5. P.20. Sc.60. GR.5+13.

*Description*.—Eye a little larger than snout. Interorbital width one-half the eye diameter. Occipital area enclosed by parietal ridges and frontal spines only slightly longer than wide; posterior part of parietal ridge somewhat better developed than anterior part; no spine or projection on posterior margin of cleithrum (in the large specimen examined). First preopercular spine moderate; next three spines rather short, the second more pointed than other two and nearer to first; fifth spine virtually absent at surface. A lengthwise row of short, slender filaments on upper part of eyeball; similar, still shorter filaments on upper part of head and opercle. Interorbital with a few scattered, largely nonimbricate scales, its greater part scaleless; maxillary and interopercle scaleless. Penultimate dorsal spine about three-fourths as long as last. Second anal spine a little longer than third. Ventral reaching about half the distance from its base to anal origin. Pectoral having its uppermost ray unbranched, next 13 rays branched, lower 6 rays unbranched.

Measurements of a specimen 433 mm.: caudal 22, ventral 15, pectoral 25.5, depth 32, head 43.5, maxillary 23.5, snout 10.6, eye 11.9, interorbital 5.8; snout 1.1 and interorbital 2 times in eye.

Ground color light yellowish, lower part somewhat lighter; upper part of head and body irregularly marked with dusky shades, a brown blotch between suborbital ridge and eye, placed under pupil, somewhat better marked than other shadings; a U-shaped mark at origin of spinous dorsal, at its base; spinous and soft dorsal with black or dusky blotches or areas on interradiial membranes; other fins unpigmented.

*Specimen examined*.—Lat.  $51^{\circ} 46'$  N., long.  $12^{\circ} 14'$  W., off southwest coast of Ireland, 550 fathoms, 433 mm. (61663). The above account is based on this one specimen. Other measurements and counts compiled from the literature on *echinata* are given below.

*Comparison*.—In accounts of the eastern Atlantic population, cited in the above synonymy, which has been named *echinata* and is closely related to the western *cristulata*, Koehler, in a footnote, and Holt and Byrne synonymize these two names. Norman tentatively treats *echinata* as a distinct species, but expresses doubt as to its distinctness. However, these authors evidently arrived at their conclusions by comparing their specimens with the account of *cristulata* rather than by a direct comparison of specimens. The specimen in the National Museum from the coast of Ireland, which forms the basis of the above description, makes possible a direct comparison of specimens from the eastern and western Atlantic.

Measurements of eastern Atlantic specimens were published by Koehler, 1 specimen 172 mm.; Holt and Byrne, 5 specimens 255-504 mm.; Norman, 6 specimens 330-510 mm. These measurements reduced to a percentage basis to correspond with the method here adopted, and divided into two size groups, 2 specimens 172-255 mm. and 10 specimens 358-510 mm. (Norman gives only part of the measurements), are as follows: ventral 14.5-16.5 (16.5-19.5), pectoral 23.5-24.5 (21.5-22.5), depth 31.5-35.5 (30.5-31.5), head 41-46 (41.5-44.0), snout 8.9-10.5 (8.8-10.7), eye 8.9-10.5 (10.5-13.5), interorbital 4.7-5.7 (4.7).

Comparing the preceding measurements with those given below for two similar size groups of *cristulata*, the eastern Atlantic specimens have a shorter head and ventral, a smaller snout and eye, a narrower interorbital, and the body not as deep. The eastern Atlantic specimen in the National Museum agrees in general with the previously published measurements of *echinata* as given above.

The eastern Atlantic specimen described above shows two noteworthy differences as compared with the extant description of *echinata*. It has 8 dorsal rays, and 20 pectoral rays (counted on both sides); whereas the given ranges in the published accounts of western Atlantic specimens are 9-10 dorsal and 21-22 pectoral rays. However, a spread of 3 in the frequency distribution of the dorsal and pectoral rays occurs also in other species (see table 1), although the variants from the predominating number of dorsal rays are generally few. At any rate the presence of only 8 dorsal rays in the specimen examined does not exclude it from being an example of *echinata*.

An adequate picture of the variability of these two counts in *echinata*



remains to be determined by a study of a satisfactory sample. Meanwhile, it may be confidently concluded that the eastern and western Atlantic populations differ considerably, at least on the average, in the pectoral count, 20-22 and 22-24, respectively.

Besides the variability in the number of dorsal rays as discussed above, Holt and Byrne in the 5 specimens tabulated by them record 3 as having 12 dorsal spines and 2 with 11 spines. Norman also records 11-12 dorsal spines. In view of the relative constancy of the number of dorsal spines in all species (table 1), this is a noteworthy variation. In all 13 specimens examined of the western Atlantic *cristulata* the dorsal count is constantly XII 9, except one which has 8 rays.

In the western Atlantic specimens, the slight nuchal depression, the area enclosed by the parietal ridges and frontal spine, is notably longer than wide, while in the eastern Atlantic specimen examined it is only moderately longer than wide. The European specimen also has one gill raker less than 13 American specimens examined, the gill-raker count being constant in the latter.

Considering all differences discussed above, especially the differences in proportional measurements and the number of pectoral rays, it may be concluded with assurance that the eastern and western Atlantic populations represent distinct species.

Holt and Byrne describe their specimens as being shaded or blotched with dark pigment, and this also holds for the specimen in the National Museum from the coast of Ireland. Specimens of *cris-  
tulata*, on the other hand, are nearly uniformly colored or moderately shaded, and the type of *echinata* is described as uniformly colored also. This color difference and the unusual variability in the number of dorsal spines and rays shown by the Irish specimens, as discussed above, point to the possibility that the Bay of Biscay and Ireland populations diverge to a degree which remains to be determined.

#### TRACHYSCORPIA CRISTULATA (Goode and Bean)

*Scorpaena cristulata* GOODE and BEAN, Oceanic ichthyology, p. 246, pl. 67, fig. 242, 1895 (off Georgia).

D.XII (8) 9. A.III 5. P.22-24. Sc.57-67. GR.6+13.

*Description.*—Eye subequal to snout in large specimens, moderately larger in medium-sized fish. Interorbital one-half to one-third the eye diameter. Occipital area limited by parietal ridges and frontal spines, notably longer than wide; usually anterior part of parietal ridge longer and lower than, and its spine not as well developed as that of posterior part; cleithrum with a rather well-developed spinous

projection in the smaller specimens, becoming reduced in large specimens. First preopercular spine extending more than half the distance across opercle in the smaller specimens, becoming relatively shorter with growth; supplemental spine well developed; second spine subequal to third or slightly smaller, placed nearer to first spine; lower 3 spines moderately developed, somewhat graduated. Short, slender filaments sparsely developed on upper part of eyeball and at some of the spines on the head. Interorbital scaled anteriorly, scaleless in large part at its middle portion; maxillary scantily scaled; interopercle with a few scales at its upper end or altogether scaleless. Penultimate dorsal spine about two-thirds as long as last spine in the smaller specimens, about half as long in larger fish. Second anal spine subequal to third or a little longer. Ventral reaching a little more than half the distance from its base to anal origin. Pectoral about reaching a vertical through anus, its uppermost ray unbranched, next 11-14 rays branched, lower 8-10 unbranched. In a large specimen, 400 mm., ventral reaching less than half the distance to anal origin, and pectoral falling a little short of a vertical through anus.

Measurements of 2 specimens 319-400 mm., 5 specimens 165-212 mm., and 3 specimens 100-142 mm. The following measurements are given in 3 groups in same order: caudal 20.5-22.0, 23.5-25.5, 24.5-26.5; ventral 17.5-18.0, 20.5-22.5, 21.5-24.0; pectoral 25, 24-27, 24.5-25.5; depth 34-36, 34.5-36.0, 33.0-34.5; head 47.5-48.0, 46.5-49.5, 46.0-47.5; maxillary 23-24, 23.0-24.5, 22.5-24.0; snout 12.2-13.5, 12.0-12.4, 11.4-11.9; eye 12.6-12.9, 13.5-14.8, 14.9-16.0; interorbital 5.4-6.8, 4.8-6.7, 4.5-5.5. Snout 1.0, 1.1-1.2, 1.3-1.4 and interorbital 1.9-2.4, 2-3, 2.9-3.3 times in eye.

Yellowish or golden nearly uniform without color marks in the preserved specimens examined; one specimen having occiput, interorbital, and a narrow lengthwise area above suborbital ridge, dusky in contrast with rest of uniform lighter coloration; some specimens having a dark irregular area on inner side of opercle, showing through on outer side as a dusky area.

*Specimens examined.*—From off the following localities: Nantucket Island, Mass. (41° 49' N., 65° 49' 30" W., 84474 and 143932); Cape Hatteras, N. C. (44644); Charleston, S. C. (130962); Cumberland Island, Ga. (39362, the type); Key West (72979), Tortugas (92058), and Cape San Blas (50547), Fla. Total examined, 13 specimens 100-400 mm., the last one listed the largest. The vertical range is 72-440 fathoms.

*Comparison.*—This species is easily distinguished from other western Atlantic scorpaenids by the characters given in the key. It is

nearest *echinata* from the eastern Atlantic and the differences between them are discussed above. A noteworthy feature of this species is that in all 13 specimens examined the combined number of gill rakers and tubercles on the first arch is constantly 6+13.

#### Genus SCORPAENA Linnaeus

*Scorpaena* LINNAEUS, *Systema naturae*, vol. 1, p. 266, 1758 (genotype by later designation).—BLEEKER, *Versl. Akad. Amsterdam*, vol. 9, p. 295, 1876 (*Scorpaena porcus* Linnaeus designated as genotype).—JORDAN and GILBERT, *U. S. Nat. Mus. Bull.* 16, p. 678, 1882 (*porcus* designated as genotype).

*Definition.*—Relative size of eye varying widely with the species from considerably larger than snout in *agassizi* to considerably smaller than snout in extreme variants of *plumieri*, with varying gradations in between among the other species. Interorbital likewise differing widely with the species from subequal to eye in *plumieri* to one-third the eye in extreme variants of *calcarata* and *inermis*. Maxillary end differing from a point under posterior margin of pupil or slightly in advance to under posterior margin of eye. Palatine teeth present. No slit behind fourth gill arch. Gill rakers moderately developed at angle of arch; upper limb with 1-5 end gill rakers low, tubercle-like, but distinguishable individually and readily countable; lower limb with 1-5 tubercles anteriorly still lower, well or moderately projecting beyond surface of arch, rounded, nearly always fairly distinguishable and countable; combined number of gill rakers and tubercles 3-7+6-12 or 10-17 in total number. Occipital pit present except in *inermis* and *calcarata* (the only genus here treated having a pit); nasal spine moderate or rather well developed, except often low in *inermis*; parietal ridge divided into two parts, the anterior part somewhat longer in small specimens, the two parts about subequal in large fish except in *bergi*, both parts ending in spinous points; frontal spine present, except in the larger specimens of *grandicornis*, placed at anterior corner of occipital pit, nearly in a line with parietal ridge except in *inermis*, *calcarata*, and *microlepis*; lower posttemporal spine present; upper posttemporal spine present, except subject to individual variability in *brasiliensis* and *microlepis*, present or absent; sphenotic spine rather small, usually double or bifid, often single, sometimes in form of a group of spinules or asperities; pterotic ridge well developed, ending in a spinous point; postorbital moderately or slightly developed or absent, when present often in form of a group of spinules or asperities; preorbital with 2 free spinous points, except 3 points in *dispar*, *plumieri*, and *microlepis*; suborbital ridge very moderate to well developed, with 1-4 spinous points depending on the species

and intraspecific variability, occasionally smooth in individual variants; cleithral spine present or absent. First preopercular spine longest, with a supplemental spine except in *inermis* and *calcarata*; the lower four spines moderate, sometimes the fifth hardly perceptible; second spine subequal to or shorter than third, sometimes virtually absent in individual variants of *calcarata*; upper outer angle of interopercle sometimes ending in a projecting blunt or sharp point. Development of tentacles differing with the species and varying greatly with the individual. Scales cycloid, 41-76, extending in front of dorsal to a transverse line through anterior parietal spine; chest and fleshy pectoral base scaled, the scales embedded in some species; flexible part of opercle on area between the two diverging spines scaled, anterior area on hard part of opercle between the two ridges naked, except for a few nonimbricate scales sometimes present in *plumieri*; a few scales near preopercular margin, in some species the scalation extending backward from preopercular margin to cover a substantial or greater part of opercle; a rather large, somewhat wedge-shaped patch of scales covering greater part of cheek posteriorly below sub-orbital ridge; area above ridge between eye and preopercular margin more or less scaled; scales at preopercular margin, on cheek, and behind eye well embedded in some species, hardly appreciable at the surface; nuchal pit, interorbital, snout, maxillary, interopercle, and mandible scaleless. Dorsal typically with 12 spines; modally with 9 rays, except 8 in *inermis*; total range 7-10; penultimate spine differing with the species, about seven-eighths to two-thirds as long as last. Outer ventral angle placed behind lower pectoral angle. Pectoral with 5-10 branched rays, except in small specimens, total number of rays 16-21; distal margin of its upper part, to about eighth ray, evenly and moderately rounded, thence the rays rapidly decreasing in length downward. Caudal slightly or moderately rounded.

*Development.*—Young fish differ from grown specimens in certain characters, some of them of importance in distinguishing the species and genera. The approximate size at which a given character changes from the juvenile to the adult condition is given under the separate accounts of the species. General statements of changes with growth in some taxonomic characters are discussed here.

In small specimens all pectoral rays are unbranched as in the adults of *Pontinus*. Ramification is a gradual process. The rays that are destined to become branched assume a finely grooved appearance in young fish, for a short distance at their tip, when examined with a moderate power of a binocular microscope. The end of the ray appears to have longitudinal, crowded, very fine, alternate grooves and

ridges. At first only one or two rays split at their tip. The number of forked rays and the length of the branches increase gradually. Usually the second ray is the last one to begin branching.

The relative development of the occipital pit differs with age. For instance, in *plumieri* a fairly well-developed pit is typically present, and *calcarata* has a slight occipital depression instead of a pit. But in young *plumieri* the pit is virtually absent, while in young *calcarata* the depression is somewhat better developed than in the adult.

The number of free preorbital spinous points is a specific character, 3 in *plumieri*, *dispar*, and *microlepis*, 2 in the other species. In *plumieri* the middle spine does not appear until the fish has reached some size. (Small specimens of *dispar* and *microlepis* are not available to determine this development.)

In the young the anterior portion of the parietal ridge is somewhat longer than the posterior part; while in grown specimens, except in *bergi*, the two parts are subequal.

The fleshy appendages, tentacles, filaments, and tabs, are better developed, in general, in the young than in grown specimens.

The edge of the scales in small specimens has a soft tumescent excrescence which is particularly noticeable in *plumieri*. It gives the fish a peculiar pimply appearance that is striking, but of no apparent taxonomic importance.

*Comparison.*—This genus differs from other western Atlantic scorpaenid genera, except *Setarches*, in having the scales cycloid instead of ctenoid. It differs from *Setarches* in its larger scales, and in having the first preopercular spine distinctly longer than the second and third. *Setarches* lacks a number of spines on the head that are present in *Scorpaena*.

#### SCORPAENA INERMIS Cuvier and Valenciennes

*Scorpaena inermis* CUVIER and VALENCIENNES, Histoire naturelle des poissons, vol. 4, p. 311, 1829 (Martinique).—LONGLEY and HILDEBRAND, Carnegie Inst. Washington Publ. 535, p. 162, 1941 (Tortugas, Fla.).

*Scorpaena occipitalis* POEY, Memorias sobre la historia natural de la Isla de Cuba, vol. 2, p. 171, 1860 (Cuba).

*Scorpaena luckei* FOWLER, Proc. Acad. Nat. Sci. Philadelphia, vol. 93, p. 87, figs. 1, 2, 1941 (Tortugas, Fla.).

D.XII 7-9. A.III 5. P.19-21. Sc.44-49. GR.3-5+6-8.

*Description.*—Eye a little larger than snout or subequal to it. Interorbital about 2.5 times in eye or a little narrower. Maxillary ending under posterior margin of pupil, varying a little both ways. Occiput between parietal ridges nearly flat, only slightly depressed, occipital pit virtually absent. Spines and ridges on head rather low; nasal spine

notably low, often a mere blunt protuberance; frontal spine placed slightly laterad of a line marking parietal ridge; preorbital with 2 very moderate spinous points, the posterior spine directed downward; suborbital ridge usually having 2 rather weak spines, under middle and a little behind eye, the anterior one often obsolescent, sometimes also posterior one; cleithrum without a spinous projection. First preopercular spine reaching about half the distance from its base to posterior margin of opercle, without a supplemental spine; second spine moderate or very short, subequal to or shorter than third. A moderate or rather well-developed tentacle at supraocular spine, sometimes slightly developed; other tentacles and tabs on head, body, and upper opaque part of eyeball rather numerous; those at the spines and along lateral line usually rather more prominent; a row of well-developed tentacles along line marking boundary between upper opaque and lower transparent part of eyeball; a curving row of rounded tabs at opercular margin usually present. Opercle largely scaleless; scales on chest partly embedded; scales on fleshy pectoral base and cheek embedded, hardly or not at all visible at surface. Penultimate dorsal spine about three-quarters as long as last spine; longest dorsal spine a little shorter than postorbital part of head. Second anal spine longer than third. Ventral about reaching anus and pectoral about reaching a vertical through base of third anal spine, both varying a little both ways; uppermost pectoral ray unbranched, next 5-6 rays branched, lower 12-15 rays unbranched.

Measurements of 5 specimens 71-89 mm. including the type of *luckei* and a cotype of *occipitalis* and 2 specimens 32-34 mm.: caudal 27-30 (30.5-31.0), ventral 24-26 (26.0-26.5), pectoral 33-36 (31.5-33.0), depth 33.5-40.0 (34.5-38.0), head 45.5-48.5 (49-50), maxillary 23.5-26.0 (25-26), snout 12.4-13.8 (12.7-13.4), eye 13.3-16.2 (16.3-17.8), interorbital 3.6-4.3 (5.3-5.8); snout 1.0-1.2 (1.2-1.4) and interorbital 2.6-4.4 (3.3) times in eye.

Opaque, usually whitish, rather narrow columns descending from the line marking the boundary between the upper opaque and the lower transparent parts of eye, the columns expanding in rounded areas at their lower ends, altogether producing effect of inverted mushroomlike figures on transparent part of eye (these marks often few or undeveloped in specimens 55 mm. or less). Upper and greater part of body irregularly mottled and shaded with brown against a lighter background, sometimes the pigment aggregated in places to give a faint suggestion of incomplete cross bands; ventral aspect light-colored or whitish. Many of the tentacles and tabs whitish. Caudal with two cross bands, one at its distal margin, the other at a moderate distance in front of it.

*Development.*—In 3 specimens 32-36 mm., all pectoral rays are unbranched. At 55 mm. the rays are branched virtually as in the adult.

*Specimens examined.*—Miami to Angelfish Creek (C.N.H.M. 46212), Florida Reefs just south of Biscayne Bay (C.N.H.M. 46213), and Tortugas (117135, fig. 6; A.N.S.P. 69716, type of *S. luckei*), Fla. Eleuthera Island, Bahamas (53212). Cuba (153576-7; cotypes of *S. occipitalis*). Ensenada de Santa Rosa (82553) and Ensenada de Cajón (82554), Cuba. Luispena Channel, Puerto Rico (117878). Curaçao (38595). The above-listed 11 lots comprise 18 specimens 32-89 mm., the largest one from Curaçao.

*Comparison.*—This species is nearest to *calcarata*, agreeing with it in the lack of a definite occipital pit, a supplemental preopercular

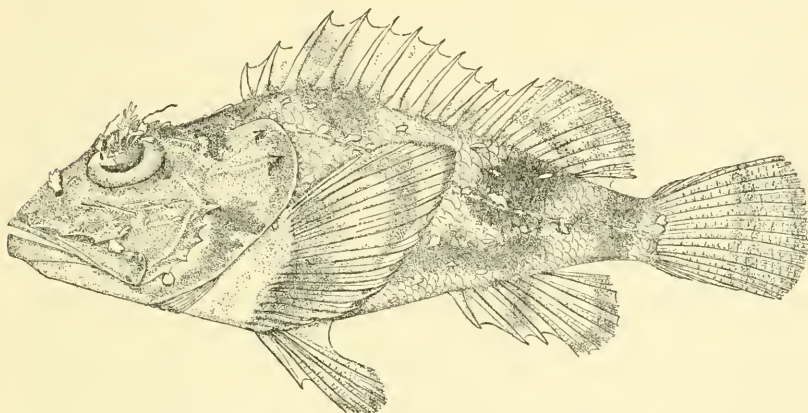


Fig. 6.—*Scorpaena inermis*, 82 mm., U.S.N.M. No. 117135; Tortugas, Fla. Drawn by Mildred H. Carrington.

spine, and other characters. The differences between them are indicated in the key and discussed under the account of *calcarata*.

*Synonymy.*—The type of *luckei* 67 mm. and 2 cotypes of *occipitalis* 46-71 mm. were examined and their data included in this account. All three specimens have 8 dorsal rays, the cross bands on the caudal are well developed, and they lack a spot behind the head. The type of *luckei* has the eyes dark, apparently caused by the preservative, but the inverted mushroom-shaped areas are discernible when viewed with a magnifying lens in the proper light. The 71-mm. cotype of *occipitalis* also has these areas. The three types also agree in other characters with the other specimens examined. They all belong to the same species which was identified by Longley with *inermis* after an examination of its type.

## SCORPAENA CALCARATA Goode and Bean

*Scorpaena calcarata* GOODE and BEAN, Proc. U. S. Nat. Mus., vol. 5, p. 422, 1882 (Clearwater Harbor, Fla.).—LONGLEY and HILDEBRAND, Carnegie Inst. Washington Publ. 535, p. 164, 1940 (Tortugas).

*Scorpaena russula atlantica* NICHOLS and BREDER, Proc. Biol. Soc. Washington, vol. 37, p. 21, pl. 7, 1924 (off Galveston, Tex.).

*Scorpaena mercatoris* DELSMAN, Mem. Mus. Roy. Hist. Nat. Belg., ser. 2, fasc. 21, p. 74, fig. 11, 1941 (Cay Sal Bank).

D.(XI)XII(XIII) 8-9 (10). A.III(4) 5(6). P.(18) 19-21. Sc.41-49. GR.(3)4-5+7-11.

*Description*.—Eye larger than snout. Interorbital 2-3 times in eye. Maxillary ending under posterior margin of pupil or a little behind. Occiput between parietal ridges with a very shallow depression, somewhat better marked in small specimens, without a definite pit. Frontal spine placed a little laterad of a line through low parietal ridge; upper posttemporal spine very moderate or slight, sometimes a mere bony angle rather than a spine; parietal ridge and upper posttemporal and supracleithral spines often alined in a curved or nearly straight line; sphenotic armature in form of a group of spinules or blunt asperities, 1-4 in number; preorbital with 2 free moderate spinous points, posterior spine usually directed downward or slightly forward (this spine doubled in one specimen observed); suborbital ridge usually with 2 moderate or slight spinous points, one under eye and one at posterior end of ridge, sometimes anterior one, less often also posterior one, absent or hardly perceptible, occasionally a third slight projection between the two usual points; cleithrum without a spine. First preopercular spine rather long, usually reaching more than half the distance from its base to opercular margin, without a supplemental spine; second spine notably small, smaller than third, occasionally absent; fifth spine usually in form of broad, blunt projection, sometimes minutely serrate; preopercular margin above first spine usually with sparse, slight, variable, and irregular serrations, sometimes with 1 or 2 comparatively prominent points. A small tentacle at base of supraocular spine sometimes present, usually absent (well developed in small specimens); a row of tentacles on eyeball marking boundary between upper opaque part and lower transparent part; some small elongate tabs along edge of preopercle often present; some broad, fimbriated tentacles often present along course of lateral line; smaller tentacles on head, body, and eyeball variable, few to many. Opercle largely scaleless; scales on chest, fleshy pectoral base, opercle, and cheek more or less embedded or fairly distinguishable at surface. Penultimate dorsal spine about two-thirds as long as last spine; longest



dorsal spine shorter than postorbital part of head. Second anal spine subequal to third varying a little both ways. Ventral reaching anus or a little behind. Pectoral about reaching a vertical through base of third anal spine, varying a little both ways; its uppermost ray unbranched, next 5-7 rays branched, lower 12-14 unbranched.

Measurements of 4 specimens 108-159 mm., 3 specimens 65-75 mm., and 2 specimens 31-36 mm., all from the coast of the United States, given in 3 groups in the same order: caudal 29-32, 30-31, 32.5-33.5; ventral 22.5-25.5, 25.5-27.5, 25.0-26.5; pectoral 32.5-35.5, 34.0-36.5, 33-37; depth 32.5-35.0, 35.0-37.5, 39.5-40.0; head 42.0-45.5, 44.0-44.5, 49.0-49.5; maxillary 21.5-23.5, 22-23, 25.5-26.5; snout 11.2-12.1, 10.9-11.8, 11.3-13.3; eye 12.4-15.3, 14.0-16.5, 17.2-17.8; interorbital 5.1-5.8, 5.5-6.5, 6.7-7.6. Snout 1.1-1.3, 1.2-1.5, 1.3-1.5 and interorbital 2.1-3.0, 2.3-2.6, 2.3-2.7 times in eye. (See also below, measurements of 2 Caribbean specimens.)

Short, elongate, oblong or broad, opaque, whitish areas extending on transparent part of eye at base of some of the tentacles in the horizontal row on the eyeball present or more often absent; when present not mushroom-shaped as in *inermis*. Upper part irregularly shaded, sometimes dusky, shading somewhat more marked in 4 transverse areas, giving very faint suggestion of a cross-banded pattern; a dusky blot a little behind head, at and below lateral line, faintly or moderately marked in most specimens, sometimes imperceptible; first dorsal often with 2 lengthwise rows of diffuse spots; second dorsal sometimes with oblique rows of diffuse smaller spots; caudal usually uniformly light-colored, sometimes with 2 transverse, rather faintly shaded cross areas near its middle and at its margin; ventral in the smaller specimens usually dusky to nearly black distally; body and fins often mottled with whitish, especially in the smaller specimens.

*Development.*—The pectoral rays begin to branch in fish between 35 and 40 mm. The nuchal depression is relatively better marked in small fish which also have a well-developed tentacle at the supra-ocular spine.

*Specimens examined.*—This is not an uncommon offshore species on the east coast of the United States whence 167 specimens 22-159 mm., in 69 constituent samples, were examined, ranging from off the mouth of Chesapeake Bay (102177) to Tortugas, Fla., to off Padre Island, Tex. (155310), including the type of *calcarata* (23556, Clearwater, Fla.) and the holotype of *russula atlantica* (86167, off Galveston, Tex.). Also, 4 specimens 94-145 mm. from off Cabo Catoche (101602, 148349) and 25 specimens 96-130 mm. from off Campeche (157543-4), Yucatan Peninsula; 1 specimen 68 mm., Flanagan Passage, Virgin

Islands (47642); 1 specimen 75 mm., off the Caribbean coast of Colombia (142881). The largest specimen, 159 mm., is from off South Carolina (151941). Depth records are available for most lots examined and range 7-50 fathoms.

*Comparison.*—This species is very close to *inermis* and the name *calcarata* had been placed in the synonymy of that species until Longley determined some of their differences. Other distinguishing characters have been elaborated during this investigation. The main differences between them are stated in the key, and they are not absolute. Besides these differences, *calcarata* usually has the upper posttemporal spine placed slightly higher up, almost directly behind the parietal ridge, the second preopercular spine is generally somewhat smaller, sometimes absent, and the nasal spine is somewhat better developed. The two species probably also differ in the averages of some proportional measurements, as may be gathered by comparing their accounts. While the two species do not differ sharply in any one character, they are satisfactorily distinguishable when all their differences are taken into consideration.

From the other species of its genus here treated, *calcarata* differs in lacking a supplemental preopercular spine and in the virtual absence of an occipital pit. Among those species it seems to be nearest to *agassizi*, with which it is compared below.

*Populations.*—The two Caribbean specimens examined are those entered in table 4 as having 41 rows of scales, while those from the coast of the United States and the Yucatan Peninsula have 42-49 scales. The measurements of these two specimens, 68-75 mm., are: caudal 30.5, ventral 23.5-24.0, pectoral 31, depth 37.5-38.5, head 44.5-47.0, maxillary 23-24, snout 10.6-10.7, eye 17.0-17.3, interorbital 4.6-5.0; snout 1.6 and interorbital 3.4-3.8 times in eye. Comparing these with the measurements of three specimens of similar size from the coast of the United States, given above, the tropical American specimens average a shorter ventral and pectoral, a deeper body, a longer head and maxillary, a shorter snout, a larger eye, and a narrower interorbital. While the precise extent of divergence of the tropical American population is, of course, indeterminable from only two specimens, it appears to be no greater than that of racial magnitude.

The 29 specimens from off the Yucatan Peninsula more frequently have 8 dorsal rays and 21 pectoral rays, the frequency distributions being as follows. Yucatan Peninsula: dorsal rays 8 (in 7 specimens) or 9 (in 22); pectoral rays 19 (1), 20 (19), 21 (9). All other constituent samples combined: dorsal rays 8 (16), 9 (159), 10 (3);

pectoral rays 18 (1), 19 (22), 20 (133), 21 (20). Approximately one-fourth of the Yucatan specimens have 8 dorsal rays and one-third have 21 pectoral rays.

*Synonymy*.—The holotype and paratype of *S. russula atlantica* have been examined and their data included in this account. Longley previously placed *atlantica* in the synonymy of *calcarata*.

The name *mercatoris* is here doubtfully placed in the synonymy of *calcarata*, as Delsman's brief description does not admit a positive identification of his specimen without its reexamination. His account agrees with *calcarata* in the main, and no essential character is given to show that *mercatoris* is different. The eye of *mercatoris* is said to measure 4 times in the head, whereas in 11 specimens of *calcarata* measured the eye varies 2.6-3.4 times in the head; but this slight difference may readily be ascribed to a difference in method. The figure of *mercatoris* shows a notably long snout; but the drawing is obviously rather crude and no special significance can be attached to this seeming difference. It seems highly probable that *mercatoris* is based on a specimen of the common *calcarata*. Another possibility is that *mercatoris* is a synonym of *inermis*.

#### SCORPAENA AGASSIZI Goode and Bean

*Scorpaena agassizi* GOODE and BEAN, Oceanic ichthyology, p. 247, pl. 67, fig. 243, 1895 (Blake station CCLIX).—LONGLEY and HILDEBRAND, Carnegie Inst. Washington Publ. 535, p. 159, 1941 (Tortugas).

D.XII (XIII) (8) 9. A.III (4) 5. P.19-21. Sc.43-53. GR.4-6+8-11.

*Description*.—Eye notably large, snout about two-thirds as long as eye. Interorbital about one-half the eye diameter. Maxillary ending under space between posterior margin of pupil and that of eye. Occipital pit moderate. Spines on head well developed; sphenotic usually bifid, sometimes single, sometimes 2 very blunt projections directly below sphenotic; preorbital with 2 spines, the posterior one usually notably long, directed backward, almost horizontal; suborbital ridge usually with 3 well-developed spines, the anterior one more widely spaced than posterior two, sometimes one or two of the spines hardly perceptible, sometimes a fourth small spine present in front; cleithrum without a spine. First preopercular spine moderate, reaching about half the distance from its base to opercular margin, with a supplemental spine; second spine smaller than third. Tentacle at supraocular spine short or absent; other tentacles or filaments usually rather sparse. Chest in the smaller specimens normally scaled and

with a smooth surface, with growth becoming much wrinkled in a somewhat cerebriform manner, without scales visible at the surface, with some deeply embedded, nonimbricate scales; scales on fleshy pectoral base and head partly embedded; opercle largely scaleless. Penultimate dorsal spine about three-quarters as long as last spine; longest dorsal spine subequal to postorbital part of head or very slightly shorter. Second anal spine subequal to or a little shorter than third. Ventral reaching anus or anal origin. Pectoral reaching a vertical approximately through end of anal base, varying a little both ways; its uppermost ray unbranched, next 6-8 rays branched, lower 11-13 unbranched.

Measurements of 5 specimens 116-172 mm. and 2 specimens 31-36 mm.: caudal 33.5-37.0 (32-33), ventral 23.5-28.5 (27.5-28.0), pectoral 44.0-48.5 (34.5-35.0), depth 32.5-39.5 (42), head 43.5-47.5 (48.5-49.0), maxillary 20.5-23.5 (24-25), snout 9.7-11.7 (9.3-11.6), eye 15.5-17.0 (17.3-20.3), interorbital 8.1-8.6 (9.4-10.5); snout 1.4-1.6 (1.5-2.2) and interorbital 1.9-2.0 (1.8-2.0) times in eye.

Upper part of body and head lightly and irregularly pigmented with dusky shades, one specimen with a few small dark points on nape extending to the area over opercle and a little behind head; the dusky pigment somewhat more concentrated in a small area behind head, giving very faint suggestion of a dusky blot; in addition to the general distribution of pigment as described, the pigment also more concentrated over central and greater part of area of each scale, surrounded by a lighter peripheral margin; distal edge of pectoral and ventral with a dark margin present or absent; the fish, including fins, otherwise notably light-colored. The above description drawn from three specimens after 2 years in preservative (152042). Specimens kept longer in preservative plain yellowish or grayish without distinctive markings; tabs sometimes whitish. Young specimens having distal part of ventral and often also that of pectoral dusky or blackish; soft dorsal and anal with dusky pigment separated by a clear area near middle; specimens in one lot of young fish, after many years of preservation, being suffused or mottled with a bright pink color, in some of these specimens the pink color incompletely separated into four broad areas, giving a faint suggestion of a cross-banded pattern, the bands extending partly on dorsal fins.

*Development.*—The pectoral rays begin to branch between 50 and 55 mm. The occipital pit is developed about as in the adult in specimens as small as 30 mm. Small specimens have the tentacles better developed. The tentacle at the supraocular spine is notably well de-

veloped and fimbriated and other rather well-developed tentacles are distributed on the head and body, being especially conspicuous along the course of the lateral line, at its anterior part.

The appearance of the chest in the larger specimens of *agassizi* is unique among the western Atlantic scorpaenids. In the smaller specimens the chest has a normally even and scaled surface as in the other species. With growth the chest becomes notably wrinkled and assumes somewhat of a cerebriform appearance, while the scales become deeply embedded and nonimbricate.

*An unusual variant.*—One small specimen, 42 mm. in standard length, from Sand Key, Fla. (74093), not in good condition, fairly agrees in its characters with *agassizi*; but the dorsal fin has a peculiar structure. It has 2 spines united by membrane and detached from the rest of the fin by an intervening space of considerable extent. The posterior part of the dorsal consists of 8 spines and 9 rays. Although the midback in the intervening space is scaled over and the specimen seems normal, it agrees so nearly with *S. agassizi* that it is safe to assume that this peculiar structure is caused by an early injury involving two of the dorsal spines. The type of *Neomerinthe hemingwayi* Fowler shows a similar development (see p. 54).

*Specimens examined.*—From off the following localities. Mid-Atlantic: Blake station 259, lat.  $23^{\circ} 10' N.$ , long.  $39^{\circ} 10' W.$  (153583; one specimen 148 mm. taken at same station as holotype, but not mentioned in original description). Coast of North Carolina (152042). Cape Lookout (101545) and Cape Fear (91430), N. C. Palm Beach (153219), Cape Florida (72980), Sand Key (74093), Key West (101600, 131612, 132197, 134160), Tortugas (117126-8, inclusive; 144570), Cape St. George (157548), Cape San Blas (133999, 157549), and Santa Rosa Island (157550), Fla. Total examined, 106 specimens 20-176 mm., the largest from off Cape St. George. Available depth records range 37-116 fathoms. This is evidently not an uncommon species offshore.

*Comparison.*—This species has the longest pectoral and largest eye of any species of *Scorpaena* here treated. *S. calcarata* approaches it in these two characters, and both are sometimes taken together in the same trawl drags. It differs from *calcarata* in having a supplemental preopercular spine and a fairly developed nuchal pit. The comparatively long posterior preorbital spine of *agassizi*, the structure of its chest, and its nearly plain color are diagnostic of most of the larger specimens.

## SCORPAENA BRASILIENSIS Cuvier and Valenciennes

- Scorpaena brasiliensis* CUVIER and VALENCIENNES, Histoire naturelle des poissons, vol. 4, p. 305, 1829 (Brazil).
- Scorpaena stearnsi* GOODE and BEAN, Proc. U. S. Nat. Mus., vol. 5, p. 421, 1882 (Pensacola, Fla.).
- Scorpaena colesi* NICHOLS, Bull. Amer. Mus. Nat. Hist., vol. 33, p. 537, fig. 1, 1941 (Cape Lookout, N. C.).
- Scorpaena isthmensis* BEEBE and TEE-VAN (not Meek and Hildebrand, which is a synonym of *bergi*), Zoologica, vol. 10, No. 1, p. 188, fig., 1928 (Port au Prince, Haiti; specimen reexamined).

D.XII (XIII) (7-8) 9. A.III (4) 5 (6). P.(17) 18-20. Sc.50-62. GR.4-5+8-10.

*Description*.—Eye moderate, snout subequal to eye, varying a little both ways. Interorbital nearly one-half to about two-thirds the eye diameter. Maxillary ending under posterior margin of eye or slightly more forward. Occipital pit well developed. Upper posttemporal spine absent or small; preorbital spines 2, well developed, posterior one directed downward or nearly so; suborbital ridge usually with 3 moderate spinous projections, often one or two of them very slight or imperceptible; cleithrum with a slight spinous projection disappearing in large specimens. First preopercular spine extending about half the distance across opercle or a little more; supplemental spine very small or moderate, virtually absent in infrequent variants; second spine subequal to third or smaller; fifth spine rudimentary or absent. Tentacle at supraocular spine very variable, short to moderately long; other tentacles, tabs, or filaments on head, body, and eye also very variable from sparse to profuse. Opercle moderately scaled, anterior area above upper spine scaled, a variable patch of scales below lower spine; scales on fleshy pectoral base, chest, and head partly embedded. Penultimate dorsal spine about two-thirds as long as last spine; longest dorsal spine subequal to postorbital part of head in the smaller specimens, shorter in larger fish. Second anal spine more or less shorter than third. Ventral reaching anus or anal origin. Pectoral reaching a vertical through base of first to third anal spine; its first ray unbranched, the following 7-10 branched, the lower 8-11 unbranched.

Measurements of 6 specimens 118-293 mm. including the types of *stearnsi* and *colesi*, and 2 specimens 46-48 mm., all from the coast of the United States: caudal 30.5-35.5 (33-34), ventral 23-26 (26-28), pectoral 33.0-38.5 (32.5-34.0), depth 34.0-37.5 (40.0-40.5), head 41.0-43.5 (43.0-45.5), maxillary 20.0-22.5 (23.5), snout 10.8-12.1 (11.5-12.4), eye 10.5-12.4 (14.6-15.2), interorbital 5.8-7.7 (8.0-8.9);

snout 0.9-1.1 (1.2-1.3) and interorbital 1.6-2.1 (1.7-1.8) times in eye. The measurements of one specimen 135 mm. from Brazil fall within the above given ranges of variation.

Two rather large spots on a horizontal line through second opercular spine, the first directly behind head, the second at a moderate distance behind in juxtaposition to lateral line, the two spots usually sharply or moderately marked, sometimes rather faint; sometimes a spot over space between preceding two spots, sometimes a third faint spot in a row with and behind the two; lower part of body with many irregularly scattered small spots of variable intensity, extending to pectoral base and usually on anterior part of inner side of fin, number of such small spots very variable from profuse to nearly or quite absent; sometimes similar spots but averaging fewer in number, also on head, pectoral base, and upper part of body; sometimes two irregular, diffuse, incomplete cross bands on posterior part of body and caudal peduncle, rather faintly indicated; sometimes rather dark or marbled or suffused with a whitish shade in part or nearly all over; often with two or three very diffuse spots at dorsal base; oblique bands on dorsal and anal poorly marked; caudal with a broad brownish transverse band at its margin and one near its middle; two or three similar but less well-marked bands at base, margin, and middle of pectoral; sometimes body and fins almost uniformly light-colored or variably shaded.

*Development.*—The pectoral rays begin to branch when the fish reach approximately a length of 50-55 mm. The occipital pit is relatively shallow at 31 mm. and becomes about as deep as in the adult at 45 or 50 mm.

*Specimens examined.*—Atlantic coast of the United States, ranging from off Cape Henry, Va. (127411), to off Tortugas, Fla., including the type of *colesi* (A.M.N.H. 4689); 66 specimens in 44 constituent samples. Gulf coast of Florida, ranging from off Cape Sable to Pensacola, including the type of *stearnsi* (30169); 47 specimens in 28 constituent samples. One specimen obtained by the *Grampus* off Galveston, Tex. (148137, 95 mm.). Also, off or at the following localities: Cabo Catoche (91431, 144574; altogether 5 specimens 182-213 mm.) and Campeche (157546-7, 2 specimens 187-201 mm.), Yucatan Peninsula, Mexico. Jamaica (32084, 2 specimens 171-204 mm.). Port au Prince, Haiti (N.Y.Z.S. 7381, 211 mm.). St. Thomas, Virgin Islands (9325, 38651; 2 specimens 32-174 mm.). Rio de Janeiro (83177, 182 mm.) and Bahia (43276, 135 mm.), Brazil. Total ex-

amined in detail, 128 specimens 31-293 mm. Besides the above, 74 specimens 42-256 mm. in 28 constituent samples were rapidly examined in the Chicago Natural History Museum and the University of Michigan Museum of Zoology after the manuscript of this account was drawn up, to verify the conclusions arrived at. The largest specimen is from off Savannah (155324). Available depth records range 1-56 fathoms. This is evidently a fairly common offshore species obtained by trawling and is also taken inshore by seining. On the Gulf coast of the United States all specimens examined were collected on the west coast of Florida, except one small specimen from Texas. Gunter (1948, p. 159) also records only two small specimens from Texas of those examined by him. Apparently this species is rather common on the west coast of Florida and comparatively uncommon on the northern Gulf coast westward of Florida.

*Comparison.*—This species is distinguishable from its western Atlantic congeners by its relatively high scale count and its distinctive color pattern, especially the presence of two dark spots behind the head and the small black spots in the pectoral axil, although the divergence is not pronounced. The lower extreme of its scale-count distribution approaches the other species closely and overlaps with *agassizi*, and the distinctive color pattern is not evident in all specimens. The absence or small size of the upper posttemporal is of some help in distinguishing *brasiliensis*, as well as the frequency distribution of its pectoral and gill-raker counts, its proportional measurements, and the relative length of the second and third anal spines. On the whole, it is not a difficult species to distinguish.

*Synonymy.*—The types of both *stearnsi* and *colesi* which are here placed in the synonymy of *brasiliensis* have been examined and their data included in this account of the species. The name *stearnsi* generally and correctly has been placed by authors in the synonymy of *brasiliensis*.

Nichols, in describing his *colesi*, compares its type with *brasiliensis* and points out some differences. However, an examination of a rather large composite sample of *brasiliensis* proves that these differences have their basis in intraspecific individual variability. The structural characters of the type of *colesi* easily fall within this range of variability. Nichols in his account of *colesi* describes the three or two large lateral blotches and the small dark axillary spots that are characteristic of *brasiliensis*. These color marks are now largely faded, but their traces may still be discerned.



## SCORPAENA GRANDICORNIS Cuvier and Valenciennes

*Scorpaena grandicornis* CUVIER and VALENCIENNES, Histoire naturelle des poissons, vol. 4, p. 309, 1829 (Martinique; Puerto Rico).—JORDAN and EVERMANN, U. S. Nat. Mus. Bull. 47, p. 1850, pl. 273, fig. 672, 1898 ("Florida Keys to Brazil").

D.XII (XIII) (8) 9 (10). A.III (4) 5. P.17-19. Sc.44-49. GR.4-6(7) + (7)8-10.

*Description*.—Eye slightly or moderately larger than snout. Interorbital about two-thirds eye diameter. Maxillary ending under posterior margin of pupil or a little behind. Occipital pit notably well developed. Spines on dorsal aspect of head notably well developed, their bases broad, somewhat shelflike; frontal spine absent in the larger specimens, very moderate or small in small specimens; upper posttemporal subequal to lower; preorbital with 2 free spinous points, the anterior one very moderate; spines on suborbital ridge very variable, 1-3, sometimes none, the one at end of ridge usually present, sometimes absent; cleithrum with a moderate spinous point in the smaller specimens tending to disappear with growth. First preopercular spine extending less than half the distance across opercle; second spine subequal to third or longer; fourth and fifth spines very slightly developed or imperceptible. Tentacle at supraocular spine notably well developed, long, broad, and branched or fimbriated, usually reaching dorsal origin; other well-developed tentacles along course of lateral line, on head and eyeball; smaller tentacles or tabs irregularly scattered on body and head. Opercle moderately scaled, anterior area over upper ridge scaled, a variable patch of scales below lower ridge at preopercular margin and sometimes a few scattered, nonimbricate scales on rest of opercular extent below lower ridge. Penultimate dorsal spine four-fifths to nine-tenths as long as last spine; longest dorsal spine subequal to postorbital part of head in the smaller specimens, moderately shorter in large fish. Second anal spine longer than third. In the larger specimens ventral reaching to anus, and pectoral over base of first anal spine or shorter; in the smaller specimens ventral about reaching anal origin and pectoral to over base of first to third anal spine; pectoral having the first ray unbranched, the following 7-9 branched, the lower 7-10 unbranched.

Measurements of 5 specimens 113-181 mm. and 2 specimens 32-47 mm., from Key West, Cuba, Puerto Rico, Guadalupe Island, Panama, and Brazil: caudal 29.0-33.5 (34.5), ventral 25.5-29.5 (27.5-28.5), pectoral 33.5-37.0 (33), depth 40.5-42.5 (43.5-45.0), head 41-43 (44.5-45.5), maxillary 19.5-20.5 (22.5), snout 9.8-10.7 (11.2-12.1),

eye 10.7-12.2 (14.6-15.1), interorbital 6.8-8.3 (7.9-8.4); snout 1.0-1.2 (1.2-1.3) and interorbital 1.5-1.7 (1.8-1.9) times in eye.

An area at upper pectoral angle, extending partly on the side of the body and partly on inner surface of fin, with many very small, crowded, whitish, rounded spots, often ringed with dark pigment. Strongly pigmented with dark color on head, body, and fins; often prevailing dark all over except ventral aspect; often with 2 broad, dark cross areas on posterior lower part of body, one under soft dorsal, the other on caudal peduncle, abruptly separated by a lighter area; caudal with 2 broad cross bands, at its middle and at the margin; soft dorsal, anal, and pectoral usually with oblique or transverse, more or less irregular, lighter areas separating the dark color; ventral often nearly black distally, lighter proximally; sometimes with a transverse black area at some distance from its end; head and body with many very small white dots, similar to dots in pectoral axil but smaller, usually well marked in the lighter-colored specimens, imperceptible in dark fish.

*Development.*—The pectoral rays begin to branch at about 60 mm. The occipital pit is well developed in the smallest specimen examined, 32 mm.

The frontal spine is very small in young fish and disappears with growth, the size at disappearance varying greatly with the individual. The smallest specimen examined lacking the frontal spine is 59 mm., and the largest having it is 110 mm. Nine specimens 32-58 mm. all have a small frontal spine; 23 specimens 113-181 mm. lack this spine; of 35 specimens 59-110 mm., 15 have the spine, at least a trace of it, some of them on one side only, and 20 lack it.

*Specimens examined.*—Key West (35101, 67655), Boca Chica (148130), and Tortugas (117139), Fla. Castle Harbor, Bermuda (50949). Cuba (4689, 9830, 13040, 24944). Port au Prince, Haiti (133728). Puerto Plata, Dominican Republic (22134). Puerto Rico (50181, 63050, 126445.) Guadeloupe (25285). St. Lucía (142833). Fort Randolph (148675), Porto Bello (80969, 81595, 81601), and Fox Bay (80968, 81596-7, 81602-4), Panama. Río Atrato, Colombia (1681). Brazil (6944). Total examined, 67 specimens 32-181 mm., the largest from Cuba (13040).

This species does not seem to range north of southern Florida. No specimens from north of Key West were examined. Records in the literature ascribing *grandicornis* to Cape Cod probably originated in a misidentification, as one lot in the National Museum (58876) from Katama Bay, Marthas Vineyard, containing four specimens 37-53 mm. and labeled *grandicornis*, proved to be the young of *plumieri*.

While no definite depth records are available, *grandicornis* seems to be an inshore, shallow-water species.

*Comparison.*—The characteristic small white spots at the pectoral angle, together with the absence of the frontal spine permit the ready identification of this species. The frontal spine is present in small specimens, but it is smaller than in specimens of related species of similar size. The tentacle at the base of the supraocular spine is longer and thicker than in the other species, but individual variants of *brasiliensis* and *plumieri* have this tentacle developed nearly as well. On the whole, taking all its characters into consideration as outlined above, this species is not difficult to distinguish.

#### SCORPAENA BERGI Evermann and Marsh

*Scorpaena bergii* EVERMANN and MARSH, Bull. U. S. Fish Comm., vol. 20, pt. 1, p. 276, fig. 83, 1902 (Mayagüez, Puerto Rico).—LONGLEY and HILDEBRAND, Carnegie Inst. Washington Publ. 535, p. 161, 1941 (Tortugas).

*Scorpaena isthmensis* MEEK and HILDEBRAND, Publ. Field Mus. Nat. Hist. Chicago, zool. ser., vol. 15, pt. 3, p. 842, pl. 80, 1928 (Porto Bello, Panama).

D.(XI) XII (8) 9. A.III 5. P.16-18. Sc.42-48. GR.3-4+7-10.

*Description.*—Snout subequal to eye, varying moderately both ways. Interorbital width about one-half eye diameter or moderately less. Maxillary reaching to under posterior margin of eye or that of pupil. Occipital pit and spines on dorsal aspect of head well developed. Anterior portion of parietal ridge usually somewhat better developed than posterior part; upper and lower posttemporal spines subequal; preorbital with 2 free spinous points, the anterior directed forward, the posterior downward; suborbital ridge moderate, usually ending posteriorly in a slight or moderate point, sometimes the point inappreciable; cleithral spine moderate or well developed. First preopercular and its supplemental spine moderate; second spine longer than third and somewhat nearer to first; fifth spine slightly developed or hardly appreciable at surface. Interopercle with a slight or moderate spinous point at its outer upper corner. Development of tentacles very variable in size and number; tentacle at supraocular spine usually well developed, broad, digitated or fimbriated, sometimes small or notably large nearly reaching spinous dorsal, other tentacles and tabs at spines on head, body, and upper part of eyeball varying from moderate to very profuse. Opercle largely scaleless; scales on cheek deeply embedded, hardly appreciable at the surface. Penultimate dorsal spine usually about four-fifths as long as last spine; longest dorsal spine only a little shorter than postorbital part of head. Second anal spine longer than third. Ventral reaching anus or a little behind. Pectoral

about reaching a vertical through base of first anal spine, varying a little both ways; in the larger specimens usually 1 upper ray unbranched, sometimes upper 2 unbranched, next 4-5 rays branched, lower 10-12 rays unbranched.

Measurements of 30 specimens 49-87 mm. and 3 specimens 33-47 mm., all from southern Florida: caudal 26.5-32.0 (28.5-32.0), depth 35.0-40.5 (35.5-41.0), head 42.5-46.5 (46.5-48.0), eye 11.4-14.2 (14.1-15.2). One specimen from Long Island 36 mm.: caudal 29, depth 40.5, head 42, eye 12.4. One specimen from Cozumel Island 59 mm.: caudal 26.5, depth 38, head 44, eye 14.3. Two specimens from Puerto Rico 57-76 mm. (types of *bergi*): caudal 27.5-28.0, depth 40.0-41.5, head 46.0-47.5, eye 15.1-16.1. One specimen from Panama (type of *isthmensis*): caudal 32, depth 38, head 42.5, eye 12.2. Five specimens 59-92 mm. and 3 specimens 33-43 mm. from the entire range of the species: ventral 25-30 (26-30), pectoral 29.5-34.0 (28.0-33.5), maxillary 20.5-24.5 (21.0-23.5), snout 11.1-13.0 (13.8-15.2), interorbital 5.3-6.3 (6.4-7.6); snout 0.9-1.3 (0.9-1.0) and interorbital 2.1-2.6 (2.4-2.8) times in eye.

Rather irregularly pigmented with brown shades against a somewhat lighter background; the pigment somewhat more concentrated on posterior part of body, at end of dorsal and anal fins, forming an irregular, not sharply defined, broad cross band; another band, more irregular and not as marked, at caudal base; the area between the two bands rather abruptly lighter (distribution of pigment in region of caudal peduncle resembling that of *plumieri*); caudal with 3 somewhat irregular, broad, cross bands at base, at distal margin and in between; spinous part of dorsal rather irregularly pigmented, the pigment especially concentrated on an area between third, fourth, or fifth to seventh or eighth dorsal spines, forming a spot only slightly distinguishable from surrounding pigment in dark specimens, well marked in light-colored or faded specimens; anal, pectoral, and soft dorsal with irregular alternate light and dark areas; ventral light-colored or moderately pigmented on its distal part.

*Development.*—The third and fourth pectoral rays are forked for a short distance in the smallest specimen examined, 33 mm. In a 36-mm. specimen all rays are still unbranched. In the next size examined, 43 mm., the second to the fifth rays are rather well branched. The nuchal pit is rather shallow in the 33-mm. specimen. It is developed nearly as in the adult at about 50 mm.

*Specimens examined.*—Porto Bello, Panama (81617, holotype of *isthmensis*, 92 mm.). Mayagüez, Puerto Rico (49533, holotype of *bergi*, 76 mm.). Culebra Island, Puerto Rico (126190, paratype of

*bergi*). Cozumel Island, Mexico (37103). Tortugas (one specimen 55 mm. in 117138; 117137, 29 specimens 43-87 mm., all other lots consisting of one specimen each), Key West (119119), Palm Beach (153128), and Miami (C.N.H.M. 46214), Fla. Fire Island Inlet, Long Island, N. Y. (108656, 36 mm.). Total examined, 38 specimens 33-92 mm. This appears to be a shallow-water species, although adequate habitat data are unavailable.

*Population.*—As may be gathered from the measurements given above, the Puerto Rico population seems to average a comparatively deep body, long head, and large eye. The Panama population might be found to average a high pectoral count, and the relative length of the second and third anal spines might differ with the population as discussed below.

*Extreme variants and other possible population differences.*—The two holotypes examined are both extreme variants in relation to the composite sample examined.

The holotype of *bergi* has 11 dorsal spines, while all other 37 specimens have 12 spines.

The type of *isthmensis* is an extreme variant in four characters: (1) It has 18 pectoral rays, while the other 37 specimens have 17 or 16 rays. (2) It lacks a spine on the suborbital ridge. In the other specimens, 32 have a spine on both sides in various stages of development from well marked to slight, 3 lack the spine on one side and 1 lacks it on both sides. (3) The end of the third anal spine is broken off in the type specimen; but judged by the larger part left and its persistent sheath of skin, it was probably not much shorter than the second spine, the relative length of the two spines in the living fish probably was as in the variant from Long Island discussed below. (4) It is very dark-colored and the spot on the spinous dorsal not sharply marked.

The long caudal of the type of *isthmensis* by which, in the original description, it is said to differ from *bergi*, does not hold, as five of the other specimens examined have the caudal about as long.

The small specimen, 36 mm., taken on Long Island, shows three differences as compared with the other specimens: (1) The head measurement, 42 percent, is unusually low for its size, not only as compared with the other specimens of *bergi* of similar size, but also with other western Atlantic species of *Scorpaena* examined. (2) In the other specimens of *bergi* the tip of the second anal spine reaches beyond that of the third when both are depressed, while in this specimen the tips of the two spines are about coterminous when depressed. (3) The distribution of the pigment on the caudal is somewhat differ-

ent. Its posterior half is rather diffusely and almost uniformly pigmented, except for a narrow, almost clear marginal area; the base is deeply pigmented transversely; the two pigmented areas are separated by a broad, transverse, nearly clear area.

The relative shortness of the head of the Long Island specimen might be explained by presuming that the specimen is precocious in this respect, having assumed the adult head length at a small size. The difference in the relative length of the second and third anal spines might be a population difference. At any rate, in the absence of conclusive evidence, a shade of doubt exists in the identification of this specimen with *bergi*.

*Comparison.*—This species averages the lowest pectoral count of all its congeners. The gill rakers average lower than in most species. It is a small species and its pectoral rays are branched at a comparatively small size. In this respect it is near to *albifimbria*. In most characters *bergi* is nearest *grandicornis* and *albifimbria*. It differs from both in usually having a fairly well-marked spot on the spinous dorsal. It further differs from *grandicornis* in having the frontal spine well developed, and in averaging a slenderer body and fewer pectoral rays and gill rakers, the extent of intergradation in the latter three characters being considerable. From *albifimbria* it differs in having a slenderer body and fewer pectoral rays and gill rakers. As only the type of *albifimbria* and one uncertain specimen are available the extent of divergence between it and *bergi* could not be determined adequately.

*Synonymy.*—As discussed above, the type specimen of *isthmensis* differs somewhat from the norm of the composite sample of *bergi* examined. However, it about agrees in the color pattern and in the important structural characters with the types and other specimens of *bergi*. There are no well-marked specific differences such as distinguish other scorpaenid species, or species of fishes in general. Evidently, the differences noted are either individual differences or they might prove to be minor population differences on examination of adequate samples. The name *isthmensis* is therefore placed in the synonymy of *bergi*.

#### SCORPAENA ALBIFIMBRIA Evermann and Marsh

*Scorpaena albifimbria* EVERMANN and MARSH, Bull. U. S. Fish Comm., vol. 20, pt. 1, p. 275, fig. 82, 1902 (off Culebra Island, Puerto Rico).

D.XII 9. A.III 5. P.19. Sc.42. GR.5+10.

*Description.*—Eye larger than snout. Interorbital about two and a half times in eye diameter. Maxillary ending under posterior mar-

gin of pupil. Occipital pit moderate. Anterior part of parietal ridge somewhat longer than posterior part; upper and lower posttemporal spines subequal, well developed; preorbital with 2 well-developed free spinous points; suborbital with 3 spinous points; cleithrum with a blunt projection. First preopercular spine well developed, supplemental spine moderate; second spine about as long as and more slender than third, somewhat nearer to first; lower 3 spines rather broad and blunt, gradually decreasing in size downward. Upper outer corner of interopercle ending in a blunt point. A long tentacle at base of preocular and supraocular spines, rather broad and somewhat fimbriated proximally, slender distally; other tentacles and tabs in very moderate numbers; head and upper part of eyeball with many papillae. Scallation at preopercular margin rather well expanded backward, but greater part of opercle scaleless; scales on cheek and behind eye well embedded. (Spinous dorsal damaged and relative length of spines indeterminable; see below relative length of spines in uncertain variant examined.) Second anal spine longer than third. Ventral falling a little short of base of first anal spine. Pectoral reaching a vertical through base of second anal spine; its first ray unbranched, next 5 rays branched, lower 13 rays unbranched.

Measurements of a specimen 43 mm.: caudal 31.5, ventral 29.5, pectoral 30.5, depth 43.5, head 49, maxillary 27, snout 13.3, eye 17.2, interorbital 7.2; snout 1.3 and interorbital 2.4 times in eye.

Pale yellowish, washed with whitish in places; pectoral with small white spots, and moderately dusky distally; other fins plain; no distinctive color marks. Published figure of specimen examined, made when recently preserved, shows a dark area behind head over lateral line, and soft dorsal and anal with spots and a band respectively.

*Specimen examined.*—Off Culebra Island, Puerto Rico, 15 fathoms, 43 mm. (49532, the holotype).

*An uncertain variant.*—A specimen having the following data possibly belongs to this species: Off Palm Beach, Fla., 40 fathoms, Thompson and McGinty, February 1950 (153127), length 44 mm., caudal 32, ventral 31.5, pectoral 33, depth 46.5, head 50.5, maxillary 25, snout 13.3, eye 17.2, interorbital 6.3; snout 1.3 and interorbital 2.7 in eye.

D.XII 9. A.III 5. P.17. Sc.46. GR.5+11.

The counts and measurements of this specimen agree rather well with those of the type given above, except that it has 17 instead of 19 pectoral rays. It further agrees in having the second to the sixth pectoral rays branched, in its almost uniformly pale color, in general appearance, and in the other characters given above, with the follow-

ing exceptions, besides the difference in the number of pectoral rays. The suborbital ridge ends in 1 moderate spinous point at the end, instead of having 3 spinous points. The second preopercular spine is smaller than the third, instead of being subequal to it. The tips of the second and third anal spines end at the same point when depressed, while in the type the tip of the second spine extends beyond that of the third. The cleithral spine is better developed than in the type. The tentacle at the supraocular spine is broader, and the one at the preocular spine much shorter, than in the type specimen.

Judged by intraspecific variability in other species of *Scorpaena* the differences outlined might well fall within the range of variation of the same species; but this conclusion needs to be confirmed by the study of an adequate sample. Meanwhile, the type and the other specimen concerned are described separately to call attention to the differences, and the counts of the type only are entered in the tables.

The twelfth dorsal spine is damaged in the type. In the variant the penultimate spine is approximately one-half as long as the last.

*Comparison.*—This is evidently a small species. The pectoral rays are branched at a size at which they are still unbranched in the other species of *Scorpaena*, except *bergi*. It is compared with *bergi* under its account. In general appearance, especially in body shape, the type specimen of *albifimbria* examined somewhat resembles small specimens of *plumieri*; but in specimens of *plumieri* of comparable size all pectoral rays are unbranched, the interorbital is much wider, the cleithral spine much better developed and they are deeply pigmented with a specific color pattern.

#### SCORPAENA DISPAR Longley and Hildebrand

*Scorpaena dispar* LONGLEY and HILDEBRAND, Carnegie Inst. Washington Publ. 517, p. 24, fig. 12, 1940 (Tortugas, Fla.).

*Scorpaena similis* GUNTER, Copeia, 1948, pt. 3, p. 161 (off the Mississippi Delta, La.).

D.(XI) XII 8-9. A.III 5. P.17-19. Sc.42-48. GR.5+10-12.

*Description.*—Eye moderate, usually a little smaller than snout, sometimes subequal to it. Interorbital about one-half the eye. Maxillary ending under space between posterior margin of pupil and that of eye. Occipital pit and spines on head well developed. Lower post-temporal spine larger than upper; preorbital with 3 free spines, the middle one close to and usually smaller than anterior spine; suborbital ridge usually with 3 spines, sometimes middle spine absent; cleithrum with a moderate spinous projection. Preopercular spines moderate, supplemental spine large in comparison, first spine extending less than



half the distance across opercle, next three spines subequal or slightly graduated, fifth spine slight or obsolescent. Upper posterior corner of interopercle forming a blunt projection or ending in a spinous point. Tentacle at supraocular spine very variable, broad, and long to short; other tentacles, tabs, or filaments on body, head, and eyeball variable, usually rather sparse. Scallation on opercle very variable, area below lower ridge scaled or naked in greater part, or covered with partly nonimbricate scales in profusion or in sparse numbers; scales on cheek and opercle moderately or well embedded. Penultimate dorsal spine about two-thirds as long as last spine; longest dorsal spine subequal to postorbital part of head or slightly shorter. Ventral reaching anal origin or a little short. Pectoral about reaching a vertical through base of first anal spine, varying slightly both ways; its first ray unbranched, next 6-8 rays branched, lower 9-11 unbranched.

Measurements of 4 specimens 167-192 mm. and 2 specimens 106-111 mm.: caudal 29.5-31.5 (30.0-30.5), ventral 25.0-26.5 (26-27), pectoral 32.0-35.5 (29.5-33.5), depth 35.0-38.5 (35.0-36.5), head 45-48 (45.0-45.5), maxillary 22-25 (21.0-21.5), snout 13.5-15.6 (12.5-13.9), eye 11.3-12.7 (12.2-12.7), interorbital 5.8-6.1 (5.1-6.0); eye 1.1-1.3 (1.0-1.1) times in snout, interorbital 1.9-2.1 (2.0-2.5) times in eye.

Plain-colored without well-defined color marks; caudal rather faintly marked in two transverse areas, near the middle and near its distal margin, with diffuse small spots; similar spots on pectoral and, to a lesser extent, on soft dorsal and anal still fainter. One specimen has a faint blotch, directly over lateral line at some distance behind head, and a faint elongate blotch directly below lateral line a little farther behind. The above color description is drawn from specimens on the coast of the United States; those from off Cabo Catoche differ somewhat in color as follows. The caudal has elongate, rounded, rather clear-cut brown spots which are generally situated on the interradiial membrane, and a few such spots are often present also on the pectoral, dorsal, and anal; while the much fainter spots on the United States specimens are generally situated partly on the rays.

*Development.*—Two specimens 50-60 mm. already have some of the pectoral rays branched, but the extent of branching is less and the number of branched rays is fewer than in the larger specimens. The same two specimens have the occipital pit and the middle preorbital spine nearly as in the large specimens.

*Specimens examined.*—Cape Florida (124304) and Tortugas (108-867, holotype of *dispar*), Fla.; off Mississippi Delta (124332, holotype of *similis*, and 155332, both collected by the *Pelican*); off Cabo

Catoche, Yucatan Peninsula, Mexico (101537, 119768, 134220). Total examined, 4 specimens 60-195 mm. from the coast of the United States and 12 specimens 50-207 mm. from off Cabo Catoche. Available depth records range 21-95 fathoms.

*Comparison.*—This species and *plumieri* differ from their other congeners, except *Microlepis*, in having 3 free spinous points on the distal margin of the preorbital and their distinguishing characters are, therefore, contrasted in the key. However, in general appearance these two species are rather unlike, and it is doubtful whether they are closely related.

*Populations.*—As noted above, the specimens examined from off Cabo Catoche differ moderately in color as compared with those from the coast of the United States. In the few specimens examined, those from Cabo Catoche average fewer pectoral rays. Counting the rays on both sides, the frequency distribution is as follows, the figures inside the parentheses giving the number of pectorals on which a stated count is based: United States 17 (2), 19 (6); Cabo Catoche 17 (5), 18 (17), 19 (1). Also, both variants having 8 dorsal rays, as shown in table 1, are from Cabo Catoche. The differences indicated point to the need of further research in regard to the precise differences between the two populations, but the specimens examined are altogether too few to form the basis for definite conclusions.

**SCORPAENA PLUMIERI** Cuvier and Valenciennes, sensu lato

D.XII (8) 9. A.III (4) 5 (6). P.18-21. Sc.42-49. GR.4-6+8-12.

*Description.*—Eye about two-thirds as large as snout. Interorbital subequal to eye, varying a little both ways. Maxillary ending approximately under posterior margin of eye. Occipital pit rather well developed or moderate; a pit under anterior margin of eye, above suborbital ridge (the only species having a definite pit in this position). Spines on head rather coarse, broadened below apex; lower post-temporal ridge somewhat better developed than upper; preorbital with 3 free spinous points, middle spine small and placed near anterior spine (occasionally absent on one side); suborbital ridge usually with 3 spinous points, sometimes a fourth small point in front; cleithral spine moderate or well developed in the smaller specimens, becoming blunt with growth; in large specimens cleithrum markedly projecting upward and somewhat backward, the two distal corners of the projecting part forming tapering, sharp or rather blunt angles with a well-developed emargination between them, the lower outer angle representing the cleithral spine of the smaller specimens; upper outer angle of interopercle blunt or moderately sharp. Preopercular spines rather short, first spine not extending halfway across opercle; supplemental

spine moderate or well developed, usually placed on upper surface of first spine; second spine slightly longer and sharper than third; fourth spine moderately sharp or blunt; fifth spine blunt or obsolescent. Tentacle at supraocular spine very variable from short to long; other tentacles, tabs, and filaments very variable in number and development. Greater part of opercle scaled, but extent of scalation on part below lower ridge very variable, often the scales nonimbricate in part, hard part of opercle between the two diverging ridges usually scaleless as in its congeners, often some nonimbricate scales present; scales on cheek, opercle, and sometimes also on chest more or less embedded. Penultimate dorsal spine averaging about seven-eighths as long as last; longest dorsal spine considerably shorter than postorbital part of head. Second anal spine more or less longer than third. Ventral reaching anus, but more often a little behind. Pectoral usually falling a little short of a vertical through base of first anal spine, sometimes reaching there; its uppermost ray unbranched, next 5-10 rays branched, lower 9-14 rays unbranched.

Body with two variably dark areas, one directly behind head, the other under soft dorsal, separated by a variable lighter area; the three areas very variable in extent and intensity of pigmentation, without clear-cut boundaries, not uniformly pigmented, mottled with lighter and darker shades; caudal peduncle light, usually almost uniformly and strikingly so; a slightly curved cross band at caudal base; an oblique band forking from middle of latter band, downward and forward to underside of peduncle, leaving a light triangular area, bounded by the two bands, at lower part of peduncle; inner surface of pectoral with a black area at its base, spotted with white, usually this pattern extending for some distance on side; caudal with two broad, dark, mottled, transverse areas, one at middle, one at margin; pectoral with three similar transverse areas, not as well marked; soft dorsal and anal mottled before and behind, separated by a nearly clear area in middle; greater distal part of ventral mottled; spinous dorsal often with a black or brown spot, or a row of spots, saliently outstanding from rest of pigmentation; often prettily marbled with white all over the light and dark areas on head, body, and fins.

Growth changes in the color pattern and structural characters are described below under the account of the subspecies *plumieri*, of which a fair sample in a graded size range is available for examination. Small specimens of the subspecies *mystes* are not available for study.

*Comparison.*—This species has a distinctive color feature which is of much value in distinguishing it from other species of its genus, namely, the inner region at the pectoral base is black with small white

spots, sometimes partly confluent, the distinctively colored area extending partly on the side and partly on the surface of the fin. The caudal peduncle stands out from the rest of the body as lighter-colored, uniformly so or more or less shaded. The distinctive combination of structural characters is as follows: 18-21 pectoral rays; 42-49 cycloid scales; total number of gill rakers and tubercles on both limbs 12-17; occipital pit moderate to well developed; 3 preorbital spines. It has a comparatively wider interorbital and smaller eye than its other western Atlantic congeners. The fairly marked pit between the suborbital ridge and eye, under its anterior margin, is unique for this species.

The larger specimens of this species are readily distinguished by the combination of their distinctive color and the structural characters given above and in the key. Small specimens have their distinctive color and the same structural characters, except that the occipital and suborbital pit and the middle preorbital spine are as yet undeveloped (see below under the subspecies *plumieri*).

This species is doubtfully divisible into two subspecies, *plumieri* in the Atlantic and *mystes* in the Pacific. As discussed below under *mystes*, the difference between the two possible subspecies is slight, and it is a question whether they should be so treated. Evidently *plumieri*, sensu lato, is one of those comparatively few species of fish, the Atlantic and Pacific populations of which have diverged but little since their long isolation.

#### SCORPAENA PLUMIERI PLUMIERI Bloch

*Scorpaena plumieri* BLOCH, Nya Handl. Stockholm, pt. 10, p. 234, 1789 (Martinique).

*Scorpaena bufo* CUVIER and VALENCIENNES, Histoire naturelle des poissons, vol. 4, p. 306, 1829 (Martinique).

*Scorpaena scrofina* CUVIER and VALENCIENNES, *ibid.*, vol. 9, p. 465, 1833 (Brazil).

*Scorpaena rascacio* POEY, Memorias sobre la historia natural de la Isla de Cuba, vol. 2, p. 169, 1860 (Cuba).

*Scorpaena albofasciata* METZLAAR, Rapp. Vissch. Kol. Curaçao, edited by J. Boeke, vol. 2, pt. 1, p. 145, fig. 43, 1919 (Curaçao).

*Scorpaena nuttingi* EVERMANN and SEALE, Stud. Nat. Hist. Univ. Iowa, vol. 10, p. 39, pl., 1924 (Carlisle Bay, Barbados).

*Scorpaena colonensis* MEEK and HILDEBRAND, Publ. Field Mus. Nat. Hist. Chicago, vol. 15, p. 844, pl. 81, fig. 1, 1928 (Colón, Panama).

*Scorpaena ginsburgi* GUNTER, Copeia, 1942, p. 105 (Texas).

D.XII (8) 9. A.III 5 (6). P.18-21. Sc.42-49. GR.4-6+8-12.

*Description*.—Measurements of 14 specimens 206-306 mm. and 3 specimens 33-43 mm.: ventral 27.5-30.5 (29-31), pectoral 33.0-36.5

(29.5-31.0), maxillary 20.5-24.0 (23.0-24.5), snout 12.6-15.0 (12.3-13.2), eye 7.6-9.4 (11.9-13.2), antedorsal distance 35.5-38.5 (41.5-44.0), depth of peduncle 10.6-12.2 (11.2-12.0); eye 1.4-1.9 (1.0-1.1) in snout, interorbital 0.8-1.2 (1.0-1.2) in eye. Measurements of caudal, depth, head, and interorbital given in table 12.

Within the limits of the specific color pattern as described above, many specimens of this subspecies show the following minor characteristics: Variegated dark and light or white markings on body and fins very notable; black area at pectoral axil very deeply pigmented, the white spots in the area very sharply contrasted, comparatively rather large, and usually extend also on side of body; light area on caudal peduncle sharply contrasted with the dark pigment before and behind; small spots on lower part of sides few and diffuse or absent. However, color markings vary much with the individual and one or all of the preceding color characteristics are not present in many of the specimens examined.

*Development.*—Small specimens, under 50 mm., have a characteristic and distinctive color pattern as follows: Head and body almost uniformly very dark, in sharp contrast the caudal peduncle abruptly very light, without melanophores, except the characteristic forking band described above under the species; posterior part of dorsal and anal likewise clear; a vertical nearly straight line marking anterior boundary of clear part of peduncle and dorsal and anal fins; rest of dorsal and anal, and ventral and pectoral almost uniformly very dark except that pectoral has a narrow whitish margin; color of caudal nearly as in grown specimens. The change from the juvenile to the adult color pattern occurs early and rather rapidly. The adult color pattern is not radically different; it is merely a modification of the juvenile pattern. The characteristic white spots against a black background in the pectoral axil begin to appear at about 40 mm.

At 30 mm. the occipital pit is virtually absent, the area occupied by the pit in the adult being only slightly depressed, almost flat for its greater part. It reaches its full development at about 90 mm. In the largest specimens it becomes again rather shallow, and also comparatively broader.

The suborbital pit begins to appear between 60 and 70 mm., and a trace of the middle preorbital spinous point somewhat later, between 65 and 75 mm. The pectoral rays begin to branch at about the time the suborbital pit begins to develop.

*Specimens examined.*—Katama Bay, Marthas Vineyard, Mass. (49677, 58876, 58901-2; altogether 7 specimens 30-53 mm.). Beaufort, N. C. (53407, 111509, 126501; altogether 3 specimens 64-87

mm.). Biscayne Bay (61704) and Tortugas (6777, 41839, 117136, 117140), Fla. Corpus Christi (148135), Harbor Island (148134, 148136), Aransas Pass (119016, holotype *ginsburgi*), Mustang Island (119015, 119017-8), and Freeport (157559), Tex. Abaco, Bahamas (38387-8). Cuba (4688; 10126; 12543; 35096; 153578, cotype *rascacio*). Jamaica (30005, 30087, 35120, 38565). Haiti (122640, 133727). Puerto Rico (50149). Dominica (29854). St. Lucía (41333). Old Providence Island (38631). Fort Randolph (128702), Colón (81606, holotype *colonensis*), Fox Bay (80978-80, 81591-2), and Porto Bello (80973-4, 81593-4), Panama. Cabo San Román (123197) and Gulf of Venezuela (123196), Venezuela. São Paulo market (100875) and Santos market (100876), Brazil. Total examined 69 specimens 30-323 mm., the largest from Cuba.

This subspecies is the most widespread of all scorpaenids here

TABLE II.—Frequency distribution of the number of pectoral rays, scales, and gill rakers in some populations of the subspecies *plumieri*.

	Pectoral rays				Scales								Gill rakers, total					
	18	19	20	21	42	43	44	45	46	47	48	49	12	13	14	15	16	17
Massachusetts . . . . .			7	..	..	2	1	1	1	2	..	..	..	..	1	3	3	..
Texas . . . . .	..	12	2	..	..	..	2	1	3	2	3	2	..	1	3	8	2	..
Cuba . . . . .	..	1	5	..	1	2	..	2	1	..	..	..	..	..	..	1	4	1
Jamaica . . . . .	..	5	..	..	..	..	..	2	1	2	..	..	..	..	3	2	..	..
Panama . . . . .	2	9	1	1	1	..	3	6	2	1	..	..	1	1	1	5	4	..

treated, ranging from Massachusetts to Brazil, and it is fairly common. The northern specimens examined are all small. It lives inshore and also ranges offshore.

*Comparison.*—This subspecies is compared with *mystes* under the account of the latter.

*Populations.*—Table II shows population differences in the frequency distribution of the number of pectoral rays, scales, and gill rakers. The gill-raker count gives the total number on the outer arch, including the gill rakers and tubercles on both limbs. While the samples are too small to serve as a basis for definitive conclusions, they at least give an indication of some of these differences.

The predominant number of pectoral rays is either 19 or 20, depending on the population. In the subspecies *mystes*, in 12 specimens representing a wide geographic range, the number is constantly 20. However, in *plumieri* the differences in the number of pectoral rays evidently cannot be correlated with geographic distribution or with other structural differences. Besides, the count within the range of

a given population is not absolutely constant. Consequently, this count cannot serve as a basis for subspecific distinction.

The scale count is low on the average in the Cuba and Panama populations and highest in that of Texas. The gill-raker count is low in the Jamaica and Panama populations and high in that of Cuba.

The caudal in small Texas specimens is appreciably longer as compared with similar specimens from Katama Bay. In 5 Texas specimens 30-52 mm. the caudal length ranges 32.4-34.1; while in 7 Katama Bay specimens 30-53 mm. the range is 28.3-30.9. Larger specimens from Katama Bay are not available for comparison. Texas specimens both large and small, when compared with combined samples of similar specimens from the West Indies and Central America do not show any striking differences in the caudal length.

On the whole, judged by the small samples examined, these minor population differences are not sufficiently divergent to serve as a basis for subspecies distinction.

*Synonymy*.—The names *bufo* and *rascacio* generally have been synonymized by authors with *plumieri*. One of Poey's cotypes of *rascacio* has been examined and its data included in this account. The original description of *bufo* is recognizable and it was evidently based on specimens of this species. The reasons for placing the other five names in the synonymy are as follows.

In the brief description of *S. scrofina*, it is said to have large white drops ("gouttes") on the pectoral axil, which is a characteristic color mark of *plumieri* and of no other known species. There is nothing in the description of *scrofina* to indicate that the specimen described is different from *plumieri*. It seems safe to conclude that it is an individual variant of this common species.

Metzlaar does not compare his *S. albofasciata* with any other species, nor does he state the reason for establishing a new species. Presumably, he based it on the striking color pattern of his specimens, which is well indicated in his published figure. This color pattern is characteristic of the young of *plumieri* as stated above. Three small specimens, 30 mm., of *plumieri* examined, about the same size as Metzlaar's specimens, are nearly exact replicas of his figure. Although I did not examine the type of *albofasciata*, there is hardly any question that it represents young specimens of *plumieri*.

The type of *colonensis*, 43 mm., which was reexamined, likewise represents a young *plumieri*. According to the character used in their key, *colonensis* was based by the original authors on the near absence of an occipital pit, which is a character of the young. In the type of *colonensis* the state of development of the occipital pit is like that

in specimens of *plumieri* of similar size, and its other specific characters agree with this species.

The single type specimen of *nuttingi* is said to differ from *plumieri* in having 5 branched pectoral rays (8 such rays shown on the figure) instead of 1. This is an error, *plumieri* normally having 5-10 such rays, except in the young. The other differences mentioned in the original description of *nuttingi* are largely governed by individual variability. The published figure of *nuttingi* is well executed and it is so typical of *plumieri* in color and general appearance that there seems no doubt that it represents a specimen of that species.

Gunter gives a number of characters which are said to distinguish *ginsburgi* from *plumieri*. However, examination of a larger series of specimens than that available to Gunter shows that those characters are subject to a great deal of individual variation. Any slight average differences that might exist evidently are no more than the slight differences that are usually found between the local populations of the same species. Some of the minor population differences are discussed above. Most any species of fish could be split up into a number of taxonomic units by using such minor population differences. To recognize such minor differences by the formal bestowal of scientific names would make nomenclature too burdensome, and in the present state of ichthyology would serve no useful purpose.

#### SCORPAENA PLUMIERI MYSTES Jordan and Starks

- Scorpaena mystes* JORDAN and STARKS, Proc. California Acad. Sci. (ser. 2) vol. 5, p. 491, pl. 52, 1895 (Mazatlán, Mexico).  
*Scorpaena tierrae* HILDEBRAND, U. S. Nat. Mus. Bull. 189, p. 441, fig. 84, 1946 (Peru; Chile).

D.XII 9. A.III (4) 5. P.20. Sc.44-47. GR.4-5+9-11.

*Description*.—Measurements of 5 specimens 199-279 mm.: ventral 27.5-29.5, pectoral 34.0-35.5, maxillary 21.0-24.5, snout 11.5-14.1, eye 8.3-9.7, antedorsal 35-39.5, depth of peduncle 10.8-11.7; eye 1.4-1.6 in snout and interorbital 1.0-1.2 in eye.

The majority of specimens differ in color characteristics from the subspecies *plumieri*, described above, as follows: Variegated dark and white markings on body and fins not as well marked; black area at pectoral axil not as strongly pigmented, and the white spots generally smaller, fewer, not as sharply marked, and usually confined to underside of pectoral fin; light area on the caudal peduncle generally somewhat suffused with a dusky tint, and not as markedly outstanding; small dark spots on lower part of side often well marked. However, there is much individual variation in the relative development of pig-



TABLE 12.—Range of depth, head, interorbital, and caudal measurements of *Scorpaena plumieri plumieri* and *S. p. mystes*, segregated into size groups, expressed as a percentage of the standard length.

Subspecies	Length of specimens	Number of specimens	Depth		Head		Interorbital		Caudal	
			Range	Average	Range	Average	Range	Average	Range	Average
<i>plumieri</i> .....	30-53	15	40.1-47.7	44.1	45.1-50.0	47.4	11.1-13.6	12.1	28.3-34.1	31.2
<i>plumieri</i> .....	58-110	14	37.5-43.7	40.9	44.4-47.6	45.9	9.1-11.0	9.9	29.0-33.9	31.4
<i>mystes</i> .....	80-108	2	33.7-35.0	34.4	46.0-46.7	46.4	7.4-7.5	7.5	29.1-30.8	30.0
<i>plumieri</i> .....	141-189	12	34.7-41.6	38.6	38.6-46.6	44.2	8.1-9.9	9.2	27.4-32.2	30.0
<i>mystes</i> .....	130-192	3	33.9-36.6	35.6	42.5-45.8	43.9	6.9-8.7	8.1	28.0-30.2	29.1
<i>plumieri</i> .....	205-280	23	33.3-40.1	35.9	39.2-46.0	43.7	7.6-9.4	8.5	27.0-31.5	29.3
<i>mystes</i> .....	199-279	5	29.8-35.2	33.4	42.5-46.7	45.1	7.7-8.9	8.3	25.0-29.9	28.0
<i>plumieri</i> .....	287-323	4	31.3-38.9	35.2	43.4-46.6	44.6	8.4-8.6	8.5	27.3-30.6	28.9
<i>mystes</i> .....	356	1	.....	29.8	.....	47.0	.....	9.8	.....	25.7
<i>mystes</i> .....	437	1	.....	33.6	.....	50.2	.....	9.2	.....	23.6

ments in both subspecies, and color differences do not distinguish them satisfactorily.

*Specimens examined*.—Bay of Guaymas (43257), Mazatlán (47450, cotype of *mystes*), and Acapulco (65657), Mexico. Taboguilla Island (128730), Taboga Island (80970, 12871), Naos Island (80971), Panama City tide pools (81599), Panama. Lobos de Tierra, Peru (128128, holotype, and 128129, paratype, of *tierrae*). Juan Fernández Island, Chile (88775, paratype of *tierrae*, 437 mm.). Total examined, 12 specimens 80-437 mm.

*Comparison*.—This Pacific population does not differ much from the corresponding Atlantic population. It differs somewhat on the average in some proportional measurements, as may be gathered by comparing the data given in table 12 and under the accounts of the subspecies, the greatest apparent degree of divergence referring to the body depth. As the depth changes with growth, an adequate appraisal of the precise degree of divergence of this measurement cannot be made with the available specimens. When the scant data included in table 12, in the size groups 130-192 and 199-280 mm., are arranged in the form of a frequency distribution, the apparent degree of divergence shown is less than that of subspecies magnitude.

A direct comparison of specimens shows that, in general, the occipital pit in the Pacific population is shallower. However, in both populations the degree of development of the pit varies with the individual, and changes markedly with growth as described above under the subspecies *plumieri*. It is very difficult to determine the precise degree of divergence of this character as it can hardly be expressed in terms of exact figures. But the difference is evidently not pronounced and individual specimens cannot be identified by its use as a criterion without a knowledge of the locality of capture. The degree of divergence of this character also appears to be less than that of subspecies magnitude.

The two populations also show, in bulk, some differences in color characteristics as described under their accounts; but individually the specimens are indistinguishable by color. This is another character that can hardly be expressed numerically.

On the whole, judged by the samples examined, the degree of divergence between the two populations seems to be of the order of race, rather than subspecies, or the border line between these two categories. But in the absence of conclusive data and considering their long isolation in point of time, it seems best to treat them, at least tentatively, as distinct subspecies, since they have been treated heretofore as distinct taxonomic entities and both have been formally named.

The relative depth of the occipital pit and the interorbital width constitute the two chief characters that have heretofore been used to distinguish the Atlantic and Pacific populations as distinct species. The very limited value of the occipital pit as a taxonomic character in separating these two populations is discussed above. Measurements of the interorbital width are given in table 12. It differs greatly with the size of the fish. When specimens of like size are compared there is a moderate difference in the smaller specimens, but hardly any difference in the size group 199-280 mm.

*Synonymy*.—The holotype of *tierrae* has the head unnaturally thrown out of shape. Evidently, the fish had the opercles spread outward when rigor mortis set in. This gives the head a broad, flat appearance; but when the opercles are pressed to their approximately normal position, the specimen does not differ materially from others of *plumieri*, sensu lato. Besides the head shape, other differences mentioned in the original description vary with the individual and the state of growth.

A statement used in the original description of *tierrae*, and also in the accompanying key, needs to be emended from the viewpoint of homology and also because it has a bearing on one of the main characters here used to separate the genera and species. The statement is made that *tierrae* has 6 preopercular spines. However, 5 preopercular spines is the typical basic number for all the species here treated, as discussed above, with the first spine having a supplementary spine or spur at its base in most species. In *plumieri*, sensu lato, the supplementary spine usually arises from the upper outer surface of the first preopercular spine, and in individual specimens, especially large ones, it sometimes becomes rather prominent. It might then mistakenly be included in the count of the preopercular spines, which would result in a total count of 6. However, though prominent, it is still the supplementary spine homologically and should not be taken for the first preopercular spine.

#### SCORPAENA MICROLEPIS Gunter

*Scorpaena microlepis* GUNTER, Copeia, 1948, No. 3, p. 162, plate 2 (off Englewood, Fla.).

D.XII 9. A.III 5. P.16-18. Sc.76. GR.5+11.

*Description*.—Eye subequal to snout. Interorbital approximately 2 times in eye. Maxillary ending on a vertical a little in front of posterior margin of eye. Occipital pit rather small and shallow. Anterior part of parietal ridge somewhat higher than posterior part;

frontal spine in a line with postocular placed laterad of parietal ridge; upper posttemporal slightly indicated (on right side of single specimen examined) or absent (on left); lower posttemporal ridge and spinous point moderate; sphenotic doubled; pterotic ridge and spinous point well developed; postorbital in form of very slight tuberosities; preorbital with 3 free spinous points; suborbital ridge with 2 very slight spinous points, 1 under eye, 1 at its posterior end (the anterior point missing on left side, the posterior absent on right side); cleithral spine well developed (on left) or very slight (on right). First preopercular spine reaching about halfway across opercle; supplemental spine slight; lower 4 spines graduated, the second longer than third, fifth slightly developed. Tentacles at supraocular spine moderate, other tentacles sparse (skin on head broken in places). Scales notably small, 76; fleshy pectoral base largely scaled, an area on its posterior lower part naked; scales on chest and pectoral base not embedded; opercle partly scaled over upper ridge (opercle below lower ridge having scalation seemingly incompletely preserved and skin partly destroyed, its greater part probably scaleless); scales in patch on cheek below suborbital ridge embedded and larger than any other. Penultimate dorsal spine about two-thirds as long as last; longest dorsal spine subequal to postorbital part of head. Second anal spine a little longer than third. Ventral nearly reaching anal origin. Pectoral reaching to over base of first anal spine; upper ray unbranched, next 6-8 rays branched (differs on both sides of specimen examined, both counts entered independently in table 2).

Measurement of one specimen 121 mm.: caudal 33.5, ventral 30, pectoral 33, depth 33, head 42, maxillary 19, snout 11.5, eye 10.9, interorbital 5.5; eye 1.1 times in snout, interorbital 2 times in eye.

Head and body a nearly uniform brown; soft dorsal and anal with irregular alternating areas of light and dark shades, similar areas on pectoral slightly perceptible; caudal with a dark transverse area at its base, followed by lighter area, its posterior and greater part diffusely dusky; ventral slightly pigmented.

*Specimen examined.*—Off Englewood, Fla., Bass Biological Laboratory, January 7, 1936 (U.M.M.Z. 110161, the holotype and only known specimen).

*Comparison.*—This is a strongly marked species. It is distinguishable from its western Atlantic congeners at a glance by its notably small scales. The occipital pit is small and rather shallow, being somewhat intermediate in this respect between *calcarata* or *inermis* and the other species of *Scorpaena*. The frontal spine is in a line with the postocular, laterad of the parietal ridge as in the above-named two

species. In having 3 preorbital spinous points it agrees with *plumieri* and *dispar* and differs from all others.

### Genus SETARCHES Johnson

*Setarches* JOHNSON, Proc. Zool. Soc. London, 1862, p. 177 (genotype *Setarches guntheri* Johnson, by monotypy).

This genus has a combination of specialized and generalized characters. The unusual structure of the lateral line and the cavernous bones of the skull are evidently specialized features, while the poor development of a number of spines on the head more nearly approaches the generalized fish morphology than other scorpaenid genera. On the whole, considering all the characters, it seems to be a highly specialized genus. The generic characters are included under the account of the single species here treated where its relationship to the other western Atlantic scorpaenids is further discussed.

### SETARCHES PARMATUS Goode

*Setarches parmatus* GOODE, Proc. U. S. Nat. Mus., vol. 3, p. 480, 1881 (*Fish Hawk* station 867, off Long Island, N. Y., 39° 57' N., 70° 56' W., 120 fathoms).—GOODE and BEAN, Oceanic ichthyology, p. 264, pl. 70, fig. 249, 1895 (the figure from the type specimen having a mutilated dorsal).

D.XII; 9-10. A.III (4) 5. P.22-24. Sc.88-103. GR.6-7+10-15.

*Description*.—Skull with large external cavities formed by configuration of skeletal elements, with ridges more or less developed between cavities, externally bridged over by a rather thin membranous skin. Eye smaller than snout. Interorbital comparatively broad, only a little less than eye diameter. Maxillary ending approximately under posterior margin of eye. Palatine teeth present. A small slit on inner side of fourth gill arch. Gill rakers at the angle of the arch rather long and slender, gradually decreasing in length both ways; difference between gill rakers and the tubercle-like outgrowths at ends of arch rather abrupt, the two kinds readily distinguishable; gill rakers on upper limb 3 (in 24) or 4 (17), infrequently 5 (1); gill rakers on lower limb 10 (25) or 11 (15), infrequently 9 (1) or 12 (1); tubercles on upper limb low but their number readily determinable, nearly always 3 or 4, infrequently 2 (in 1 out of 42 specimens); tubercles on lower limb not as well marked, their number difficult to determine with precision (see discussion below), varying 0-5. Occipital region flat, without a pit. Nasal and preocular spines small but sharp; supraocular and postocular absent, except indicated as blunt protuberances in small specimens (the only species here treated lacking

these spines); parietal ridge entire, long, low, ending in a single spinous point posteriorly; frontal spine absent; upper posttemporal short or moderate, sharp or rather blunt; lower posttemporal short, blunt, or nearly absent; sphenotic absent, except moderate in young; pterotic ridge and spine moderate; no postorbital spine or tuberosity; preorbital with 3 free spinous points well developed; suborbital ridge smooth, without spinous points; cleithrum with a moderate, blunt projection. The 5 preopercular spines well developed; upper 3 notably long in comparison, subequal, or second spine slightly longer than other two, sometimes first or third slightly longer; supplemental preopercular spine absent; fifth spine directed downward. Tentacles, filaments, and tabs absent. Lateral line a continuous channel, in form of very shallow ditchlike depression covered over by membranous vaulted roof; two rows of very thin, notably elongate, membranous scales forming part of roof, one row arranged in a horizontal series at lower part of roof, the ends of the scales moderately separated or almost touching, another row at upper part of roof containing narrower and flimsier scales somewhat more widely separated and rather obliquely placed (the rooflike structure more or less damaged in nearly all preserved specimens; the modified lateral line present in only this species of those examined). Scales small, cycloid, roundedly oblong, rather moderately imbricated, 88-103 (in four specimens, scales missing in large patches in other specimens); scalation on anterodorsal area extending to parietal spines; opercle with a patch of scales above upper ridge, and its thin membranous marginal area more or less scaled, its greater part scaleless; a patch of scales on posterior part of cheek below suborbital ridge; area above suborbital ridge between eye and preopercular margin scaled; rest of head and occiput scaleless. Emargination between spinous and soft parts of dorsal notably developed, virtually forming two separate fins, eleventh spine about one-third as long as twelfth; longest dorsal spine subequal to snout length. Second anal spine shorter than third. Ventral falling considerably short of anus, its outer angle under lower pectoral angle. Pectoral irregularly wedge-shaped, the longest rays near its middle, but lower outline notably more curved than upper; fin reaching to over base of second anal spine or a little shorter, its upper 2 or 3 rays unbranched, next 12-16 rays branched, lower 5-9 rays unbranched. Caudal slightly emarginate or truncate.

Measurements of 3 specimens 115-167 mm.: caudal 24.5-27.5, ventral 19-21, pectoral 33.5-34.5, depth 32.0-35.5, head 40.0-43.5, maxillary 22.0-24.5, snout 12.3-13.6, eye 9.5-10.8, interorbital 8.4-9.2; eye 1.2-1.3 times in snout, interorbital 1.1-1.2 times in eye.

Recently preserved specimens having the head, body, and inner face of opercle suffused somewhat irregularly with a dusky shade; upper part above lateral line often with very small dusky or dark spots of a deeper shade than ground color; fins mostly yellowish, very moderately suffused with dusky; palate black; no distinctive markings; specimens long in preservative almost uniformly plain yellowish.

*Development.*—Although this is a small species the pectoral rays begin to branch comparatively late, at about 80 mm. Rudiments of supraocular, postocular, and sphenotic spines are evident in five specimens 49-58 mm. as blunt protuberances. Slighter traces of these spines persist up to 70 mm. and generally disappear at 80 mm.

*Gill rakers.*—The tubercles on the upper limb are low but easily distinguishable and their number varies only moderately with the individual. However, the precise enumeration of the tubercles on the anterior part of the lower limb is attended with some difficulties. They are often only slightly developed, especially in small specimens, and not easily observed. Sometimes they apparently coalesce and are not distinguishable individually. It seems also that supernumerary tubercles that are hardly distinguishable from the regular tubercles sometimes appear with growth. Some evidence points to the possibility of their being absent or few in the young and appearing after some growth has been attained. On top of this, the number of tubercles appears to vary widely with the individual. As a consequence, the number of tubercles on the lower limb constitutes an unstable and unsatisfactory specific character, and of course this also applies when the number of these tubercles is combined with the gill rakers into a single figure. On the other hand, in this species, unlike the condition in other scorpaenids here treated, the gill rakers are distinguishable readily from the tubercles, they vary within narrow limits, and their number given separately constitutes a well-marked, comparatively stable specific character. Therefore, under the above description the frequency distribution of the number of gill rakers only is stated separately; while in tables 3-5 and in the formula at the head of the species account the combined number of gill rakers and tubercles is given for the purpose of comparison with the other species, but these numbers are not as valuable taxonomically as the gill-raker numbers alone.

*Specimens examined.*—Off the following localities: Long Island, N. Y. (26084, the holotype). Cape Charles, Va. (46074). Cape Lookout, N. C. (57817). Savannah, Ga. (155333). Tortugas (92059, 117146), Egmont Key (157553, 157556), and Cape San Blas (44672, 46081), Fla. Horn Island, Miss. (157554). Isle Derniere, La.

(157555). Padre Island, Tex. (157568). Barbadoes (47644). Total examined, 42 specimens 49-167 mm., the largest from off Cape San Blas. Depth records, available for 11 of 13 constituent samples examined, range 93-280 fathoms.

*Comparison.*—This species differs from all other western Atlantic scorpaenids in having very small cycloid scales, in the peculiar structure of the lateral line, in having the upper 3 preopercular spines long, slender, and subequal or nearly so, in lacking the supraocular and postocular spines, and in the virtual presence of 2 dorsal fins. It has notably well-developed cavities at the surface of the head skeleton that are bridged over by the thin membranous skin. It is apparently the most specialized species as compared with the others here treated.

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# INDEX

[Synonyms are printed in *italics*. Page numbers in boldface type refer to main account of species or genus and to the key, the smaller number referring to the latter.]

- 
- agassizi, *Scorpaena*, 12, **24**, 55, 63, 70,  
**71**  
 albifimbria, *Scorpaena*, 2, 20, **25**, **82**  
*albofasciata*, *Scorpaena*, 88, 91  
 Anal fin, discussion, 12  
     frequency distribution, 11, 29  
     third spine, 12  
 Appendages of skin, 16  
*atlantica*, *Scorpaena russula*, 68, 69, **71**  
 Bathystoma, 12  
 beanorum, *Neomerinthe*, 4, **23**, 53, 55,  
**56**  
     preopercular spines, 10  
 beanorum, *Pontinus*, 56  
 bergi, *Scorpaena*, 20, 24, **25**, 63, 65,  
 74, **79**, 84  
 brasiliensis, *Scorpaena*, **24**, 63, **74**, 76,  
 79  
*bufo*, *Scorpaena*, 88, 91  
 calcarata, *Scorpaena*, 8, 12, 23, **24**, 63,  
 64, 65, 67, **68**, 73, 96  
     preopercular spines, 10  
 caribbaeus, *Scorpaenodes*, **21**, **38**, 41  
     preopercular spines, 10  
 castor, *Pontinus*, 8, **22**, 42, 45, 49, 55  
     preopercular spines, 10  
 Characters, taxonomic, 5  
 Cleithral spine, 8  
*colesi*, *Scorpaena*, 74, 75, 76  
 Collections examined, 2  
*colonensis*, *Scorpaena*, 88, 90, 91  
 corallinus, *Pontinus*, 2, 44  
 cristulata, *Scorpaena*, 57, 59, 61  
 cristulata, *Trachyscorpia*, **23**, 58, 60,  
**61**  
     pectoral fin, 13  
     preopercular spines, 10  
 dactyloptera, *Scorpaena*, 30, 32  
 dactylopterus, *Helicolenus*, **30**, 36  
     *Helicolenus dactylopterus*, **21**, **32**,  
     34,  
     *Sebastes*, 26  
     Development, *See* growth changes  
     dispar, *Scorpaena*, **25**, 63, 65, **84**, 97  
     Divergence, degree of, 35  
     Dorsal fin, discussion, 9  
         frequency distribution, 11, 29  
 echinata, *Scorpaena*, 59  
     *Trachyscorpia*, **23**, 58, **59**, 61, 63  
*fasciatus*, *Sebastes*, 26  
 Fin, anal, 11, 12, 29  
     dorsal, 9, 11, 29  
     pectoral, 12, 13, 15, 29  
 floridae, *Scorpaenodes*, 1, **21**, 38, **41**  
 Frontal spine, 7  
 Gill rakers, discussion, 14, 99  
     frequencies, 16, 17, 18, 29, 90, 97  
 Gill slit, fourth, 16  
*ginsburgi*, *Scorpaena*, 88, 90, 92  
*grandicornis*, *Scorpaena*, 7, 20, **24**, 63,  
**77**, 82  
     pectoral fin, 13  
 Growth changes, 1, 2, 9, 12, 27, 39, 46,  
 48, 50, 54, 64, 67, 69, 72, 75, 78,  
 80, 85, 89, 99  
*guntheri*, *Setarches*, 97  
 Haemulon, 12  
 Haemulonidae, 12  
*Helicolenus*, 9, 14, **21**, 26, **30**, 53, 58,  
 dactylopterus, 30  
     *dactylopterus dactylopterus*, **32**  
     *dactylopterus lahillei*, **36**  
     *dactylopterus maderensis*, **33**  
     *thelma*, 33  
     *uruguayensis*, 36  
*hemingwayi*, *Neomerinthe*, 51, 53, 54,  
 55, 73  
*imperialis*, *Sebastes*, 34  
*inermis*, *Scorpaena*, **23**, 63, 64, **65**, 69,  
 70, 96  
 Interopercle, 4, 27, 31, 64

- Interorbital spines, 7  
*isthmenis*, Scorpaena, 74, 79, 80, 81, 82
- Key to the genera and species, 20
- lahillei, *Helicolenus dactylopterus*, 21, 32, 36  
 longispinis, *Pontinus*, 4, 9, 12, 22, 45, 48, 51, 53  
 pectoral fin, 13  
 preopercular spines, 10  
*luckei*, Scorpaena, 65, 67
- macrolepis, *Pontinus*, 22, 44  
 maderensis, *Helicolenus dactylopterus*, 21, 31, 32, 33  
 pectoral fin, 13  
 preopercular spines, 10  
*marina*, *Perca*, 26  
*marinus*, *Sebastes*, 4, 7, 12, 21, 26  
 preopercular spines, 10
- Measurements, methods of, 20  
 table of, 93
- mercatoris*, Scorpaena, 68, 71  
*microlepis*, *Pontinus*, 49, 50, 51  
*microlepis*, Scorpaena, 24, 25, 63, 65, 86, 95
- Mugil, 12
- mystes, Scorpaena plumieri, 9, 25, 87, 88, 90, 92
- Nasal spine, 7  
*nematophthalmus*, *Sebastes*, 49, 51  
 Neomerinthe, 9, 23, 51, 53, 58  
 beanorum, 56  
*hemingwayi*, 53  
 pollux, 53  
*tortugae*, 53  
*norvegicus*, *Sebastes*, 26  
*nuttingi*, Scorpaena, 88, 92
- occipitalis*, Scorpaena, 65, 67  
 Orthopristes, 12  
 Osorioia, 58
- Parietal spines, 7  
*parmatus*, *Setarches*, 4, 7, 9, 15, 25, 97  
 preopercular spines, 10
- Pectoral fin, discussion, 12  
 frequency distribution, 15, 29, 90  
 illustrations, 13
- Perca marina*, 26  
 plumieri, Scorpaena, 5, 6, 20, 25, 63, 64, 65, 79, 80, 84, 86, 95, 97  
 spines on head, illustration, 6  
 plumieri, Scorpaena plumieri, 25, 78, 87, 88, 92, 93, 94  
 pollux, *Neomerinthe*, 8, 23, 53, 57  
 preopercular spines, 10  
 pollux, *Pontinus*, 42, 51, 53, 55, 56  
 polylepis, Scorpaena, 37  
 Scorpaenodes, 37  
*Pontinus*, 5, 9, 13, 16, 22, 42, 53, 64  
 castor, 49  
 corallinus, 44  
 longispinis, 45  
 macrolepis, 44  
*microlepis*, 49  
 rathbuni, 47  
*Pontinus*, beanorum, 56  
 pollux, 53  
 Population, 28, 34, 70, 81, 86, 90  
 porcus, Scorpaena, 63  
 Postocular spine, 7  
 Postorbital spine, 8  
 Posttemporal spines, 7  
 Preocular spine, 7  
 Preopercular spines, 9  
 outline drawings, 10  
 Preorbital spines, 8  
 Pterotic spine, 7
- rascacio*, Scorpaena, 88, 90, 91  
 rathbuni, *Pontinus*, 9, 12, 22, 45, 47  
*russelli*, Scorpaenodes, 38, 39, 40  
*russula atlantica*, Scorpaena, 68, 69, 71
- Scales, discussion, 14  
 frequency distribution, 19, 29, 90  
 spinous, two, 8  
 Scorpaena, 8, 12, 14, 20, 23, 30, 52, 53, 58, 63, 65, 81, 84, 96  
 agassizi, 71  
 albifimbria, 82  
 albofasciata, 88  
 bergi, 79  
 brasiliensis, 74  
 bufo, 88  
 calcarata, 68  
 colesi, 74  
 colonensis, 88  
 dispar, 84

- Scorpaena, ginsburgi*, 88  
*grandicornis*, 77  
*inermis*, 65  
*isthmensis*, 74, 79  
*luckei*, 65  
*mercatoris*, 68  
*microlepis*, 95  
*nuttingi*, 88  
*occipitalis*, 65  
*plumieri*, 86  
*plumieri mystes*, 92  
*plumieri plumieri*, 88  
*porcus*, 63  
*rascacio*, 88  
*russula atlantica*, 68  
*scrofina*, 88  
*similis*, 84  
*stearnsi*, 74  
*tierrae*, 92
- Scorpaena, cristulata*, 59, 61  
*dactyloptera*, 32  
*echinata*, 59  
*polylepis*, 37  
*tridecimspinosa*, 40
- Scorpaenidae, 3
- Scorpaenodes, 3, 5, 7, 8, 16, 21, 37  
*caribbaeus*, 38  
*floridae*, 41  
*polylepis*, 37  
*russelli*, 38  
*triacanthus*, 38  
*tridecimspinus*, 40
- scrofina*, *Scorpaena*, 88, 91
- Sebastes*, 9, 10, 26, 30, 53  
*fasciatus*, 26  
*marinus*, 26  
*norvegicus*, 26  
*viviparus*, 28
- Sebastes, dactylopterus*, 26  
*imperialis*, 34  
*nematophthalmus*, 49
- Setarches*, 9, 14, 65, 97  
*guntheri*, 97  
*parnatus*, 97  
*similis*, *Scorpaena*, 84, 85
- Species included, number of, extra-  
 limital, 2  
 western Atlantic, 2
- Sphenotic spine, 7  
 spine, third anal, 12  
 spines on head, 5, 6,  
   cleithral, 8  
   frontal, 7  
   interorbital, 7  
   nasal, 7  
   parietal, anterior, 7  
     posterior, 7  
   postocular, 7  
   postorbital, 8  
   posttemporal, lower, 7  
     upper, 7  
   preocular, 7  
   preopercular, 9, 10  
   preorbital, 8  
   pterotic, 7  
   sphenotic, 7  
   suborbital, 8  
   supracleithral, 8  
   supraocular, 7  
   terminology, basis of, 8
- stearnsi*, *Scorpaena*, 74, 75, 76
- Subopercle, 4, 26
- Suborbital spines, 8
- Supracleithral spine, 8
- Supraocular spine, 7
- Symphurus, 2
- Synonyms, unusually numerous, 1, 2
- Taxonomic characters, definitions, 5
- Tentacles and other appendages, 16
- thelmae*, *Helicolenus*, 33, 35  
*tierrae*, *Scorpaena*, 92, 94, 95  
*tortugae*, *Neomerinthe*, 53, 54, 55
- Trachyscorpia*, 23, 52, 53, 57, 58  
   *cristulata*, 61  
   *echinata*, 59  
   *triacanthus*, *Scorpaenodes*, 38, 39, 40  
   *tridecimspinosa*, *Scorpaena*, 40  
   *tridecimspinus*, *Scorpaenodes*, 21,  
     38, 40, 42
- uruguayensis*, *Helicolenus*, 36
- viviparus*, *Sebastes*, 28