PONTINUS VAUGHANI
A NEW SCORPAENID FISH FROM BAJA CALIFORNIA

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INTRODUCTION

ICHTHYOLOGICALLY speaking, one of the least-explored parts of North America is Baja California. From the waters along its coast several hitherto unknown species have been collected. One of these, a very distinct kind of rockfish or scorpionfish (a member of the family Scorpaenidae), is described in this contribution. The single specimen, a large adult, was presented to the Scripps Institution of Oceanography by the Hall-Booth Fish Company of San Diego, as Accession No. 1252. The fishermen who took this fish were not consulted, but according to information obtained from the company, the specimen was included among some "rock cod" (*Sebastodes*) that were caught in the Pacific Ocean off Cedros Island on May 14, 1931. The rockfish grounds off this island are on the west side, where an abundance of kelp grows on the rocky bottom in shallow water.

This new scorpaenid belongs to a group that is predominantly deep-sea and tropical. It is one of the few littoral fishes of its type and is one of the northernmost outliers of a fauna that is more tropical than that of southern California. Recent exploration has shown that the shore fauna of northwestern Baja California is distinctly more northerly in its affinities than is the littoral fauna of southern California. As one goes southward from San Diego he finds only southern California fish types, plus a few central Californian species. More tropical types are first encountered in small numbers in the vicinity of Cedros Island. The new species is one of these. Another is a possibly new species of the tropical blenny genus *Malacoctenus,* of which one small specimen, recently reëxamined, was reported from the adjacent San Benito Island by Osburn and Nichols (1916, p. 178). Four other tropical fishes are reported by these authors from Cedros Island.

The species here described was long ago recognized by the senior author as undescribed and as referable to the genus *Pontinus*. Consequently he drew up a description, prepared a drawing (see figure 1), and named the species for Dr. T. Wayland Vaughan, then the Director of the Scripps Institution of Oceanography. The junior author has collaborated in preparing the description, has contributed the discussion of generic reference and has augmented the species comparisons. The authors share the pleasure of dedicating this species to the man who played a leading role in the development of Scripps Institution.

The authorities of the United States National Museum are thanked for privileges extended during a comparative study of the new fish. Type specimens of many of the species were examined.

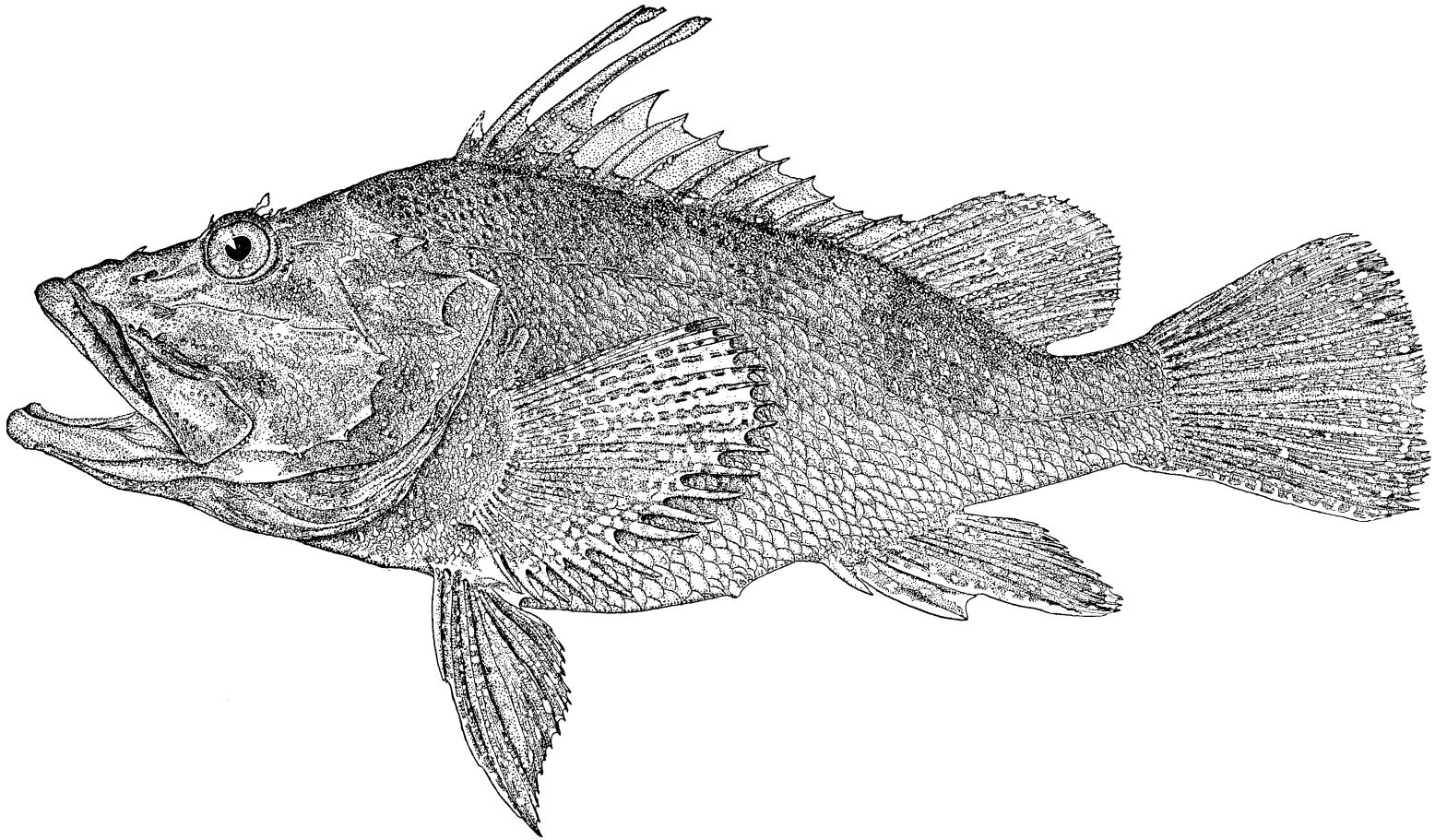

Fig. 1. *Pontinus vaughani* Barnhart and Hubbs, new species. From a drawing by Percy S. Barnhart of the holotype, a specimen 427 mm. in standard length, taken near Cedros Island, Baja California, Mexico.

GENERIC REFERENCE, WITH NOTES ON THE STATUS OF RELATED GENERA AND SPECIES

Pontinus vaughani is so distinct that it might be made the type of a new genus. To do so would be consistent with a tendency toward generic splitting in the Scorpaenidae which has been indulged by certain authors, for instance by Jordan and Evermann (1905, pp. 454–471, pls. 55–56 and col. pls. 71–73, figs. 199–207). We have decided, however, to hold to a more conservative course, at least until the genera of the tropical subfamily Scorpaeninae have been subjected to a general and critical revision.

In the key to the deep-sea genera of Scorpaenidae presented by Goode and Bean (1895, pp. 244–265, figs. 242–249 on pls. 67–70), the fish at hand runs to *Pontinus,* as it also does in the expanded, modified, and often copied generic analysis of the North American scorpaenids published by Jordan and Evermann (1898, pp. 1758–1861, 2 figs., and 1900, pp. 3286–3288, figs. 652–673 on pls. 268–279) and in the key to Atlantic scorpaenid genera given by Norman (1935*b*, p. 21).

Characters consistent with this generic reference include the following: the dorsal fin begins well backward on the nape, far behind the eye, is not deeply notched between the spines and the soft rays, and has 12 spines, which as a group are not elongated; the pectoral fin has a narrow, not markedly procurrent base and none of its rays are either branched or greatly produced; the body is completely scaled and ctenoid scales cover nearly all the head, including the interorbital region; the lateral line is complete; palatine teeth are developed; the bones of the head are scarcely cavernous and the head surfaces are relatively smooth, lacking the deep pits and the abrupt projections that disfigure many of the tropical scorpion fishes. Because the head spines are only moderately developed, the physiognomy suggests the medium-smooth species of *Sebastodes* more than *Scorpaena* and related genera.

The fin-ray formula and the basic fin structure (see Hubbs, 1944), however, agree with the characters recently ascribed (Hubbs, 1945) to *Scorpaena* as contrasted with the *Sebastodes* group. The dorsal rays number XI, I, 9; all soft rays are branched and in the last one the two elements are widely separated. The anal rays are III, 5; all soft rays are branched and the anterior and posterior parts of the last one are closely approximated. The principal caudal rays number 13; 11 are branched and the 2 unbranched rays extend nearly to the tips of the lobes. The pelvic fin has 1 stiff spine and 5 branched rays.

The prominent, four-spined suborbital ridge is another character that suggests a relationship with the *Scorpaena* group rather than with *Sebastodes.*

On currently accepted criteria the lack of branched rays in the pectoral fin excludes the new species from *Helicolenus* Goode and Bean (1895, p. 248), which in many respects it much resembles. The same distinction separates it from the Japanese genus *Hozukius* Matsubara (1934, pp. 200–205, figs. 1 and 4), which was based on *Helicolenus emblemarius* Jordan and Starks (1904, pp. 127, 129–131, fig. 9). Some of the characters of *Hozukius* are given in the key on page 386. The lack of any branched pectoral rays distinguishes *Pon-*

tinus vaughani likewise from the western North Atlantic genus *Neomerinthe* Fowler (1935).

Doubts surround the characters and validity of *Neomerinthe,* and this doubt bears also on the status of *Pontinus* and *Helicolenus.* The peculiar dorsal fin structure of the type specimen of *N. hemingwayi,* the genotype, indicates that the second and third spines were lost by injury, as indeed Fowler suspected. Assuming such an injury, Hildebrand (in Longley and Hildebrand, 1940, pp. 247–251, fig. 13) referred a new species, *tortugae,* with normal dorsal fin structure, to *Neomerinthe* and suggested that *Pontinus beanorum* Evermann and Marsh (1902, pp. 279–280, fig. 85) should also be referred to this genus. As Hildebrand stated, *Neomerinthe* combines a main character of *Helicolenus* (some pectoral rays branched), with one of the features of *Pontinus* (the multispinous suborbital keel), but differs from both in having few, short, spinulate gill rakers on the first as well as on the following arches. He concluded: "It seems probable that species will be found that will bridge the gaps now apparently separating this genus and *Pontinus* and *Helicolenus.*" The gill-raker character may have little generic value, but in this regard the published accounts are not very accurate. Thus the holotype of *Neomerinthe beanorum* has the rakers only slightly less reduced than the other species referred to *Neomerinthe.* Some species still referred to *Pontinus* are described as having short rakers, but probably none of them have the semitubercular rakers of *Neomerinthe.* Thus these structures in *P. sierra* are described as only "about as high as wide," but in the type we find the longest rakers to be about 3 times as high as broad. Only 6 rakers plus rudiments on the lower limb of the outer arch are ascribed to *P. corallinus* and to *P. microlepis* (references are given later), but in the type of the latter species (= *P. castor*) we count 9 rather long to moderately developed rakers. In *Pontinus* the rakers appear to be consistently shorter and fewer than in *Helicolenus,* but not tubercular throughout as in *Neomerinthe.* Provisionally we treat *Helicolenus* and *Neomerinthe* as generically distinct from one another and from *Pontinus.*

In physiognomy and in the squamation of the head *Pontinus vaughani* closely resembles *Neomerinthe hemingwayi* and *N. tortugae.* In these respects *N. beanorum* appears to be transitional between *Neomerinthe* and *Scorpaena.*

In physiognomy the new species is even more suggestive of *Merinthe.* This generic name was first introduced by Snyder (1904, p. 535), in the combination *Merinthe macrocephala* (Sauvage), when he recorded and briefly characterized topotypic specimens from Honolulu, Hawaii. It is therefore attributed to Snyder, though he obviously took it from the monograph on Hawaiian fishes published later by Jordan and Evermann (1905, p. 461, pl. 55). In their key to the genera (p. 455) as well as in their diagnosis (p. 461) those authors misplaced *Merinthe.* They compared it with *Helicolenus* rather than with *Pontinus,* despite its agreement with *Pontinus* in the unbranched pectoral rays and in the multispinous suborbital keel—the very characters by which *Pontinus* differs from *Helicolenus.* In fact, the generic distinction of *Merinthe* from *Pontinus* seems hardly warranted, and we propose to call the type species *Pontinus macrocephalus* (Sauvage). If *Merinthe* should be separated, on such

minor grounds as its distinctive physiognomy, a new genus for our species would also appear to be warranted. *P. vaughani* differs trenchantly from *P. macrocephalus* in the great thickening, elongation, and separation of the second and third dorsal spines. Further differences are the better development of the preopercular spines (the second spine is obsolete in *P. macrocephalus*), the scaly covering of the maxillary, the darker, prominently light-speckled, and less extensively red color, and in other respects.

Pontinus spilistius Gilbert (1905, pp. 633–634, fig. 247) was obviously based on the young of *P. macrocephalus*. The type differs little from other specimens of that species except in characters, such as the large eye, which are attributable to youth. In the holotype and one paratype the second spine on the infraorbital ridge is hardly developed, but probably because of either individual or age variation.

In recent years *P. macrocephalus* has been recorded from regions beyond Hawaii. It also occurs in Honshu, Japan, according to Tanaka (1928, pp. 884–887, pl. 181, fig. 494); Okada, Uchida, and Matsubara (1935, p. 210, col. pl. 119, fig. 2); Okada (1938, p. 222); and Okada and Matsubara (1938, p. 307). Further descriptions of Hawaiian specimens have been published by Fowler (1928, p. 291, pl. 34, fig. *C;* 1931, p. 349). More recently (1938, pp. 73–75, fig. 32) Fowler described this fish from the Philippine Islands as *Nemapontinus tentacularis,* new genus and species. The types, however, have palatine teeth, the supposed lack of which was the only character in which Fowler's description differs from *P. macrocephalus.* Comparison of these types with Hawaiian specimens discloses no differences.

Another species was listed under *Merinthe,* as *M. nematophthalmus,* by Jordan, Evermann, and Clark (1930, p. 372). It was described as *Sebastes nematophthalmus* by Günther (1860, pp. 99–100) on the basis of a stuffed adult, doubtfully from Île de France (Mauritius), and of a half-grown specimen thought certainly to have come from the West Indies. This name was overlooked by Jordan and Evermann in their main account of the North American Scorpaenidae, but was included by them (1898, p. 2861) in their Addenda as *Scorpaena nematophthalma.* The Mauritius specimen was probably an example of *Pontinus macrocephalus.* The smaller one from the West Indies, obviously to be regarded as the type, was reëxamined by Norman (1935*b*, p. 22), who regarded it as "an undoubted *Pontinus.*" It seems to be identical with *Pontinus castor* Poey (1860, pp. 173–174), which is represented in the United States National Museum by two of Poey's specimens, both smaller than his holotype. These specimens (Nos. 24954 and 37566) are almost unbelievably like Hawaiian and Philippine specimens of *P. macrocephalus.* The only difference observed was the obsolescence in the Cuban specimens of the first of the 4 spines on the infraorbital ridge. This appears to be a specific difference. The West Indian species may be known as *Pontinus castor.* Poey's name was published in July, 1860, according to a note on page 427 of his "Memorias." Günther's name probably appeared later in the year, for the preface was signed June 1, 1860. *P. microlepis* Bean (1912, pp. 125–136), from Bermuda, is to be regarded as another synonym of *P. castor,* for the

holotype agrees in all essentials with the Cuban specimens of *P. castor*. *P. vaughani* differs from *P. castor* in the same characters by which it is distinguishable from *P. macrocephalus*.

In some respects *P. vaughani* agrees with the nominal Hawaiian genus *Iracundus* Jordan and Evermann (1903, p. 209; 1905, pp. 470–471, fig. 207). Our species might even be confused with that genus as characterized in Jordan and Evermann's repeatedly inaccurate generic analysis (p. 455). Examination of the description, however, shows that *"Iracundus"* is not closely related to *Helicolenus* and *Pontinus,* as Jordan and Evermann thought, for it differs from those genera in the scaleless top of the head, in the lack of palatine teeth and in the high development of dermal flaps. It disagrees further from *Pontinus* in the branching of some pectoral rays. These characters align *Iracundus* with *Scorpaenopsis,* and we suggest that the type species be called *Scorpaenopsis signifera* (Jordan and Evermann), a new combination.

P. vaughani does not appear to be particularly closely related to any of the six new genera that were recently described and referred to the Scorpaeninae by Fowler in his account of Philippine scorpaenids (1938, pp. 50–89, figs. 19–40). The pluriserial palatine and vomerine teeth and the scaly head and breast separate it from *Scorpaenopsella* (the type of *Scorpaenopsella armata* has a single row of teeth on the palatines and on the vomer, rather than none on the palatines and a triangular band on the vomer, as misdescribed by Fowler). The palatine teeth and the complete lateral line set it apart from *Phenacoscorpius* (also treated by Norman, 1939, pp. 94–95, fig. 29). Numerous characters distinguished *P. vaughani* from *Hipposcorpaena,* which seems to have been misplaced in the Scorpaeninae (the teeth in the type of *H. filamentosa* are not obsolete, as described by Fowler, but form bands on both jaws and a triangular patch on the vomer). *Nemapontinus* has already been disposed of as a synonym of *Pontinus*. The lack of lateral line flaps is the only obvious difference from *Crossoscorpaena* as originally diagnosed. The anal fin formula (III, 5, rather than II, 6), connected dorsals, well-spined head, and ctenoid body scales provide adequate distinctions from *Macroscorpius*. Incidentally, Fowler's description of *Pteropelor* disagrees with both of the stated characters of the new subfamily (*Pterodichthyinae*), to which this genus is referred in his generic analysis. The characters of *Macroscorpius* do agree with that diagnosis. Furthermore, *Brachypterois* was described as lacking the greatly extended dorsal spines that characterize the group in which it is placed, but an examination of the type of *B. serrulifer* indicates that the dorsal membranes were probably incised for more than half their length.

P. vaughani differs from another Indo-Pacific genus recently proposed by Fowler (1939, pp. 1–2), namely *Oligoscorpaena,* in the less developed head armature, the lack of a pit at the vertex, and the scaly head. Disregarding these more trenchant characters, Fowler separated this genus from *Merinthe* solely on the basis of the smaller size of the fish and the shorter snout.

We conclude that the new species from Baja California is most satisfactorily referred, in the present stage of scorpaenid taxonomy, to the genus *Pontinus*. It also seems to be closely related to the species now classed in the genera

Helicolenus and *Neomerinthe*. The generic characters stated in the preceding section obviate the comparison of *P. vaughani* with species referred to any other genera.

SPECIES COMPARISONS

P. vaughani is readily separable from the species that are referred to *Helicolenus* by the complete lack of branched rays in the pectoral fin and by the multispinous suborbital keel. This distinction holds not only for the species of *Helicolenus* treated by Goode and Bean (1895, pp. 248–252, pl. 68, fig. 244), but also for other kinds more recently described from Hawaii (Gilbert, 1905, pp. 631–633, fig. 246), from the Americas (Norman, 1937, pp. 124–126, figs. 68–69; Fowler, 1937, pp. 300–302, fig. 5), and from England (Norman, 1935*a*, pp. 612–613, fig. 1). The Atlantic species of *Helicolenus* were recently revised by Norman (1935*b*, pp. 23–25, 53).

From the western North Atlantic species referred to *Neomerinthe* by Hildebrand (p. 374) *P. vaughani* differs in having no branched pectoral rays, in the slender gill rakers, and in the great specialization of the second and third dorsal spines.

Sharp differences distinguish *P. vaughani* from any of the species described under *Pontinus* by Goode and Bean (1895, pp. 252–259). The eye is smaller and the second and the third dorsal spines are much thickened, elongated, and well set off from the rest of the fin by very deeply incised membranes. In most of their species the eye is about as long instead of little more than two-fifths as long as the snout (or less than two-thirds as long as the snout, if the orbit instead of the eye proper is measured). In *P. filifer,* as described by Goode and Bean, the eye is only two-thirds as long as the snout, and only the second dorsal spine is much produced, though presumably not isolated. According to Norman (1935*b*, p. 22), *P. filifer* is a synonym of *P. kuhli,* in which the eye is described as shorter than the snout and either the second or the third spine (or both) is elongated. In most species of *Pontinus* the outline of the spinous dorsal is rather evenly rounded, though in several, notably *P. longispinis,* the third spine is strengthened and elongated (though not largely free, as the second and the third spines are in *P. vaughani*). Furthermore, the eye and the snout are of subequal length in the described specimens of *P. longispinis,* which, however, are much smaller than the type of *P. vaughani.* According to Hildebrand (in Longley and Hildebrand, 1941, p. 166) the third spine in *P. longispinis* becomes produced only in larger individuals. It is highly improbable, however, that either *longispinis* or any of the other described species of *Pontinus* ever develops into a fish as small-eyed as *P. vaughani,* and none of the other forms exhibits at any age the extreme modification of the dorsal fin that is seen in the large type of *P. vaughani.*

The species of *Pontinus* that have been named subsequent to the publication of Goode and Bean's monograph all seem quite distinct from *P. vaughani.* *P. spilistius* Gilbert from Hawaii and *P. microlepis* Bean from Bermuda are treated elsewhere in this report as synonyms of *P. macrocephalus* and *P. castor,* respectively. In *P. corallinus* de Miranda Ribeiro (1903, pp. 35–37; 1915, pp. 4–5 of Scorpaenidae [pp. 744–747 of the nonconsecutively paged

volume], 1 pl.), from Brazil, none of the dorsal spines are produced and there are said to be only 6 well-developed gill rakers on the outer limb of the anterior arch, instead of about 9 as in *P. vaughani.* In *P. accraensis* Norman (1935*b,* pp. 22–23), from western Africa, the snout is little longer than the

TABLE 1

COMPARISON OF PONTINUS VAUGHANI AND PONTINUS SIERRA, BASED ON HOLOTYPES

	P. vaughani	*P. sierra*
Body form	Deeper, more compressed	Slenderer, thicker
Depth in standard length	2.7	3.0
Width in depth	2.5	1.7
Profiles of snout and top of head	Almost in line	Forming an angle of 16°
Angle between dorsal contour of head and closed mouth	65°	53°
Upper jaw length relative to head length	Nearly two-thirds	Not quite one-half
Height across both lips anteriorly relative to eye length	Nearly equal	About one-third
Anterior process of premaxillary tooth band	Less extroverted, concealed by lip	Rather strongly extroverted, pointed, partly exposed
Inner process at front end of premaxillary tooth band	Well developed, concealed by mandibular teeth	Scarcely developed; no teeth concealed by mandibular band
Relative length of eye and snout	Eye less than half snout	Eye 1.3 in snout
Least interorbital width in orbit	1.5	2.7
Head spines	Less prominent	High and sharp
Infraorbital keel and first preopercular spine	Spine definitely lower	In line
Second preopercular spine	Rather strong	Lacking
Second and third dorsal spines	Thicker, longer, strongly exserted	Not modified
Orbit in height of third dorsal spine	2.5	0.95
Pectoral rays	20	18
Maxillary	Largely scaled	Wholly scaleless
Color over larger part of body	Dark olive	Red
Color of branchial cavity	Dusky	White

eye and only the second dorsal spine is elongated. As was indicated by Longley (Longley and Hildebrand, 1941, p. 161), *Scorpaena bergii* Evermann and Marsh (1902, pp. 273, 276–277, fig. 83), a Puerto Rican species, was wrongly transferred to *Pontinus* by Jordan, Evermann, and Clark (1930, p. 372). The holotype, like Longley's specimens, has 4 branched pectoral rays.

P. vaughani is quite unlike *P. sierra,* the first species of the genus described from the eastern Pacific and the one that most closely approaches *P. vaughani* geographically. *Scorpaena* (*Sebastoplus*) *sierra* was described by Gilbert (1890, pp. 82–83; description repeated by Jordan and Evermann, 1898, pp.

1855, 1859–1860) from the Gulf of California at Albatross stations 2996 (112 fathoms) and 3011 (71 fathoms). The type of *P. vaughani* differs in many respects from the holotype of *S. sierra*. Some of the major distinctions are outlined in Table 1. A few of the differences may be attributable, but in part only, to the discrepancy between the specimens in size: the type of *P. vaughani* is 427 mm. in standard length, that of *P. sierra* (No. 46469, United States National Museum), 189 mm.

Comparison of the type of *P. vaughani* with the original description of *P. strigatus* Heller and Snodgrass (1903, pp. 208–209), from the Galápagos Islands, discloses the following differences. The pectoral rays number 20, not 18. The eye is smaller, 6.8 rather than 3.17 in head, and the snout longer, 2.8 instead of 3.17. The interorbital width is two-thirds rather than one-third the length of the eye. There are 4 rather than 3 spines on the suborbital keel. The upper jaw extends far beyond the vertical from the pupil (which it reaches in *P. strigatus*) and is contained 1.7 instead of 2.0 times in the head. The interorbital space is scaly, not naked. The second and third dorsal spines are much produced and exserted, rather than "third spine highest" and presumably little exserted. The larger part of the body is dark olive, in place of bright red.

P. vaughani differs in much the same characters from the two other eastern Pacific species which have been referred to *Pontinus,* namely *P. furcirhinus* Garman (1899, pp. 51–53, pl. 7), from the Gulf of Panama and from Malpelo and Cocos islands, and *P. dubius* Steindachner (1902, pp. 124–125, pl. 3, fig. 1), from Paita, Peru (see also Evermann and Radcliffe, 1917, pp. 138–139, and Hildebrand, 1946, pp. 448–450). Those are large-eyed, red species (perhaps inseparable), with only the third dorsal spine elevated, but not separated, and with the anterior premaxillary teeth extroverted over a very conspicuous forward-projecting semispherical lobe on either side of the recess into which the symphyseal knob fits. In *P. vaughani* the dentition is only incipiently modified in this direction. In *P. sierra* the projecting tooth lobes are flatter and more pointed. *P. longispinis* of the Atlantic closely resembles *P. dubius* in dentition and in many other respects but differs in that the anterior spine on the preorbital margin points forward.

DIAGNOSIS

Pontinus vaughani is referable to *Pontinus* on the basis of a series of characters already outlined (p. 373). Within the genus its outstanding features are the very large size (to 21 inches over-all); the dark olive color of the back and sides and the many small round light spots covering nearly all surfaces of the head, body, and fins; the rather deep, compressed body; the small eye, little more than two-fifths as long as the snout (orbit 1.7 in snout) and little wider than the interorbital; the large mouth (upper jaw 1.7 in head); the scaled maxillary; the slight forward projection, covered by the lip, of the anterior end of each premaxillary tooth band; the marked inward expansion of this band, above the mandibular teeth, on either side of the semioval space into which the symphyseal knob fits; the quadrispinous suborbital keel, ending

well above the uppermost preopercular spine; the 20 somewhat exserted pectoral rays; and, above all, the much thickened, elongated, and largely free second and third dorsal spines.

DESCRIPTION

The holotype is a well-preserved specimen 21.1 inches long over-all, 427 mm. in standard length. It is deposited in the collections of Scripps Institution of Oceanography (Acc. 1252). The data are given on page 371.

The body is wedge-shaped. The greatest depth (370 thousandths of the standard length),[1] from the origin of the dorsal fin to the insertion of the pelvic, is contained 2.7 times in the standard length (as stepped over the curve of the body). The dorsal contour is rather sharply elevated at the origin of the dorsal and forms there an angle of 150° (measured with an arm protractor). From the tip of the snout to a point on the nape one eye's diameter in front of the dorsal origin the contour is an almost straight line. The orbit projects about 2 mm. and four depressions about 2 mm. deep are situated: (1) just behind the premaxillary; (2) immediately before the nasal spine; (3) in advance of the orbit, and (4) between the tympanic and occipital spines. The dorsal contour takes another obtuse angle (164°) near the junction of the two dorsal fins and thence slopes downward at an angle of 155° with the horizontal until it enters the gentle arc on the top of the caudal peduncle. The least depth (100) of the peduncle is slightly more than one-fourth the length of the head (stepped over the curve) and measures 1.85 in the length (183) of the caudal peduncle. The ventral contour is a rather strong and even curve from the tip of the mandible to the origin of the anal fin (a line perpendicular to the chord enters the chord 7.7 times). An outstanding character is the strong compression of the body: the greatest width (168) across the shoulder girdle, is contained (over the curve) 2.5 times in the greatest depth; the greatest width (97), directly above the anal origin, enters the depth at this point 2.8 times; the greatest width (183) of the head, over the uppermost preopercular spines, steps 2.3 times into the head length and equals the length of the caudal peduncle.

The wedge-shaped head forms in side view an angle of 65° between its straightish dorsal contour and the closed mouth. The length of the head (417) measures 2.4 in the standard length. The jaws are rather massive anteriorly, where the height (59) across both lips approximates the length of the eye. When the mouth is tightly closed the tip of the mandible projects about a millimeter beyond the upper lip. Between the occipital spines the head is nearly flat, but over the middle of the orbit the depression below the orbital rims approximates one-fifth the least interorbital width (56), which nearly equals the length of the eye and is about two-thirds the length of the orbit. The surface of the interorbital region is obtusely elevated outward from a pair of rather strong ridges, which parallel the margins and are set apart a distance

[1] Corresponding figures in parenthesis throughout the description also represent the proportional measurements expressed in thousandths of the standard length. Measurements and counts were taken according to the recommendations by Hubbs and Lagler (1941, pp. 12–20, figs. 2–3).

that approximates one-half the interorbital width. The length (61) of the eye (the greatest diameter across the cornea) is a little more than two-fifths the length of the snout (136) and enters the head 6.8 times. The length of the snout measures 2.8 times in the head. The length of the orbit (81) enters the snout length about 1.7 times and the head length 5.1 times. When measured to the fleshy edge the least suborbital width (70) slightly exceeds half the snout length, but when measured to the lower edge of the bone this width (48) is little more than one-third the snout length.

The spines of the head are moderately strong though relatively weak for a tropical scorpaenid. The strong, convergent nasal spines (separation of tips, 21) project into the contour. The preorbital spines, though rather large, do not project. The bluntish supraorbital spine is nearly flat (in the figure it is hidden by a roll of the conjunctiva). The postorbital and tympanic spines, next in line, are directed about as far outward as backward and enter the contour rather inconspicuously. The tips of the postorbitals are separated by a distance (78) little less than the orbital length. The length (about 54) of the occipital ridges slightly exceeds the least interspace (52) between the origins of the ridges but is much less than the distance (74) between the tips of the terminal spines. On the right side the ridge bears 3 spines increasing in strength backward, but on the left side, apparently as the result of an injury, the first spine is lacking and the second is blunt. Below and behind the tympanic spine is a thick, prominent ridge, which is more than one-fourth as long as the orbit but does not end in a spine. Below this ridge, near the edge of the orbit directly behind the middle of the eye, lie a cluster of several small spines (3 on the left side, 5 on the right). These spines are not connected with definite ridges, but they lie in advance of and just below a strong horizontal ridge that ends in a spine and that lies just above the upper end of the preopercle. Near the orbital rim, farther down, just below and behind the eye, there is developed on the left side a rather strong outward-projecting triangular spine, with a smaller cusp at the lower base, but on the right side there is only a slight tubercle in the corresponding position. Two rather strong spines, on the shoulder girdle near the origin of the lateral line, lie at the end of ridges, which are aligned with the lateral line and are about one-third as long as the orbit. On the right side the more posterior of these spines is tricuspid. Above the first of these ridges is another, more oblique ridge that also ends in a spine. The shoulder girdle above the pectoral fin bears a very flat bony ridge which is directed more upward than backward and ends in 2 flat spines. The rather strong suborbital keel bears 4 spines, of which the first, on the preorbital, is obsolescent on the right side. Between the first and second spines the ridge is arched upward. Before the origin of the ridge, on the preorbital, are 2 other, nonspinous ridges, divergent forward. Another similar ridge lies below the first spine of the suborbital keel. The 2 strong triangular spines on the preorbital edge project downward and slightly backward. The suborbital keel ends in a spine well above the upper preopercular spine (the interspace, measured from the projection of the last segment of the keel, is nearly half the interval between the last two suborbital spines). The uppermost of the 5

preopercular spines is by far the strongest. The ridge of the right side bears a secondary spine. The broadly triangular third spine is next strongest (it is injured on the left side). The second spine, also rather strong, is much nearer to the first than to the third. The fourth is also strong and directed backward. The fifth and lowest is weak on the left side and obsolescent on the right. The moderately strong opercular spines (distance apart, 46) lie at the end of slightly divergent ridges.

The mouth is large. The upper jaw extends to the vertical that passes through the posterior rim of the orbit. Its length (244) enters the head 1.7 times, and slightly exceeds the length of the mandible (237). The greatest bony width of the maxillary (54) nearly equals the least interorbital width. On the surface of the maxillary, nearer to the trenchant upper edge than to the lower edge, is a broad, flat ridge. The angle between the upper and the posterior borders of the maxillary is 70°.

The teeth are in villiform bands on the jaws and on the vomer and the palatines. Medially the premaxillary band is strongly arched; anteriorly, under the cover of the upper lip, it becomes moderately expanded and gibbous on the outer edge, obliquely truncated in front, and markedly expanded on the inner side behind the large semioval space that receives the rather strong symphyseal knob. Except on this projection the premaxillary teeth lie outside those of the mandible when the mouth is closed. The vomerine band is very narrow posteriorly but broadens anteriorly just behind the anterior semicircular section. The palatine band, which is weakly arched inward, is very narrow though slightly expanded toward the very weakly incurved posterior end and moderately dilated toward the inward-hooked anterior end.

In thousandths of the standard length the tooth bands have the following dimensions. Premaxillary band: width near middle, 11; greatest width anteriorly, 20; width at anterior recess, 14; distance between tips of anterior mesial projections of the two sides, 18; least distance between bands, 16; length of band, 145. Mandibular band: least width, 5; width just behind symphyseal knob, 11; across symphyseal knob, 17; least distance between bands, 3; length of band, 164. Vomerine band: distance between ends of the two arms, 42; chord of anterior semicircular expansion, 11; length of left arm, 11. Palatine band: least width, 4; width of posterior expansion, 5; width of anterior expansion, 8; length of band, 18.

There are 6 branchiostegals. The pseudobranchiae, though short, form a row one-fourth as long as the head. The gill rakers on the outer arch number $7 + 1 + 13 = 21$. Above the angle are 2 well-developed rakers and 5 spiny tubercles. Below, about 9 might be termed developed rakers; the other 4, spiny tubercules or plates. The longer rakers are about 3 times as high as broad. The longest one (32), at the angle, is about two-fifths as long as the orbit.

The body is covered with finely ctenoid scales, and on the average about two-thirds of the surface of each scale is covered by small accessory scales, also strongly ctenoid. The rows, rather irregular and difficult to count, number 8—39 (very oblique rows) or 62 (subvertical rows)—28. The lateral line has 28 pores (to caudal base). Near the tip on each side the chin is perforated

by a round pore, and following this are 5 slitlike pores of which the last 2 lie between the fourth and fifth and between the third and fourth preopercular spines. Scales like those of the body, but somewhat smaller, cover all the opercles, the postorbital region and the cheeks. Ctenoid accessory scales occur over these areas in abundance and somewhat similar minute ctenoid scales, becoming almost shagreen-like anteriorly, cover the interorbital region and extend thence forward to near the nasal spines, and such scales also occur on the suborbital and preorbital regions. Before the nasal spines, on the lips, and on the anterior half of the mandible are numerous somewhat scalelike villi and fimbriae. Small to minute ctenoid scales cover most of the maxillary except near the edges. Small scales roughen the upper surface of the eyeball and the edge of the branchiostegal rays. Minute ctenoid scales cover most of the outer surfaces of nearly all the fin rays, including the dorsal spines and also the pectoral rays, except where the 11 lower rays are thickened.

For a scorpaenine this specimen's dermal filaments are scantily developed. The supraorbital cirrus (length, 23) has a subcylindrical base with a much flattened, expanded, and somewhat fimbriate tip. A slenderer and shorter cirrus rises from the preorbital spine and a minute one is attached to the postorbital spine. Very small dermal flaps are associated with the 3 lower preopercular spines. A fimbriated flap on the upper half of the posterior border of the anterior nostril overlaps the anterior fourth of the large posterior nostril. No cirri are apparent on the body and some of those on the head are not apparent on the right side.

The fin-ray formula and the basic fin structure is indicated on page 373. The dorsal fin originates directly over the edge of the opercular bone at the deepest point of the indentation between the opercular spines. The distance (133) from the slight groove at the occiput to the origin of the dorsal is nearly equal to the length of the snout. The anal fin begins vertically below the second dorsal soft ray, at a distance (89) behind the middle of the anus about equal to the base of the soft part of the anal fin. The pelvic is inserted just below the lower end of the pectoral base.

The outstanding feature of the fins is the great thickening and elongation of the second and third dorsal spines and particularly the great exsertion of these rays. The membranes are deeply indented behind these spines and become reduced to a slight membranous keel along the middle of the posterior edge of the spine. Distally each of these membranes becomes expanded into a thick, leathery flap that projects beyond the bony point. The first dorsal spine is broken, but it appears to have been less than one-fourth as long as the second. The second spine may be even longer in most specimens, since in the type it is twisted, perhaps as the result of an injury. In this specimen it is as long as the postorbital part of the head. The third spine is a little longer than the second.

Dimensions of the dorsal spines in thousandths of the standard length follow. Second spine: length (measured as for other spines from extreme base on left side), 204; width near base, 10; greatest width, about two-fifths of way out, 13. Third spine: length, 208; width at corresponding points same as second

spine. Fourth spine: length, 127; maximum width on left side, 7 (the right side is wider, as the spines are heteracanthous). Fifth spine: length, 109; greatest width, 8 (less on right side). Lengths of subsequent spines: sixth, 107; seventh, 102; eighth, 91+ (injured at tip); ninth, 91; tenth, 68+ (tip broken); eleventh, 66; twelfth, about 82 (reconstructed at tip).

The heights of the dorsal membranes at the front of each spine, measured from the junction of fin and body at the front of the spine, and expressed as a percentage of the length of the spine (measured as indicated above), are as follows: second, 7; third, 19; fourth, 45; fifth, 66; sixth, 76; seventh, 88; (eighth and tenth broken); ninth, 95; eleventh, 92; twelfth, 66.

The soft dorsal fin is abruptly higher than the last dorsal spines. The length (169) of the fourth, the longest ray, slightly exceeds two-fifths the head length. The caudal fin (length, 254) has a gently rounded posterior border. The second anal spine is much thicker than the third. The proportional lengths of the anal spines, in thousandths of the standard length, are: first, 53; second, 126; third, 116. The soft portion of the anal fin is high and pointed. The length (221) of the second, the longest ray, is slightly more than half the head length.

The pectoral fin has a relatively narrow base. The width (114) is much less than half the length (246) of the eleventh and longest ray, which is as long as the head behind the middle of the eye. The base is slightly inclined but the lower rays are not markedly procurrent. All 20 rays are unbranched, even at the extreme tip. All membranes except the uppermost are incised, as is shown in the figure. The deepest incision, below the fourteenth ray, is one-third the length of that ray. The lower 11 rays are considerably swollen distally over a length about equal to that of the orbit. Where they are most swollen these rays are 2 to 3 times as thick as they are basally. The pectoral extends slightly behind the vertical from the anus.

The pelvic fin reaches more than nine-tenths the distance to the anus, therefore not as far backward as the pectoral. The tip of the pelvic is sharply pointed. The length (254) of the fin, from its insertion to the tip of the second ray, enters the head length about 1.7 times.

When fresh the specimen was olive-green over the head, back, sides and fins, becoming somewhat darker on the back, particularly in four blotches. The first dark area lies below the first 4 dorsal spines; the second lies below the last 6 spines and is extended rather indistinctly onto the fin. This blotch narrows downward and is somewhat intensified along the lateral line. It is slightly lighter medially near the dorsal fin. The most prominent blotch extends from the third to the ninth dorsal soft rays and then downward in a squarish area to just below the lateral line. The fourth dark blotch is on the upper part of the caudal peduncle. The lips, the gular region, and the lower parts of the body were bright red. The entire body and fins are finely speckled with small blue-white spots, which become especially conspicuous on the upper part of the shoulder girdle, on the maxillary, and on the adjacent part of the suborbital region, because in these regions most of the spots are sharply outlined with dark rings. On the spinous dorsal the spots are similarly ringed and somewhat enlarged, but are reduced in number and are largely confined to the extreme

base of the fin and to a few spots along the spines. The darkened base is separated from the rest of the fin by a fine line. On the other fins the spots increase in size and distinctness outward. The caudal becomes particularly dark outward between the spots, and a similar tendency is seen in the other fins. The lower edge of the caudal, the front edge of the anal and pelvic fins, and the thickened part of the pectoral rays are largely clear or whitish. The outer face of the mandible, the hidden areas of the gular membranes, the concealed membranes of the premaxillary and the maxillary, and the branchiostegal regions, are all dark and well-spotted with light, but the inner face of the mandible and the concealed parts of the lower lip are whitish. The lining of the buccal cavity is clear white; that of the branchial region is finely blotched with dark.

SUMMARY AND CONCLUSIONS

Pontinus vaughani, a distinct new species of the fish family Scorpaenidae, is described in detail from Cedros Island, off the west coast of Baja California, Mexico.

The generic reference is doubtful, because the characters of the new species are highly distinctive and because the taxonomy of the group is somewhat confused. To avoid creation of a new genus for the species, it is referred to *Pontinus.* Its most striking feature is the great thickening, elongation, and exsertion of the second and third dorsal spines. The very small eye, the distinctive coloration, and other characters distinguish it from all described forms of *Pontinus* and of other closely related genera, such as *Helicolenus, Hozukius* and *Neomerinthe.* The distinctive features may be summarized in key form, as follows:

SUMMARY COMPARISON OF PONTINUS VAUGHANI WITH OTHER SPECIES OF PONTINUS AND WITH RELATED GENERA

1a.—Several branched rays in pectoral fin.
  2a.—No spine, or only one spine or two weak ones, on sides of suborbital bones. Gill rakers numerous and relatively slender.
    3a.—Top of skull smooth. Bony margin of orbit smooth.
      A suborbital keel developed, anteriorly at least. . . . . Genus *Helicolenus*
    3b.—Top of skull cavernous. Bony margin of orbit spinulate.
      No suborbital keel. . . . . Genus *Hozukius*
  2b.—Suborbital keel multispinous. Gill rakers few and tubercular. . . . Genus *Neomerinthe*
1b.—No branched rays in pectoral fin.
  2c.—Suborbital keel multispinous. Gill rakers relatively few and moderately short, but not tubercular. . . . . Genus *Pontinus*
    4a.—Spinous dorsal rounded, or with second or third spine, or both, somewhat thickened and elongated, but not much exserted. Eye much more than two-thirds as long as snout. Mouth smaller (upper jaw contained more than 1.7 times in the head). Color largely red (in most species), never with numerous small light spots. Maximum size less than 20 inches. . . . . All other species of *Pontinus*
    4b.—Second and third dorsal spines much thickened, produced and largely exserted (free from membranes). Eye little more than two-thirds as long as snout. Mouth larger (upper jaw contained 1.7 times in the head). Color largely dark olive, with numerous small light spots. Maximum size more than 20 inches. . . . . *Pontinus vaughani*

In treating the generic reference it is concluded that *Merinthe* should be synonymized with *Pontinus* and that *Iracundus* be made a synonym of *Scorpaenopsis*. The type species of these nominal genera therefore receive new name combinations, respectively *Pontinus macrocephalus* and *Scorpaenopsis signifera*. *Neomerinthe* is provisionally retained as distinct from *Helicolenus* and *Pontinus*. *Pontinus spilistius* from Hawaii and *Nemapontinus tentacularis* from the Philippines are synonymized with *Pontinus macrocephalus*. *Sebastodes nematophthalmus* from the West Indies and *Pontinus microlepis* from Bermuda are referred to *Pontinus castor*. That West Indian species is remarkably like the Indo-Pacific *P. macrocephalus*. Descriptions of the dentition in Philippine scorpaenids are corrected.

ADDENDUM

On the day that the page proof for this paper was returned, there was received the monumental "Studies on the Scorpaenoid Fishes of Japan—Anatomy, Phylogeny and Taxonomy" (Transactions of the Sigenkagaku Kenkyusyo, Nos. 1–2, 1943, pp. 1–486, figs. 1–156, pls. 1–4), by Kiyomatsu Matsubara. This monograph bears significantly on several points raised in the present paper.

Merinthe macrosephala is described in detail (pp. 286–290, figs. 96, 97) from Japan, Hawaii, and Pelew Island. *Merinthe* is recognized as a distinct genus, for it was not appreciated that its type species (*macrocephala*) is barely separable from the type (*castor*) of *Pontinus*. This point was also not clearly recognized in the present paper. If a generic division of *Pontinus* should be made, *Merinthe* would remain in *Pontinus* and most of the species would be separated as *Sebastoplus* (type species *kuhlii*).

On the basis of apparently significant differences in the structure of the suborbital bones and associated lateral line structures, Matsubara classes *Helicolenus* and *Hozukius* in the Sebastinae and keeps *merinthe* (=*Pontinus*) in the Scorpaeninae. It will be interesting to determine how the species of *Neomerinthe,* which seem to combine characters of *Pontinus* and *Helicolenus,* fit into this scheme.

A key is given (p. 261) to the known species of *Helicolenus*. *Macroscorpius* is placed as a second genus of the new subfamily Setarchinae (pp. 359–388).

Matsubara describes *Pontinus* (on pp. 282–283) and separates it from *Merinthe* (p. 267) on the basis of a single Japanese specimen which he refers to the nominal Hawaiian species, *Pontinus spilistius*. This is the form which we regard as having been based on the young of *Pontinus macrocephalus* (*Merinthe macrocephala*). The Japanese specimen has the upper pectoral rays branched and is therefore separable not only specifically but also generically from *Pontinus*. It also has a strongly spined suborbital ridge and short, blunt gill rakers. For these reasons it is to be referred provisionally to *Neomerinthe*. It represents an apparently unnamed species, obviously distinct from the Atlantic forms which have constituted that genus.

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