

REDESCRIPTION AND RELATIONSHIPS OF
PARASPHYRAENOPS ATRIMANUS BEAN (PISCES: SERRANIDAE),
WITH DISCUSSION OF OTHER BERMUDIAN FISHES
KNOWN ONLY FROM STOMACH CONTENTS

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ABSTRACT

Parasphyraenops atrimanus Bean, an apparent Bermuda endemic known only from two specimens, is redescribed. Originally placed in the Cheilodipteridae, *P. atrimanus* is shown to be a planktivorous serranid belonging to the subfamily Serraninae. It is hypothesized to be most closely related to *Serranus incisus* and *S. luciopercanus*, based on unique modifications of the infraorbital series. A novel specialization of *P. atrimanus* is the configuration and articulation of its lacrimal, but otherwise this fish is remarkably similar to *S. incisus*, also a planktivore; the two species exhibit at least seven synapomorphies. Accordingly, we assign *S. incisus* to *Parasphyraenops*. Two additional fish species, *Sebastes paucispinis* and *Cepola* sp., recorded from Bermuda solely from stomach contents, are discussed.

The primary purposes of this paper are to redescribe a poorly known seabass, remarkable in possessing a novel modification of the lacrimal, and to discuss its phylogenetic relationships. When Bean (1912) described *Parasphyraenops atrimanus*, he assigned it to the Cheilodipteridae; until now, its affinities with the Serranidae have remained unrecognized. Apparently endemic to Bermuda, *P. atrimanus* is known from only two specimens collected by L. L. Mowbray on 14 January 1909 from the stomach(s) of *Seriola falcata* (= *S. rivoliiana* Valenciennes) taken at a depth of 43 fathoms (79 m) on Argus Bank, Bermuda (31°59'N; 65°11'W). The smaller of the two specimens mentioned in the original description is presumed to be lost. The terete body, reduced dentition and numerous long gill rakers indicate that *P. atrimanus* is a particulate planktivore that forages in the water column. That no additional specimens have been collected suggests that it probably lives in moderately deep, rocky areas inaccessible to trawling and most recreational SCUBA activity. Its closest relative, *Serranus incisus* Colin, described from Jamaica and Puerto Rico, is known only from a few specimens collected "on steep slopes or vertical faces on the edge of island shelves at depths of 30-60 m" (Colin, 1978).

We take this opportunity to document and discuss two unexpected and zoogeographically significant records of fishes from Bermuda, that are also based exclusively on stomach contents. A complete summary of all Bermudian shore fishes is now in preparation by the junior author.

MATERIALS AND METHODS

Counts and measurements follow the methodology of Robins and Starck (1961), and values given for species other than *Parasphyraenops atrimanus*, *Serranus luciopercanus* and *S. incisus* are taken from those authors. The following is a list of material examined. Number of specimens is in parentheses. Cleared and stained specimens are designated by a C following the number of specimens. Specimens from which the right infraorbital series was removed and cleared and stained are designated by CI. Infraorbitals were examined by superficial dissection on all other specimens. Institutional abbreviations are those recommended by Leviton et al. (1985).

Bullisichthys caribbaeus, USNM 204940 (1 C). *Centropristis striata*, GMBL 259-FB-70 (1 C). *Diplectrum formosum*, USNM 211264 (1). *Dules auriga*, USNM 77310 (1). *Paralabrax nebulifer* USNM 26754 (1). *Parasphyraenops atrimanus*, USNM 74085 (holotype, 1 CI). *P. incisus*, ANSP 145219 (4 +

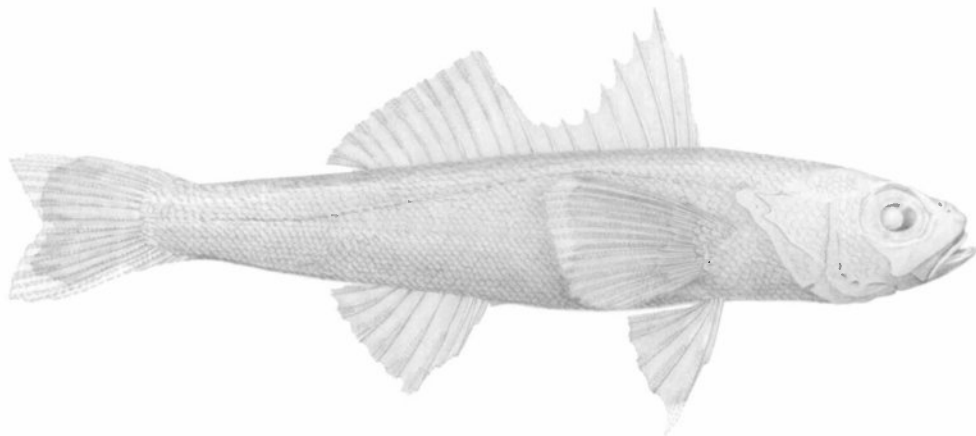


Figure 1. *Parasphyraenops atrimanus*, USNM 74085, 83.8 mm SL, Argus Bank, Bermuda; dorsal-fin pigmentation not shown. (Drawn by Penelope K. Hollingsworth.)

1C). *Schultzea beta*, USNM 18900 (1); USNM 189002 (3 C). *Serraniculus pumilio*, ANSP 120603 (1). *Serranus annularis*, ANSP 133370 (1); ANSP 149182 (1). *S. atricauda*, ANSP 114579 (1). *S. atrobranchus*, ANSP 100200 (1). *S. baldwini*, ANSP 144929 (1). *S. cabrilla*, ANSP 13405 (1 CI); USNM 269884 (1 C). *S. psittacinus*, USNM 181272 (1). *S. flaviventris*, ANSP 105675 (1); USNM 170011 (1). *S. hepatus*, ANSP 149182 (1); USNM 218887 (1 C). *S. huascarii*, USNM 200375 (1). *S. luciopercanus*, ANSP 143825 (1 C); ANSP 83650 (2); ANSP 144700 (1); USNM 4667 (2); USNM 9840 (1); USNM 156961 (1). *S. notospilus*, ANSP 100480 (1). *S. phoebe*, ANSP 148023 (1). *S. scriba*, ANSP 95125 (1). *S. subligarius*, ANSP 86331 (1); USNM 184232 (1). *S. tabacarius*, ANSP 112421 (1); ANSP 121720 (1 C). *S. tigrinus*, ANSP 11902 (1). *S. tortugarum*, USNM 185039 (1).

Parasphyraenops atrimanus Bean

Figure 1

Parasphyraenops atrimanus Bean, 1912: 121 (original description; holotype USNM 74085, 83.8 mm SL; type locality Argus Bank, Bermuda); Jordan, Evermann and Clark, 1930: 297 (listed); Beebe and Tee-Van, 1933: 117 (description; unnumbered fig.); Collette, 1962: 441 (listed, doubtful endemic); Norman, 1966: 242a (listed, placed in *Apogonops* Ogilby).

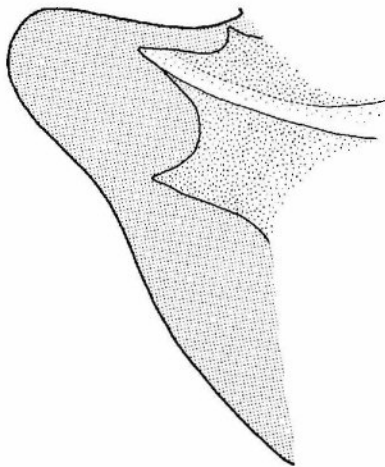


Figure 2. Right opercle and membranous subopercular flap of *Parasphyraenops atrimanus*.

Description (based only on holotype). — Dorsal fin X,10; anal fin III,6; pectoral fin 17-17; pelvic fin I,5; caudal fin 9+8 principal, 10+9 procurent rays; branchiostegal rays 7; gill rakers damaged, 9+19 (+?); pyloric caeca 6.

Measurements of the holotype, 83.8 mm SL, in percent standard length: head length 31.6; postorbital head length 16.5; snout length 5.8; eye diameter 9.5; predorsal length 33.2; prepelvic length 32.8; preanal length 61.7; depth at anal-fin origin 18.0; minimum depth at caudal peduncle 10.0; fleshy interorbital width 8.0; pectoral-fin length 23.9; pelvic-fin length 18.4; depth, pelvic-fin origin to dorsal-fin origin 20.9; first dorsal-fin spine length 3.9, second 14.7, third 19.3, eighth 6.2, ninth 5.8, tenth 10.3; first anal-fin spine length 3.3, second 8.8, third 10.6.

Spinous dorsal fin deeply notched; third spine longest, first shortest, eighth and ninth subequal, slightly more than half length of tenth and shorter than all others except first. Third anal spine longest, first shortest, second most robust. Dorsal and anal soft rays progressively shorter posteriorly. All caudal fin rays broken. First (anterior) pelvic soft ray longest, all rays branched near mid-length or closer to base. Dorsalmost one and ventralmost two pectoral rays unbranched, all others branched near tips.

Opercle with three spines, uppermost very small and embedded in skin; middle spine turned upward slightly and somewhat larger than lower (Fig. 2). Posterior margin of upper limb of preopercle serrate; fine serrations on ventral margins of interopercle posteriorly and subopercle anteriorly.

Body entirely covered with small ctenoid scales. Scales on head mostly missing, but presence of scale pockets indicates scales were probably present on all opercular bones and cheek; a finger-like patch of overlapping indentations, reminiscent of scale pockets, along dorsal midline of postorbital region of cranium, similar in shape and position to the scale patch of *Serranus incisus*; no evidence of scales at bases of dorsal and anal fin rays; ctenoid scales extend well out onto bases of caudal fin rays; apparent scale pockets in skin at bases of pectoral-fin rays indicate scales may have been present. Lateral-line scales ca. 49; circumferential caudal peduncle scales ca. 36; cheek scale rows 5–6.

Dentition reduced or absent; a single row of tiny conical teeth in each jaw; vomer and palatines edentulous. Upper jaw protrusible; no supramaxilla; maxilla almost completely concealed by enlarged lacrimal with mouth closed. Lacrimal expanded ventrally and extending posteriorly along ventral margin of third infraorbital to posterior margin of orbit; second infraorbital absent; lacrimal laterally mobile, articulating with lateral ethmoid by means of a large, dorsomedial, hook (Fig. 3D).

Vertebrae 10+14; 3 epurals, 1 uroneural pair, 1 parhypural, 5 hypurals, procurent spur absent; predorsal pattern 0/0/0+2/1+1/; proximal-medial radials fused in all dorsal- and anal-fin pterygiophores.

Pigment described by Bean (1912) still evident, consisting of a large black blotch in basal third to half of spinous-dorsal fin between bases of second to fifth spines and another blotch in axil of pectoral fin; head, body and remainder of fin pale yellowish brown.

Condition of specimen precluded determination of sex. We were unable to determine the sex of the single specimen.

Relationships. — Without explanation, Bean (1912) placed the monotypic *Parasphyraenops* (gender: masculine) in the Cheilodipteridae and stated that it is allied to *Scombrops*. Norman (1966) incorrectly listed *Parasphyraenops* as a synonym of the Australian genus, *Apogonops*; Fraser (1972) considered its family allocation

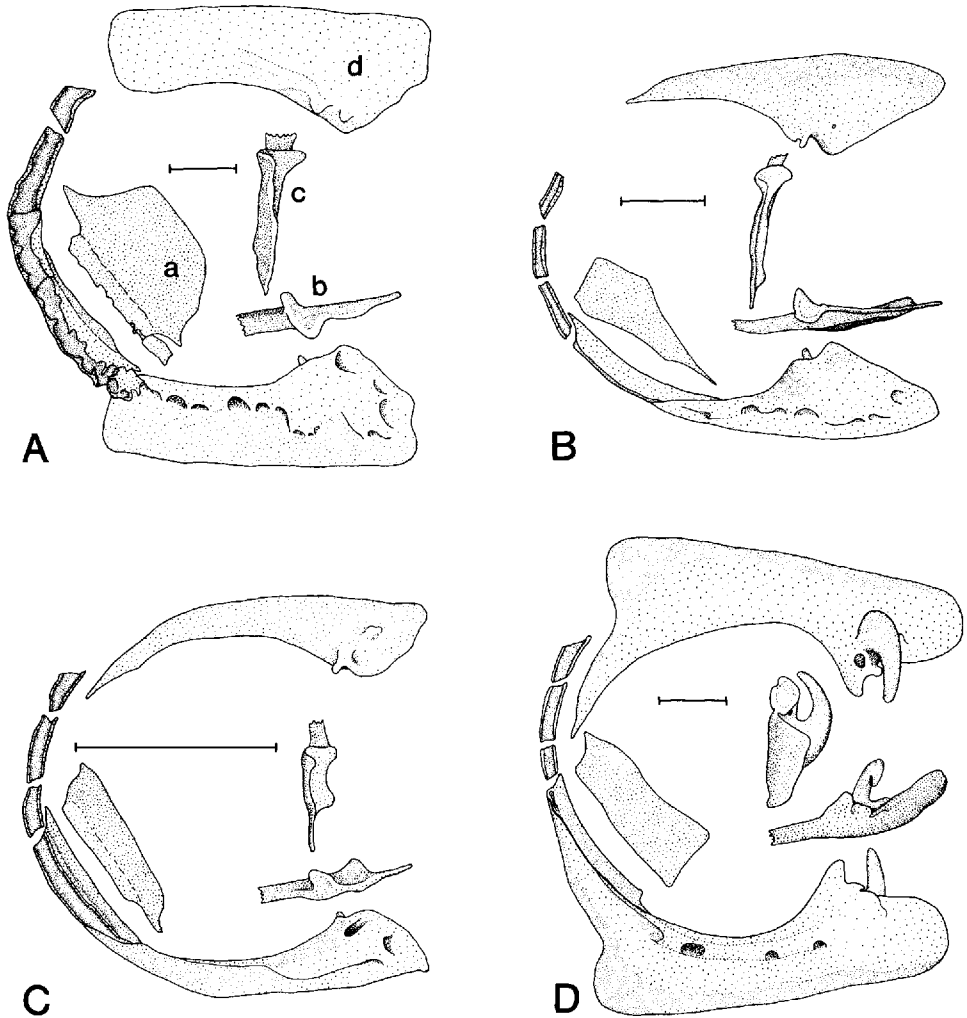


Figure 3. Right infraorbital bones of selected serranids: A, *Serranus cabrilla*, ANSP 13405, 101 mm SL; B, *S. luciopercanus*, ANSP 143825, 51.0 mm SL; C, *Parasphyraenops incisus*, ANSP 145219, 26.2 mm SL; and D, *P. atrimanus* (a = dorsal view of third infraorbital; b = anterodorsal view of lacrimal; c = frontal view of lacrimal; d = mesial view of lacrimal; scale = 2.0 mm).

to be uncertain. There have been no subsequent considerations of the affinities of *Parasphyraenops*.

Parasphyraenops is a member of the Serranidae as defined by Johnson (1983). It shares the single innovative and at least two of the three reductive specializations that characterize that family: three opercular spines; procurrent spur absent; a single uroneural pair. Presence or absence of the third preural radial cartilage could not be determined. Within the Serranidae, the affinities of *Parasphyraenops* lie with the Serraninae. It lacks the specialized first dorsal pterygiophore that defines the Epinephelinae (Johnson, 1983) and the specialized scales (McCully, 1961 and Johnson, 1984: 483) and arched lateral line that characterize most members of the Anthiinae. The scales of *Parasphyraenops* (Fig. 4) are identical

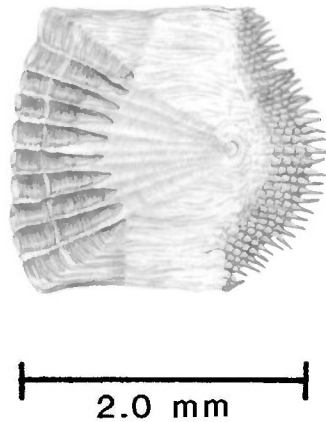


Figure 4. Scale of *Parasphyraenops atrimanus* (from area between anal fin and lateral line).

to those described by McCully (1961) for the Serraninae. In these scales, amputation (or resorption) of the distal tips of the scalelets (ctenii) appears to be stimulated by the laterally projecting alae at the bases of the scalelets in each succeeding row.

Within the subfamily Serraninae, *Parasphyraenops* is most closely related to two species currently placed within the poorly defined genus *Serranus*, *S. luciopercanus* Poey and *S. incisus*. Robins and Starck (1961) listed 17 characters that "in part" define the genus *Serranus*. Few, if any, of these characters are derived for the Serraninae and, among serranines, none is unique to the species currently placed in *Serranus*.

Robins and Starck (1961) described and illustrated the distinctive opercular spination of *S. luciopercanus* wherein the middle spine is curved upward, and the upper spine is considerably reduced and embedded in the skin. This condition also characterizes *P. atrimanus* and Colin (1978) reported that it is found elsewhere within western Atlantic *Serranus* only in *S. incisus*. Opercular spine configuration may be a synapomorphy of these three species; however, we note that the middle opercular spine points slightly upward in other species, such as *S. hepatus* (Linnaeus) and *S. maytagi* Robins and Starck, but it is not quite so strongly curved and the upper spine is not reduced. In some specimens of *Schultzea beta* (Hildebrand) the middle opercular spine is curved upward, and again, the upper spine is not reduced. In view of the subjectivity in characterizing opercular spine configuration and the observed intraspecific variability, we question the phylogenetic significance of this character.

The most convincing evidence in support of a species group comprising *Parasphyraenops*, *S. luciopercanus* and *S. incisus* is the shared presence of a unique modification of the infraorbital series (Figs. 3B–D). These species lack the second infraorbital, and there is a pronounced overlapping articulation between the third infraorbital and the lacrimal, the latter tapering to a point posteriorly. In all other serranines examined (see material examined), the second infraorbital is present (although small), the lacrimal is not pointed posteriorly, and there is little or no overlap between the lacrimal and the third infraorbital (Fig. 3A).

Gill (1862) erected the genus *Mentiperca* (gender: feminine) for *S. luciopercanus* based on its prominent lower jaw and few pyloric caeca. Neither *S. incisus* nor *P. atrimanus* has a prominent lower jaw, and, although they share a low number

Table 1. Comparison of serranine genera, *Parasphyraenops*, *Serranus* and *Schultzea*

Character	<i>Parasphyraenops</i>		<i>Serranus</i>		<i>Schultzea beta</i>
	<i>atrimanus</i>	<i>incisus</i>	<i>luciopercanus</i>	Other	
Second infraorbital	absent	absent	absent	present	present
Lacrimal shape posteriorly	pointed	pointed	pointed	truncate	truncate
Lacrimal hook	present	absent	absent	absent	absent
Postmaxillary process	narrow	narrow	broad	broad	very narrow
Dorsal-fin rays	X, 10	X, 10	X, 12	X, 12-15	X, 11-12
Dorsal-fin margin	deeply notched	deeply notched	weakly notched	even, or weakly notched	weakly notched
Anal-fin rays	III, 6	III, 7	III, 7	III, 7	III, 7
Pectoral-fin rays	17	17	14	13-17	16
Gill rakers	28	28	20-24	14-25*	29-39
Branchiostegal rays	7	7	7	7	6
Vomerine and palatine teeth	absent	absent	present	present	absent
Jaw teeth	uniserial, reduced	uniserial, reduced	bands, enlarged	bands, enlarged	absent
Body depth (% SL)	21	21-23	26-32	26-39	21-24
Snout length (% SL)	6	6	11-14	7-14	7-8

* Except 27-31 in *S. tortugarum*, 28-34 in *S. novemcinctus* and 26-29 in *S. aequidens*.

of caeca (6) with *S. luciopercanus*, the same number is common in other *Serranus*. Nonetheless, the name *Mentiperca* is available for these three species and, perhaps, should be applied in light of their uniquely specialized infraorbitals. However, we believe this nomenclatural change would be premature pending a detailed anatomical study and full revision of *Serranus* and related genera. Assignment of these three species to *Mentiperca* based on their hypothesized monophyletic origin will result in a generic concept considerably different from those currently applied in the Serraninae. In all features, except infraorbital modification and opercular spination, *S. luciopercanus* resembles a typical bass-like serranine; the other two species differ strikingly from the typical serranine physiognomy, in having terete bodies and an array of specializations associated with foraging in the water column (see below). Nonetheless, with further corroboration of their hypothesized monophyly, placement of these three species in *Mentiperca* would be merited.

P. atrimanus and *S. incisus* share several specializations that are not found among other species of *Serranus*, and we conclude that they are sister species (Table 1). Accordingly, we formally recognize this relationship by assigning *S. incisus* to *Parasphyraenops*. We take special note that if our hypothesis that *Serranus luciopercanus* is the sister taxon of *Parasphyraenops* is correct then recognition of *Parasphyraenops* would make *Serranus* a paraphyletic genus. However, as previously discussed, *Serranus* is a "catch-basket" assemblage of species currently undefinable on the basis of derived characters (refer also to our discussion above of *Mentiperca*). We hypothesize that the following are synapomorphies of *Parasphyraenops atrimanus* and *P. incisus*:

1) The vomer and palatines are edentulous. Colin (1978) reported small teeth on the vomer and palatines of *P. incisus*, but examination of the holotype and five additional specimens, including one cleared and stained, reveals that teeth are lacking on these bones. Teeth are present on the vomer and palatines of all other species of *Serranus* (including *S. luciopercanus*).

2) The primary jaw dentition is greatly reduced, consisting of a single row of

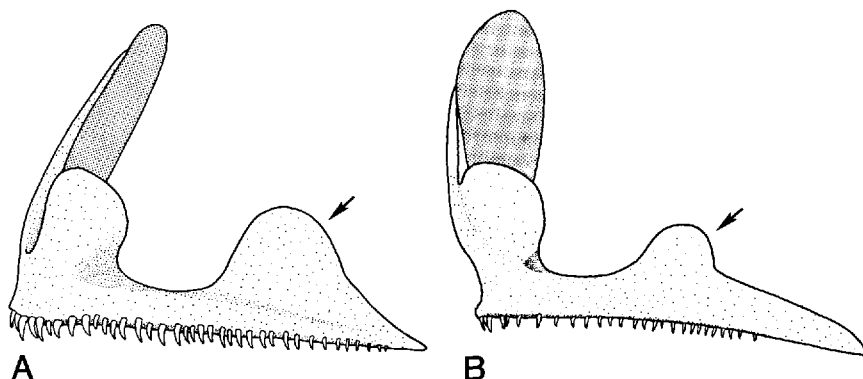


Figure 5. Left premaxilla and rostral cartilage: A, *Serranus luciopercanus*, ANSP 143825, 51.0 mm SL; B, *Parasphyraenops incisus*, ANSP 145219, 26.2 mm SL. (Small arrow points to postmaxillary process.)

tiny conical teeth on the upper and lower jaws. In all other species of *Serranus*, the teeth are not strictly uniserial, occur in broad patches near the premaxillary symphysis and are variously enlarged in both jaws.

3) The postmaxillary process of each premaxilla is located near the midlength of the alveolar ramus and is relatively narrow (Fig. 5B). In all other species of *Serranus*, the postmaxillary process is more broader-based and occupies approximately half the length of the alveolar ramus (Robins and Starck, 1961, fig. 8A).

4) There are 9+19 gill rakers. Colin (1978) reported 26 total gill rakers in the holotype of *P. incisus* (28.2 mm SL). We counted 9+19 for a total of 28 in a cleared and stained specimen (26.6 mm SL), and observed that the two terminal elements would not have been apparent in a whole specimen of equivalent size. Our count for *P. atrimanus* (83.8 mm SL) is also 9+19, although there originally may have been one or two additional elements on the damaged lower limb. The range of total gill rakers in *Serranus luciopercanus* is 20–24. A total of 28 or more gill rakers is found elsewhere among western Atlantic species of *Serranus* only in *S. tortugarum* (Longley), which Robins and Starck (1961: 280) documented as a plankton feeder. The range among all other western Atlantic species is 14–25. *S. novemcinctus* (Kner) from the eastern Atlantic has 28–34 and *S. aequidens* Gilbert from the eastern Pacific has 26–29 (M. Meisler, pers. comm.).

5) The distinctly terete body is quite shallow (21% SL in *P. atrimanus*; 21–23% SL in *P. incisus*, N = 5). In *S. luciopercanus* (N = 7), the range of body depth is 26–32% SL and in other *Serranus* is 26–39% SL (Robins and Starck, 1961).

6) The spinous dorsal fin is steeply graduated, so that its distal margin forms an angle of 45° or more with the dorsal margin of the body (Fig. 1; Colin, 1978, fig. 1). In other *Serranus*, the outline of the dorsal fin is even or only slightly indented, and is approximately parallel to or forms a much smaller angle with the dorsal body margin.

7) There are only 10 soft rays in the dorsal fin. There are typically 12 dorsal soft rays in *S. luciopercanus*, and 12–15 (rarely 10, 11 or 16) among other species of *Serranus*.

The two species of *Parasphyraenops* exhibit at least the seven putative synapomorphies listed above. Most of these synapomorphies are associated with planktivorous foraging and may be functionally correlated; they are duplicated or approximated in *Schultzea beta*, a planktivorous serranine also treated by

Robins and Starck (1961). The monotypic *Schultzea* has: edentulous vomer, palatines, and upper and lower jaws; narrow postmaxillary processes; 29–39 total gill rakers; and a terete body (body depth 21–24% SL). The possibility exists, then, that *Schultzea*, not *Serranus luciopercanus*, is the sister group of *Parasphyraenops*. In fact, based only on the available evidence as discussed and delineated as individual characters here, an unweighted parsimony argument would support this hypothesis. Alternatively, as we believe, these planktivorous adaptations have been independently acquired in these two genera; the same attributes characterize many unrelated plankton-feeding percoid fishes that forage in the water column, including the lutjanoid Caesionidae, the haemuloid Inermiidae, the sparoid Centracanthidae, the scorpidid *Labracoglossa*, the Emmelichthyidae, and *Caesiocorpsis* (Davis and Birdsong, 1973; Johnson, 1980). Aside from the specializations apparently associated with planktivory, there is no evidence that would suggest a particularly close relationship between *Parasphyraenops* and *Schultzea*. Most notably, *Schultzea* lacks the unique infraorbital modifications that we interpret as a synapomorphy of *Parasphyraenops* and *Serranus luciopercanus*. In *Schultzea* the second infraorbital is present, elongate, and completely interposed between the lacrimal and the third infraorbital (Davis and Birdsong, 1973, fig. 3b). Furthermore, *Schultzea* has a pronounced proliferation of multibranching, cephalic laterosensory tubes and pores very similar to that found in *Serranus scriba* (Linnaeus), *S. cabrilla* (Linnaeus) and, according to M. Meisler (pers. comm.), *S. sanctaehelenae* (Boulenger) but lacking in *Parasphyraenops* and *S. luciopercanus*, as well as in most other species of *Serranus*. In *Schultzea*, a portion of this sensory network is associated with a series of postorbital papillae along the posterior margin of the orbit, another feature frequently found in small planktivorous fishes, but lacking in *Parasphyraenops*. *Schultzea* is also unusual in having only six branchiostegal rays (Table 1). For the reasons discussed above, we hypothesize that *Serranus luciopercanus* and *Parasphyraenops* are sister groups and that the specializations shared by *Schultzea* and *Parasphyraenops* result from convergence for a planktivorous mode of life.

The strong morphological similarity between *P. atrimanus* and *P. incisus*, coupled with the discrepancy in the sizes of the known specimens of each species, raises the possibility that they are conspecific. They differ notably in one complex feature—the configuration of the lacrimal and its association with the lateral ethmoid. In *P. atrimanus* (Fig. 3D) the lacrimal is greatly enlarged; it completely conceals the maxilla when the mouth is closed, and the pointed posterior extension runs along the entire length of the ventral margin of the third infraorbital. The most remarkable feature is a large hook on the medial side of the lacrimal that wraps around a pronounced anterior extension of the lateral ethmoid, allowing considerable lateral mobility of the lacrimal. The function of this lateral mobility is unknown (it could serve as a nasal pump), and the motive mechanism is not evident. A spindle-shaped muscle lies medial to the lacrimal and inserts on the maxilla near its head, but the condition of the single specimen is inadequate to determine if there was originally any association of this muscle with the lacrimal or other infraorbital bones, or if the muscle was continuous with the adductor mandibulae. An anterior extension of adductor mandibulae division A_1 is variously developed among species of *Serranus*. In *S. luciopercanus* and *S. tabacarius* (Cuvier), its configuration anteriorly appears similar to the muscle in *P. atrimanus*, and some fibers appear to originate from the subocular shelf of the third infraorbital.

In *P. incisus* (Fig. 3C) the lacrimal is not expanded ventrally and thus does not conceal the maxilla, and the posterior extension extends along only about one-

third the length of the third infraorbital. Furthermore, there is no medial hook on the lacrimal, no anterior process on the lateral ethmoid and no anterior extension of A₁. It seems unlikely that these pronounced and relatively complex differences between *P. atrimanus* and *incisus* are ontogenetic, but we cannot entirely discount that possibility without additional material. The largest known specimen of *P. incisus* is 28.2 mm SL, while the holotype of *P. atrimanus* is 83.8 mm SL. Colin (1978) did not discuss the question of maturity in *P. incisus*, and we found no evidence of sexual maturity in the specimens we examined.

Other Fish Records.—We here document the collection of a single Californian scorpaenid from Bermuda, apparently due to a bait discard. The 118-mm SL specimen (ANSP 147651), in relatively good condition, was removed from the stomach of a "gummy shark," *Mustelus canis* (Mitchill), caught April 1981 by E. B. Tucker on the northwest edge of the Bermuda Platform off Chub Cut in 256–274 m. Initially, the identity of this fish was perplexing. Ultimately, we determined that it represented a distinctive species of *Sebastes* not closely related to any of its Atlantic congeners. It possessed the unique configuration of the extrinsic swim bladder musculature described by Hallacher (1974) for *Sebastes paucispinis* Ayres. Direct comparison with specimens of *S. paucispinis* revealed that the Bermuda specimen was indeed that species. The following scenario and circumstantial evidence could explain the unintentional introduction and capture of a specimen of *Sebastes paucispinis* in Bermudian waters.

(1) Squid shipped frozen from California are commonly used as bait by Bermudian fishermen. (2) *Sebastes paucispinis* is a common Californian species, and it would not be surprising if small individuals were inadvertently included with shipments of frozen squid. [Histological examination of the *Sebastes* specimen by J. Harshbarger (Registry of Tumors in Lower Animals, USNM) indicated that it had been frozen (cell walls ruptured); however, we later learned that Mr. Tucker had placed the specimen in a freezer prior to fixing it in formalin.] (3) Upon finding a *Sebastes* mixed with his squid bait, a fisherman would likely throw overboard such a small bony fish. (4) The discarded fish would sink to the bottom where it would soon be eaten by a scavenger. (5) *Mustelus canis* is such a scavenger and is relatively common in Bermuda. It constantly patrols the bottom for food, feeds on a variety of small bony fishes, and, in captivity, quickly devours dead fish (Compagno, 1984: 406).

Perhaps the most remarkable aspect of the above scenario is not that it could have occurred, but rather the overwhelming odds against the specimen being recovered from the shark's stomach, retained and brought to our attention. We hope our documentation of this improbable set of events will encourage others to consider the possibility of an introduction (no matter how unlikely) when confronted with a new faunal addition that is zoogeographically unexpected and based on a single specimen. Our failure to initially consider this possibility led us down a tortured path of unproductive research.

The second record also represents a Bermudian faunal addition based solely on stomach contents. Kanazawa (1952) reported a single specimen (FMNH 49184), ca. 232 mm SL, identified as *Cepola* sp., taken from the stomach of a grouper (Serranidae) caught March 1903 by L. L. Mowbray on Challenger Bank in 73 m. Two species of *Cepola*, *C. macrophthalmia* (Linnaeus) and *C. pauciradiata* Cadenat, occur in the eastern Atlantic Ocean, but except for this single Bermudian record the genus is unknown from the western Atlantic. The Bermuda specimen is unquestionably a *Cepola*, but because of its poor condition (partially digested and broken into five parts) cannot be identified to species. A radiograph reveals

that this specimen has 10 precaudal (? several apparently missing) and 53 caudal vertebrae.

It seems less likely that the single Bermudian *Cepola* record is based on an introduction like that postulated for *Sebastes paucispinis*. The possibility that the specimen of *Cepola* reached Bermuda via a surface shipment of iced or frozen bait from Madeira or Portugal cannot be excluded, but we doubt that such shipments were being made in 1903. The one common eastern Atlantic *Cepola* is a burrow dweller usually trawled on mud bottom in 70–200 m (Wheeler, 1969; Atkinson, 1976). Trawling is not a fishing method used at Bermuda.

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