31 December 1984
PROC. BIOL. SOC. WASH.
97(4), 1984, pp. 942–950

A NEW SPECIES OF *CALLANTHIAS* (PISCES: PERCIFORMES: PERCOIDEI: CALLANTHIIDAE) FROM THE SOUTHEASTERN PACIFIC OCEAN

William D. Anderson, Jr. and G. David Johnson

Abstract.—*Callanthias parini,* a new species from the Nazca Ridge, is distinguished from all other species of *Callanthias* in having the following combination of characters: tubed lateral-line scales 25 to 30, unilaterally, 52 to 59, bilaterally; circum-caudal-peduncle scales 21 to 24; epipleural ribs 10 to 12; and segmented dorsal- and anal-fin rays—each 10. The new species is dimorphic in lengths of its dorsal-, anal-, and caudal-fin rays, and appears to be protogynous. *Callanthias* can be distinguished from the closely related *Grammatonotus* by the presence of two well-developed opercular spines and in having more segmented dorsal- and anal-fin rays, branched caudal-fin rays, and tubed lateral-line scales (segmented dorsal- and anal-fin rays almost always 10 or 11, branched caudal-fin rays 15 (8 + 7), and tubed lateral-line scales 21 to 42 in *Callanthias*).

During the course of our revisionary studies of the percoid genera *Callanthias* and *Grammatonotus,* we have been fortunate to receive from N. V. Parin (via J. E. Randall) ten specimens of an undescribed species of *Callanthias* collected from the Nazca Ridge in the southeastern Pacific.

Callanthias Lowe, 1839, has been assigned by various authors to the Serranidae. Gilbert (1905) described *Grammatonotus,* assigned it to the Serranidae, and stated that he believed it to be closely allied to *Callanthias.* Our findings confirm the close relationship of these two genera, but we agree with Gosline (1966) that they should be removed from the Serranidae because they lack the innovative specialization, three spines on the opercle, that characterizes that family (Johnson, 1983). Böhlke (1960) placed *Grammatonotus* in the Grammidae (=Grammatidae). Springer (1982) considered both *Callanthias* and *Grammatonotus* to be representatives of the Grammatidae, but acknowledged that "there is little evidence to unite" the five genera he included in that family. Fourmanoir (1981) elevated the Callanthiinae, considered by Ogilby (1900), Katayama (1960), and Katayama *et al.* (1982) as a subfamily of the Serranidae, to the familial level; Johnson (in press) concurred with this and included both *Callanthias* and *Grammatonotus* in the Callanthiidae.

Methods and Abbreviations

Counts and measurements were made following Hubbs and Lagler (1958) except as noted. Lateral-line scales were counted on both sides of each specimen. Other scale counts, with exception of those around the caudal peduncle, were made on either side, depending on condition of the specimen. Mid-side lateral scales were counted along a horizontal line extending from middle of gill opening to middle of structural base of caudal fin. In making counts of rows of cheek scales, rows of scales above the lateral line, and scales above and below the lateral line, small scales at orbit and at bases of dorsal and anal fins were excluded. Rows of cheek scales were difficult to count because of missing scales and the irregularity of the rows. The count of scales below lateral line was made along a posterodorsal series from the origin of the anal fin. Gillrakers on first gill arch and pseudobranchial filaments were counted on the right side. The first vertebra with a haemal spine was considered the first caudal vertebra; the urostylar vertebra, the last. On radiographs it is frequently difficult to determine which vertebra is the first bearing a haemal spine, but the first haemal spine in percoid fishes is almost always just posterior to the first pterygiophore of the anal fin.

Measurements were made with needlepoint dial calipers to nearest 0.1 mm. Measurements from anterior end of snout were taken from premaxillary symphysis; those involving orbit (snout length, orbit diameter, interorbital width, and postorbital length of head) were of bony orbit. Measurement of orbit was of horizontal diameter. Body depth was measured from dorsal-fin origin vertically to ventral midline of body. Pectoral- and pelvic-fin lengths were of longer (either left or right) fin. Lengths of caudal-fin lobes were taken from middle of fin base to distal tips of longest rays. The distance from the more posterior rib of last pair of pleural ribs to first haemal spine was measured on radiographs; this measurement was taken perpendicularly at the greatest point of separation between rib and haemal spine; damaged or grossly distorted specimens were not measured.

Abbreviations used include: ANSP (The Academy of Natural Sciences of Philadelphia), BPBM (Bernice P. Bishop Museum, Honolulu), CAS (California Academy of Sciences, San Francisco), GMBL (Grice Marine Biological Laboratory, College of Charleston), IOAN (Institute of Oceanology, Moscow), SL (standard length), USNM (National Museum of Natural History, Smithsonian Institution, Washington, D.C.), and ZMMU (Zoological Museum, Moscow State University).

Callanthias parini, new species
Figs. 1, 2

Callanthias, sp., Parin *et al.*, 1981:14 (brief description of material collected by R/V *Ikhtiandr* on the Nazca Ridge).

Material examined.—Ten specimens, 148 to 179 mm SL; all from the Nazca Ridge in the southeastern Pacific.

HOLOTYPE: USNM 265444, 175 mm SL; 21°25′S, 81°37′W; 325 m; *Akademik Knipovich* trawl 27; 4 Sep 1980.

PARATYPES: 4 specimens, 148 to 179 mm SL; same data as for holotype, BPBM 29399, 1 specimen, 148 mm SL; CAS 54643, 1 specimen, 179 mm SL; ZMMU P-15572, 2 specimens, 157 & 174 mm SL. ANSP 152995, 1 specimen, 153 mm SL; 21°27′S, 81°39′W; 335 m; *Ikhtiandr* trawl 43; 26 Sep 1979. IOAN uncat., 1 specimen, 177 mm SL; 21°27′S, 81°41′W; 330 m; *Ikhtiandr* trawl 15; 7 Sep 1979. IOAN uncat., 1 specimen, 164 mm SL; 21°25′S, 81°38′W; 320 to 330 m; *Ikhtiandr* trawl 24; 12 Sep 1979. IOAN uncat., 2 specimens, 163 & 168 mm SL; 21°29′S, 81°41′W; 335 m; *Ikhtiandr* trawl 83; 13 Nov 1979.

Diagnosis.—Dorsal-fin rays XI, 10. Anal-fin rays III, 10. Tubed lateral-line scales 25 to 30; sum of tubed lateral-line scales from left and right sides of each

Table 1.—Data on morphometric characters for *Callanthias parini.* Standard length is in mm; other measurements in percentage of standard length.

Character	n	Range	$\bar{x}$	Holotype
Standard length	10	148–179	166	175
Head, length	10	33.0–35.6	34.2	33.7
Snout, length	10	6.3–8.4	7.5	6.3
Orbit, diameter	10	11.3–13.2	12.3	11.3
Postorbital length of head	10	13.0–15.3	14.6	15.2
Upper jaw, length	10	13.3–15.4	14.2	13.7
Interorbital width	10	6.3–8.7	7.8	7.7
Body, depth	10	33.4–36.9	35.0	35.0
Predorsal length	10	29.1–33.1	31.1	30.3
Caudal peduncle, length	10	18.8–22.8	20.6	20.3
Caudal peduncle, depth	10	10.6–12.6	11.6	11.8
Pectoral fin, length	9	25.3–28.3	27.2	27.7
Pelvic fin, length	8	20.9–25.3	23.1	24.4
Anal fin, length of base	10	23.0–28.8	26.4	26.8
Distance from most posterior pleural rib to first haemal spine	10	2.4–3.9	3.2	3.4

specimen 52 to 59. Circum-caudal-peduncle scales 21 to 24. Dimorphism evident in lengths of dorsal-, anal-, and caudal-fin rays; these structures appreciably shorter (in most cases) in specimens less than 160 mm SL than in larger specimens.

Description.—Morphometric data appear in Tables 1 and 2. Meristic data are given below; counts for the holotype are followed by asterisks. Pectoral-fin rays 21 or 22, counts bilaterally symmetrical (21* in 3 specimens, 22 in 7). Pelvic-fin rays I, 5*. Branched caudal-fin rays 8 + 7*. Dorsal procurrent caudal rays 7 or 8 (7* in 8, 8 in 2); ventral procurrent caudal rays 7*. (Most posterior dorsal procurrent ray supported by most posterior epural and apparently also by the fifth hypural; most posterior ventral procurrent ray articulating with haemal spine of penultimate vertebra.) Branchiostegal rays 6*. Pseudobranch with 22 to 27 filaments (22 in 1, 23* in 3, 24 in 4, 25 in 1, 27 in 1). Gillrakers, including rudiments, on first gill arch 8 to 10 + 22 to 24—total 30 to 34 (upper limb: 8 in 1, 9 in 8, 10* in 1; lower limb: 22 in 3, 23 in 3, 24* in 4; total: 30 in 1, 31 in 2, 32 in 3, 33 in 3, 34* in 1).

Tubed lateral-line scales 25 to 30 (left: 26 in 3, 27 in 1, 28 in 4, 29* in 1, 30 in 1; right: 25 in 1, 26 in 3, 27 in 3, 28 in 1, 29* in 2); sum of tubed lateral-line scales from left and right sides of each specimen 52 to 59 (52 in 2, 53 in 2, 54 in 2, 55 in 1, 56 in 1, 58* in 1, 59 in 1). (Range of differences between left and right counts of lateral-line scales for individual specimens 0 to 3.) Mid-body lateral scales 38 to 46 (38 in 1, 39 in 1, 42 in 1, 43 in 1, 44 in 2, 45 in 1, 46* in 1). Rows of scales between lateral line and mid-base of spinous dorsal fin 1 or 2*. Scales between dorsal-fin origin and lateral line 2 to 4*. Scales between anal-fin origin and lateral line 15 to 19 (17*). Rows of cheek scales 7 to 10*. Circum-caudal-peduncle scales 21 to 24 (21 in 1, 23 in 4, 24* in 2).

Vertebrae 24 (10 precaudal + 14 caudal)*. Procurrent spur (Johnson 1975) absent; parhypural and 5 hypurals present; hypural 1 fused with hypural 2 and hypural 3 fused with hypural 4; epurals 2 or 3 (2 in 1, 3* in 9); uroneurals 1 pair.

Table 2.—Measurements of fins and fin rays and sex of specimens of *Callanthias parini*; dimorphism is evident in the data for almost all of the structures examined. Specimens less than 160 mm SL compose one morph; those greater than 160 mm SL, another. Standard length is in mm; other measurements in percentage of standard length. The holotype is denoted by an asterisk. Specimens that are possibly hermaphroditic are indicated by P.H.

Character	BPBM 29399	ANSP 152995	ZMMU P-15572	IOAN uncat.	IOAN uncat.	IOAN uncat.	ZMMU P-15572	USNM 265444*	IOAN uncat.	CAS 54643
Standard Length	148	153	157	163	164	168	174	175	177	179
Length:										
First dorsal spine	5.5	5.5	3.9	4.8	6.3	6.3	—	5.7	6.3	5.7
Second dorsal spine	6.9	7.2	7.6	7.7	10.5	8.7	8.2	8.8	8.6	8.4
Third dorsal spine	9.0	9.4	10.1	—	14.9	12.6	—	13.0	12.4	11.7
Fifth dorsal spine	10.4	12.4	11.5	17.6	—	17.1	18.0	18.4	—	17.4
Seventh dorsal spine	11.8	15.2	14.8	—	—	23.0	22.8	22.9	—	22.2
Ninth dorsal spine	14.0	16.6	16.0	—	—	—	26.1	>25.7	—	>24.9
Eleventh dorsal spine	14.5	—	16.8	—	—	ca. 27.5	27.2	27.7	—	>26.0
First dorsal soft ray	17.7	19.5	18.1	ca. 30.2	ca. 32.6	—	30.9	31.2	31.0	29.6
Third dorsal soft ray	18.5	19.1	19.3	ca. 29.7	31.4	32.1	30.4	32.0	ca. 30.5	—
Seventh dorsal soft ray	16.4	17.4	17.8	ca. 26.2	ca. 25.0	27.1	23.6	25.4	ca. 24.7	24.0
Ninth dorsal soft ray	14.8	15.6	15.7	24.6	23.7	24.6	ca. 20.6	22.4	21.2	22.2
Tenth dorsal soft ray	—	13.8	13.7	22.7	20.4	22.4	18.7	20.9	20.5	20.0
Depressed dorsal fin	66.4	66.1	66.4	79.9	75.7	79.8	73.4	75.2	72.3	76.3
First anal spine	5.9	7.7	6.6	8.2	9.5	9.2	7.6	—	9.6	—
Second anal spine	9.7	12.0	12.0	18.4	21.9	20.9	—	18.4	—	18.9
Third anal spine	13.5	14.0	15.2	22.0	>26.0	—	22.0	23.3	—	21.7
First anal soft ray	16.4	17.4	—	25.8	28.7	ca. 27.2	28.2	27.6	26.3	—
Third anal soft ray	17.1	18.5	>18.4	28.8	30.5	28.6	30.3	29.9	ca. 29.4	29.8
Fourth anal soft ray	17.5	18.5	19.0	29.0	29.2	31.2	29.4	29.3	ca. 30.2	29.6
Ninth anal soft ray	14.7	15.5	15.4	25.6	23.0	25.6	22.3	22.0	22.0	24.4
Tenth anal soft ray	13.3	13.9	13.9	23.9	21.4	23.7	21.1	21.6	20.3	22.1
Depressed anal fin	37.2	40.1	ca. 39.4	49.1	48.2	51.2	47.1	46.7	47.6	47.7
Upper caudal-fin lobe	>28.7	ca. 30.1	31.8	—	>48.4	>38.7	>33.4	>50.7	ca. 44.1	>39.8
Lower caudal-fin lobe	28.8	ca. 29.9	ca. 32.3	>54.0	>46.3	>33.9	>30.6	>56.4	ca. 33.2	>45.4
Sex	female	female	female	?	P.H.	P.H.	?	?	P.H.	male?

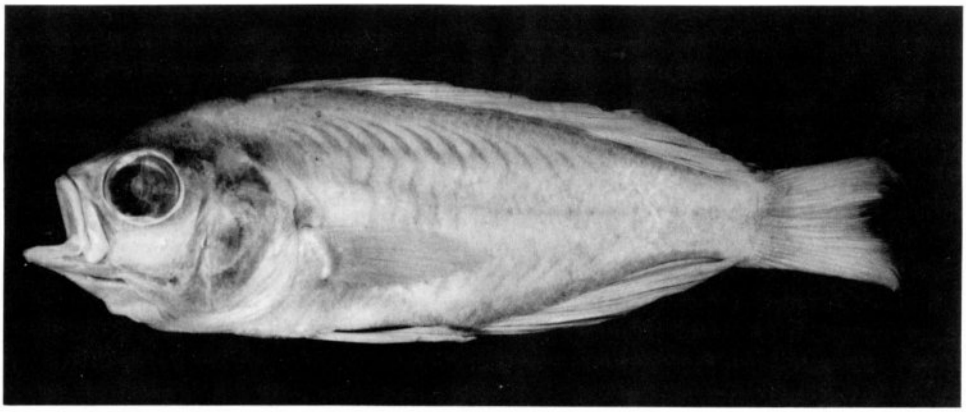
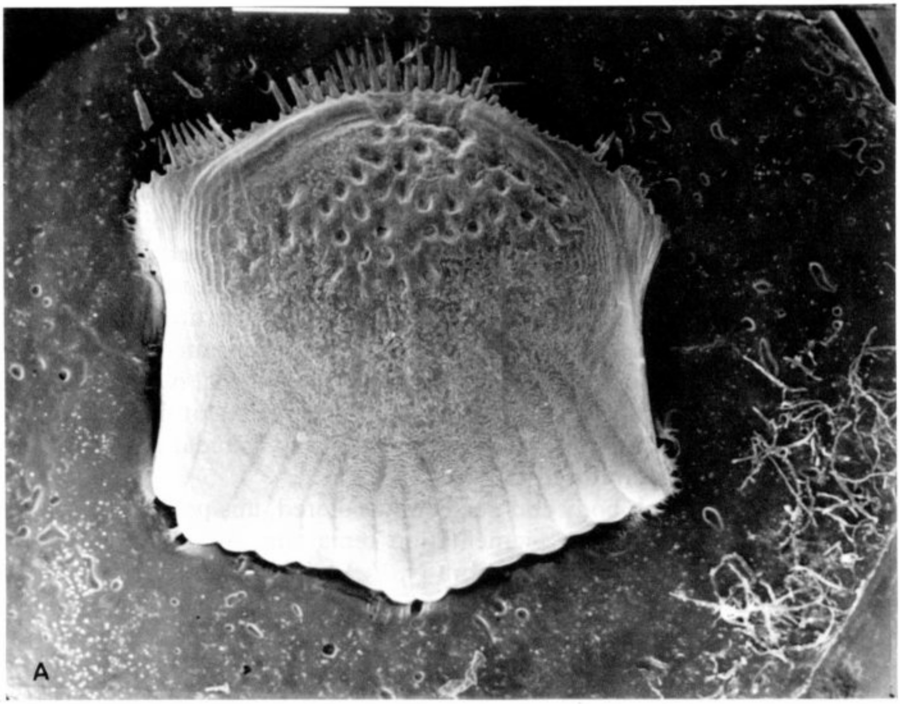


Fig. 1. *Callanthias parini,* new species, holotype, USNM 265444, 175 mm SL.

Epipleural ribs on first 10 to 12 vertebrae (10 in 1, 11 in 1, 12* in 7). Pleural ribs on vertebrae 3 through 10. Configuration of predorsal bones and anterior neural spines difficult to describe in conventional symbolization of Ahlstrom *et al.* (1976) because predorsal bones do not actually interdigitate with neural spines; the two predorsal bones oriented more or less obliquely with their proximal ends usually terminating anterior to distal end of anteriormost neural spine. Posteriorly, dorsal and anal fins each associated with single trisegmental pterygiophore.

Mouth terminal and oblique; jaws almost equal. Maxilla reaching posteriorly to near middle of eye. Premaxilla protrusible. No supramaxilla. Posterodorsal border of maxilla not covered by infraorbital bones. Interorbital slightly convex to flattened. Anterior nostril in short tube somewhat remote from eye; posterior nostril elliptical, near eye, much larger than anterior nostril, bordered by fleshy rim which is quite well developed anteriorly. Section A_1 of adductor mandibulae simple, without anterodorsal extension. Posteriormost point of head extending somewhat past vertical through anterior end of dorsal-fin base. Distal margins of preopercle, interopercle, and subopercle without serrations. Opercular spines two, ventral spine better developed. Lateral series of rakers on first gill arch long and slender, medial series of rakers on first gill arch and rakers on other arches short. Gillrakers on all arches with small teeth. Premaxilla with outer series consisting of conical teeth and a few small exserted canines at anterior end of jaw; inner band of villiform to conical teeth, band expanded near symphysis; no teeth at symphysis. Dentary with series of conical teeth, teeth larger anteriorly; patch of villiform to conical teeth next to symphysis; one to few exserted canines at anterior end of jaw; no teeth at symphysis. Vomer with small conical teeth in crescent-shaped or chevron-shaped patch. Palatine with series of small conical teeth; series of teeth may be expanded anteriorly into narrow band. No teeth on tongue or pterygoids. Body compressed, moderately deep. Scales ctenoid; posterior field of a scale with single row of primary and secondary scalelets. Secondary squamation essentially absent. Anterior end of lower jaw, gular region, branchiostegal membranes, and usually small section on lateral part of snout without scales; scales on maxilla largely restricted to distal end; remainder of head heavily scaled. Midlateral series of modified scales on body (Fig. 2). Lateral line ascending abrupt-



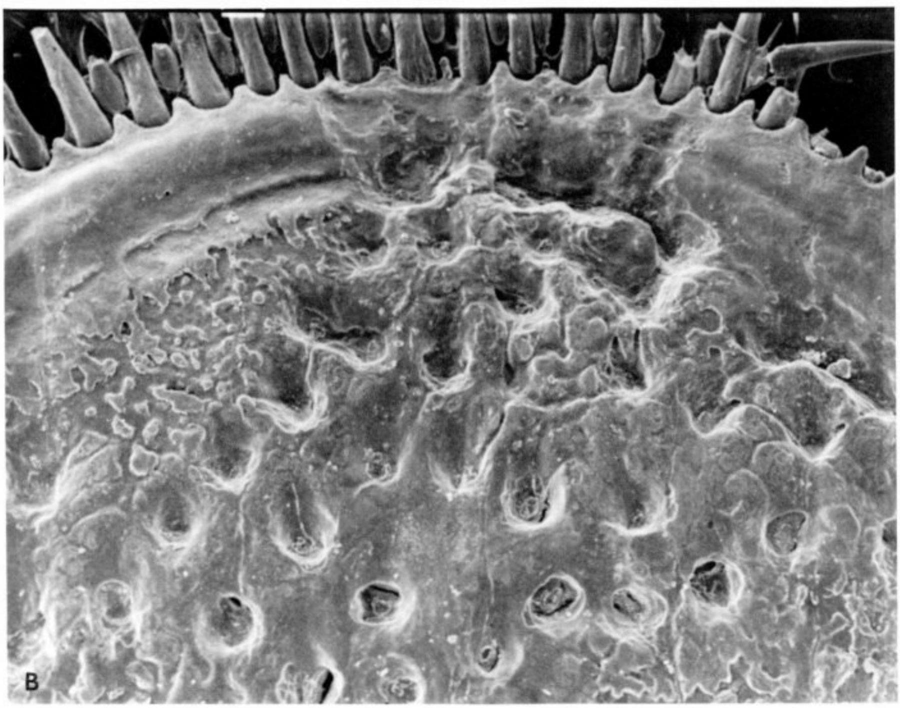


Fig. 2. *Callanthias parini,* new species; scanning electron photomicrographs of a modified midlateral scale from the caudal peduncle of CAS 54643, 179 mm SL; scale bar = 1000 μm in A, 100 μm in B.

ly from origin near opercle to within one or two scale rows of dorsal-fin base, continuing posteriorly to terminate at or near base of ultimate dorsal soft ray. Tubes in lateral line straight and simple, each extending for most of length of a scale. Lateral scale rows essentially parallel to horizontal part of lateral line. Membranes of dorsal and anal fins without scales. Pectoral-fin base with scales. Pelvic axillary scales present; pelvic-fin bases covered by mid-ventral triangular cluster of scales. Scales extending onto caudal fin. Dorsal and anal spines relatively slender. Dorsal fin not incised at junction between spinous and soft portions. Distal margin of anal fin rounded. Pectoral fin: distal margin rounded; longest rays in dorsal part of fin, reaching posteriorly to at least vertical from base of tenth dorsal spine to as far as vertical from base of second segmented dorsal ray; two dorsalmost and one to three ventralmost rays unbranched, others branched. Pelvic fin reaching posteriorly at least as far as between bases of first and second anal spines to as far as base of first segmented anal ray. Caudal-fin lunate with dorsal and ventral lobes produced in larger specimens.

Coloration.—In alcohol, body and head straw colored, fins pallid to straw colored; no distinctive patterns of pigmentation remaining. We received a color transparency of one of the specimens from N. V. Parin via J. E. Randall. In that photograph, head and body mostly orange; iris mostly pale anterodorsally and mostly melanistic elsewhere; dorsal and anal fins yellow-orange; pectoral and pelvic fins orange; caudal fin dull orange.

Dimorphism.—Our specimens are separable into two distinct morphs based on lengths of dorsal-, anal-, and caudal-fin rays (see Table 2). Individuals less than about 160 mm SL have short fin rays and larger specimens have long fin rays. Determinations of sex reported in Table 2 are based on examination of histological sections of the gonads by Mr. William A. Roumillat. Unfortunately, the viscera were not well preserved; consequently, sex could not be determined for each specimen unequivocally. Despite this, it seems likely that *Callanthias parini* is a protogynous hermaphrodite and that the two morphs represent different sexual stages.

Comparisons.—The other nominal species of *Callanthias* are: *C. allporti* Günther, 1876, and *C. australis* Ogilby, 1900, both from the Australian-New Zealand region; *C. japonicus* Franz, 1910, from Japanese waters; *C. legras* Smith, 1947, from off southern Africa; *C. platei* Steindachner, 1898, from the southeastern Pacific; and *C. ruber* (Rafinesque, 1810), from the eastern Atlantic and Mediterranean Sea. (*Callanthias crosnieri* Fourmanoir, 1981, is a *Grammatonotus.*) *Callanthias parini* may be distinguished by number of tubed lateral-line scales from *C. allporti, C. australis, C. japonicus,* and *C. platei* (25 to 30 in *C. parini* vs. 33 to 42 in the others); by sum of tubed lateral-line scales from left and right sides (from individual specimens) from *C. ruber* and the species previously listed (52 to 59 in *C. parini* vs. 43 to 50 in *C. ruber* and 68 to 83 in the others); and by numbers of circum-caudal-peduncle scales, epipleural ribs, and epural bones from *C. legras* (*C. parini* with 21 to 24 caudal-peduncle scales, 10 to 12 epipleural ribs, and 2 or 3 (almost always 3) epural bones; *C. legras* with 15 to 17 caudal-peduncle scales, 13 to 16 epipleural ribs, and 2 epural bones). Also useful in separating *C. parini* from *C. australis, C. japonicus,* and *C. platei* are numbers of dorsal- and anal-soft rays (*C. parini* with 10 in each fin, the other species almost always with 11 in each fin). In addition, dimorphism in length of some fin rays (see above and Table 2) has been demonstrated only in *C. parini.*

Distribution.—*Callanthias parini* is known only from the Nazca Ridge off the coast of Chile in depths of 320 to 335 meters.

Etymology.—It is a pleasure to name this species for N. V. Parin who provided the specimens of the new species.

Remarks.—*Callanthias* and *Grammatonotus* appear to be sister groups. They share three characters (Johnson, in press) that appear to be unique among percoid fishes: structure of the nasal organ (devoid of lamellae), presence of modified scales with unique ornamentation along the body mid-laterally, and lateral line running along base of dorsal fin and terminating near base of ultimate dorsal soft ray or continuing posteriorly on dorso-lateral surface of caudal peduncle. *Callanthias* can be distinguished easily from *Grammatonotus* in having more opercular spines, segmented dorsal- and anal-fin rays, branched caudal-fin rays, and tubed lateral-line scales (two well-developed opercular spines in *Callanthias,* one in *Grammatonotus*; segmented dorsal-fin rays 10 or 11—very rarely 12—in *Callanthias,* usually 9—rarely 8 or 10—in *Grammatonotus*; segmented anal-fin rays 10 or 11—very rarely 9 or 12 in *Callanthias,* 9 in *Grammatonotus*; branched caudal-fin rays 15 (8 + 7) in *Callanthias,* 13 (7 + 6) in *Grammatonotus*; tubed lateral-line scales 21 to 42 in *Callanthias,* 14 to 18 in *Grammatonotus*). Also, in *Callanthias* the most posterior dorsal procurrent caudal-fin ray articulates with the most posterior epural and apparently in most cases also receives support from the fifth hypural; whereas, in *Grammatonotus* support for this element is almost always from the fifth hypural and only occasionally from both the most posterior epural and the fifth hypural. In *Callanthias* the most posterior ventral procurrent caudal-fin ray always articulates with the haemal spine of the penultimate vertebra, but in *Grammatonotus* this fin ray is almost always supported by the haemal spine of the penultimate vertebra and by the parhypural. The distance from the most posterior pleural rib to the first haemal spine is usually appreciably greater in *Callanthias* than in *Grammatonotus* (*Callanthias*: N = 172, range in % SL = 1.05 − 4.79, $\bar{x}$ in % SL = 3.20; *Grammatonotus*: N = 28, range in % SL = 0.68 − 2.14, $\bar{x}$ in % SL = 1.63).

Acknowledgments

John E. Randall (BPBM) forwarded the specimens described herein and a color transparency of one of them to us from N. V. Parin of the P. P. Shirshov Institute of Oceanology, Moscow, who very generously allowed us to deposit types in museums in the United States. William A. Roumillat, South Carolina Marine Resources Research Institute, Charleston, made and examined the histological sections of gonads. James F. McKinney (GMBL) provided the radiographs and the photograph for Fig. 1, and Robert Ashcraft (Medical University of South Carolina) made the scanning electron photomicrographs for Fig. 2. Carole C. Baldwin (GMBL) typed the manuscript and assisted in a number of other ways in its preparation. Carole C. Baldwin and John E. Randall reviewed the manuscript. This is GMBL contribution number 63.

Literature Cited

Ahlstrom, E. H., J. L. Butler, and B. Y. Sumida. 1976. Pelagic stromateoid fishes (Pisces, Perciformes) of the eastern Pacific: kinds, distributions, and early life histories and observations on five of these from the northwest Atlantic.—Bulletin of Marine Science 26:285–402.

Böhlke, J. E. 1960. Comments on serranoid fishes with disjunct lateral lines, with the description of a new one from the Bahamas.—Notulae Naturae No. 330:1–11.

Fourmanoir, P. 1981. Poissons (première liste).—Résultats des campagnes MUSORSTOM. I—Philippines (18–28 Mars 1976):85–102.

Franz, V. 1910. Die japanischen Knochenfische der Sammlungen Haberer und Doflein.—Abhandlungen der math.-phys. Klasse der K. Bayer. Akademie der Wissenschaften, Supplement 4, no. I:1–135.

Gilbert, C. H. 1905. The deep-sea fishes of the Hawaiian Islands. *In* D. S. Jordan and B. W. Evermann, eds. The aquatic resources of the Hawaiian Islands.—Bulletin of the United States Fish Commission 23, part 2, section 2:575–713.

Gosline, W. A. 1966. The limits of the fish family Serranidae, with notes on other lower percoids.—Proceedings of the California Academy of Sciences, 4th Series, 33(6):91–112.

Günther, A. 1876. Remarks on fishes, with descriptions of new species in the British Museum, chiefly from southern seas.—Annals and Magazine of Natural History, (4), 17:389–402.

Hubbs, C. L., and K. F. Lagler. 1958. Fishes of the Great Lakes region.—Cranbrook Institute of Science, Bulletin 26, Bloomfield Hills, Michigan.

Johnson, G. D. 1975. The procurrent spur: an undescribed perciform caudal character and its phylogenetic implications.—Occasional Papers of the California Academy of Sciences 121: 1–23.

———. 1983. *Niphon spinosus*: A primitive epinepheline serranid, with comments on the monophyly and intrarelationships of the Serranidae.—Copeia 1983:777–787.

———. [In press]. Percoidei: development and relationships. *In* H. G. Moser *et al.*, eds., Ontogeny and Systematics of Fishes.—Special Publication No. 1, Supplement to Copeia, American Society of Ichthyologists and Herpetologists.

Katayama, M. 1960. Fauna Japonica Serranidae (Pisces).—Biogeographical Society of Japan, Tokyo, 189 pp.

Katayama, M., E. Yamamoto, and T. Yamakawa. 1982. A review of the serranid fish genus *Grammatonotus*, with description of a new species.—Japanese Journal of Ichthyology 28:368–374.

Lowe, R. T. 1839. A supplement to a synopsis of the fishes of Madeira.—Proceedings of the Zoological Society of London, 7:76–92.

Ogilby, J. D. 1900. Contribution to Australian ichthyology.—The Proceedings of the Linnean Society of New South Wales for the year 1899, 24:154–186.

Parin, N. V., G. A. Golovan, N. P. Pakhorukov, Yu. I. Sazonov, and Yu. N. Shcherbachev. 1981. Fishes from the Nazca and Sala-y-Gomez underwater ridges collected in cruise of R/V "Ikhtiandr." *In* Fishes of the open ocean.—Institute of Oceanology, Academy of Sciences of the USSR, Moscow (1980), pp. 5–18.

Rafinesque, C. S. 1810. Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia, con varie osservazioni sopra i medesimi. Palermo, 105 pp.

Smith, J. L. B. 1947. Brief revisions and new records of South African marine fishes.—Annals and Magazine of Natural History (11)14:335–346.

Springer, V. G. 1982. Pacific plate biogeography, with special reference to shorefishes.—Smithsonian Contributions to Zoology, No. 367, iv + 182 pp.

Steindachner, F. 1898. Die Fische der Sammlung Plate. Fauna Chilensis.—Zoologische Jahrbücher. Supplement 4:281–337.

(WDA) Grice Marine Biological Laboratory, College of Charleston, Charleston, South Carolina 29412; (GDJ) Department of Vertebrate Zoology, Smithsonian Institution, Washington, D.C. 20560.