STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 80.

THREE NEW SPECIES AND SIX NEW RECORDS OF SMALL SERRANOID FISHES FROM CURAÇAO AND PUERTO RICO

by

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Among the fishes taken during a recent collecting trip to Curaçao are three very colorful small serranoids which represent undescribed species. Two of the three new fishes are grammids of the previously monotypic genus *Lipogramma*, and their discovery necessitates a slight modification of the generic description. The remaining fish is provisionally placed in *Chorististium* (this genus may not be distinct from *Liopropoma*). Five other small serranids and one grammistid not known from Curaçao were also collected: *Chorististium rubre*, *C. mowbrayi*, *Serranus annularis*, *S. luciopercanus*, *Schultzea beta* and *Pseudogramma bermudensis*. Four of these fishes have also been taken in Puerto Rico for the first time and two of the new species as well.

The holotype of each new species has been deposited in the United States National Museum (USNM). Paratypes have been variously placed in the U.S. National Museum, Academy of Natural Sciences of Philadelphia (ANSP), Marine Laboratory of the University of Miami (UMML), Rijksmuseum van Natuurlijke Historie at Leiden (RMNH) and the University of Puerto Rico at Mayagüez (UPR).

The assistance in collecting by GERRIT KLAY, is gratefully acknowledged. LUIS C. MORERA of the University of Puerto Rico also helped collect fishes and has assisted in curatorial work at the university. Special thanks are due INGVAR KRISTENSEN, Director of the Caribbean Marine Biological Institute on Curaçao, who sponsored KLAY and made the facilities of the Institute freely available. M. L. BAUCHOT of the Museum National d'Histoire Naturelle in Paris (MNHN), JAMES E. BÖHLKE of the Academy of Natural Sciences of Philadelphia, WALTER R. COURTENAY of Duke University and LOREN P. WOODS of the Chicago Natural History Museum (CNHM) kindly loaned specimens. M. BOESEMAN provided lists of large collections of fishes

made by P. WAGENAAR HUMMELINCK and J. S. ZANEVELD at Curaçao and other West Indian localities. These fishes are now deposited in the Rijksmuseum van Natuurlijke Historieat Leide n; most were identified by G. F. MEES. STANLEY H. WEITZMAN of the United States National Museum provided data on the osteology of *Lipogramma* and C. RICHARD ROBINS of the Marine Laboratory of the University of Miami supplied information from the literature.

Family GRAMMIDAE

BÖHLKE (1960) tentatively recognized the family Grammidae and included the genera *Gramma* Poey, *Stigmatonotus* Peters, *Grammatonotus* Gilbert, *Pseudochromichthys* Schmidt (with some uncertainty), *Fraudella* Whitley, and *Lipogramma* Böhlke. He distinguished the Grammidae from related serranoid families with interrupted lateral lines principally in its possession of I,5 pelvic rays and XII or XIII dorsal spines. As he has pointed out, future study of the classification of small serraniform fishes may result in the combination of the Grammidae with one or more other families.

In the western Atlantic this family is represented by two species of *Gramma*, *G. loreto* (Poey) and *G. melacara* Böhlke & Randall, and *Lipogramma*. *G. loreto* was described from Cuba (*hemichrysos* Mowbray from Bermuda is a synonym), and *melacara* from the Bahamas and British Honduras. One of the objectives in making the deeper dives in Curaçao and Puerto Rico was to ascertain if *melacara* occurred at these islands. *G. loreto* proved to be abundant, but *melacara*, one of the most common fishes on reefs in the Bahamas at depths greater than about 150 feet, was not seen. *Lipogramma anabantoides* Böhlke is still known from only four small type specimens from Grand Bahama Island.

KEY TO THE GRAMMIDAE OF THE WESTERN ATLANTIC

1a. Lateral line on body present, divided into an antero-dorsal portion ending beneath rear of dorsal fin and a median lateral portion on caudal peduncle; preopercular margin serrate; opercle with two well developed spines; accessory caudal rays not spinous; scale rows on body of adults 45 to 51 2

1b. Lateral line on body absent; preopercular margin smooth; opercle without well-developed spines; accessory caudal rays spinous; scale rows on body of adults 26 to 39 3

2a. Dorsal rays nearly always XII,10; pectoral rays usually 16 (sometimes 15); anterior half of fish purple or violet in life, posterior half yellow . . . . . *Gramma loreto*

2b. Dorsal rays XIII,9; pectoral rays usually 17 (sometimes 18); magenta in life except upper part of head and nape which is black, this color continuing on to anterior and distal part of dorsal fin . . . . . *Gramma melacara*

3a. Caudal fin rounded; pectoral rays 17; lateral scales 26; color in alcohol moderately dark brown, the median and pelvic fins even darker . . . . . *Lipogramma anabantoides*

3b. Caudal fin emarginate; pectoral rays 15; lateral scales 29 to 38; color not as above 4

4a. Upper profile of head nearly straight; snout not very short, its length contained 4 to 4.5 times in head length; dorsal rays XII,10; anal rays III,7; caudal rays III,19,III; color in life yellow, the edges of scales bluish gray, with three dark-edged blue lines on head and anteriorly on body, one mid-dorsally and one on each side extending posteriorly from upper edge of eye . . . . . *Lipogramma trilineata*, n. sp.

4b. Upper profile of head convex; snout very short, its length contained about 5 times in head length; dorsal rays XII,9; anal rays III,8; caudal rays IV,19,III; anterior half of fish heliotrope in life, posterior half yellow (lines of yellow invade heliotrope region and scattered dots of heliotrope occur on the yellow) . . . . . *Lipogramma klayi*, n. sp.

Genus **Lipogramma**

Lipogramma BÖHLKE, 1960, Notulae Nat. *330*, p. 3, 6 (type species, *Lipogramma anabantoides* Böhlke, by original designation).

Diagnosis. — Dorsal fin with XII or XIII spines and 8 to 10 soft rays, with no notch between spinous and soft portions; anal fin rays III,7 or 8; pectoral fins rounded, not extending posterior to anus, and with 15 or 17 rays; pelvic fin rays I,5, the first soft ray highly elongate, reaching beyond spinous portion of anal fin, at times posterior to entire fin (this ray probably not so prolonged in juveniles); caudal fin emarginate or rounded, with 19 segmented rays, the accessory rays occurring as III or IV stout spines. No lateral line on body; pore systems on head well developed, some of the pores large. Scales on head, nape, thorax, pectoral base and dorsal base cycloid, those elsewhere on body finely ctenoid; no scales on snout, maxillary, or narrow portion of interorbital; small scales occur on basal portion of caudal rays but not on membranes of other fins; lateral series of scales on body ranges from 26 to 38; gill rakers 12 to 19, vertebrae 10 + 15. Depth of body about 2.5 to 3 in standard length; body moderately compressed, the width just behind head contained 5 to 6.5 times in standard length; head 2.7 to 2.9 in standard length; snout short, 4 to 5 in head length; eye large, 2.6 to 3.3 in head length. Mouth small, the maxillary reaching slightly beyond front of pupil; maxillary narrow, fairly uniform in width over most of its length; villiform teeth on vomer, palatines, and jaws, and moderately large canines anteriorly in jaws. No well developed spines on opercle (posterior bony margin of opercle may end in a blunt, flattened protuberance; another protuberance, more spine-like, may occur at posterior end of post-temporal bone); preopercular margin entire, with no serrations. Gill membranes united, forming a free fold over isthmus beneath rear half of eye; 6 branchiostegal rays. Pseudobranchiae present. Anterior nostrils tubular; posterior nostrils close to eye, in juxtaposition with a large pore (nostril and pore appear as one elliptical opening divided by a septum). Very small reef fishes, known thus far from depths of 70 to 240 feet.

Lipogramma trilineata, new species

Plate Ia, Table 2.

Holotype. — USNM 179004, 26.0 mm standard length, collected with emulsified rotenone (Chem-Tox) off the jail at Willemstad, CURAÇAO, in 160 feet by J. Randall and G. Klay on November 24, 1962. Rotenone released beneath a small ledge in a head of coral which was isolated from other coral clumps nearby by a stretch of sand.

Paratypes. — USNM 179003, 21.7 mm standard length, same collecting data as holotype; ANSP 98681, 20.6 mm standard length, collected off Lagoen, CURAÇAO, in a coral head in 160 feet with Chem-Tox by J. Randall on November 25, 1962; RMNH 24608, 25.0 mm standard length, KLEIN CURAÇAO (12° N; 68°40′ W), south side of island off fishing camp at drop-off into deep water, depth 120 feet, Chem-Tox, J. Randall, November 28, 1962; UMML 11141, 27.5 mm standard length, same collecting data as preceding specimen; UPR 1127, 19.5 mm standard length, same data as preceding; UPR 1128, 28.0 mm standard length, 6 miles south of La Parguera, PUERTO RICO (17° 52.2′ N; 65° 2.5′ W), depth 72 feet, beneath ledge in vertical discontinuity of about 10 feet in coral reef, emulsified rotenone (Pro-Noxfish), J. Randall, April 11, 1963.

Description [fin-ray and scale counts taken from all specimens; measurements (Table 2) made of largest and smallest paratypes from Curaçao and single paratype from Puerto Rico]. — Dorsal rays XII,10 (last ray composite); anal rays III,7 (last ray composite); caudal rays III,19,III (median 13 to 15, usually 14 rays branched); pectoral rays 15 (upper 2 to 4 and lower 2 to 3 rays unbranched); pelvic rays I,5 (elongate first soft ray unbranched, remaining 4 branched); lateral scales (upper end of gill opening to end of hypural plate; first scale counted lies above posterior spinous end of post-temporal bone) 30 (29 on two paratypes); scales between origin of anal fin and dorsal fin 16 (14 on paratypes); 10 horizontal rows of scales on caudal peduncle, including mid-dorsal and mid-ventral rows; gill rakers on first arch 4 + 1 + 10 (last 4 as rudiments) (holotype and Puerto Rico paratype only); vertebrae 10 + 15 (holotype only, by X ray).

No lateral line on body. Pores of lateral line system on head well developed. Four large pores in supraorbital series, the first three large; first pore occurs dorso-posteriorly near edge of eye slightly posterior to a line at rear edge of pupil, second near edge of eye almost in line with front of pupil, third contiguous with posterior nostril and fourth just in front of anterior nostril; a single median

TABLE 2

Measurements of the holotype and three paratypes of *Lipogramma trilineata*,

in thousandths of the standard length.

	Holotype	*Paratypes*		
	USNM 179004	UMML 11141	UPR 1127	UPR 1128
Standard length (mm) . .	26.0	27.5	19.5	28.0
Body depth at origin of pelvics	334	327	328	336
Width of body behind gill opening	161	171	154	164
Head length	354	364	369	365
Snout length	88	91	87	82
Eye diameter	111	115	138	114
Postorbital length of head	162	171	164	161
Bony interorbital space . .	61	62	62	68
Least depth of caudal peduncle	181	185	184	180
Length of caudal peduncle *	138	138	138	142
Snout to origin of dorsal fin	385	378	405	394
Snout to origin of anal fin	642	631	652	650
Snout to origin of pelvic fin	384	367	415	384
Length of dorsal fin base . .	520	532	471	512
Length of anal fin base . .	192	189	167	182
Length of pectoral fin . . .	215	218	205	239
Length of pelvic fin	693		369	507
Length of pelvic spine . . .	162	156	159	154
Length of 1st dorsal spine	37	36	46	41
Length of 2nd dorsal spine	60	69	77	71
Length of 3rd dorsal spine	89	109	100	100
Length of 12th dorsal spine	154	149	149	150
Length of 1st dorsal soft ray	186	178		172
Length of longest (6th) dorsal soft ray	269	276		207
Length of last dorsal soft ray	115	109	103	93
Length of 1st anal spine . .	39	40	51	46
Length of 2nd anal spine . .	100	105	111	114
Length of 3rd anal spine . .	161	171	167	171
Length of 1st anal soft ray	200	200	195	193
Length of longest (4th) anal soft ray	259	247		242
Length of last anal soft ray	119	109	87	89
Length of caudal fin . . .	435			307

*) Distance from rear base of dorsal fin to end of hypural plate.

Blank spaces in table denote measurements not possible due to broken fin rays.

pore on top of head slightly anterior to a line through hind edge of pupil. Postorbital series of four pores begins with a large pore at hind edge of eye at level of top of pupil and ends with one at rear of post-temporal bone. A single supratemporal pore well above juncture of postorbital and mandibular series in line with upper limb of preopercle. Nine pores may be counted in the mandibular series, the first at upper end of free edge of preopercle, three along upper limb, one at angle, two on lower limb (the second of these at ventro-anterior terminus of preopercular margin), and two on chin. Two widely separated pores in suborbital series between eye and upper jaw.

Scales on head and anteriorly on body cycloid; scales on rest of body finely ctenoid except for row at base of most of dorsal fin. Snout, interorbital anterior to hind edge of pupil, maxillary, and chin not scaled. About four rows of scales on cheek between eye and lower limb of preopercle. No scales on fins except caudal where progressively smaller scales extend on to basal third of fin.

Origin of dorsal fin over hind edge of opercular membrane, and in line with or slightly posterior to origin of pelvic fins. Spines of dorsal and anal fins progressively longer from first to last. Longest rays of dorsal and anal fins reach well beyond base of caudal fin, the longest dorsal ray to a vertical at about half length of median caudal rays. Three upper and three lower accessory caudal rays are stout spines. Caudal fin emarginate. Fifteenth caudal ray prolonged on some specimens (3.5 mm longer than shortest median caudal ray of holotype; longest caudal ray other than fifteenth 1.2 mm longer than shortest median ray). Pectoral fins rounded and short, reaching a vertical to base of tenth dorsal spine. Pelvic fins very long by virtue of prolongation of first soft ray, (this ray when laid back may extend posterior to base of caudal fin; it is variable in length among specimens and is easily broken).

Snout pointed, long for the genus. Interorbital flat. Eye large, circular, the upper edge coinciding with the relatively straight upper profile of head. Pupil ovoid, the more attenuate end facing anteriorly. Nostrils broadly separated; anterior nostril tubular, directed anteriorly with slight upward and outward components; posterior nostril near front of eye, sharing an elliptical opening with third supraorbital pore. Mouth terminal, relatively small, oblique,

protractile. Maxillary reaching a vertical at approximately first fourth of eye. Upper part of maxillary slides a short distance beneath rim of narrow suborbital when mouth is closed. Six moderately large canine teeth, slightly incurved and not depressible, on each side of symphysis of upper jaw and four in the lower; an outer row of smaller canine teeth posterior to front canines in upper jaw; a band of villiform teeth medial to canines in both jaws, this band broad anteriorly and narrow on sides of jaws; narrow bands of villiform teeth on vomer.

No spines or external ridges on operculum. Post-temporal bone terminates in a spine just above upper end of gill opening. Preopercular margin smooth, the angle broadly rounded, the upper limb beginning slightly above a horizontal at middle of eye and the lower limb ending beneath middle of pupil.

Color in alcohol light tan, the edges of scales of body brown; a dark brown horizontal line running posteriorly from upper part of eye, ending on body approximately beneath middle of spinous portion of dorsal fin; a median brown line from tip of snout to origin of dorsal (a little pigment extends along base of first few dorsal spines), faint on unscaled portion of interorbital and on snout; all fins relatively pale (slightly dusky in a broad submarginal band on dorsal, on caudal membranes, in interconnected spots on anal and on pelvic fins); front of lips dusky.

Color of holotype shortly after death: bright yellow, the scales on body edged with light bluish gray (blue-gray edges more prominent, and the yellow less obvious posteriorly); head and thorax below level of lower third of eye abruptly light lavender gray; body, particularly posteriorly, translucent (a dark object placed beneath the fish may be vaguely seen through the fish); a brilliant, dark-edged blue line running from tip of snout to origin of dorsal fin; a dusky streak continues along base of dorsal fin to seventh dorsal spine; a large reddish spot on top of head above hind edge of eye over which the median blue line passes; a dark-edged bright blue line extending horizontally from upper edge of eye on to body, ending beneath base of sixth dorsal spine; dorsal fin pale yellow with a light blue-gray margin and a submarginal dusky bluish band which on soft portion broadens to cover most of fin; anal fin light blue gray with a pale

yellow submarginal band and small pale yellow spots; caudal light pinkish, a little dusky on membranes; pectoral fins pink, the color more evident basally; pelvic fins light bluish gray, faintly spotted with pale yellow; tip of lower jaw bluish; iris bright blue, except posteriorly where green, with a narrow inner rim of pale yellow.

The 21.7 mm paratype collected at the same time as the holotype was colored much the same, but the blue line from the eye was not so well developed and ended beneath the base of the fourth dorsal spine. The 28 mm paratype from Puerto Rico differed slightly in life color from the Curaçao specimens. The dorsal fin was light dusky red, with a pale submarginal band; the pink of the caudal and pectoral fins was more evident, and there was a pinkish tinge to the pelvics. There was a suffusion of orange over the yellow on the head behind and above the eye.

Remarks. — Although small, the type specimens of *Lipogramma trilineata* are not juveniles. The 20.6 mm paratype is a mature female. The 25 mm paratype is a ripe female with ova of variable size up to 0.8 mm in diameter, which seem large for so small a fish.

The specimens were collected from beneath small ledges in coral or rock from depths of 72 to 160 feet.

The occurrence of the species in both northern and southern Caribbean localities suggests that it may eventually be taken throughout the region.

Lipogramma klayi, new species

Plate Ib, Table 3.

Holotype. — USNM 179000, 25.4 mm standard length, collected with a dip net south of Hotel Avila, Willemstad, CURAÇAO, in 240 feet by G. Klay on January 2, 1963. Bottom sand and rock.

Paratypes. — UPR 1129, 22.9 mm standard length, same collecting data as holotype; RMNH 24607, 22.8 mm standard length, collected with a dip net in Piscadera Bay, CURAÇAO, in 220 to 240 feet by G. Klay on December 10, 1962.

Description. — Dorsal rays XII,9 (last ray composite); anal rays III,8 (last ray composite); caudal rays III,19,IV (median 13 to 15 rays branched); pectoral rays 15 (16 on one side of holotype, 15 on both sides of the two paratypes) (upper and lower 2 rays unbranched); pelvic rays I,5 (elongate first soft ray unbranched, remaining 4 branched); lateral scales (upper end of gill opening to

TABLE 3

Measurements of the holotype and two paratypes of *Lipogramma klayi*,

in thousandths of the standard length.

	Holotype USNM 179000	*Paratypes* UPR 1129	RMNH 24607
Standard length (mm)	25.4	22.9	22.8
Body depth at origin of pelvics	384	375	368
Width of body behind gill opening	169	179	175
Head length	346	358	350
Snout length	72	70	70
Eye diameter	126	131	132
Postorbital length of head	165	166	162
Bony interorbital space	71	70	70
Least depth of caudal peduncle	189	192	188
Length of caudal peduncle *	149	160	140
Snout to origin of dorsal fin	374	382	384
Snout to origin of anal fin	662	648	662
Snout to origin of pelvic fin	361	384	390
Length of dorsal fin base	571	578	550
Length of anal fin base	220	218	227
Length of pectoral fin	228	234	227
Length of pelvic fin	540	585	386
Length of pelvic spine	200	187	188
Length of 1st dorsal spine	63	65	57
Length of 2nd dorsal spine	83	87	88
Length of 3rd dorsal spine	108	113	111
Length of 12th dorsal spine	159	157	154
Length of 1st dorsal soft ray	165	162	166
Length of longest (6th) dorsal soft ray	197		197
Length of last dorsal soft ray	137		132
Length of 1st anal spine	45	48	52
Length of 2nd anal spine	108	109	110
Length of 3rd anal spine	177	170	173
Length of 1st anal soft ray		188	188
Length of longest (5th) anal soft ray	220	201	197
Length of last anal soft ray	138	140	136
Length of caudal fin	433	358	350

*) Distance from rear base of dorsal fin to end of hypural plate.

Blank spaces in table denote measurements not possible due to broken fin rays.

end of hypural plate; first scale counted lies above posterior spinous end of post-temporal bone) 38 (36 on paratypes); 11 horizontal rows of scales on caudal peduncle, including mid-dorsal and mid-ventral rows; gill rakers on first arch 6 + 1 + 12 (none as rudiments) (holotype and one paratype counted); vertebrae 10 + 15 (holotype only, by X ray).

No lateral line on body. Pores of lateral line system on head well developed, the tubes clearly visible externally. Four pores in supraorbital series, the first dorso-posteriorly near edge of eye, the second near edge of eye slightly posterior to a vertical through front of pupil, the third dorsal and adjacent to posterior nostril and the fourth just in front of anterior nostril; medial side branches of supraorbital system posterior to the second pore meet at a pore mid-dorsally at hind part of narrow interorbital space. Postorbital series of four pores, the first next to eye at level of top of pupil at point of juncture with supraorbital tube, the last at posterior process of post-temporal bone. Supratemporal tube containing two pores joins suborbital between second and third postorbital pores and passes upward, curves anteriorly, and terminates dorsal to eye in line with hind edge of eye. Mandibular series of seven pores begins with a pore just ventral to second postorbital pore; there are three more along upper limb of preopercle, one anteriorly on lower limb, and two on chin. Suborbital system consists of a short tube in narrow space between eye and upper jaw, with a pore at either end, the posterior one with a large elliptical opening.

Scales on head and anteriorly on body cycloid, on rest of body finely ctenoid; region of transition of two scale types at level of about outer third of pectoral fin (more posteriorly beneath dorsal fin). No scales on snout, interorbital (except median posterior portion), maxillary, or chin. About five rows of scales between eye and lower limb of preopercle. No scales on fins except caudal where progressively smaller scales extend on to base about one-third length of fin.

Origin of dorsal fin over or slightly anterior to hind edge of opercular membrane, and in line with or slightly anterior to origin of pelvic fins. Spines of dorsal and anal fins progressively longer from first to last, with no notch between spinous and soft portions.

Longest rays of dorsal and anal fins reach slightly posterior to base of caudal fin. Three upper and four lower accessory rays of caudal fin are stout spines. Caudal fin emarginate, the seventh and thirteenth rays the longest (thirteenth ray of holotype 3.2 mm longer than shortest median caudal rays). Pectoral fins rounded and short, reaching a vertical to between bases of ninth and tenth dorsal spines. First soft ray of pelvic fins highly elongate, reaching rear base of anal fin of holotype and one of the paratypes.

Snout short, not pointed. Upper profile of head evenly convex. Interorbital slightly convex. Eye large, perfectly circular; pupil ovoid, the more attenuate end facing anteriorly. Nostrils broadly separated, the anterior one tubular and directed dorso-anteriorly, the posterior one next to eye and immediately adjacent to third supraorbital pore. Mouth relatively small, oblique, protractile; lower jaw projecting slightly forward of upper when mouth is closed, more so as mouth opens. Maxillary extends posteriorly to approximately first third of eye. Upper part of maxillary slides slightly beneath rim of suborbital when mouth is firmly closed. Six moderately large canine teeth, slightly incurved and not depressible, on each side of symphysis of upper jaw and four in the lower; an outer row of canine teeth in upper jaw posterior to and nearly as large as front canines; a broad band of villiform teeth medial to canines at front of both jaws which narrows as it passes on to side of jaws. Narrow bands of villiform teeth on vomer and palatines; roof of mouth and upper surface of tongue with scattered small papillae.

No spines or external bony ridges on operculum (flattened posterior edge of opercle ends in a rounded prominence and above this is another slight convexity, but these could not possibly be construed as spines). Post-temporal bone terminates in a blunt spine above upper end of gill opening. Preopercular margin smooth, the angle broadly rounded.

Color in alcohol medium brown on head (lower third paler) and anteriorly on body, pale posteriorly with scattered brown dots which are arranged into rows in a broad zone of transition of the two colors from pectoral region to beneath spinous portion of dorsal fin; a pale spot on snout just in front of eye; a pale band across narrow suborbital ventro-anteriorly to eye; a large pale area posteriorly on

maxillary; lips dusky, this pigment interrupted by a broad pale area about half way back on upper lip; spinous portion of dorsal fin faintly dusky with clear spots and a submarginal clear band; soft portion of fin clear with a few dusky spots, these interconnected anteriorly; anal fin clear with a faint irregular dusky band near base and another half way out in fin; tips of rays slightly dusky; pelvic fins clear with irregular dusky transverse bands; caudal and pectoral fins pale.

Color of holotype after four days in formalin (but away from light): head and anterior part of body heliotrope becoming lavender ventrally; rest of body bright sulfur yellow with scattered dots of heliotrope, each in a scale center.[1]) Zone of demarcation of the two principal colors occurs on the body in region from pectoral fin to spinous portion of dorsal fin; longitudinal lines of heliotrope extend posteriorly from heliotrope region, gradually become rows of discrete dots, one per scale which deeply invade the yellow area; an elongate blotch of yellow from eye to just beneath base of anterior nostril; another short segment of yellow between antero-ventral edge of eye and maxillary; upper part of maxillary yellow, this color continuous with a short horizontal band running beneath eye; a small yellow blotch on preopercle nearly in line with rear and lower edges of eye; tubular anterior nostrils and front of lips dusky purplish; lower edge of upper lip and groove between lip and snout yellow; dorsal fin dull lavender anteriorly, with yellow spots and a narrow heliotrope margin and yellow submarginal band; posteriorly the fin is yellow, spotted with lavender; anal fin light yellow with pale lavender spots and margin; caudal fin bright yellow like body, becoming pale yellowish distally; pectoral fins pale orangish; pelvic fins light yellow with irregular pale lavender cross bands; eye purple and yellow, the outer rim narrowly yellow except dorso-anteriorly where it is heliotrope; extreme inner edge of iris whitish.

The colors of the holotype were the same as those of a color photograph of the paratype taken by FRED. FISCHER of Curaçao on December 10.

The 22.9 mm paratype is a ripe female.

[1]) The names of the two dominant colors were obtained by comparing the colors of the fish to those of the charts of MAERZ & PAUL (1950).

Remarks. — *Lipogramma klayi* bears a strong resemblance in both form and color to *Gramma loreto* (for a discussion of the color of *Gramma* see BÖHLKE & RANDALL, 1963) and presumably could be confused with small individuals of the latter by an underwater observer. KLAY reported that he first sighted the species among a group of *G. loreto*. He would not have distinguished it except for its different behavior. Instead of hovering near a hole, it swam nervously back and forth as he approached. When it finally did seek cover in a hole, it was forced out by an individual of *G. loreto* already occupying the refuge. It was then caught with a small dip net.

KLAY collected the three specimens of this species in Curaçao in the depth range of 220 to 240 feet. He observed another, however, in 120 feet which was over sand about 8 feet away from a small rock. It rapidly swam to cover in the rock. Later the fish was caught but was lost while bringing it to the surface.

Family SERRANIDAE

Genus **Chorististium**

Chorististium GILL, 1862, Proc. Acad. Nat. Sci. Phila. *14*, p. 15 (type species, *Liopropoma rubre* Poey, by original designation).

Pikea Steindachner, 1874. Sitzungsber. Akad. Wiss. Wien., *69*, p. *375* (type species, *Grystes lunulatus* Guichenot, by monotypy).

Ypsigramma SCHULTZ, 1953, Bull. U.S. Nat. Mus. *202*, p. 334, 372 (type species, *Ypsigramma lineata* Schultz, by original designation).

Preliminary diagnosis. — Dorsal rays VIII, 11 or 12, the posterior part of spinous portion deeply indented, with spine tips just protruding from scaly basal sheath, or dorsal fin separated into two portions by a scaled area between the fifth and eighth spines (intermediate spines either imbedded or with tips just projecting); seventh dorsal spine the shortest; anal rays III, 8; pectoral rays 13 to 16, the fourth or fifth the longest. Lateral line complete, highly arched above pectoral fin, the pored scales numbering 44 to 50 (including those which extend posterior to hypural plate); most body scales finely ctenoid, remaining scales cycloid; head, including maxillary, scaled except lips and for some species, a small region medially at front of snout; basal half or more of soft portions of median fins scaled; basal third to more than half of pelvic fins scaled; pectorals scaled only at extreme base. Opercle with three flattened spines, the central one the strongest and most prominent,

the upper and lower ones usually not readily apparent due to overlying scales; middle opercular spine much closer to lower than upper spine; angle of preopercle rounded, the margin smooth or with fine denticulations on upper limb. Body moderately elongate, the depth 2.9 to 3.8 in standard length and moderately compressed, the width behind gill opening about 2.2 to 2.7 in head length. Snout pointed, the lower jaw projecting. Maxillary very broad posteriorly, part of this width due to a ventral process; maxillary reaches posterior to center of eye but not beyond rear edge of eye; supramaxillary present. Teeth small, in villiform bands in jaws, on palatines, and in a "V" shape on vomer; no teeth conspicuously enlarged, the longest occurring posteriorly in the broadened bands at the front of the upper jaw and at the sides of the lower jaw (inner teeth depressible); tongue long and narrow, with very small tubercles scattered on upper surface. Interorbital flat or slightly convex. Nostrils broadly separated, the anterior nostril tubular and near front of upper lip, the posterior nostril near eye. Gill membranes narrowly attached to isthmus beneath eye, with no free fold; 7 branchiostegal rays. Pseudobranchiae present. Caudal fin varies from slightly rounded (particularly in young), through truncate, to emarginate or slightly forked with rounded corners. Vertebrae 10 + 14. Small fishes, rarely exceeding 65 mm in standard length.

The above diagnosis is based on the following species of *Chorististium: africanum* Smith (Zanzibar), *brocki* (Schultz) (Marshall Islands and Gilbert Islands), *carmabi* (described in the present paper) (West Indies), *eukrines* Starck and Courtenay (Florida and North Carolina), *lineata* (Schultz) (Marshall Islands and Philippines), *mowbrayi* (Woods and Kanazawa) (Bermuda and West Indies), *pallidum* Fowler (Line Islands and Marshall Islands), *rubre* (Poey) (Caribbean Sea), *susumi* Jordan and Seale (Samoa and East Africa), and *swalesi* Fowler and Bean (Celebes).

Discussion. — Woods & Kanazawa (1951), Schultz *et al* (1953), Smith (1954), Böhlke (1956), Schultz (1958), Katayama (1960), and Starck & Courtenay (1962) have written recent papers concerning the classification of *Chorististium*. It is evident from these and earlier papers that there has been confusion in the

use of the generic names *Chorististium* Gill, *Pikea* Steindachner, and *Liopropoma* Gill. WOODS & KANAZAWA included *Chorististium* in *Liopropoma*. SCHULTZ (1958) recognized all three genera. KATAYAMA regarded *Liopropoma* as distinct, but placed *Pikea* in the synonymy of *Chorististium*. BÖHLKE and STARCK & COURTENAY have pointed out the need for examination of the type species of *Liopropoma* and *Pikea* before final decisions can be made on the classification of these related genera.

The type of *Perca aberrans* Poey (1860), the type species of *Liopropoma*, is apparently not extant, and no other specimens of of this species could be found (SCHULTZ, 1958, realized that the specimens named *Liopropoma aberrans* by LONGLEY & HILDEBRAND, 1941, could not be the same as POEY's species and renamed them *Pikea mexicanus*). Until a specimen of *aberrans* can be examined, the status of *Liopropoma* cannot be determined with assurance. SCHULTZ (1958) and KATAYAMA (1960) have used only its IX dorsal spines to distinguish it from *Chorististium* which has VIII. NORMAN (MS) used, in addition, the supposed single opercular spine of *aberrans* and the lack of serrations on the preopercle to further distinguish *Liopropoma* (he overlooked *Chorististium* in his classification insofar as his manuscript was completed); however POEY did mention two other opercular spines, less obvious than the central one, which are not shown on his figure. Fine serrations may or may not be present on the upper limb of the preopercle of *Chorististium*.

If the difference of one spine in the count of the dorsal fin rays is the only significant character found to separate *Liopropoma* from *Chorististium*, then the latter should be placed in the synonymy of *Liopropoma*. POEY's description and figure indicate that nearly all of the characters listed in the preliminary diagnosis above for *Chorististium* are shared by *aberrans*. Only a few important features not discussed by POEY, such as the presence or absence of a supramaxillary and of a prominent ventral process from the posterior end of the maxillary need to be checked.

The holotype of *Grystes lunulatus* Guichenot, the type species of *Pikea*, is in the Muséum National d'Histoire Naturelle in Paris. The specimen (No. 1318), 125 mm in standard length, was examined

by the author. It is stuffed and in very poor condition. All fins have broken rays, and many scales have been lost. The lower jaw is broken, the palatal region of the mouth is damaged, and the tongue is missing.

The only characteristics by which the specimen of *lunulatus* was found to differ from the diagnosis of *Chorististium* as given above is its greater size and its shorter sixth (instead of seventh) dorsal spine. Possibly more differences could be determined if the specimen were in better condition; however there seems to be no alternative but to follow KATAYAMA in placing *Pikea* in the synonymy of *Chorististium.*

The following more specific observations were made of the type of *lunulatus*: dorsal rays VIII, 12; anal rays III,8; pectoral rays 15; lateral-line scales about 46 to end of hypural; 7 scales in a diagonal row above lateral line to origin of dorsal fin; 4 scales between dorsal fin and most highly arched portion of lateral line; 19 scales above lateral line on one side of caudal peduncle to lateral line on other side; gill rakers 6+1+10 (including rudiments; the tenth raker of lower limb of the gill arch appears to represent a fusion of about 4 rudiments) (longest gill raker 3.5 mm); branchiostegal rays 7. Lengths of intact dorsal spines: I – 5.8 mm; IV – 10.2 mm; V – 8.2 mm; VI – 7.7 mm; VII – 8 mm. First anal spine 5.2 mm; second anal spine 11 mm (third spine broken). Most scales of body finely ctenoid, those covering head (lips not scaled) cycloid; where still adherent, scales extend nearly to tips of last few dorsal spines; scales extend far out on soft dorsal, caudal, and anal fins; little of the paired fins remains and what remains is abraded, but there are scales at least basally. Depth of body 35 mm and width 19 mm (these measurements may have been altered by the stuffing of the specimen). Snout pointed, 12 mm in length. Eye diameter 10 mm. Head length 49 mm, the distal end of the opercular membrane moderately pointed; 3 flattened opercular spines, only the central one prominent and stout; tip of lower opercular spine about 2 mm below middle spine; tip of upper spine about 4 mm above and anterior to middle spine. Preopercle rounded, the margin smooth except for very small denticulations on lower part of upper limb. Maxillary extends slightly posterior to center of eye; supramaxillary present; maxillary 8 mm broad posteriorly, one-fourth of this width due to ventral process. A prominent pore on snout between and above the widely-spaced nostrils; anterior nostril tubular. Villiform teeth in bands on jaws, palatine, and in a "V" shape on vomer; no teeth enlarged to form canines.

SCHULTZ (1958) included two of the species used above for the diagnosis of *Chorististium, mowbrayi* and *swalesi,* in the genus *Pikea.* He distinguished *Chorististium* from *Pikea* by the scaled area that divides the dorsal fin into two parts. In *Pikea* the two fins are continuous by a ridge of scales along the sides of the connecting dorsal spines. There is, however, a great range of variability among

the species of *Chorististium* with respect to this character. At one extreme is *C. pallidum* on which there is a broad scaled zone with no trace of ridge between the dorsal fins and in which the sixth and seventh spines are completely covered by scales. The other extreme is represented by *C. swalesi* (the complex color pattern of which is almost identical to *rubre*) which has a high scaled ridge, and even the shortest (seventh) dorsal spine protrudes well above the ridge. Intermediate lie *rubre* with a slight ridge and *mowbrayi* with a moderately well developed one.

In order to include other species in *Chorististium* which SCHULTZ has classified in *Pikea*, considerable modification of the generic diagnosis must be made. *Pikea aurora* Jordan & Evermann from Hawaii, for example, has 13 dorsal soft rays and 9 anal soft rays, a thicker body (width about 2 in head length), smaller scales (up to 52 in lateral line), no small tubercles on tongue, and the patch of vomerine teeth in more of triangular shape than in a "V". *Pikea japonicus* (Döderlein) has 14 soft dorsal and 10 soft anal rays; its dorsal fin shows little indentation, and the eighth spine is the shortest. *Pikea maculata* Steindachner & Döderlein has 65 to 70 lateral-line scales. *Pikea mexicanus* Schultz and *P. cubensis* Schultz have 14 dorsal soft rays, relatively little indentation of the dorsal fin, and a rounded instead of a pointed snout. *Pikea longilepis* (Garman) (described in *Liopropoma*) is perhaps the most diverse. A paratype from "off Panama" (USNM 153602), 102 mm in standard length, was examined. It is a slender fish, the depth only 21 mm. The caudal is strongly emarginate, the lobes with filamentous tips; the soft portions of the dorsal and anal fins are very long (longest rays about 22 mm), but the spinous portions are short (longest dorsal spine, 8 mm); there is no scaly sheath at the base of the dorsal fin; the snout is 11 mm long, its upper profile convex; the head length is 42 mm.

The limits of *Chorististium* as here set forth should probably not be extended to include all of the above species. It seems inadvisable to attempt to restrict the genus in the present paper without further study, and particularly without a specimen of *Liopropoma*.

Clearly, a generic revision of the Liopropominae (as defined by KATAYAMA, 1960) is needed.

COLOR KEY TO THE WESTERN ATLANTIC SPECIES OF *Chorististium*

1a. Body without one or more stripes; color in life red with a yellow band from tip of snout and lower jaw to eye (Bermuda and West Indies) . . . . . *mowbrayi*

1b. Body with one or more lengthwise dark stripes 2

2a. Body with a single median lateral dark stripe from snout to end of caudal fin (stripe broadens as it passes posteriorly); no dark spot in second dorsal fin (Florida and North Carolina)[1]) *eukrines*

2b. Body with six lengthwise dark stripes (ventral ones faint on preserved specimens of *carmabi*), the first located mid-dorsally; a black spot in second dorsal fin 3

3a. Head and body alternately striped with dark reddish brown and light pinkish tan, the tan bands bisected by a yellowish green line; black spot on anal fin; two black spots posteriorly on caudal fin interconnected medially by a narrow black region (Florida, Yucatan, and West Indies) . . . . . *rubre*

3b. Head and body alternately striped with yellow or orange and lavender, these stripes separated by red lines; no black spot on anal fin; two separate black spots posteriorly on caudal fin (Puerto Rico and Curaçao) . . . . . *carmabi*, n. sp.

[1]) A 23.3 mm specimen was recently collected off Cape Lookout, North Carolina in 75 fathoms by M. Cerame Vivas of Duke University. The opportunity of reporting on this specimen, the first taken outside of Florida (both east and Gulf coasts), was provided by Walter R. Courtenay who made the identification. The fish was sent to the U. S. National Museum by Lawrence McCloskey; it is catalogued under number 197499. Still another specimen was collected off northeast Florida ("Silver Bay" 4419, 29°09′ N, 80°12′ W, in 36–40 fathoms). It is 55 mm in standard length and is catalogued at the Marine Laboratory, University of Miami under number 11622 (data courtesy C. Richard Robins).

Chorististium mowbrayi

Plate Ic, Table 5.

Liopropoma mowbrayi WOODS & KANAZAWA, 1951. Fieldiana, Zool. *31* (53), p. 663, fig. 134 (type locality, Bermuda).

CURAÇAO record. — UPR 1131, 1 specimen, 50.7 mm standard length, collected by G. Klay east of Willemstad, in 100 feet with a dip net on January 6, 1963. Fins badly abraded.

PUERTO RICO record. — UPR 1132, 1 specimen, 39.6 mm standard length, collected by J. Randall 6 miles south of La Parguera, in 180 feet with a multi-prong Hawaiian sling spear on March 3, 1963.

Descriptive notes. — Dorsal rays VI–I–I,12; anal rays III,8; pectoral rays 13; lateral line scales 47 (not possible to count on Puerto Rican specimen because of spear wound); gill rakers 16.

INGVAR KRISTENSEN described the life color of the Curaçao specimen as follows: dark red, the ventral part lighter (belly between pelvic and anal fins almost rose); yellowish on snout; iris yellowish; caudal edge white, submarginally black; black spot on second dorsal fin (spot on anal fin probably missing as a result of fin damage).

The Puerto Rican specimen was grayish red with a yellow band from tip of snout to eye; hind margin and corners of caudal fin whitish with a broad black submarginal band; a small black spot distally in soft dorsal and anal fins.

Remarks. — Contrary to the opinion of BÖHLKE (1956, p. 2), *mowbrayi* fits well in *Chorististium*. In addition to color, it differs from the two other West Indian species in being more compressed (width of body about 2.5 in head length; 2.3 in head length of other two species), in having a more pointed head (the genus, in general, is somewhat reminiscent in head shape to *Centropomus*); also the hind flap of the opercular membrane is more pointed on *mowbrayi*. As pointed out by STARCK & COURTENAY (1962), there is more of a ridge on the back of *mowbrayi* between the two dorsal fins than on *rubre* (and *carmabi*), a character shared by *eukrines*.

C. mowbrayi is known from only five specimens: the holotype from Bermuda collected by MOWBRAY, two from the Bahamas collected by the author and associates, and the two reported in the present paper. With the exception of the holotype which was found washed up on a beach after a storm, all specimens were taken at depths of 100 to 180 feet. The species has been sighted on several occasions, singly beneath small ledges in coral reefs, and always in water of 100 feet or more. It is not as rare as the few specimens would indicate.

Chorististium rubre

Plate IIa, Table 5.

Liopropoma? rubre POEY, 1861. Memorias ... Cuba, vol. *2*, p. 418 (type locality, Cuba).

CURAÇAO record. — UPR 1133, 3 specimens, 40 to 48.8 mm standard length, collected with Chem-Tox by J. Randall in 45 feet in a coral head near drop-off into deep water off Lagoen, Curaçao on November 25, 1962.
ST. JOHN, Virgin Islands record. — UPR 1134, 1 specimen, 63 mm standard length, collected by spear in a cave at Stevens Cay, in 10 feet of water on March 10, 1961; UPR 1135, 5 specimens, 19.5 to 54 mm standard length, collected with Pro-Noxfish by J. Randall and R. E. Schroeder in a coral reef in Lameshur Bay, in 40 feet on May 24, 1961.
PUERTO RICO record. — UPR 1136, 4 specimens, 38.5 to 58.5 mm standard length, collected with Pro-Noxfish by J. Randall in coral rock at El Negro Reef off Mayagüez, Puerto Rico in 50 feet on December 3, 1961; UPR 1137, 4 specimens, 37.5 to 57 mm standard length, collected with Pro-Noxfish by J. Randall in reef 6 miles south of La Parguera, in 70 feet on January 20, 1963; UPR 1138, 1 specimen, 42 mm standard length, collected with Pro-Noxfish by J. Randall from a cave 6 miles south of La Parguera, in 72 feet on April 11, 1963.

Descriptive notes.—Dorsal rays VI–I–I,12; anal rays III,8; pectoral rays 13, lateral line scales 48 or 49 (mostly 49); gill rakers 16 to 18 (mostly 17) (19 specimens).

Color in life of UPR 1138 (Pl. IIa): pink with six dark reddish brown stripes on head and body, the uppermost running from interorbital to origin of dorsal fin and the lowermost beginning just behind lower part of maxillary, continuing along thorax, abdomen, and base of anal fin to merge with its fellow of the other side as one midventral band on caudal peduncle and fin; pink interspaces between dark stripes bisected by olive green streaks of about equal width to the pink region on either side (dark brown stripes nearly twice as broad as the green); dark stripes extend on to caudal fin, ending in a vertically elongate bilobed black area near end of fin; posterior to black area is a narrow region of pale blue (broadest at corners of fin), followed by a hyaline border; basal scaled portion of second dorsal and anal fins colored like body; remainder of these fins, first dorsal, and paired fins with pink rays and hyaline membranes except greater part of region between third and fifth dorsal spines which is clear and for a black spot on outer front half of second

dorsal fin and a smaller one at a comparable location on anal fin (both spots rimmed distally with light blue); a dark reddish brown stripe from eye to tip of snout; tip of lower jaw dark brown.

A color photograph of UPR 1135 shows a ground color of light tan instead of pink. The pink specimen was taken in 70 feet of water and the light tan specimen in 10 feet. The greater amount of red color within a species with increasing depth is well known for serranid and other fishes.

Remarks. — BÖHLKE (1956) has redescribed *rubre* in detail. The species is now known from Cuba, Bahamas, Florida Keys, Yucatan, Haiti, Virgin Islands, Puerto Rico, and Curaçao.

Although fairly common on West Indian reefs, this fish is not often seen by divers. It is a secretive species, at least by day, and is most often found in caves or deep recesses in reefs.

Chorististium carmabi, new species

Plate IIb, Tables 4–5.

Holotype. — USNM 179001, 39.2 mm standard length, collected with emulsified rotenone (Pro-Noxfish) 6 miles south of La Parguera, PUERTO RICO (17° 52.2′ N; 65° 2.5′ W), in 180 feet by J. Randall and L. Morera on April 11, 1963. Coral near sand; bottom steep.

Paratypes. — USNM 179002, 18.6 mm standard length, collected with Chem-Tox in 70 feet by J. Randall at entrance to cave in near-vertical reef front at KLEIN CURAÇAO (12° N; 68° 40′ W), south side of island off fishing camp, on November 28, 1962; ANSP 98680, 42.4 mm standard length, collected with Chem-Tox by J. Randall off Lagoen, CURAÇAO in 200 feet on a coral rubble bottom at the steep drop off into deep water on November 30, 1962; RMNH 24609, 40.8 mm standard length, collected with quinaldine by G. Klay in 180 feet off Lagoen, CURAÇAO at steep drop-off into deep water on November 30, 1962; UPR 1130, 32.8 mm standard length, collected with Chem-Tox by J. Randall in 45 feet off Lagoen, CURAÇAO, in a coral head near drop-off into deep water on November 25, 1962.

Description [fin ray and scale counts taken from all specimens; measurements (Table 4) made of holotype and largest and smallest paratypes]. — Dorsal rays VI–I–I, 12 (last ray composite except that of one paratype with 13 soft rays) (first dorsal soft ray unbranched); anal rays III,8 (last ray composite); principal caudal rays 17 (15 branched); pectoral rays 13 (upper two and lower one or two unbranched); pelvic rays I, 5; lateral line scales 48 (includes 2

TABLE 4

Measurements of the holotype and two paratypes of *Chorististium carmabi,*

in thousandths of the standard length.

	Holotype USNM 179001	*Paratypes* ANSP 98680	USNM 179002
Standard length (mm)	39.2	42.4	18.6
Greatest depth of body	308	339	301
Width of body behind gill opening	171	174	156
Head length	406	402	430
Snout length	817	825	915
Horizontal diameter of eye	94	97	124
Postorbital length of head	222	219	215
Bony interorbital space	51	54	48
Least depth of caudal peduncle	166	177	162
Length of caudal peduncle	189	179	188
Snout to origin of first dorsal fin	477	462	462
Snout to origin of anal fin	658	721	693
Snout to origin of pelvic fin	380	370	430
Length of base of both dorsal fins	403	397	365
Length of anal fin base	151	144	143
Length of pectoral fin	291	280	
Length of pelvic fin	228	231	242
Length of pelvic spine	133	130	134
Length of 1st dorsal spine	17	21	21
Length of 2nd dorsal spine	123	125	118
Length of 3rd (longest) dorsal spine	135	141	134
Length of 6th dorsal spine	43	39	37
Length of 8th dorsal spine	76	77	70
Length of 1st dorsal soft ray	102	113	108
Length of longest (4th or 5th) dorsal soft ray	184	175	
Length of last dorsal soft ray	102	122	139
Length of 1st anal spine	65	71	54
Length of 2nd anal spine	156	156	140
Length of 3rd anal spine	145	135	129
Length of 1st anal soft ray	194	170	199
Length of longest (3rd) anal soft ray	217		
Length of last anal soft ray	115	120	124
Length of caudal fin	204	207	240

Blank spaces in table denote measurements not possible due to broken fin rays.

past hypural); horizontal rows of scales on caudal peduncle, including mid-dorsal and mid-ventral scales, 17 to 19 (17 on holotype); scales above lateral line to origin of dorsal fin 5 (not counting small median predorsal scale); scales below lateral line to origin of anal fin 17; gill rakers usually 5 + 1 + 10 (4 + 1 + 9 on one side of holotype and 5 + 1 + 10 on the other) (rudiments counted; those on ventral end of lower limb of arch tend to coalesce); vertebrae 10 + 14 (holotype only, by X ray).

Lateral line highly arched beneath first dorsal fin, dropping to mid-lateral position at level of rear base of second dorsal and anal fins and straight thereafter to caudal base; 4 rows of scales between lateral line and mid-base of first dorsal fin and 8 above lateral line on caudal peduncle to and including mid-dorsal row; head scaled except for lips and a small region medially on front of snout; 8 scales in a row between eye and center of rounded edge at corner of preopercle; scales on head, thorax, nape, and along base of first dorsal fin cycloid, those on rest of body finely ctenoid; no scales on base of first dorsal fin; small scales about half way out on second dorsal and pelvic fins, about two-thirds out on caudal and anal fins, and one-fifth on pectoral fins.

Lateral line system on head well developed, the largest pores being the three anterior ones of the supraorbital series (one above and slightly anterior to center of eye, one in front of posterior nostril and the third at the edge of the upper lip above and slightly anterior to front nostril) and five anterior ones of the mandibular series (the first of these occurring just anterior to end of margin of lower limb of preopercle).

Origin of first dorsal fin above sixth to seventh lateral line scales; first dorsal spine small and feeble, about one-sixth length of second dorsal spine, and close to this spine; third dorsal spine the longest; seventh spine not linked by membrane with the sixth and nearly covered by scales; eighth dorsal spine at front of second dorsal, encased in scales of basal part of fin; caudal fin rounded, the median portion truncate to very slightly emarginate; origin of anal fin slightly posterior to origin of second dorsal fin; rear base (axil) of anal fin in line with rear base (axil) of second dorsal fin; anal spines all stout, the first contained about 2.5 times in the second, the third slightly shorter

TABLE 5

Lateral-line Scales and Total Gill Rakers
of Species of *Chorististium* from the West Indies

	Lateral-line Scales			Total Gill Rakers			
	47	*48*	*49*	*15*	*16*	*17*	*18*
C. mowbrayi	3	1			3	1	
C. rubre		4	15		5	13	1
C. carmabi		5		1	4		

and more slender than the second; pectoral fins pointed, the fourth and fifth rays the longest, reaching to level of origin of anal fin; pelvic fins not long, reaching to level of base of fifth or sixth dorsal spines, hence short of anus; pelvic spine contained about 1.7 times in first soft ray of fin.

Snout moderately pointed, its length contained nearly five times in head length; interorbital nearly flat; eye about 4 times in head length; pupil ovoid, the narrower end facing anteriorly; nostrils broadly separated, the anterior one near front of snout tubular, the tube broader than width of upper lip; posterior nostril next to eye, elliptical, the long axis parallel to edge of eye; mouth oblique, the lower jaw projecting, the broadly expanded maxillary reaching to or slightly posterior to hind edge of pupil; supramaxillary present; no canine teeth; villiform teeth in bands in jaws which are broader anteriorly, the longest in upper jaw occurring at rear of bands at front and the longest of the lower along the sides of the jaw; villiform teeth in a V-shaped band on vomer and in a narrow band on palatines; tongue free, long and slender; gill membranes united beneath anterior fourth of eye and free from isthmus; longest gill rakers about half the length of gill filaments.

Opercle with three flattened posterior spines, the uppermost poorly developed and difficult to locate; hind edge of opercular membrane slightly pointed, ending above upper base of pectoral fin; preopercular margin smooth, broadly rounded, with a slight indentation below center of corner; upper limb of preopercle begins at level of center of eye and lower limb ends slightly posterior to hind edge of eye.

Body elongate, the depth about 3 to 3.3 in standard length; body depth maximal from origin of first to origin of second dorsal fins; depth of caudal peduncle about half depth of body; width of body about equal to depth of caudal peduncle; upper profile of head slightly concave from snout to level of hind edge of eye and slightly convex from there to origin of first dorsal fin.

Color in alcohol of holotype: light tan, almost white, with five lengthwise dusky stripes (average width about half that of pale interspaces, at no place greater in width than maximum depth of pupil); first stripe mid-dorsal, beginning on snout just anterior to front edge of eye and ending at origin of first dorsal fin; second stripe begins at upper edge of eye and ends on second dorsal fin near rear base; third stripe begins on upper lip, runs through eye just above pupil and ends at rear of caudal fin; fourth stripe commences at tip of lower jaw, passes through eye just below pupil, runs slightly below middle of body and ends at rear of caudal fin; fifth stripe is faint, beginning beneath pectoral fin near lower base and ending at rear of caudal fin; third and fifth stripes converge slightly on caudal fin toward fourth stripe in mid-line; first dorsal fin hyaline with some blackish pigment on basal third of leading edge of fin and a narrow blackish streak on membrane in front of third dorsal spine; second dorsal fin pale with a black spot about as large as eye in outer front part of fin; leading edge of fin blackish; a horizontal dusky stripe from front of fin to lower part of black spot; caudal fin with a dusky stripe above and below the three previously mentioned median stripes and two large black spots in rear of fin (these slightly smaller than spot on second dorsal), to each of which the upper and lower pairs of caudal stripes are marginal; a small amount of pigment on upper outer edge of caudal fin; remaining fins pale.

The paratypes are colored in preservative almost the same as the holotype. The smallest specimen shows a sixth stripe on the abdomen which extends to rear base of anal fin. UPR 1130 has dusky stripes nearly equal in width to the pale interspaces; these stripes are edged with dark lines.

Color in life of holotype: bright yellow with six stripes of lavender-pink, edged narrowly with orange-red, on head and body, the uppermost mid-dorsal from front of interorbital to origin of dorsal

fin; the second from upper edge of eye to rear base of second dorsal fin; the third from tip of snout, interrupted at upper edge of eye, and continuing to end of caudal fin; the fourth from tip of lower jaw, interrupted at lower edge of eye, and continuing down body slightly below the mid-line to hind edge of caudal fin; the fifth beginning near end of lower jaw, crossing maxillary and lower edge of pectoral base, and passing to hind edge of caudal fin; the sixth from chin, ending initially in hind part of anal fin, reappearing mid-ventrally at front of caudal peduncle and lower edge of caudal fin; first dorsal fin yellow, the first three spines edged narrowly in front with dark purple; second dorsal fin yellow with a large black spot distally, edged in purplish blue; continuous with blue edge of spot is a horizontal streak of purplish blue which runs to purplish blue margin at front of fin; caudal fin yellow with five lavender-pink stripes, the three medial ones continuous with body stripes; two black spots, each slightly smaller than second dorsal spot, in hind part of caudal fin, these spots edged anteriorly in lavender-pink and posteriorly with purplish blue; soft portion of anal fin yellow with a narrow pink margin anteriorly, a basal pink stripe continuous with lowermost body stripe, and a short horizontal pink stripe in middle of fin; pelvics yellow with a few streaks of pink; pectorals pinkish; iris pale yellow, the upper and lower edges bright blue.

The paratypes from Curaçao differ in life color from the holotype from Puerto Rico principally in the color of the alternate stripes. The yellow stripe of the Puerto Rico specimen corresponds with orange of the Curaçao material, and the lavender-pink of the holotype with lavender-blue of Curaçao specimens.

The life color of UPR 1130, a 32.8 mm specimen from Curaçao, was as follows: head, body, and caudal fin alternately striped with deep orange, edged narrowly with red, and pale lavender-blue; lavender-blue stripes are bluer on the head (particularly on snout and chin) and on caudal fin; first dorsal fin largely yellow (first interradial membrane as much lavender as yellow), the leading edge of the first spine bluish, the tips of the spines dusky; second dorsal fin receives in its basal portion the uppermost orange body stripe; outer part of fin with a black spot as large as eye edged in bright blue; posterior to spot soft rays are orange, the membranes clear;

anterior to spot the rays are blue except for a median section of the second and third rays which are orange; ventral orange body stripe enters anal fin at origin and bifurcates in center; rest of fin pale lavender; caudal with two black spots about as large as one on second dorsal in hind part of fin, one at upper corner and one at lower, both edged with bright blue, this color confluent with lavender-blue stripes of fin and body; paired fins pale hyaline pink, the pelvics with an orange lateral edge; iris bright blue above and below where lavender-blue stripes merge from front and back; iris in between blue region pale yellow with an orange inner ring.

Remarks. — *C. carmabi* is one of the most complexly and beautifully colored of West Indian fishes, and it is with pleasure that I name it in honor of the Caribbean Marine Biological Institute ("Caraïbisch Marien-Biologisch Instituut", Carmabi) of Curaçao and its most cooperative staff headed by INGVAR KRISTENSEN.

C. carmabi might be confused with *rubre* because of the striped color pattern, the two black spots in the caudal fin (interconnected in *rubre*) and single black spot in the second dorsal fin. *C. rubre* has, in addition, a small black spot in the anal fin. Also it is more elongate (depth 3.2 to 3.5 in standard length) and has a longer snout (snout length about 4 in head length). It appears to have slightly higher lateral-line scale and gill-raker counts (Tables 4 and 5).

C. carmabi seems to prefer deeper water on the average than *rubre*. The latter may be found in water only a few feet deep and has been taken at various depths to 72 feet; the five known specimens of *carmabi* were captured in from 45 to 200 feet.

Mr. DON A. STEWART and PERCY D. SWEETNAM, who collect small marine fishes for the aquarium trade, observed four individuals of *carmabi* in BONAIRE in 120 feet in September, 1962 and collected one alive. This fish, which they measured at 2⅛ inches total length, was sent to Amsterdam and ended up in the aquarium there in the care of FRANK DE GRAAF. A colored drawing made by Mr. STEWART was sent via Dr. KRISTENSEN to the author in January, 1963. It leaves no doubt of the identity of the fish as *carmabi;* thus Bonaire may be considered as a third known locality. Mr. DE GRAAF suspected that the specimen might represent a new form, but kindly deferred further investigation upon learning of the author's intention to describe the species.

Genus **Serranus**

Serranus CUVIER, 1817, Règne Animal, vol. *2*, p. 276; 1829, p. 139 (type species, *Perca cabrilla* Linnaeus, by subsequent designation).

Prionodes JENYNS, 1842, The zoology ... Beagle ... 1832–1836, pt. *4* (Fishes), p. 46 (type species, *Prionodes fasciatus* Jenyns, by monotypy).

Mentiperca GILL, 1862, Proc. Acad. Nat. Sci. Phila., p. 236 (type species, *Serranus luciopercanus* Poey, by monotypy).

Serranellus JORDAN (in JORDAN & EIGENMANN), 1890, Bull. U. S. Fish Comm. *8*, p. 399 (type species, *Perca scriba* Linnaeus, by original designation).

ROBINS & STARCK (1961) recorded 11 species of *Serranus* from West Indian localities. Only three (*phoebe, tigrinus,* and *tabacarius*) are recorded by METZELAAR (1919) from Curaçao. Two others were collected by the author (see below). In addition, *S. tortugarum* and *S. baldwini* were observed but not taken.

Serranus annularis

Plate IIIa

Centropristis annularis GÜNTHER, 1880, Report ... fishes ... Challenger .. 1873–1876, p. 6 (type locality, off Pernambuco, Brazil).
Prionodes nigropunctatus HILDEBRAND (in LONGLEY & HILDEBRAND), 1940, Pap. Tortugas Lab. *32*, no. 14, p. 236, fig. 7 (type locality, Tortugas, Florida).

CURAÇAO record. — UPR 1139, 1 specimen, 31 mm standard length, collected with quinaldine by Gerrit Klay off Lagoen, in 180 feet on November 30, 1962.

Descriptive notes. — Dorsal rays X,12; anal rays III,7; pectoral rays 13 (12); lateral line scales 47; gill rakers 5 + 1 + 10.

The color in life seemed the same as that of Virgin Islands specimens collected by the author [color recorded from author's kodachrome by ROBINS & STARCK (1961)]. The specimen shows the characteristic narrow-lined square just behind the eye and a slightly larger squarish marking on the head immediately posterior to the square.

Remarks. — The species is known from the northern coast of South America, Virgin Islands, Florida Keys, Bermuda, and now Curaçao. It is not uncommon, and the few records are the result of its occurrence in relatively deep water, *i.e.* 100 to at least 220 feet.

Serranus luciopercanus

Plate IIIb

Serranus luciopercanus POEY, 1852. Memorias ... Cuba, p. 56, pl. 9 fig. 1 (type locality, near Havana, Cuba).

CURAÇAO records. — UPR 1141, 1 specimen, 93 mm standard length, taken with a multi-prong Hawaiian sling spear by J. Randall in Piscadera Bay, in 210 feet on January 2, 1962; UPR 1142, 1 specimen, 122 mm standard length,

taken with a multi-prong Hawaiian sling spear by J. Randall in Piscadera Bay, in 180 feet on November 29, 1962.
PUERTO RICO record. — UPR 1143, 1 specimen, 83.5 mm standard length, collected with Pro-Noxfish by J. Randall and L. Morera 6 miles south of La Parguera, in 180 feet on April 11, 1963.

Descriptive notes. — Dorsal rays X,12 (one with X,11); anal rays III,7; pectoral rays 14 (one with 13); lateral line scales to end of hypural plate 55; gill rakers 7 + 1 + 15 (3 specimens).

Color in life grayish blue, shading to white ventrally, with squarish blackish blotches (most consisting of many narrow black bars which merge centrally) arranged in three lengthwise rows on upper two-thirds of body and in vertical-oblique bars, the most prominent one beginning with a large blotch on back and base of dorsal at fifth to tenth dorsal spines; spinous portion of dorsal fin pale bluish gray, shading outwardly to yellowish, with two dark areas basally which are adjacent to the blackish bar at base of fifth to tenth dorsal spines and a diagonal blackish band from front of the first of these dark areas to middle of third dorsal spine; soft portion of fin with alternate bands of grayish blue and light yellow; caudal and anal fins light yellowish, the lobes of the caudal with close-set diagonal blackish cross bands; paired fins pale; iris primarily light yellow.

Remarks. — This species is apparently not only confined to relatively deep water (known depth records 180 to 360 feet) but is also rare. It is known only from Cuba, Honduras, and Martinique; thus the additional records from Curaçao and Puerto Rico are noteworthy. The three specimens taken by the author were all found on a steep bottom of small coral patches and sand.

As suspected by ROBINS & STARCK (1961), *luciopercanus* is a more actively swimming form, like *S. tabacarius*, than most other West Indian *Serranus*. The stomach of the 122 mm specimen from Curaçao contained an unidentified fish (60% volume) and 49 mysid shrimps from about 4 to 8 mm in length. The mysids were identified as *Mysidium columbiae* by Thomas E. BOWMAN of the U. S. National Museum.

In the deep water where *luciopercanus* has been observed, the blue color of the head and body appears much deeper and brighter than when the fish is viewed, still living, at the surface. The same applies to the blue color of *Serranus tortugarum*.

Two specimens in the United States National Museum (no. 4667, labelled *Mentiperca luciopercana*) were collected by POEY in Cuba. Very possible these are syntypes, for no other POEY material has been found.

Genus **Schultzea**

Schultzea WOODS, 1958, Fieldiana, Zool. *39*, no. 22, p. 249 (type species, *Schultzea campechanus* Woods, by original designation).

Schultzea beta

Plate IIc

Serranus beta HILDEBRAND (in LONGLEY & HILDEBRAND), 1940, Pap. Tortugas Lab. *32*, no. 14, p. 239, fig. 9 (type locality, south of Tortugas, Florida).

Schultzea campechanus WOODS, 1958, Fieldiana, Zool. *39*, no. 22, p. 250 (type locality, about 135 miles north of Cape Catoche, Yucatan, Mexico, in 45 fathoms).

CURAÇAO records. — UPR 1144, 1 specimen, 47 mm standard length, taken with a multi-prong Hawaiian sling spear by J. Randall in Piscadera Bay, in 150 feet on January 1, 1962; UPR 1145, 1 specimen, 48 mm standard length, collected with Chem-Tox by J. Randall in Piscadera Bay, in 140 feet on November 30, 1962.

Descriptive notes. — Dorsal rays X,11 or 12; anal rays III,7; pectoral rays 15; lateral line scales to end of hypural plate 48 or 50; gill rakers 10 + 1 + 21 (2 specimens).

In life the Curaçao fish display a broad reticulum of brownish orange (edges of scales dark brown, centers orange), which becomes orange ventrally on body and yellow on caudal peduncle (one departure from the irregularity of this pattern consists of two lengthwise orange bands on mid-side of body which, however, are an integral part of the reticulate pattern); intervening areas, which are larger ventrally, bluish white; lateral line pale; caudal fin yellow with brown spots basally and small white spots; dorsal fin mottled with orangish brown and pale bluish spots, the ends of the last three rays whitish; anal fin pale bluish with a broad median band of brownish orange and a large whitish spot posteriorly; pectoral fins pale; pelvic fins light blue and orange (the orange mostly on spine and first ray); iris pale yellow with broad brown blotches.

Remarks. — The present record of *Schultzea beta* from Curaçao constitutes the first from the southern Caribbean. It is otherwise known from Florida, Yucatan, Honduras, Bahamas, Virgin Islands, and the Saba Bank, in the depth range of 70 to 270 feet. The species has been encountered on several occasions by the author, always

in water of at least 80 feet or more, and usually in small schools over or near coral heads a foot or more above the substratum. ROBINS & STARCK (1961) have noted that it is a plankton feeder, a fact which is also suggested by its mode of life, mouth structure, and numerous long gill rakers. The yellow of the caudal peduncle and fin is the most striking color feature when the fish is viewed underwater.

Family GRAMMISTIDAE

This family has been defined and restricted by GOSLINE (1960). He recognized the genus *Rhegma* Gilbert as distinct from *Pseudogramma* Bleeker by its possession of a single fleshy tentacle over each eye; however he stated that its consideration as more than a subgenus of *Pseudogramma* is open to question. MYERS (1935) placed *Rhegma* and *Caribrhegma* Breder in the synonymy of *Pseudogramma*. NORMAN (MS) also regarded *Rhegma* as a synonym of *Pseudogramma*. The decisions of MYERS and NORMAN are followed in the present paper.

Genus **Pseudogramma**

Pseudogramma Bleeker, 1875. Verh. Akad. Amsterdam, *15*, pp. 2, 24 (type species, *Pseudochromis polyacanthus* Bleeker, by monotypy).

Rhegma Gilbert (in JORDAN & EVERMANN), 1900. Bull. U. S. Nat. Mus., *47*, pt. 4, p. 3169 (type species, *Rhegma thaumasium* Gilbert, by monotypy).

Pseudogramma bermudensis

Plate IIIc

Rhegma bermudensis KANAZAWA, 1952, Fieldiana, Zool. *34*, p. 82, fig. 11 (type locality, Bermuda).

CURAÇAO record. — UPR 1146, 2 specimens, 33 and 35.5 mm standard length, collected with Chem-Tox by J. Randall off Lagoen, in 45 feet on November 25, 1962.

PUERTO RICO record. — UPR 1147, 6 specimens, 24.5 to 40 mm standard length, collected with Pro-Noxfish by J. Randall 6 miles south of La Parguera, in 70 feet on January 20, 1963.

Descriptive notes. — Dorsal rays VII,19 (one with VIII,19); anal rays III,15 (one with 16); pectoral rays 14; pored lateral-line scales 24 to 28 (lateral line ends beneath base of about sixth dorsal

soft ray); scale rows from upper end of gill opening to end of hypural plate about 42 to 44; gill rakers (including rudiments) 5 or 6 + 1 + 9 (8 specimens).

Color in life: head and anterior part of body mottled brown with a large ocellated dark brown spot on opercle; rest of body reddish brown (progressively more red posteriorly) with light reddish brown spots slightly smaller than opercular spot (these pale spots more-or-less regularly spaced but do not line up in rows); spinous portion of dorsal fin brown; soft portion of fin, caudal fin, and anal fin red; paired fins pink; iris light yellow.

Remarks. — Apparently known previously only from six type specimens, the holotype and four paratypes from Bermuda and a paratype from Turk Island, Bahamas. Two paratypes of *Rghema bermudensis* (CNHM 48924), 23.1 and 23.4 mm in standard length were compared with a 24.5 mm specimen from Puerto Rico. No obvious differences were noted; however a complete comparison was not possible because of the poor condition of the paratypes. All of the Bermuda type material was found on beaches after a storm.

REFERENCES

Böhlke, James, 1956. Notes on the serranid fish Chorististium rubrum (Poey) and on the status of Ypsigramma Schultz. *Notulae Naturae 291*, p. 1–7, 1 fig., 1 pl.

Böhlke, James, 1960. Comments on serranoid fishes with disjunct lateral lines, with the description of a new one from the Bahamas. *Notulae Naturae 330*, p. 1–11, 1 fig.

Böhlke, James E. & Randall, John E., 1963. The fishes of the western Atlantic serranoid genus Gramma. *Proc. Acad. Nat. Sci. Phila. 115* (2), p. 33–52, 3 figs.

Gosline, William A., 1960. A new Hawaiian percoid fish, Suttonia lineata, with a discussion of its relationships and a definition of the family Grammistidae. *Pacific Sci. 14* (1), p. 28–38, 8 figs.

Howell y Rivero, Luís, 1938. List of the fishes, types of Poey, in the Museum of Comparative Zoölogy. *Bull. Mus. Comp. Zoöl. 82* (3), p. 169–227.

Katayama, Masao, 1960. *Fauna Japonica. Serranidae (Pisces)*. Tokyo News Serv., Inc., Tokyo, viii + 189 pp., 86 pls.

Longley, William H. & Hildebrand, Samuel F., 1941. *Systematic catalogue of the fishes of Tortugas, Florida, with observations on color, habits, and local distribution*. Publ. Carnegie Inst. Wash. *535* (Pap. Tortugas Lab. *34*), xiii + 331 pp., 34 pls.

MAERZ, A. & PAUL, M. REA, 1950. *A dictionary of color.* Ed. 2. McGraw Hill Book Co., New York, viii + 208 pp., 56 col. pls.

METZELAAR, JAN, 1919. *Over Tropisch Atlantische Visschen.* Thesis, Amsterdam. Part I (West Indian Fishes), p. 3–179, 55 figs. — Also in: BOEKE, *Rapport betreffende ... de Visscherij ... in de kolonie Curaçao,* vol. *2.* 's-Gravenhage.

MYERS, GEORGE S., 1935. A new genus of opisthognathid fishes. *Smithson. Misc. Coll. 91* (23), p. 1–5, 1 fig.

NORMAN, J. R., 1957. *A draft synopsis of the orders, families and genera of recent fishes and fish-like vertebrates.* Limited printing, British Museum (Nat. Hist.), London, 649 pp.

POEY, FELIPE, 1858–61. *Memorias sobre la histoire naturelle de la Isla de Cuba.* Vol. 2. Imprenta Viuda de Barcina, Habana, 442 pp., 19 pls.

ROBINS, C. RICHARD & STARCK, II, WALTER A., 1961. Materials for a revision of Serranus and related fish genera. *Proc. Acad. Nat. Sci. Phila. 113* (11), p. 259–314, 8 figs.

SCHULTZ, LEONARD P. & collaborators, 1953. *Fishes of the Marshall and Marianas Islands.* Vol. *1.* Bull. U.S. Nat. Mus. *202,* xxxii + 685 pp., 90 figs., 74 pls.

SCHULTZ, LEONARD P., 1958. Three new serranid fishes, genus Pikea, from the western Atlantic. *Proc. U. S. Nat. Mus. 108* (3405), p. 321–329, 2 figs.

SMITH, J. L. B., 1954. Aberrant serraniform fishes from East Africa. *Ann. Mag. Nat. Hist.* (*12*) *7,* p. 861–872, 1 text-fig., 1 pl.

STARCK, II, WALTER A. & COURTENAY, JR., WALTER R., 1962. Chorististium eukrines, a new serranid fish from Florida, with notes on related species. *Proc. Biol. Soc. Wash. 75,* p. 159–168, 1 fig.

WOODS, LOREN P. & ROBERT H. KANAZAWA, 1951. New species and new records of fishes from Bermuda. *Fieldiana Zool. 31* (53), p. 629–644, 4 figs.

PLATE I

Ia. Holotype of *Lipogramma trilineata* from Curaçao; 26.0 mm standard length (USNM 179004).

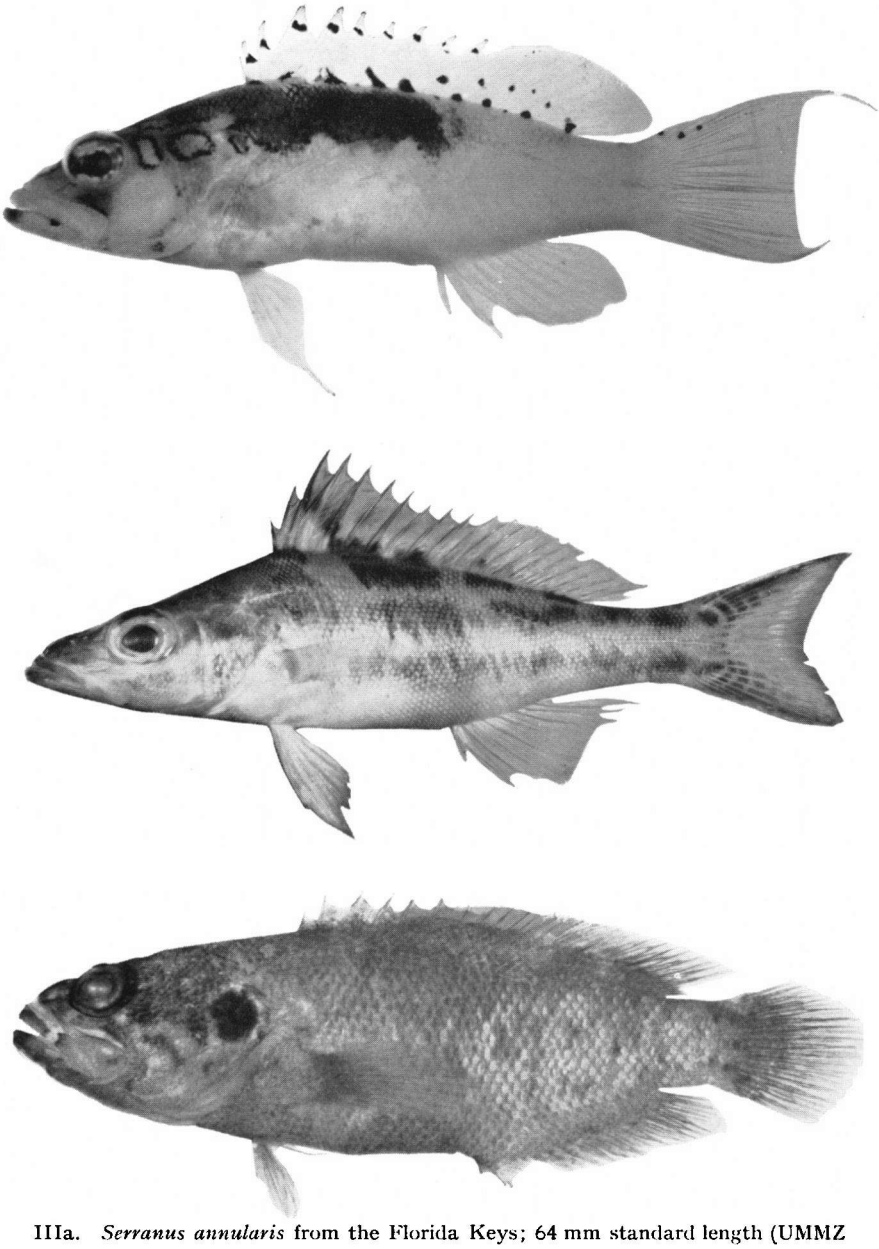
Ib. Holotype of *Lipogramma klayi* from Curaçao; 25.4 mm standard length (USNM 179000).

Ic. *Chorististium mowbrayi* from Curaçao; 50.7 mm standard length (UPR 1131). Distal ends of caudal and anal fins missing.

PLATE II

IIa. *Chorististium rubre* from Puerto Rico; 42 mm standard length (UPR 1138).
IIb. Holotype of *Chorististium carmabi* from Puerto Rico; 39.2 mm standard length (USNM 179001).
IIc. *Schultzea beta* from Curaçao; 48 mm standard length (UPR 1145).

PLATE III



IIIa. *Serranus annularis* from the Florida Keys; 64 mm standard length (UMMZ 178244).

IIIb. *Serranus luciopercanus* from Curaçao; 93 mm standard length (UPR 1141)

IIIc. *Pseudogramma bermudensis* from Curaçao; 35.5 mm standard length (UPR 1146). Many scales missing on posterior half of body.