The Chaenopsine blennies of the southwestern Caribbean (Pisces: Clinidae: Chaenopsinae). II. The genera *Acanthemblemaria, Ekemblemaria* and *Lucayablennius*

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Abstract; *Acanthemblemaria aspera* is a shallow water species that has not been found in the Santa Marta region (Colombia). *Acantina betinensis* is an endemic of the southern Caribbean which inhabits empty worm holes in dead corals. *Acantina rivasi* is a shallow water form that inhabits empty barnacle shells. *Ekemblemaria nigra* is rare in the Colombian Carribbean. *Lucayablennius zingaro* is common below 20 m at Islas del Rosario (Colombia), but is absent from the Santa Marta region.

The chaenopsine blennies have been considered as a separate family or as a subfamily of the family Clinidae. The last point of view is backed by recent authors (Robins *et al.*, 1980; Acero, 1984). Few comprehensive studies have been done on the Caribbean chaenopsines. Stephens (1963; 1970). Robins and Randall (1974) contributed to our knowledge of the systematics of the group, and Greenfield and Johnson (1981) and Greenfield and Greenfield (1982) contributed to the knowledge of the ecology of the chaenopsines of Belize and Honduras.

In the southwestern Caribbean, principally in the Colombian section (Figure 1), I found 12 species, 7 of which are in the genera *Chaenopsis, Coralliozetus,* and *Emblemaria.* The other five are distributed in the genera *Acanthemblemaria, Ekemblemaria* and *Lucayablennius,* and are the object of this study.

MATERIAL AND METHODS

The method for collection of specimens was determined by the situation encountered. Generally chaenopsine blennies are easily observed in the field and can be collected using quinaldine or small quantities of formalin injected in the holes inhabited by the blennies. This method was used also when it was necessary to know the exact depths where the specimens were living. For large scale collections or when there was the need of checking the existence of cryptic species, the ichthyocide rotenone was used.

The methods of counting fin rays follow those of Stephens (1963; 1970). Lengths are given as the standard length, SL, in mm. For counting the pores of the cephalic laterosensory system the nomenclature of Smith-Vaniz and Palacio (1974), as modified by Johnson and Greenfield (1976) is followed. Abbreviations of institutions where the specimens are deposited are as follows: ANSP, Academy of Natural Sciences of Philadelphia, USA; INVEMAR-P, Instituto de Investigaciones Marinas de Punta de Betín, Santa Marta, Colombia; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge, USA; UMML, University of Miami, Rosenstiel School of Marine and Atmospheric Science, USA.

RESULTS

Acanthemblemaria Metzelaar

Acanthemblemaria Metzelaar, 1919: 159 (type-species: *A. spinosa* Metzelaar, by monotypy).

Paremblemaria Longley, 1927: 222 (type-species: *P. aspera* Longley, by original designation).

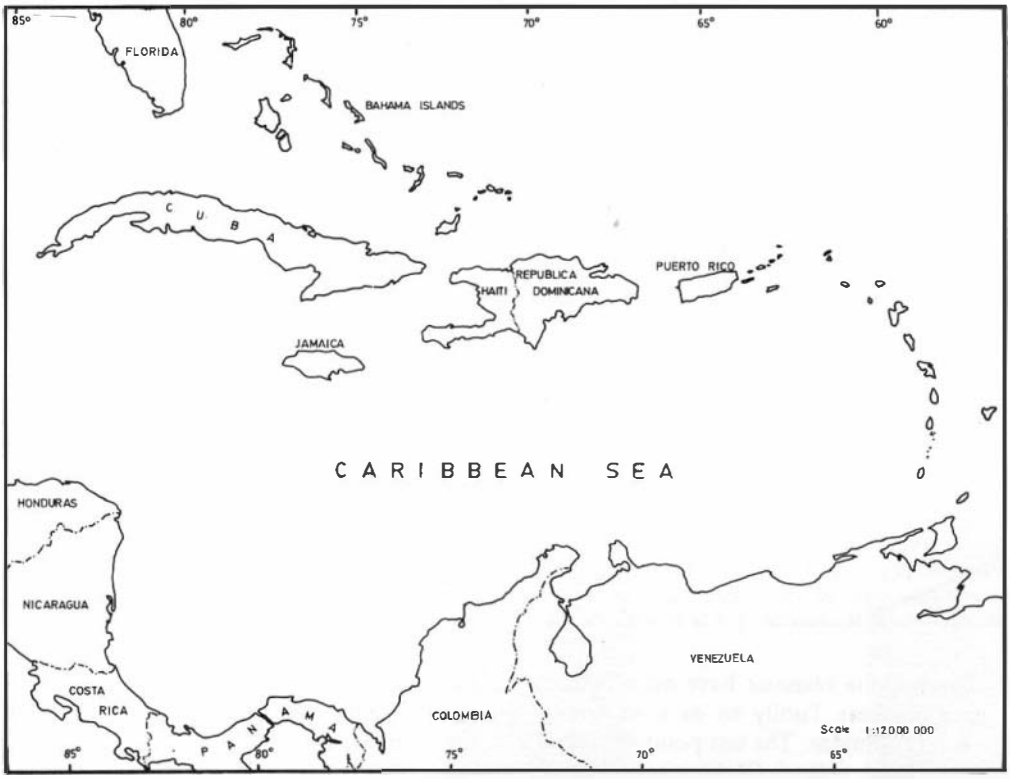

Fig. 1. Map of the Caribbean area.

Diagnosis: Spines usually present on frontals which are externally expressed, or at least with some knobby projections. Supraorbital cirrus single, simple to multifid. Teeth biserial on each palatine. Dorsal fin low, not sexually dimorphic. 19-27 dorsal-fin spines, 11-22 soft dorsal-fin rays, 32-44 total dorsal-fin elements, 2 anal-fin spines, 21-30 soft anal-fin rays, 11-14 pectoral-fin rays.

Species included: The genus includes 14 species, 6 in the American Pacific and 8 in the Caribbean and adjacent waters. It is apparently absent from Bermuda and Brazil. Five of the Caribbean species have restricted distributions: *medusa* (eastern Caribbean); *chaplini* (Florida and the Bahamas); *greenfieldi* (a relatively small area of the northwestern Caribbean); and *betinensis* and *rivasi* (southern Caribbean). The relationships between the species have been discussed by Smith-Vaniz and Palacio (1974) using the development of the cranial spines and other characters. From their conclusions and also from Stephens (1963), it may be inferred that four relatively well-defined species groups (which some may choose to elevate to subgenera) exist within the genus. Two have available names: *Paremblemaria,* for the group represented by *chaplini, greenfieldi, medusa,* and *aspera* and *Acanthemblemaria s.s.* for *spinosa* and *maria.* The other two groups are the *hancocki* group (*rivasi, hancocki, macrospilus, balanorum,* and *castroi*) and the *exilispinus* group *(exilispinus, betinensis,* and *crockeri*). *Paremblemaria* and *Acanthemblemaria s.s.* are completely Atlantic in distribution and the *hancocki* and *exilispinus* groups are primarily Pacific, with one Caribbean species in each.

Acanthemblemaria aspera (Longley)

Paremblemaria aspera Longley 1927: 224 (type-locality: Tortugas, Florida).

Acanthemblemaria aspera: Smith-Vaniz and Palacio 1974: 214-216, figs. 3a-b, 5d, 6h, 7h, 8h, 10b (redescription, coloration, comparison, illustration, habitat, distribution). Greenfield and Johnson 1981: 53 (ecology, Honduras record).

Diagnosis: A small species of *Acanthemblemaria* with long cranial spines extending posterioly no more than half distance between posterior orbital rims and dorsal fin origin; each frontal bone with a patch of 3-5 spines projecting anterodorsally, separated by a narrow groove from spines on posterodorsal rim of orbit. Dorsal rim of supraorbital flange with 3-5 large spines on posterior third, and with 0-4 small to medium spines on anterior third. Supraorbital cirrus complex, deeply branched. 4 pores in the preopercular series. 19-22 dorsal-fin spines, 14-17 soft dorsal-fin rays, 34-38 total dorsal-fin elements, 2 anal-fin spines, 21-25 soft anal-fin rays, 12-14 pectoral-fin rays.

Color in life: Males with greenish-gray head speckled with whitish spots. Dorsal-fin membrane with dark pigmented area between first and fourth spine, usually restricted to between third and fourth spine, body pale green. Females with orange to yellow heads and body almost unpigmented. Dorsal-fin membrane with some pigmentation between third and fourth spine.

Distribution: Known from southern Florida, Bahamas, Greater Antilles, St. Barthelemy, Dominica, and from Yucatán to Islas del Rosario (Colombia) in continental Central and South America, including the offshore island of Providencia. It seems to be absent from the Santa Marta region (northeastern Colombia), Venezuela, and the southeastern Caribbean.

Ecology: The species was observed and collected several times in Islas de San Bernardo at depths shallower than 4 m, living in small holes in eroded coral. Females were seen living in perforated pieces of dead finger coral, *Porites porites*. The maximum depth where the species was collected was 20 m (Isla del Tesoro, Islas del Rosario). This agrees in general terms with Smith-Vaniz and Palacio (1974) and with Greenfield and Johnson (1981) who reported the preference of *A. aspera* for shallow reefs, and that the species does not occur frequently in coral rubble in Belize, which is one of its preferred habitats in the Colombian islands. In shallow water (less than 3 m) the species was sometimes collected with *Acanthemblemaria rivasi*, and in deeper water with *A. betinensis*.

Comments: The population of *A. aspera*

TABLE 1

Frequency distribution of dorsal and anal fin-ray counts in Acanthemblemaria aspera. *A, non-Colombian populations (Smith-Vaniz and Palacio, 1974); B, Cartagena population; C, Florida and Bahamas populations (Böhlke, 1957b)*

	Dorsal-fin spines				Soft dorsal-fin rays			
	19	20	21	22	14	15	16	17
A	1	59	53	8	5	29	68	18
B	3	19	1	–	8	14	1	–

	Total dorsal-fin elements					Soft anal-fin rays				
	34	35	36	37	38	21	22	23	24	25
A	–	16	49	48	7	–	11	50	48	11
B	9	14	–	–	–	5	18	–	–	–

	Total dorsal-fin elements = anal-fin rays								
	55	56	57	58	59	60	61	62	63
C	–	–	4	1	23	6	18	–	3
B	3	7	13	–	–	–	–	–	–

from southwestern Colombia (Islas de San Bernardo and Islas del Rosario) differs significantly from populations of the rest of the Caribbean and adjacent waters (Table 1). The modal counts of the non-Colombian (mainly Bahamas and Florida) populations of *aspera* are: dorsal-fin spines 20 ($\bar{x}$ = 20.57), soft dorsal-fin rays 16 ($\bar{x}$ = 15.83), total dorsal-fin elements 36 ($\bar{x}$ = 36.34), soft anal-fin rays($\bar{x}$ = 23.48). The modal counts of the Colombian population of *aspera* are: dorsal-fin spines 20 ($\bar{x}$ = 19.91), soft dorsol-fin rays 15 ($\bar{x}$ = 14.70), total dorsal-fin elements 35 ($\bar{x}$ = 34.61), soft anal-fin rays 22 ($\bar{x}$=21.78). A *t* test for the total dorsal-fin and the segmented anal-fin elements is signficant at the 0.001 level. The Colombian specimens are also smaller than those from the rest of the Caribbean and adjacent waters. The size of the collected specimens varied between 13.6 and 21.9 mm SL while those examined by Smith-Vaniz and Palacio (1974) varied between 12.1 and 34.9 mm SL.

In southwestern Colombia the average surface temperature varies from 26.0 to 28.5 ^{o}C (average 27.4 ^{o}C), while in the Bahamas and Florida the water is cooler, e.g., in the Bahamas it varies from 24.5 to 29,0 ^{o}C (average 26.6 ^{o}C), and in southern Florida from 23.0 to 30.0 ^{o}C (average 26.6 ^{o}C) (Robinson, 1973). Lindsay (1966) discussed the trend which relates larger adult sizes and the displacement from the equator toward the poles. Lindsay (1975) presented explanations for the so-called Jordan's rule (Jordan, 1892) and discussed what he called pleomerism, both of which relate meristic series (vertebrae, fin rays) and the lowering of the temperature and larger sizes

of fishes. It is possible that the low counts and the small size of the Cartagena specimens of *A. aspera* compared with those from other parts of the Caribbean and adjacent waters are related to the warmer water temperatures around Cartagena.

A. aspera belongs to a group of western Atlantic species usually of small size, vomerine teeth arranged in a complete ring, and with tendency towards development of fleshy papillae on the head, probably derived from the spines. Three other species of *Acanthemblemaria,* with restricted and allopatric distributions, may be derived from *aspera* (see above). If the group deserves subgeneric status, the name *Paremblemaria* is available with *aspera* as the type species.

Material **examined**: A total of 23 specimens from 7 collections. Colombia: Islas de San Bernardo: INVEMAR-P 0730 (6), 0731 (6), 0732 (5), 0733 (2), 0734 (2); Islas del Rosario: INVEMAR-P 0735 (1), 0736 (1).

Acanthemblemaria betinensis Smith-Vaniz and Palacio=*A. betenensis* Smith-Vaniz and Palacio, 1974: 208-210, figs. 2a-b, 4d, 6d, 7d, 8d, 9b, 11 (type locality: Colombia, Cartagena, Isla de Tierra Bomba).

Diagnosis: A large species of *Acanthemblemaria* with moderately long cranial spines extending posteriorly no more than half distance between posterior orbital rims and dorsal fin origin; two parallel rows of 5-11 proximally united spines on interorbital region. Inner rim of posterior infraorbital smooth or spiny in specimens larger than 30.6 mm SL. Supraorbital cirrus pinnately multifd. 3-4 pores in posterior infraorbital series; 4 pores in posttemporal series. 22-25 dorsal-fin spines, 13-16 soft dorsal-fin rays, 36-40 total dorsal-fin elements, 2 anal-fin spines, 22-26 soft anal-fin rays, 12-14 pectoral-fin rays.

Color in life: Body reddish brown speckled with elongated white spots, which increase in size posteriorly. Head also reddish brown, covered with bluish spots in lower jaw, snout and interorbital region. Spots increasing in size and elongation over opercle. Postorbital blotch brown, darker in its anterior rim. Head spines posterior to eyes dark. A brown, inferior blotch in base of pectoral fin. Vertical fins orange-red covered with small white spots, except caudal fin. Spinous dorsal reddish with clearer border. Interradial membrane of first 3-5 dorsal-fin spines heavily pigmented with black distally and greenish white proximally. Anal fin reddish with blackish border. Base of caudal fin with two green blotches, one dorsal and another ventral. Females colored very similarly to males. Interradial membrane of first dorsal-fin spines paler than in males; anal fin almost unpigmented.

Distribution: Known from Costa Rica (Puerto Limón) to Colombia (Bahía de Cinto).

Ecology: *A. betinensis* usually inhabits large empty worm holes in dead corals, in horizontal and slightly tilted situations. It has never been observed dwelling on living coral, but on the pillars of the Santa Marta harbor it lives between the masses of sponges and clams adhered to the artificial structure. It has been observed and collected between 1.5 m (Isla de Tierra Bomba, Cartagena) and 25 m (Punta de Betín, Santa Marta). In the Santa Marta region it is usually found below 10 m, but in Bahía de Nenguange it was seen as shallow as 4 m. In Islas de San Bernardo, on the other hand, the species was collected commonly below 4 m. On some occasions large collections of the species have been made, as in Bahía de Chengue at 10 m (14 specimens) and in Bahía de Nenguange at 18 m (17 specimens), but usually not more than 6 individuals were collected each time. *A. betinensis* has never been seen sharing the same coral head with *A. rivasi,* since the latter tends to be a shallower water form. *A. betinensis* apparently does not compete with *A. aspera* either, since this species is smaller than *A. betinensis* and inhabits smaller worm holes. *A. betinensis* is highly secretive and is not aggresive towards the observer.

Comments: Comparing the meristic characters of the specimens from Costa Rica-Panamá and the Cartagena regions and those from the Santa Marta region (Table 2), it is clear that two populations are involved. The Central American and Cartagena series of *A. betinensis* have the following modal counts: dorsal-fin spines 23 ($\bar{x}$ = 23.17 and 22.92 respectively), soft dorsal-fin rays 15 ($\bar{x}$ = 14.88 and 15.08), total dorsal-fin elements 38 ($\bar{x}$ = 38.04 and 38.00), soft anal-fin rays 24 ($\bar{x}$ = 24.21 and 23.96) (Smith-Vaniz and Palacio, 1974; present

TABLE 2

Frequency distributions of dorsal and anal fin-ray counts in Acanthemblemaria betinensis. *A, Costa Rica and Panamá population (Smith-Vaniz and Palacio, 1974); B, Cartagena population; C, Santa Marta population*

	Dorsal-fin spines				Soft dorsal-fin rays			
	22	23	24	25	13	14	15	16
A	4	13	6	1	–	4	19	1
B	4	18	2	–	1	3	14	6
C	–	14	28	1	1	2	30	10

	Total dorsal-fin elements					Soft anal-fin rays				
	36	37	38	39	40	22	23	24	25	26
A	1	3	14	6	–	–	3	13	8	–
B	1	2	17	4	–	1	1	20	2	–
C	–	1	9	29	4	–	1	3	32	7

study). The Santa Marta population of *A. betinensis* is defined meristically by the following modal counts: dorsal-fin spines 24 ($\bar{x}$ = 23.70), soft dorsal-fin rays 15 ($\bar{x}$ = 15.14), total dorsal-fin elements 39 ($\bar{x}$ = 38.84), soft anal-fin elements 25 (x = 25.05) A *t* test for the total dorsal-fin and the soft anal-fin elements between the Central American and the Santa Marta population is significant at the 0.001 level. The members of the Santa Marta population of *A. betinensis* seem to reach a larger size than those of the Central American population. Smith-Vaniz and Palacio (1974) worked with specimens of maximum length 42.8 mm SL, while 8 of 43 (18%) Santa Marta individuals grew to that size or larger. Also the Colombian specimens have slightly to relatively developed spines in the inner rim of the posterior infraorbital, principally in specimens larger than 30.6 mm SL, while Smith-Vaniz and Palacio (1974: 210) described this bony character as: "...smooth or with weak tubercles on ventral half".

The average water temperature of the Santa Marta region is lower than that of the southwestern Caribbean in general (Robinson, 1973; Bula Meyer, 1977). The average water temperature in Bahía de Santa Marta between November 1974 and May 1982 was 25.5 °C during the dry season (December to April) and 28.8 °C during the rainy season (May to November), with annual mean values of 27.0 °C (Salzwedel and Müller, 1983). The average water temperature in Islas del Rosario in 1978 varied between 28 and 30.5 °C (Vidal, 1981). As in *A. aspera*, Lindsay (1966; 1975) reported that the lowering of the temperature may cause an increase in the meristic characters and in the size of fishes. It may be inferred that there is a relationship between the low water temperature of Santa Marta and the high number of fin elements and larger size of *A. betinensis* there.

A. betinensis is the largest species of the genus in the Caribbean and it is restricted to the western part of the southern Caribbean. *A. exilispinus* Stephens is a Pacific form which is the largest species of the genus (largest specimen recorded 59.1 mm SL; Smith-Vaniz and Palacio, 1974), reported between Costa Rica (Bahía Santa Elena) and Ecuador (Isla La Plata). This distribution is analogous to the Caribbean records of *A. betinensis*. Smith-Vaniz and Palacio (1974) consider these two species to be geminate (twin species of immediate common ancestry) based on spine development of the infraorbital and frontal bones, similar fin ray and vertebral counts, development of supraorbital cirri, and arrangement of vomerine teeth.

Material examined: A total of 67 specimens from 17 Collections. Colombia: Islas de San Bernardo: INVEMAR-P 0737 (1), 0738 (1). Cartagena, Isla de Tierra Bomba: INVEMAR-P 0209 (1); ANSP 117924 (1, holotype); UMML 29863 (1, paratype). Bahía de Cartagena: INVEMAR-P 0760 (12). Bahía de Santa Marta: INVEMAR-P 0208 (2), 0210 (1), 0211 (1), 0741 (3), 0742 (5), 0743 (1); ANSP 117925 (1, paratype). Bahía de Chengue: INVEMAR-P 0740 (14). Bahía de Gayraca: MCZ 47429 (1). Bahía de Nenguange: INVEMAR-P 0739 (14).

Acanthemblemaria rivasi Stephens

A. rivasi Stephens, 1970: 308-309, fig. 15 (type locality: Costa Rica, Puerto Limón). Smith-Vaniz and Palacio 1974: 208-209, figs. 1e, 4c, 6c, 7c, 8c, 9a (description, comparisons; habitat, distribution, illustration).

Diagnosis: A medium size species of *Acanthemblemaria* with short and blunt cranial spines forming a posteriorly rounded patch not extending much past postorbital rim. Inner rim

of posterior infraorbital bone smooth. Supraorbital cirrus simple to trifid. 4 pores in the posterior infraorbital series. 21-23 dorsal-fin spines, 11-14 soft dorsal-fin rays, 32-36 total dorsal-fin elements, 2 anal-fin spines, 21-24 soft anal-fin rays, 11-14 pectoral-fin rays.

Color in life: Males with pale green body, 5 brownish vertical bands anteriorly and diffuse indications of additional bands posteriorly. Interspaces between bands brilliant green. Head white anteriorly and dark violet brown posteriorly. A dark square blotch in preopercle immediately posterior to eye; a whitish blotch below the dark one. Corner of mouth red, with 3 small brown blotches posterior to it. Head dark violet-brown ventrally. Supraorbital cirrus reddish, eye surrounded by narrow sky-blue ring, surrounded by wider red ring. Head covered dorsally with small blue spots. Fins pale green. Dorsal-fin interradial membrane between first and second spine, and sometimes between second and third spine with vertically elongated dark blotches surrounded by a red background. Sometimes whole spinous dorsal-fin membrane covered by melanophores concentrated in the anterior region. Females in general paler, principally around head. Throat with two V-shaped bands with anterior apex. Three black blotches within first band, and six black blotches within the second band.

Distribution: Known from Costa Rica (Puerto Vargas) to Venezuela (Morón, Carabobo).

Ecology: *A. rivasi* is a shallow water species which has been collected in the Colombian Caribbean between 0 and 10 m depth. It frequently inhabits empty barnacle shells in vertical or highly tilted surfaces. The species has been seen living in shells surrounded by the hydrozoan *Millepora*, or in barnacles that grew within the coral *Acropora palmata*. It is abundant in heavy surge situation living with *Coralliozetus cardonae*. However, in Islas de San Bernardo it has also been collected together with *A. aspera* in protected situations.

The species is very abundant in the pilings of Santa Marta harbor, which are overgrown by barnacles, hydroids, sponges, and other incrusting organisms. The depth distribution of *A. rivasi* was studied in three different pilings. The size of the 21 specimens living between 0 and 0.75 m at one piling varied between 23.8 and 40.4 mm ($\bar{x}$ = 31.2 mm); the size of the 80 specimens living between 0.75 and 2.75 m varied between 20.0 and 36.8 mm ($\bar{x}$ = 25.1 mm). A *t* test for these two averages is significant at the 0.01 level.

TABLE 3

Frequency distribution of dorsal and anal fin-ray counts in Acanthemblemaria rivasi. *A, Costa Rica and Panamá population (Smith-Vaniz and Palacio, 1974); B, Santa Mara and Venezuela populations*

	Dorsal-fin spines			Soft dorsal-fin rays			
	21	22	23	11	12	13	14
A	14	22	–	1	12	23	–
B	5	81	21	–	9	78	20

	Total dorsal-fin elements					Soft anal-fin rays			
	32	33	34	35	36	21	22	23	24
A	1	1	23	11	–	1	17	17	1
B	–	1	3	73	30	1	8	48	49

Comments: Similar to *A. betinensis*, there are two well defined populations of *A. rivasi* (Table 3). Using Smith-Vaniz and Palacio (1974) data the Central American population of this species is defined by the following modal counts: dorsal-fin spines 22 ($\bar{x}$ = 21.61); soft dorsal-fin rays 13 ($\bar{x}$ = 12.61); total dorsal-fin elements 34 ($\bar{x}$ = 34.22); segmented anal-fin elements 22 and 23 ($\bar{x}$ = 22.5). The Santa Marta population is defined modally by the following counts: dorsal-fin spines 22 ($\bar{x}$ = 22.15); soft dorsal-fin rays 13 ($\bar{x}$ = 13.10), total dorsal-fin elements 35 ($\bar{x}$ = 35.23); segmental anal-fin elements 24 ($\bar{x}$ = 23.37). A *t* test for the total dorsal-fin and the segmented anal-fin elements is significant at the 0.001 level. In addition, the size of *A. rivasi* in Colombia seems to be larger than in Central America. The largest Colombian specimen collected was 40.4 mm and 6 of 101 individuals (6% approximately) were larger than 36 mm, which is 20% larger than the largest specimen examined by Smith-Vaniz and Palacio (1974).

I propose the same explanation forwarded for *A. betinensis* as the reason. That is, the cooler average temperatures of the Santa Marta region compared with the rest of the southwest Caribbean result in a higher number of meristic characters and in the larger size of *A rivasi*. Also, the Santa Marta population differes from the Central American in the supraorbital cirrus, since 20 of 202 cirri examined (approximately

10%) are bifid and 4 are trifid, while the supraorbital cirri of the 36 specimens examined by Smith-Vaniz and Palacio (1974) were simple.

There is also evidence of a sexual difference in size. The male specimens examined ranged between 21.2 and 40.4 mm (average 29.79 mm); the 53 female specimens examined ranged between 20.0 and 30.2 mm (average 23.68 mm). A *t* test for these data is significant at the 0.01 level. Smith-Vaniz and Palacio (1974: 209) wrote: "Sexual dichromatism not apparent in preserved specimens", but I was able to separate 91 of 101 specimens based on head and dorsal-fin coloration.

Smith-Vaniz and Palacio (1974) included *A. rivasi* within the *"hancocki* species group of *Acanthemblemaria".* This is a group of 4 Pacific species with *rivasi* as the only Atlantic species. Again, we have here the case of a Caribbean species restricted to the southern part of the sea whose nearest relatives have a Pacific distribution.

Material examined: A total of 107 specimens from 2 collections. Colombia: Bahía de Santa Marta: INVEMAR-P 0749 (101). Venezuela: Carabobo, Morón: ANSP 147650 (6).

Ekemblemaria Stephens

Ekemblemaria Stephens, 1963: 21-22 (type-species: *E. myersi* Stephens, by original designation).

Diagnosis: Parietals and other skull bones very rugose, but rugosity not expressed epidermally. Supraorbital cirrus single, pinnately multifid. Teeth in a single row on palatines. Dorsal fin low, not sexually dimorphic. 19-22 dorsal-fin spines, 15-22 soft dorsal-fin rays, 37-41 total dorsal-fin elements, 2 anal-fin spines, 23-27 soft anal-fin rays, 13-15 pectoral-fin rays.

Species included: The genus includes 2 species, one in the American Pacific and one in the Caribbean. The Caribbean species has a very restricted distribution since it is known only from Panamá and Colombia. The Pacific species, on the other hand, is widely distributed from the Golfo de California (Bahía Santa Inés) to Colombia (Isla de Gorgonilla).

Ekemblemaria nigra (Meek and Hildebrand)

Emblemaria nigra Meek and Hildebrand 1928: 953, pl. 97 (type locality: Panamá, Puerto Bello).

Ekemblemaria nigra; Stephens 1963: 26, pl. 2, fig. 2 (description, illustration). Stephens 1970: 307-308 (comparisons).

Diagnosis: A small species of *Ekemblemaria* (less than 40 mm SL) with 19-22 dorsal-fin spines, 15-19 soft dorsal-fin rays, 37-39 total dorsal-fin elements, 2 anal-fin spines, 23-25 soft anal-fin rays; females with 5 unpigmented blotches on dorsal fin approximately evenly distributed.

Color in life: Head and body deep brown, with 5-7 irregular horizontal lines of yellow-light brown coloration over body. Area behind eye with inverted C-band of brown-orange coloration with small bright blue chromatophores grouped posteriorly to the band. Some groups of bright blue chromatophores also over anterior border of opercle. Throat with 4 whitish-green spots and some irregular lines anteriorly to the pectoral fins. One or two large whitish-green blotches at each side of pelvic fins. Dorsal-fin membrane heavily pigmented of same color than body; membrane between first five dorsal-fin spines dark brown; membrane between last seven to ten soft dorsal-fin rays progressively unpigmented distally. Distal border of dorsal-fin membrane pigmented with orange principally in males, this line running also between the pigmented and the unpigmented areas of last soft dorsal-fin rays. Five unpigmented blotches over dorsal-fin membrane of females located mesially and evenly distributed between approximately 20 medial elements. Anal-fin membrane also heavily pigmented with deep brown, except distal parts of last seven to ten anal-fin rays, which are progressively unpigmented distally. Caudal fin membrane unpigmented except for two small white-cream blotches on base of first three and last three principal elements. Pectoral fins clear. Pelvic fins dark brown.

Distribution: Known from Panamá (Colón) to Colombia (Bahia de Nenguange).

Comments: The genus *Ekemblemaria* has the

TABLE 4

Frequency distributions of dorsal and anal fin-ray counts in Ekemblemaria nigra. *A, Panamá population (Stepehns, 1970); B, Colombia population*

	Dorsal-fin spines				Soft dorsal-fin rays				
	19	20	21	22	15	16	17	18	19
A	–	5	34	3	1	6	29	6	–
B	1	2	4	–	–	–	2	3	2
	Total dorsal-fin elements				Soft anal-fin rays				
	37	38	39	40	23	24	25		
A	7	32	3	–	5	32	5		
B	2	1	3	1	1	–	6		

narrowest distribution of the chaenopsine genera in the Caribbean. *E. nigra* seems to be very abundant in the Caribbean coast of Panamá where it lives in holes surrounded by brown algae (C. R. Robins, pers. comm.) but it is rare in Colombia where only six specimens have been collected near the city of Cartagena, and one in the Santa Marta region. In Table 4 a comparison between the meristic characters of the Panamá and Colombia populations is made.

There are some clear differences between the two species of the genus. First there is almost no overlapping in the number of soft dorsal-fin rays, 15-19, mode 17, in *E. nigra,* 19-22, mode 20, in *E. myersi.* The body color of *E. myersi* is deep brown with 8 light brown bars; in *E. nigra* there are no bars, but the color is deep brown with 5-7 irregular yellowish horizontal lines.

Material examined: A total of 80 specimens from 6 collections. Panamá, Bahía Limón: UMML 22455 (not 24453, Stephens, 1970) (73). Colombia, Islas de San Bernardo: INVEMAR-P 0751 (1); Isla de Tierra Bomba: INVEMAR-P 0268 (1), 0752 (3); Cartagena (Castillo Grande) 0207 (1); Bahía de Nenguage 0761 (1).

Lucayablennius Böhlke

Lucaya Böhlke, 1957 a: 83-84 (type-species: *L. zingaro* Böhlke, by original designation). *Lucayablennius* Böhlke, 1958: 59 (substitute name for *Lucaya* Böhlke preoccupied by *Lucaya* Chase, a crustacean, and therefore taking the same type-species).

Diagnosis: Snout very long and pointed; snout length 1.2-1.4 in upper jaw length; lower jaw produced into a long fleshy tip. Size small, maximum 40 mm SL. Supraorbital and nasal cirrus absent. Dorsal fin low, 18-19 dorsal-fin spines, 19-21 soft-dorsal fin rays, 38-40 total dorsal-fin elements, 2 anal-fin spines, 21-23 soft anal-fin rays, 13 pectoral-fin rays.

Species included: The genus is monotypic and endemic to the Caribbean.

Lucayablennius zingaro (Böhlke)

Lucaya zingaro Böhlke 1957a: 84-88, fig. 2, pl. 5 (type locality: Bahamas, 1/4 mile west of Green Cay).
Lucayablennius zingaro; Böhlke 1958: 59 (*Lucayablennius* substitute for the preoccupied *Lucaya*). Robins and Randall 1965: 226 (specimens from Barbados and Grand Cayman; counts; coloration). Greenfield 1972: 590-592, fig. (ecological notes; illustration). Colin and Gomon 1973: 59-61, figs. (ecological notes, distribution, illustrations).

Diagnosis: Since the genus is monotypic the diagnosis of the species is the same as that of genus.

Distribution: Known from Bahamas, Grand Cayman, Jamaica, Bonaire (R. Hensen, pers. comm.), Barbados, Belize, Honduras, Panamá, and Colombia.

Comments: There is a large quantity of information published on the ecology of this species. Palacio (1974) reported the collection of one specimen of *L. zingaro* in Santa Marta, together with *Gramma loreto* and *Paraclinus barbatus.* I have collected extensively and have made numerous observations on the reef fishes around Santa Marta for three years and I have not been able to find any of these species. Since Palacio collected both in Santa Marta and in Cartagena, it seems likely that his samples got mixed and the specimens reported from station JFP-C-11 (Palacio, 1974) are not from Santa Marta but from Cartagena. It is interesting to quote what Colin and Gomon (1973: 59) wrote about the Colombian sample of *L. zingaro:* "...and a number of inviduals taken near Cartagena, Colombia, by F. Palacio and the senior author". *L. zingaro* is, therefore, absent from the Santa Marta region. It is rare in Islas de San Bernardo, but relatively common in Islas del Rosario, principally below 20 m. A comparison between the meristic characters of the

TABLE5

Frequency distributions of dorsal and anal fin-ray counts in Lucayablennius zingaro. *A, Bahamas and Barbados (Böhlke, 1957a; Robins and Randall, 1965); B, Colombia*

	Dorsal-fin spines			Soft dorsal-fin rays			Total dorsal elements		
	18	19	20	19	20	21	38	39	40
A	1	4	1	2	3	1	2	3	1
B	1	5	–	2	4	1	3	4	–

	Soft anal-fin rays			Total dorsal-fin elements + soft anal-fin rays				
	21	22	23	59	60	61	62	63
A	–	1	5	–	1	1	3	1
B	2	1	3	1	1	3	1	–

Colombian series and those of previous collections of the species is presented in Table 5.

Material examined: A total of 7 specimens from 4 collections. Colombia, Islas de San Bernardo: INVEMAR-P 0748 (1). Islas del Rosario: UMML 30291 (1); INVEMAR-P 0753 (3), 0754 (2).

SUMMARY

Acanthemblemaria aspera, type species of the subgenus *Paremblemaria,* is a shallow water species with two well defined populations. The northern population (Florida and Bahamas) has modally one more soft dorsal-fin ray and one more soft anal-fin ray than the population from the southern Caribbean (Cartagena region).

A. betinensis is an endemic of the southern Caribbean which is a member of the *exilispinus* species group. Two well defined populations were detected, one from Costa Rica to Cartagena (Colombia), and another from Santa Marta (Colombia). The second one has modally one more dorsal-fin spine and one more anal-fin ray than the first. The species inhabits preferentially empty worm holes in dead corals.

A. rivasi is another member of a basically Pacific group, the *hancocki*-species group, and also has two well defined populations. The one from Costa Rica and Panamá has modally one less total dorsal-fin element and one to two less soft anal-fin rays than the population from Santa Marta and Venezuela. This species is a shallow water form that frequently inhabits empty barnacle shells.

Ekemblemaria nigra is not a common species in the Colombian Caribbean where only seven specimens have been collected.

Lucayablennius zingaro is a rather common species below 20 m in the coralline islands around Cartagena (Islas del Rosario), but it is unknown from the rocky reefs around Santa Marta.

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RESUMEN

Acanthemblemaria aspera es una especie de aguas someras que no ha sido encontrada en la región de Santa Marta (Colombia). *A. betinensis* es un endémico del sur del Caribe que vive dentro de agujeros de gusanos en coral muerto. *A. rivasi* es una especie de aguas someras que vive en conchas vacías de cirripedios. *Ekemblemaria nigra* es rara en el Caribe colombiano. *Lucayablennius zingaro* es común por debajo de los 20 m en Islas del Rosario (Colombia), pero está ausente de la región de Santa Marta.

LITERATURE CITED

Acero P., A. 1984. The chaenopsine blennies of the southwestern Caribbean (Pisces: Clinidae: Chaenopsinae). I. Systematic analysis and zoogeography. An. Inst. Invest. Mar.-Punta Betín, (in press).

distribución Colombia. Lucayablennius zingaro

Acanthemblemaria aspera descripción A. rivasi Ekemblemaria nigra

Böhlke, J.E. 1957a. A review of the blenny genus *Chaenopsis* and a description of a related new genus from the Bahamas. Proc. Acad. Nat. Sci. Phila., 109: 25-27.

Böhlke, J.E. 1957b. The Bahaman species of emblemariid blenies. Proc. Acad. Nat. Sci. Phila., 109: 81-103.

Böhlke, J.E. 1958. Substitute names for *Nystactes* Böhlke and *Lucaya* Böhlke, preoccupied. Copeia, 1958: 59.

Bula Meyer, G. 1977. Algas marinas bénticas indicadoras de un área afectada por aguas de surgencia frente a la costa Caribe de Colombia. An. Inst. Inv. Mar.-Punta Betín, 9: 45-71.

Colin, P. L., & M. F. Gomon. 1973. Notes on the behavior, ecology and distribution of *Lucayablennius zingaro* (Pisces: Clinidae). Caribb. J. Sci., 13: 59-61.

Greenfield, D. W. 1972. Notes on the biology of the arrow blenny, *Lucayablennius zingaro* (Böhlke) from British Honduras. Copeia, 1972: 590-592.

Greenfield, D. W., & T. A. Greenfield. 1982. Habitat and resource partitioning between two species of *Acanthemblemaria* (Pisces: Chaenopsidae), with comments on the chaos hypothesis. Smithsonian Contr. Marine Sci., 12: 499-507.

Greenfield, D. W., & R. K. Johnson. 1981. The blennioid fishes of Belize and Honduras, Central America, with comments on their systematics, ecology, and distribution (Blenniidae, Chaenopsidae, Labrisomidae, Tripterygiidae). Fieldiana Zool., 8: 106 p.

Johnson, R. K., & D. W. Greenfield. 1976. A new chaenopsid fish, *Emblemaria hyltoni*, from Isla Roatán, Honduras. Fieldiana Zool., 70: 13-28.

Jordan, D. S. 1892. Relations of temperature to vertebrae among fishes. Proc. U.S. Nat. Mus., 14: 107-120.

Lindsay, C. C. 1966. Body sizes of poikilotherm vertebrates at different latitudes. Evolution, 20: 456-465.

Lindsay, C. C. 1975. Pleomerism, the widespread tendency among related fish species for vertebral number to be correlated with maximum body length. J. Fish. Res. Board Can., 32:2453-2469.

Longley, W.H. 1927. Observations upon the ecology of Tortugas fishes with notes upon the taxonomy of species new or little known. Yearb. Carnegie Inst. Wash., 26: 222-224.

Meek, S.E., & S. F. Hildebrand. 1928. The marine fishes of Panamá. Part 3. Field Mus. Nat. Hist., Publ. 249, Zool. Ser., 15: 709-1045.

Metzelaar, J. 1919. Over tropisch Atlantische Visschen Vol. 1. Amsterdam, A. H. Kruyt-Uitgeuer, 179 p.

Palacio, F. J. 1974. Peces colectados en el Caribe colombiano por la Universidad de Miami. Bol. Mus. Mar, 6: 137 p.

Robins, C.R., R. M. Bailey, C. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea, & W. B. Scott. 1980. A list of common and scientific names of fishes from the United States and Canada. 4th ed. Special Pub. Amer. Fish. Soc., 12: 174 p.

Robins, C. R., & J.E. Randall. 1965. Three new western Atlantic fishes of the blennioid genus *Chaenopsis* with notes on the related *Lucayablennius zingaro*. Proc. Acad. Nat. Sci. Phila., 117: 213-234.

Robinson, M. K. 1973. Atlas of monthly sea surface and subsurface temperatures and depth of the top of the thermocline Gulf of Mexico and Caribbean Sea. Scripps Inst. Ocean., 73-8: 12 p.

Salzwedel, H., & K. Müller. 1983. A summary of meteorological and hydrological data from the Bay of Santa Marta, Colombian Caribbean. An. Inst. Inv. Mar.-Punta Betín, (in press).

Smith-Vaniz, W. F., & F. J. Palacio. 1974. Atlantic fishes of the genus *Acanthemblemaria*, with description of three new species and comments on the Pacific species (Clinidae: Chaenopsinae). Proc. Acad. Nat. Sci. Phila., 125: 197-224.

Stephens, J. S. 1963. A revised classification of the blennioid fishes of the American family Chaenopsidae. U. C. Publ. Zool., 68: iv + 165 p.

Stephens, J. S. 1970. Seven new chaenopsid blennies from the western Atlantic. Copeia, 1970: 280-309.

Vidal, A. 1981. Diatomeas y dinoflagelados en las Islas del Rosario (arrecife coralino) y alrededores. Boletín Centro Inv. Ocean. Hidro., 3: 75-133.