

**A new species of chaenopsid fish, *Emblemariopsis ruetzleri*,
from the western Caribbean off Belize (Blennioidei),
with notes on its life history**

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Abstract.—A new species of *Emblemariopsis* is described from the shallow waters around Carrie Bow Cay, Belize. *Emblemariopsis ruetzleri* differs from other species of the genus in having a combination of 14 pectoral-fin rays and a low supraorbital cirrus, whereas the other two species with 14 pectoral-fin rays (*E. pricei* and *E. randalli*) have no supraorbital cirri. Sexually mature males of the new species are dark headed and live in holes in coral (usually dead coral), whereas females and immature males are pale and surface dwelling. The new species is diminutive, with an average size of 14.5 mm SL for the 35 dark-headed and sexually mature territorial males collected from holes (largest specimen 19.4 mm SL).

While studying the life history of the sea fan blenny, *Emblemariopsis pricei* Greenfield (1975), at the Smithsonian Institution's marine laboratory at Carrie Bow Cay (Ellen Cay) on the Belize Barrier Reef, we routinely collected dark-headed territorial male specimens of *Emblemariopsis* that we found living in holes in coral. Nearly all of the dark-headed males collected from holes in living coral proved to be the territorial, sexually mature males of *E. pricei*; females, nonbreeding males, and immatures of *E. pricei* are found on sea fans and coral surfaces (Tyler & Tyler 1997).

Nearly all of the dark-headed males collected from holes in dead coral differed from *E. pricei* by being somewhat less darkly pigmented in preservation (but not in life as seen with only the front of the head protruding from the hole), by having a low, simple supraorbital cirrus, and by being smaller in average size. This smaller species, which has 14 pectoral-fin rays like *E. pricei* (and *E. randalli* Cervigon, 1965), is an undescribed species. Although dark-headed males of the new species usually are

found in holes in dead coral (rarely in live coral), the two females captured to date are pale and inhabit the algal turf in the same dead coral habitat where holes containing mature males are found. The only known pale, immature male was found on the surface of a live coral, near dead coral containing a hole with a dark-headed male.

We describe below this diminutive species whose life history and shelter specificity we continue to investigate.

Methods

Abbreviations: ANSP = Academy of Natural Sciences of Philadelphia; CBC = Carrie Bow Cay, Belize; SL = standard length; USNM = United States National Museum specimens at the National Museum of Natural History, Smithsonian Institution.

All specimens were collected using a weak solution of quinaldine sulfate (1 gram per 500 ml water). Those from holes were trapped in clear plastic tubes placed upright over the opening of the holes immediately

after the solution was squirted into them, driving out the partially narcotized and disoriented specimens. Those collected on the surface had been partially narcotized by the solution dispensed around them before being caught in plastic tubes or plastic bags.

Emblemariopsis ruetzleri, new species

Diagnosis.—The new species differs from all other species of *Emblemariopsis* by having a combination of 14 pectoral-fin rays and a supraorbital cirrus (low and simple).

The two other species of *Emblemariopsis* with 14 pectoral-fin rays (*E. randalli* and *E. pricei*; see Tyler & Tyler 1997 for meristics and other differences between these two species) do not have supraorbital cirri. Of the seven species of *Emblemariopsis* with 13 pectoral-fin rays, a supraorbital cirrus is either absent (*E. bahamensis* Stephens, *E. bottomei* Stephens, *E. diaphana* Longley) or present (*E. leptocirris* Stephens, *E. occidentalis* Stephens, *E. signifera* (Ginsberg), *E. tayrona* (Acero)) (see Stephens 1963, 1970, for meristics of the first six species and Acero 1987, for the last).

Type locality.—All 38 specimens are from the reefs around Carrie Bow Cay (or Ellen Cay on some hydrographic charts), Belize (see below for details), on the Belize Barrier Reef, 16°48.15'N, 88°04.91'W, 18 km off the nearest point on the mainland (Sittee Point, south of Dangriga), 1–8 m depth.

Type specimens.—The 35 dark-headed, sexually mature, hole-dwelling males range from 11.9–19.4 mm SL, average 14.5 mm SL; the single pale, immature, surface-dwelling male is 14.6 mm SL; and the two females are 12.3–13.4 mm SL.

Holotype: USNM 337496, 14.4 mm SL, dark-headed male from hole in dead coral, spur and groove formation just east of CBC, 5 m, 1 Mar 1995, J. and D. Tyler, A. Sundberg.

Paratypes: Dark-headed males from holes in coral: USNM 337497, 1, 11.9 mm

SL, from hole in dead coral, same data as holotype (notes on color in life). USNM 337509, 1, 19.4 mm SL (cleared and stained), from hole in dead coral, patch reef about 800 m southwest of CBC, 8 m, 12 Mar 1994, J. and D. Tyler, A. Sundberg. USNM 337510, 2, 13.5–14.3 mm SL (cleared and stained), from holes in dead coral, spur and groove formation just east of CBC, 7 m, 7 Mar 1995, J. and D. Tyler, A. Sundberg. USNM 325490, 1, 13.6 mm SL, from hole in living *Porites astreoides*, surge channel in forereef along east side of CBC, 2.5 m, 19 Mar 1991, R. and K. Clarke (the only hole-dwelling male from living coral). USNM 325491, 2, 13.4–16.0 mm SL, from holes in dead *Acropora palmata*, back of reef crest along east side of CBC, 1 m, 21 Mar 1991, R. and K. Clarke. USNM 337499, 5, 12.9–15.7 mm SL, from holes in different but close-by large heads of dead coral (four from the sides of the head and one from the top) marked with ribbons for subsequent observations after removal of original occupants, patch reef just northwest of CBC, 1.5 m, 3 Mar 1995, J. and D. Tyler. USNM 337498, 1, 15.2 mm SL, replacement from one of the holes from which individuals were removed on 3 Mar 1995 (see preceding entry), patch reef just northwest of CBC, 1.5 m, 7 Mar 1995, J. and D. Tyler. USNM 337500, 1, 12.6 mm SL, from hole in dead coral marked with ribbon for subsequent observations after removal of original occupant (no replacements seen during next seven days of observations), patch reef just northwest of CBC, 1 m, 28 Feb 1995, J. and D. Tyler (notes on color in life). USNM 337501, 1, 13.6 mm SL, from hole in dead coral rubble, patch reef at Curlew Cay, southeast of CBC, 5 m, 2 Mar 1995, J. and D. Tyler, A. Sundberg (notes on color in life). USNM 337502, 1, 12.1 mm SL, from hole in dead part of otherwise living *Montastrea* sp., patch reef about 800 m southwest of CBC, 8 m, 3 Mar 1995, J. and D. Tyler, A. Sundberg. USNM 337503, 1, 17.6 mm SL, from hole in dead part of otherwise living *Diplo-*

ria sp., spur and groove formation just east of CBC, 5 m, 15 Mar 1995, J. and D. Tyler, A. Sundberg. USNM 337504, 2, 13.6–15.0 mm SL, from holes in dead coral (openings of 2.7 and 3.0 mm diameter; burrow with the 3.0 mm opening collected), patch reef just northwest of CBC, 1 m, 13 Mar 1994, J. and D. Tyler. USNM 337505, 1, 12.5 mm SL, from hole in dead part of otherwise living *Montastrea* sp., patch reef about 1000 m southwest of CBC, 8 m, 6 Mar 1994, J. and D. Tyler, A. Sundberg. USNM 337506, 4, 14.2–17.0 mm SL, from holes in dead coral, patch reef just northwest of CBC, 1 m, 12 Mar 1994, J. and D. Tyler. USNM 337507, 2, 12.9–13.0 mm SL, from holes in dead coral (both openings 2.5 mm diameter), spur and groove formation just east of CBC, 8 m, 13 Mar 1994, J. and D. Tyler, A. Sundberg. USNM 337508, 1, 15.3 mm SL, from hole in dead *Acropora palmata* (opening of 5.3 mm diameter; burrow collected), patch reef just northwest of CBC, 1 m, 6 Mar 1994, J. and D. Tyler. USNM 341534, 1, 16.6 mm SL, from hole in dead part of otherwise living *Montastrea* sp., patch reef just northwest of CBC, 1 m, 16 Mar 1996, J. and D. Tyler (see below for a pale male collected nearby on the surface, USNM 341535). USNM 341536, 1, 15.2 mm SL, from hole in dead part of otherwise living *Montastrea* sp., cut in back reef just east of south end of CBC, 1 m, 21 Mar 1996, J. and D. Tyler (notes on color in life). USNM 341537, 1, 13.8 mm SL, from hole in dead part of otherwise living *Montastrea* sp., patch reef just northwest of CBC, 1 m, 24 Mar 1996, J. and D. Tyler (see below for a female collected at the same time nearby on the surface, with the same catalogue number). ANSP 173572, 1, 15.6 mm SL, from hole in dead part of otherwise living *Montastrea* sp., patch reef just off south end of CBC, 1 m, 6 Mar 1994, J. and D. Tyler, R.E. Clark (notes and photograph in laboratory of color in life). ANSP 173573, 1, 13.1 mm SL, from hole in dead coral rubble, spur and groove formation just east of CBC, 3 m, 12 Mar 1994, R. and K.

Clarke. ANSP 173574, 2, 13.4–15.3 mm SL, from holes in dead *Acropora palmata*, spur and groove formation just east of CBC, 5 m, 15 Mar 1994, J. and D. Tyler.

Pale male from surface of coral: USNM 341535, 1, 14.6 mm SL, from surface of living part of *Montastrea* sp., within 20 cm of hole in dead part of coral from which a dark-headed male was collected just moments before (see USNM 341534, above), patch reef just northwest of CBC, 1 m, 16 Mar 1996, J. and D. Tyler.

Females: USNM 325489, 1, 12.3 mm SL, from surface of algal-turf covered coral boulder, back of reef crest along east side of CBC, 1 m, 18 Mar 1991, R. and K. Clarke. USNM 341537, 1, 13.4 mm SL, from surface of algal-turf area in dead region of a mostly living *Montastrea* sp., within 10 cm of hole in dead part of coral from which a dark-headed male was collected just moments before (see above under same catalogue number), patch reef just northwest of CBC, 1 m, 24 Mar 1996, J. and D. Tyler.

Description.—See Table 1 for meristics and Table 2 for measurements.

Snout short, slightly less than diameter of orbit. Supraorbital cirrus short, simple; cirrus length usually less than one-half pupil diameter (and about equal to length of nasal cirrus), sometimes about one-half pupil diameter, and about equal to pupil in largest specimen. Anterior nasal opening tubular, with a simple cirrus projecting from rear edge; cirrus length about equal to length of tubular part. Depth of head about 6–7 times in SL. Depth of body at anal-fin origin about 7–8 times in SL. Anterior two or three dorsal-fin spines moderately elongate, second spine usually longest (but often the first longest), greatest spine-length about 2 times in head length; interradiial membrane more deeply incised in the two females and the pale surface-dwelling male than in the dark-headed hole-dwelling males. Pelvic fins shorter than pectoral fins; pelvic rays extending beyond incised membranes, third ray about one-third to two-thirds (usually

Table 1.—Meristics of *Emblemariopsis ruetzleri* new species.

Dorsal-fin spines		Dorsal-fin rays				Anal-fin rays*		
XX	XXI	10	11	12	13	19	20	21
21	7	1	23	3	1	7	23	2
Pectoral-fin rays†			Caudal vertebrae‡					
13	14	15	25	26	27			
7	56	3	1	16	1			

* All specimens with two anal-fin spines.

† Two specimens with 13 rays on both sides; three specimens with 13 rays on one side and 14 on the other; one specimen with 15 rays on both sides; one specimen with 14 rays on one side and 15 on the other.

‡ The number of abdominal vertebrae was not clearly visible on radiographs, but all three cleared and stained specimens have 11 abdominal vertebrae, and we presume that there are usually a total of 37 vertebrae.

one-half) length of second ray; pelvic spine short and only visible in cleared and stained specimens.

Dorsal fin usually XX,11; anal fin usually II,20; pectoral fin usually 14 on both sides; pelvic fin I,3 (spine inconspicuous); caudal fin with 13 segmented unbranched rays and 2-4 procurrent rays above and below.

About 15–20 teeth in upper jaw, with fifth, sixth, and sometimes seventh from front enlarged on both sides. About 17–19 teeth in lower jaw, the fifth to eighth or ninth from front enlarged on both sides.

About 7–8 large palatine teeth, in a crescent. About 7–8 moderate-size vomerine teeth. Gill rakers two above and six below the angle (from a cleared and stained specimen).

There being no standardized terminology for the cephalic sensory pore system widely accepted for blennies, we prefer to illustrate the major features in the diagnostically important orbital and temporal regions (Fig. 1) rather than to verbally describe them. We follow the terminology used for *Emblemariopsis* and related genera by Stephens (1970) in simply noting that there is a sin-

Table 2.—Measurements of *Emblemariopsis ruetzleri* new species, in percent of standard length (SL).

Character	Dark-headed males from holes in coral				Pale male from coral surface (one specimen)	Pale female from algal turf (one specimen)*
	Number of specimens	Range in values in percent of SL	Average value	Value for holotype		
Head length	19†	23.3–27.8	25.8	25.7	24.7	26.1
Head depth	18	13.7–16.3	14.7	13.9	13.7	14.9
Snout length	16	4.6–6.1	5.3	5.9	5.5	6.0
Orbit diameter	15	6.1–7.3	6.6	6.9	6.8	7.1
Interorbital width	15	2.6–3.6	2.9	2.8	3.1	3.0
Body depth	15	10.4–15.0	12.8	11.8	11.6	13.1
Pelvic-fin spine length	3‡	1.5–2.1	1.8	—	—	—
First pelvic-fin ray length	12	9.0–11.3	10.5	10.4	9.2	9.0
Second pelvic-fin ray length	12	12.8–15.4	14.3	14.6	13.7	13.4
Third pelvic-fin ray length	11	7.2–9.2	8.4	8.7	7.5	7.5
Pectoral-fin length	12	18.4–21.6	19.8	20.1	21.2	26.1
Spiny dorsal-fin height	17	10.8–14.0	12.6	12.5	14.4	15.7

* A second female specimen is too poorly preserved and twisted for most measurements to be meaningful, but it has a relatively high spiny dorsal fin at 15.4% SL and a long pectoral fin of 26.0% SL like the female in the table.

† RANGE 12.1–19.4 mm SL.

‡ Cleared and stained specimens, 13.5–19.4 mm SL.

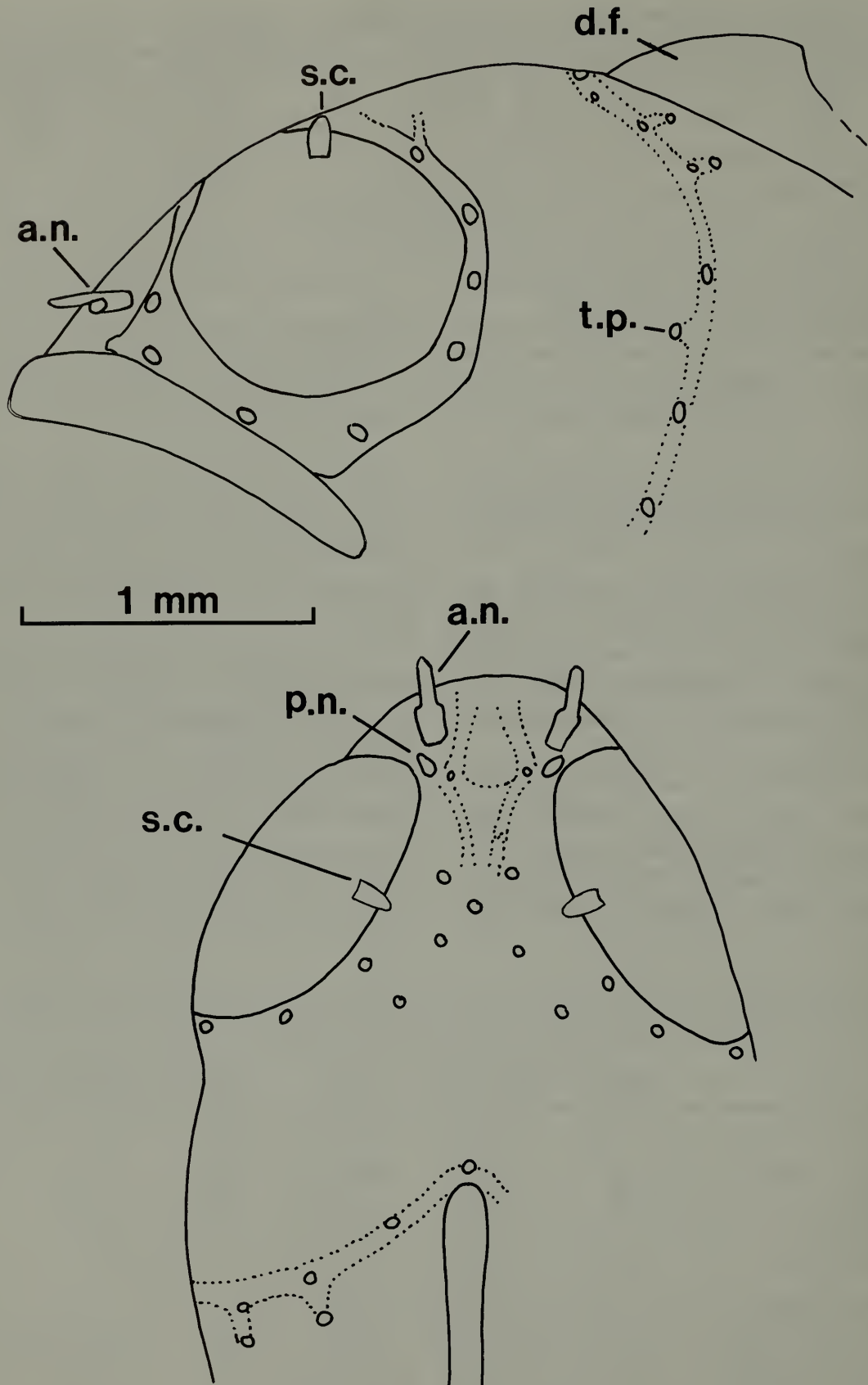


Fig. 1. Cephalic sensory pore system in *Emblemariopsis ruetzleri*, based mostly on USNM 337505, 12.5 mm SL: above, pores of the infraorbital and the preopercular-temporal series; below, pores in the interorbital area and the more posterodorsal ones of the infraorbital series and those of the preopercular-temporal series evident in dorsal view. Scale line applies to both dorsal and lateral views. Abbreviations: a.n. = anterior nostril; p.n. = posterior nostril; d.f. = dorsal fin; t.p. = temporal pore; s.c. = supraorbital cirrus. There are no postorbital pores.



Fig. 2. Living dark-headed male of *Emblemariopsis ruetzleri* from a hole in a dead part of an otherwise living head of *Montastrea* sp., ANSP 173572, 15.6 mm SL, 35 mm photograph of specimen under anesthesia in the lab, showing a typical amount of melanophore development for mature males; patch reef just off south end of Carrie Bow Cay, Belize, 1 m.

gle temporal pore (Fig. 1, lateral view) and that postorbital pores are absent.

Coloration of dark-headed, hole-dwelling males in life (Fig. 2): The following description is based on notes from five males (see list of type specimens) collected on separate occasions. Each specimen was kept alive under light anesthesia with quinaldine for several hours in the laboratory before preservation. These males have low anal mounds, prominent genital papillae, and elongate, relatively plump testes.

The head of living males is uniformly jet black when observed protruding from holes in coral. However, immediately upon emergence from the hole after application of quinaldine and capture in a clear plastic test tube, the head notably lightens and small dark spots predominate over a yellowish green background. The rest of the body is relatively transparent except for dark spotting on the spinous dorsal fin, scattered black and white markings on the bases of the dorsal and anal fins, yellowish green suffusions over parts of the body, and a prominent internal pattern of dark and light bars on the upper abdomen and along the vertebral column and pterygiophores.

The entire head is covered with numerous small black spots; those on the preopercular region of the cheek tend to be larger than those on the snout and the opercle, and two larger black spots are especially prominent on the lower jaw. All of these black spots (whose expansion in undis-

turbed specimens presumably leads to the jet black head seen protruding from the hole of the burrow) are underlain by a yellowish to gold-green coloration, with some patchy areas of chalky white. There are also a few discrete chalky white markings in the following locations: one is along the lower rear of the orbit; one is just above and behind this mark; and several other smaller ones are scattered around the cheek region, including one or two that seem to outline cephalic lateral-line pores. The black pupil is surrounded by a narrow ring of golden yellow, outside of which the rest of the eye is creamy with gold-brown suffusions, bluish to purplish to yellow-green iridescence, and irregular streakings of black. The supraorbital cirrus is creamy with black spots or streakings; the nasal cirrus is sometimes dark spotted. As seen dorsally on the head, there is a large, roundish area in the occipital region from the rear of the eyes to the origin of the spinous dorsal fin that has a creamy basal color overlain by golden yellow, with numerous small spots of grayish blue to greenish iridescence and even smaller and fewer black dots.

The black spotting of the head broadly continues posteriorly onto the lateral side of the body to the level of the pectoral-fin base; dorsal to the pectoral-fin base the region of spotting tapers posteriorly variously to the base of about the eighth to the last dorsal-fin spine. There is a relatively unpigmented region between this tapered region

of spotting and the upper edge of the rear half of the abdominal cavity.

The fleshy base of the pectoral fin has black spots about as large as those on the preopercular region. The basal one-fifth to one-third of the pectoral-fin rays has chalky white markings overlain with much smaller black spots; sometimes there is one large irregular white mark and/or sometimes several more rounded ones. More distal regions of the pectoral-fin rays are pale. The rest of the thoracic area toward the isthmus and the lower half of the abdomen behind the pectoral-fin base are covered by small black spots.

The dorsal half of the abdominal cavity from behind the pectoral-fin base has a distinctive pattern of internal coloration. There is a chalky white band that is transected in the middle by a vertical saddle-shaped bar of blackish to dark yellow-green pigment (color partially dependent on both the condition of the living specimen and the angle of observation), with the dark saddle being wider dorsally than ventrally. Ventral to this chalky, saddled, upper region of the abdominal cavity, the lower abdomen is slightly yellowish with small black external spots. There is a dark spot at the front of the anal region and a white spot just behind it.

The membranes between the first three dorsal-fin spines are chalky white with black spots and, especially basally, black reticulations. There are scattered black spots covering most or parts of the otherwise pale interradiial membranes posterior to the third dorsal-fin spine variously to the eighth to last dorsal-fin spine. The density of the spotting and its posterior extent is a function of the degree of overall body darkness. Posterior to the darkened part of the spinous dorsal fin, the interradiial membranes are usually without many melanophores and become more uniformly pale. In the paler parts of the dorsal fin, each spine or soft ray has specks or slightly larger dots of black along much of the length of the element or immediately alongside it but not broadly on the interradiial membrane; there

also are a few white spots along some of these fin elements. At the base of each dorsal-fin element is a discrete spot of either black or white, with the two colors usually alternating with one another on the bases of successive elements.

The anal fin has essentially no pigmentation on the interradiial membranes, but there are black specks along most of the fin rays. At the base of each anal-fin spine and ray is a discrete spot of either black or white, alternating on successive elements just as in the dorsal fin (with the base of the first ray following the two spines usually with the first black spot).

The caudal fin is pale except for two white elongate marks, one along the bases of several rays in the upper lobe and one along the bases of several rays in the lower lobe, and several smaller white spots of variable occurrence more distally on the fin.

Besides the external pigmentation patterns described above, there is little other surface pigmentation on the body. The transparent body is, however, distinctly patterned by internal markings associated with the vertebrae and pterygiophores, as well as by those of the abdominal cavity. There are rusty pink patches of internal color on the top of the head and the top of the iris.

The vertebral column has prominent dark markings that alternate with shorter white marks to form a continuous series along the top of the centra. The dark markings range in color from blackish to dark golden green (depending on specimen condition and angle of observation), and the white markings are creamy. The white markings span the tops of two centra and have no ventral extensions. The dark markings usually span three or four centra, and, at their anterior and posterior ends, they have ventral extensions along the front of the centra that continue down the haemal spines. These dark markings extend only partially down the length of the haemal spines in the region just behind the level of the anus, but they extend most of the way down the lengths of more posterior haemal spines. The net



Fig. 3. Preserved holotype of *Emblemariopsis ruetzleri* from a hole in a dead coral of unidentified species, USNM 337496, 14.4 mm SL; spur and groove formation just east of Carrie Bow Cay, Belize, 5 m.

effect is of short white horizontal markings separating longer dark horizontal markings along the top of the vertebral column, with dark ventral extensions onto every other or every third or fourth haemal spine.

Coloration of preserved dark-headed males (Figs. 3, 4): With preservation, the

transparent body becomes increasingly opaque, and nearly all of the internal coloration of the vertebral column, pterygiophores, and abdominal cavity is obscured; the surface melanophores form nearly all that remains of the pattern seen in life. Of the internal coloration, only rusty or pink



Fig. 4. Preserved specimens of a 13.8 mm SL dark-headed male (above) and a 13.4 mm SL female of *Emblemariopsis ruetzleri* collected within moments of one another, the male from a hole in a dead part of an otherwise living head of *Montastrea* sp. and the female from the surface of the algal turf within 10 cm of that hole, both specimens USNM 341537; patch reef just northwest of Carrie Bow Cay, Belize, 1 m.



Fig. 5. Preserved pale male of *Emblemariopsis ruetzleri* from the surface of the living part of a mostly living head of *Montastrea* sp. (collected within moments of a dark-headed male from a hole 20 cm away in a dead part of the coral head), USNM 341535, 14.6 mm SL; patch reef just northwest of Carrie Bow Cay, Belize, 1 m.

patches on the top of the head and the top half of the iris usually are evident. All of the chalky white and greenish yellow to grayish blue iridescent undertones of live specimens are lost after months in preservative, except that sometimes there are remnants of the chalky markings on the cheek and pectoral-fin base. The pattern of dark melanophores on the surface remains as described above in living specimens, with the darkest males having closely spaced spots of dark pigment over most of the head and anterior half of the body, on the entire course of the spinous dorsal fin, and along the bases of every few dorsal- and anal-fin rays.

Coloration of live and preserved females and an immature male (Figs. 4, 5): When alive, females (two specimens collected, with high anal mounds and no genital papillae) and immature males (one specimen collected, with low anal mound, genital papilla low and not protruding, and testes thin) have transparent bodies that show all of the internal markings described above for dark-headed males. However, the only external coloration evident in life comprises some small black and white alternating spots along the bases of the dorsal- and anal-fin elements (as above for dark-headed males) and some coloration between the first two or three dorsal-fin spines (details not specified in our notes). In preservative, the opaque body obscures all of the internal markings on the vertebral column, pterygiophores, and abdominal cavity. Some

rusty pink coloration is found on the head in the roundish occipital area, top half of the eye, and sometimes in the opercular region. External melanophores (sometimes rusty in color rather than black) evident in preserved specimens are as follows: dark spots along the bases of some of the dorsal-fin and anal-fin elements; lightly scattered spots along the course of the dorsal- and anal-fin elements laterally but not on the interradial membranes; irregular bands of speckling in the interradial membrane between the first two or three dorsal-fin spines (mostly as an irregular band just internal to the distal edge of the membrane, with some chalky color also present between the second and third spines in the larger female); and a few spots along the upper jaw and on the underside of the lower jaw.

Sexual dimorphism.—In addition to mature dark-headed males of *E. ruetzleri* differing from pale females and immature males in coloration, there is dimorphism in the length of the pectoral fin and in the height of the elevated anterior part of the spinous dorsal fin. In both female specimens, the pectoral fin (26.0–26.1% SL) is longer and the anterior spinous dorsal-fin rays (15.4–15.7% SL) are higher than in mature males (18.4–21.6% SL for the pectoral fin and 10.8–14.0% SL for the dorsal fin). In the single immature pale male specimen, the pectoral-fin length (21.2% SL) is similar to the high end of the range of mature males, and the elevation of the anterior

elements of the spinous dorsal fin is only slightly greater than that of mature males.

In mature dark-headed males the interradial membrane of the anterior region of the dorsal fin is not greatly indented between the spines, but in both of the female specimens and in the immature male specimen the interrational membrane is deeply incised (to about one-half of its greatest depth) between the third and fourth dorsal spines. This difference between mature males and females in the depth of the indentation between the third and fourth spines also is evident in *Emblemariopsis occidentalis* (see figures in Böhlke & Chaplin 1968:548, incorrectly identified as *Pseudemblemaria signifera*, as shown by Stevens 1970).

Characters supporting generic allocation.—Although Acero (1987) recommended synonymizing *Emblemariopsis* with *Coralliozetus*, we follow the ongoing cladistic-based revisions of various chaenopsids by Hastings (e.g., 1992, 1997) and Hastings & Springer (1994) in recognizing the distinctiveness of *Emblemariopsis* within a *Coralliozetus*-like clade.

The most recent revision of the taxonomy of the species of *Emblemariopsis* and related genera is that of Stephens (1970). *Emblemariopsis ruetzleri* has all of the diagnostic features given by Stephens for that genus (Stephens 1970:283; based on seven species, *E. bahamensis*, *E. bottomei*, *E. diaphana*, *E. leptocirris*, *E. occidentalis*, *E. signifera*, *E. randalli*, i.e., all but *E. pricei*, *E. ruetzleri*, and *E. tayrona*). These features are as follows (condition of *E. ruetzleri* given in parenthesis if there is variation in the generic character): no spinous projections on the frontal or parietal; nasals separate; snout short; pelvics shorter than pectorals; pelvic fin with membranes deeply incised between first two rays and last pelvic ray short; one or two temporal pores (one in *E. ruetzleri*); no postorbital pores; dorsal fin not sail-like; dorsal fin XIX–XXII, 10–14 (usually XX, 11 in *E. ruetzleri*), anal fin II, 19–23 (usually II, 20 in *E. ruetzleri*); pec-

toral rays 12–14 (usually 14 in *E. ruetzleri*); no anterior flap on first dorsal spine; first three dorsal spines closely spaced; 5–9 moderate- to large-size teeth on palatine (7–8 large-size teeth in *E. ruetzleri*); 6–12 small- to moderate-size teeth on vomer (7–8 moderate-size teeth in *E. ruetzleri*); supraorbital cirrus either present and short or absent (short in *E. ruetzleri*); nasal cirrus simple or absent (simple in *E. ruetzleri*); sexual dimorphism well developed or absent (dimorphism in coloration, pectoral-fin length, and height of spinous dorsal fin in *E. ruetzleri*).

In conjunction with the description and phylogenetic relationships of a new genus of Chaenopsidae, Hastings (1992: table 1), mentioned five derived characteristics that in combination are unique to the three species of *Emblemariopsis* that he studied (*E. diaphana*, *E. signifera*, *E. tayrona*). *Emblemariopsis ruetzleri* has all five of these derived features: females with pelvic-fin rays prolonged, the membranes not extending to the tips; males same as preceding; mesopterygoid absent; nasals with ridges; and third pelvic-fin ray reduced, its length about one-half that of second ray but longer than pelvic spine.

Hastings (1992) also listed another four derived features, each of which is found in one or two but not all three of the species he examined: supraorbital cirrus present (primitive, the condition in *E. ruetzleri*) or absent; fleshy flap anteriorly on first dorsal-fin spine present (primitive) or absent (as in *E. ruetzleri*); dorsal fin of males relatively low (primitive, the condition in *E. ruetzleri*) or elevated; and third basibranchial ossified (primitive) or unossified (unossified in the two smaller cleared and stained specimens of *E. ruetzleri*, 13.5 and 14.3 mm SL, but ossified in the largest specimen, 19.4 mm SL).

In a manuscript nearing completion, P. Hastings (pers. comm.) describes a synapomorphy of the four species of *Emblemariopsis* he has examined (the three species given in Hastings 1992, plus *E. leptocirris*).

cirris): the neural spine of the penultimate vertebra is truncate and much shorter than the preceding neural spines and the single epural is expanded proximally and occupies the position of the neural spine. *Emblema-riopsis ruetzleri* has a shortened penultimate neural spine and expanded epural (as does *E. pricei*; Fig. 6), which gives us further assurance of the proper generic allocation of the new species.

Habitat and natural history notes.—Mature males are dark-headed and inhabit holes in coral, usually dead coral, whereas females are pale and are found on the surface of the algal turf overlying dead coral and near the hole-dwelling males; the single immature, pale male collected during the study was on the surface of a live part of a coral that also had a dead section containing a dark-headed male in a hole.

Two burrows of *E. ruetzleri* were collected along with their male residents. The internal surface of both burrows was smooth and brownish black, and each was the empty coiled shell of a vermetid gastropod. M. G. Harasewych (pers. comm.) tentatively identified these two shells, on the basis of their structure and locality, as those of *Dendropoma*, perhaps *D. irregularis*. We have not collected any other chaenopsid at Carrie Bow Cay inside a vermetid shell.

Both burrows contained both eyed and eyeless eggs that were being incubated by the resident male. Moreover, both burrows had at least two different developmental stages of eyed and eyeless eggs, indicating several different clutches. One of the burrows was so intact that almost the full complement of eggs could be counted; there were about 32 eyeless and 58 eyed eggs, a total of about 90 (± 3). This burrow had an opening diameter of 5.3 mm and a similar diameter deep inside the coil where the eggs (both eyed and eyeless) were attached. The other burrow was broken in the region where eggs were attached, and a partial count of those remaining yielded about 60 eggs. This burrow had an opening diameter of 3.0 mm and was about 3.7 mm diameter

lower inside the coil in the region of the eggs. The eggs in both burrows were between 0.6–0.7 mm in diameter.

The smaller of the two female specimens collected during this study, 12.3 mm SL, is not fully ripe. The right side ovary has 13 developing eggs of about 0.25–0.3 mm diameter and many much smaller egg primordia. The larger female, 13.4 mm SL, is fully ripe, with nine eggs of 0.55–0.6 mm diameter on the right side and only a few much smaller eggs. We presume, therefore, that there are a total of about 18 eggs available for laying by this mature female. This is further confirmation that burrows with about 90 incubating eggs must be the result of multiple deposits.

To determine whether vacant holes in dead coral were as keenly competed for by *E. ruetzleri* as are those in live coral by *E. pricei* (Tyler & Tyler 1997), we removed a dark-headed male (USNM 337500) of *E. ruetzleri* from a hole in a shallow patch reef just off the northwest side of Carrie Bow Cay on 28 Feb 1995, marked the location with a ribbon, and returned to it daily to see if a replacement had entered the empty hole. No replacement individual was present during the seven days of subsequent monitoring.

Additionally, on 3 Mar 1995 we collected five dark-headed males of *E. ruetzleri* (USNM 337499, mature males, 12.9–15.7 mm SL) on a shallow patch reef on the northwest side of Carrie Bow Cay, and marked their holes with ribbons. The five collected specimens were kept alive in the laboratory. They had blanched only moderately when collected and thereafter in the aquaria, and had good retention of darkness in preservative. We next observed the marked holes on 7 Mar and found that four of them were empty whereas one had a dark-headed replacement that we removed. The replacement was a 15.2 mm male (USNM 337498) that blanched considerably when collected. It had a minimal speckling of melanophores on the head and body, and it is now one of the least dark

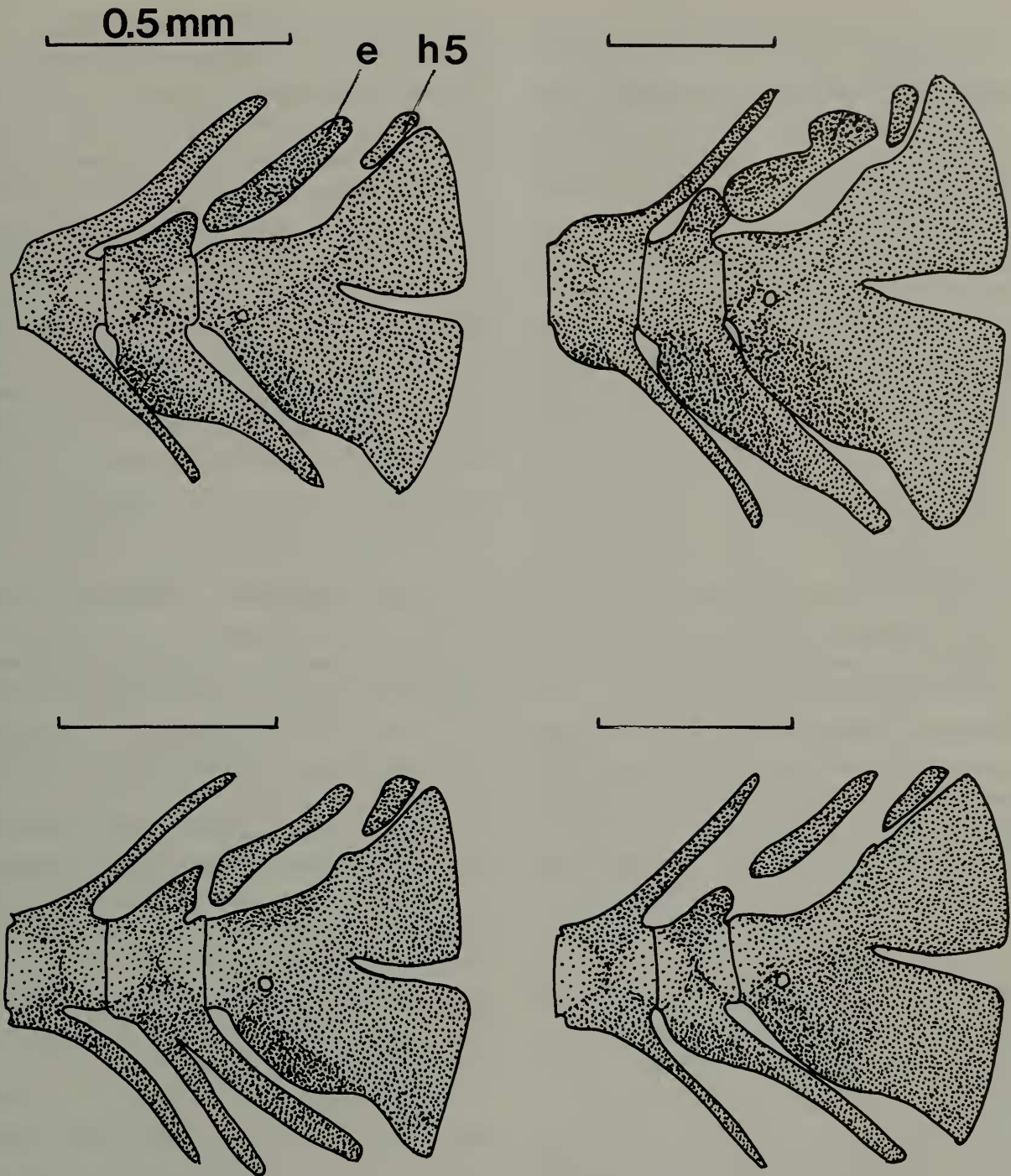


Fig. 6. Caudal skeletons in two specimens of, above, *Emblemariopsis ruetzleri*, USNM 337510, 13.5 mm SL to left and USNM 337507, 19.4 mm SL to right, and, below, two specimens of *E. pricei*, both USNM 325446, 13.6 mm SL to left and 16.5 mm SL to right, to show the derived condition in both species of the short neural spine of the penultimate centrum, typical of most species of the genus. The caudal skeleton has a single epural, hypural 5 free, and hypurals 1–4 consolidated. Abbreviations: h5 = fifth hypural; e = epural.

males in preservative. We conclude that, in marked contrast to *E. pricei*, holes in coral appropriate for habitation of mature males may not be in short supply for *E. ruetzleri*.

We presume that *E. ruetzleri* feeds on microplankton in the water column based on finding the remains of small or larval crus-

taceans in the stomach contents of several specimens.

We found the holes occupied by *E. ruetzleri* on both the relatively horizontal (top) and vertical (side) surfaces of dead corals, but we did not find a predominance of one orientation versus the other.

Etymology.—We take pleasure in naming this new species in honor of Dr. Klaus Ruetzler, Curator of Invertebrate Zoology at the National Museum of Natural History, who has so effectively directed the Smithsonian's Caribbean Coral Reef Ecosystem (CCRE) Program and its marine laboratory at Carrie Bow Cay, Belize, since its inception in 1972; he has given generously of his time and talents for all those years in providing research opportunities for many Smithsonian scientists and their colleagues throughout the world.

Discussion

Emblemariopsis ruetzleri and *E. pricei* are the only species of chaenopsids with strikingly dark-headed males living in holes in large coral mounds that are relatively common around Carrie Bow Cay.

The hole-dwelling males of both of these species are found in similar habitats around the reef crest, on patch reefs in the lagoon, and in the spur and groove zone around Carrie Bow Cay (to at least 8 m depth for *E. ruetzleri*, and deeper for *E. pricei*). Mature males of *E. ruetzleri*, however, are almost always found in holes in dead coral (only one of 35 dark-headed males in a hole in living coral), whereas those of *E. pricei* are almost always found in holes in live coral.

Most of the burrows that have been collected of breeding males of *E. pricei* are in the empty, partially tubular, and partially irregularly eroded tubes of serpulid worms (*Spirobranchus*) embedded in coral, but the two burrows that have been collected of breeding males of *E. ruetzleri* were both in empty, coiled, smooth-surfaced tubes of vermetid gastropods embedded in coral.

Another chaenopsid present around Carrie Bow Cay, the sailfin blenny *Emblemaria pandionis* Evermann & Marsh, is found in irregular cavities formed by many different kinds of invertebrates (worms, bivalves, snapping shrimps) and by erosion, in a great variety of sizes and shapes of dead

coral rubble. In a few cases these cavities are probably the old corroded remains of vermetid gastropods (Smith & Tyler, in litt.). However, the cavities occupied by *E. pandionis* are of various shapes and are rough surfaced in loose rubble, in comparison to those of the complete coiled smooth tubes in large coral heads or boulders occupied by *Emblemariopsis ruetzleri*. Some chaenopsids in the eastern Pacific are known to have their shelter burrows in vacated mollusk tubes, including *Emblemaria hypacanthus* (Jenkins & Evermann) in *Turbo* gastropod shells (Hastings 1991) and *Acanthemblemaria crockeri* Beebe & Tee-Van in, among other kinds, *Lithophaga* boring bivalve cavities (Hastings 1988).

Another ecological difference between the two common species of *Emblemariopsis* at Carrie Bow Cay is the habitat of females, nonbreeding males, and immatures. Those of *E. pricei* are found mostly on the surface of soft-coral sea fans (*Gorgonia ventalina* Linnaeus) and clumps of live elkhorn coral (*Acropora palmata* (Lamarck)), whereas females of *E. ruetzleri* are on the surface of the algal turf on the same kinds of coral heads and boulders as the holes of the breeding males, and the immature males are also surface dwelling (on live coral near dead sections of coral for the single immature specimen collected).

The new species is one of the many chaenopsids living at least some of its life history in holes in dead coral around Carrie Bow Cay. All five species of *Acanthemblemaria* found there have both males and females in holes in dead coral (Clarke 1994), in contrast to *E. ruetzleri* having only dark-headed breeding males in such holes. Hole-dwelling males of the two common species of *Emblemariopsis* around Carrie Bow Cay are easily distinguished from the five species of *Acanthemblemaria* there because the heads of the species of the latter genus have spiny or rugose upper surfaces and are never as darkly and uniformly black as those of the two species of *Emblemariopsis*.

There are several other chaenopsids be-

sides *Emblemariopsis ruetzleri* and *E. pricei* in which mature males utilize different habitats than females and immature males. In the sailfin blenny, *Emblemaria pandionis*, at Carrie Bow Cay, mature males are resident in holes in coral rubble, but females and immature males move about much more freely along the sandy bottom and frequently change their rubble shelter sites (Smith & Tyler, in litt.). In the Gulf of California sailfin blenny, *Emblemaria hypacanthus*, Hastings (1991) has shown that in areas of low predation risk, males are closely tied to their shelters whereas females move about more freely in the open, but that in areas of high predation both sexes spend most of their time in shelters. Hastings (1986) also has shown that most males of *Coralliozetus angelica* (Böhlke & Mead) in the Gulf of California are resident in barnacle shells, but females spend much time foraging in the open.

With sexually active males ranging in size from 11.9 to 19.4 mm SL (\bar{X} = 14.5 mm SL for 35 individuals), *E. ruetzleri* is a relatively small species. A few other species of *Emblemariopsis* apparently are also relatively small, such as *E. leptocirris* and *E. occidentalis*, which have maximum known sizes of about 21 mm SL. Others are only slightly larger, such as *E. bahamensis*, *E. diaphana*, *E. signifera*, and *E. tayrona*, which reach between 23–25 mm SL (Stephens 1963, 1970; Acero 1987). The largest members of the genus are *E. randalli*, *E. bottomei*, and *E. pricei*, which have maximum sizes of 28–30 mm SL (Cervigon 1965, Stephens 1963, Tyler & Tyler 1997).

Emblemariopsis ruetzleri is about as diminutive as the smallest species of *Acanthemblemaria* at Carrie Bow Cay, *A. paula* Johnson & Brothers, which has a maximum size of about 18 mm SL and is sexually active as small as 11 mm SL (Johnson & Brothers 1989).

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