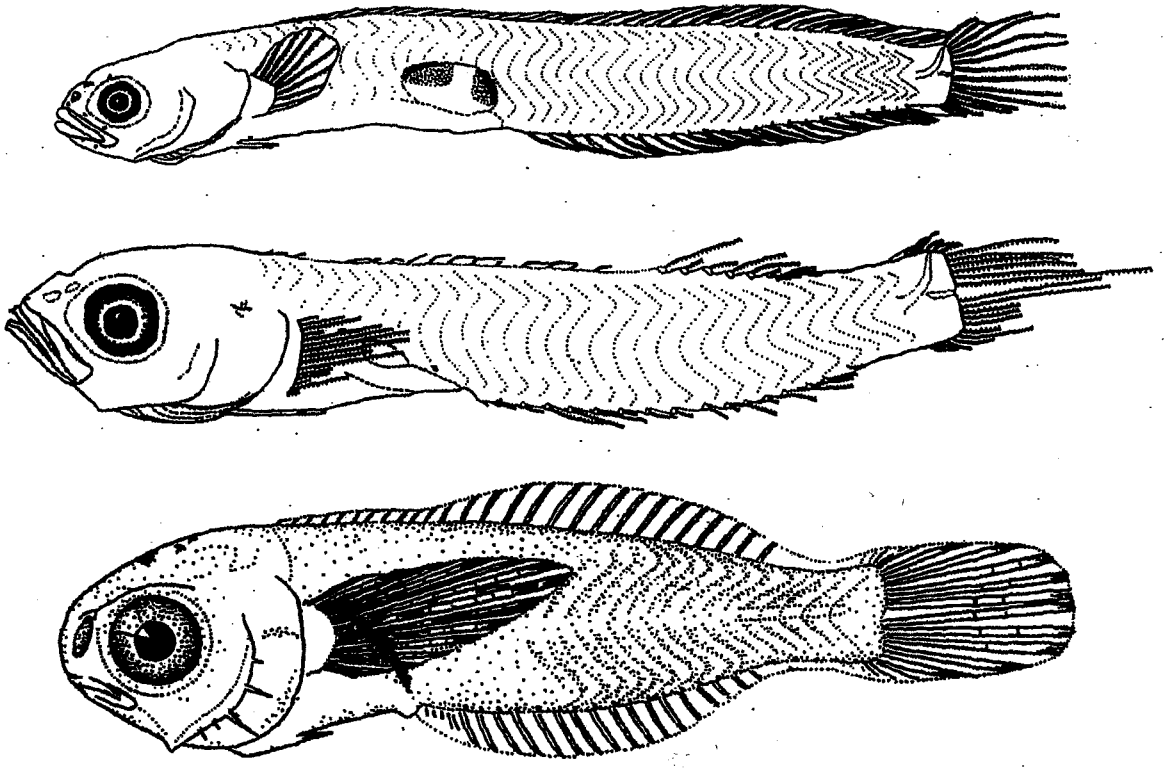
NOAA Technical Memorandum NMFS-SEFSC-416

PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE HISTORY STAGES OF BLENNIOID FISHES OF THE WESTERN CENTRAL ATLANTIC, FAUNAL LIST AND MERISTIC DATA FOR ALL KNOWN BLENNIOID SPECIES

BY

MARTIN R. CAVALLUZZI AND JOHN E. OLNEY



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
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Miami, Florida 33149

December 1998

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INTRODUCTION

The suborder Blennioidei comprises six families: Blenniidae, Chaenopsidae, Clinidae, Dactyloscopidae, Labrisomidae, and Tripterygiidae (Springer and Freihofer, 1976; George and Springer, 1980; Springer, 1993). Adult blennioids are small (most less than 15 cm standard length), benthic, non-commercial, cryptic fishes that primarily inhabit tidepools and coral and rocky reefs. Most species are distributed in tropical and subtropical regions of the Atlantic, Pacific, and Indian oceans (Nelson, 1994); however, representatives of some families can be found in boreal (e.g., Blenniidae, Clinidae), brackish (e.g., Dactyloscopidae, Blenniidae), and freshwater (e.g., Blenniidae) environments (Springer and Gomon, 1975a; Matarese et al., 1984; Nelson, 1994; Springer, pers. comm.)

The monophyly of the Blennioidei has been hypothesized based on six specialized osteological features involving the dorsal gill arches, pectoral fin and girdle, pelvic fin and girdle, caudal fin, anal fin, and vertebrae (Springer, 1993; Johnson, 1993). A detailed summary of blennioid classification since 1975 is provided by Springer (1993).

Recent estimates for the number of genera and species composing the suborder range from 127 genera and 683 species (Stepien et al., 1993) to 138 genera and approximately 800 species (Springer, 1995), some of which are not formally described. Although substantial progress has been made with the taxonomy of adult blennioid fishes, comparatively little is known about the egg and larval stages. Early life history information is available for approximately 76 species (ca. 10% of total), and the majority of this information is for blenniid taxa. Within the area represented by this volume, early life history information is available for only 13 of the 122 blennioid species (ca. %11 of total).

Blennioid eggs are not readily available, being primarily demersal and adhesive. The usual condition is that eggs are laid in batches in the "nest" of a male. Nests are commonly hidden within small holes or crevices of coral or rocky reefs, making collection difficult. In some dactyloscopids, males carry eggs in clusters cradled by the pectoral fins (Böhlke and Chaplin, 1993). In all taxa, eggs are not planktonic.

Blennioid larvae are easier to collect than eggs since thay are pelagic. However, the identification of these larvae is dependent on information published for adults, unless a complete ontogenetic series is available. The taxonomy of adults is based primarily on meristic characters, adult coloration, osteological features (e.g., soft-ray type, scale type), and morphology and position of sensory structures (i.e., cirri, sensory canal pores) (e.g., Rosenblatt, 1960; Stephens, 1963; Springer, 1971; George and Springer, 1980; Dawson, 1982; Williams, 1988; Böhlke and Chaplin, 1993; Nelson, 1994). Meristic variability within species, overlapping meristic ranges among species, lack of available meristic data, and the absence of adult characteristics in many larvae, all combine to make identification of blennioid larvae difficult. In addition, available meristic data are scattered throughout so many publications that their utility for identification purposes are restricted. These factors probably account for the relative paucity of published data on the early life history of blennioid fishes.

Summaries (with numerous citations within) of the present knowledge of blennioid reproduction, ontogeny, larval morphology and pigmentation are presented in Leis and Rennis (1983), Matarese et al. (1984), Thresher (1984), Brogan (1992), Moser (1996) and Cavalluzzi (1997). Most of this information is for species outside of the study area. In this report, we summarize early life history information and offer faunal and meristic summaries for the species in the tropical and subtropical western Atlantic. It is hoped that this information will provide the basis for future identifications and descriptions of larval blennioid fishes.

Our faunal list expands a previous list (Richards, 1990) to 5 families, 33 genera, 122 species, and 6 subspecies (Appendix I). The list includes all families of Blennioidei except Clinidae; there are no species of the family Clinidae known to inhabit the study area. No blennioid species is known to inhabit both the eastern Pacific and the western Atlantic. However, one Indo-West Pacific blenniid (*Omobranchus punctatus*) was introduced into the Caribbean (Springer and Gomon, 1975a).

The meristic data for the 122 species (Appendices III-XII) were compiled from the literature and supplemented with original data when possible. There are a high number of taxa for which there is incomplete meristic information. Nonetheless, the data tables should serve as a guide for identifying both larvae and adults, as well as indicating where research efforts in adult taxonomy should be concentrated. The reader is cautioned that available data for some species are based on few specimens, and do not account for intraspecific variation over zoogeographic zones. Intraspecific meristic variation is wide-ranging in many blennioids (e.g., see Springer and Gomon, 1975b), particularly between localities. In addition, counts listed for caudal-fin rays may be of limited use for the identification of larvae. Many authors define the number of principle caudal-fin rays as

the number of branched rays plus two; these data offer limited utility in identifying early-stage larvae which may not possess branched rays.

Since we do not know the complete zoogeographical ranges of most blennioid species, researchers are urged to consider all species from the study area when attempting to identify a larva. Springer and Gomon (1975b) demonstrated the wide range and meristic variation exhibited by *Malacoctenus triangulatus*. Greenfield and Johnson (1981), in their study of adult blennioid fishes, reported 20 blennioid species new to Belize, 40 new to Honduras, and 15 new to the Caribbean coast of Central America, representing significant range extensions for these species. The pelagic larvae are even more likely to be found in an area where adults have not yet been found (e.g., Cavalluzzi, 1997).

Our knowledge of the taxonomy of larval blennioids in the study area is in its infancy. We urge researchers to apply the following approaches in studies of larvae of blennioid fishes: (1) The rearing and spawning of blennies in captivity has been shown to be highly successful (e.g., Thresher, 1984). Adults are demersal, territorial, hardy, and can be reared in captivity if provided enough space, spawning shelters, and plenty of food (Thresher, 1984). This technique can result in a complete ontogenetic series of both eggs and larvae. (2) Eggs can be collected directly from the field and reared in the laboratory. Advantages of collecting eggs in situ are that multiple batches of eggs may be present within one nest, and the attending male is usually collected with them, allowing for positive identification (e.g., Stevens and Moser, 1982). In general, tropical blennies are multiple spawners and spawning probably occurs over several months (Thresher, 1984) allowing for many collection opportunities. Eggs of some species can be difficult to collect without damage since the process often requires chiseling away the substrate in order to remove the egg batches intact. (3) Advancements in larval taxonomy will be facilitated by advancements in adult taxonomy. For wild-caught larvae, identification necessitates the use of accurate and complete meristic data. There are many species for which meristic data are wanting; completing meristic summaries can only increase our identification success. (4) Regarding larvae, more detailed descriptions and illustrations of pigment locations are necessary in order to make accurate identifications, as well as comparisons within and among families. To facilitate this, illustrations of ventral and dorsal surfaces of larvae, which are rare in published literature, should be included. (5) Combining eggs and larvae from various collections could lead to increased identification success and the description of complete ontogenetic series. An excellent example of this is the California Cooperative Oceanic Fisheries Investigations (CalCOFI) for the California Current region. These cooperative investigations recently resulted in the description of larvae of about half of the known species in that area (Moser, 1996). To

our knowledge, there are no efforts of comparable scale in the tropical and subtropical western Atlantic.

Family Blenniidae

This family is by far the most speciose of the blennioid families with 53 genera and approximately 345 species from the Atlantic, Pacific, and Indian oceans (Nelson, 1994). However, in the study area, blenniids are the third most speciose family, following Labrisomidae and Chaenopsidae, respectively, and only exceeding Dactyloscopidae by one species. There are 3 tribes (Omobranchini, Parablenniini, Salariini), 9 genera, 18 species, and 4 subspecies represented in the study area (Appendix I), of which larvae have been described for only 7 species.

More is known about the reproduction of blenniids than any other blennioid family, although most information is on species outside of the study area. In general, fecundity is relatively low, but because a male often mates with several females, guarding the eggs from multiple spawnings, several thousand eggs can be contained within one nest (Hildebrand and Cable, 1938; Peters, 1981; LaBelle and Nursall, 1992).

Commonly known as combtooth blennies, because of the possession of a single row of close-set incisorform teeth in adults, most species are demersal and cryptic. They inhabit fringing reefs, reef crests, mangove roots, pier pilings, and coral rubble in shallow water areas of less than 1 m to 6 m (e.g., Greenfield and Johnson, 1981) although some species of the tribe Nemophini are semi-pelagic. Monophyly of the family is based on five specialized characters involving the coracoid and cleithrum, premaxilla, canine teeth, urohyal, and gill membranes (Springer, 1993).

Blenniid larvae exhibit more morphological variation than larvae of the other families. This variation is greater between tribes than within tribes (Leis and Rennis, 1983). Blenniids are unique in that the larvae of many species exhibit one or more specializations (i.e., preopercular spination, elongate pectoral fins, large hooked teeth) not seen in other blennioid larvae, although these occur variously within and among the tribes. Salariin larvae exhibit a specialized stage, the "ophioblennius", that is a modification for a pelagic existance. This stage is characterized by a laterally compressed body, large body (up to 66 mm SL), large hooked teeth, large early-forming pectoral fins, light pigmentation, and a forked caudal fin in larger larvae (Springer, 1962; Leis and Rennis, 1983; Watson, 1996).

Larvae of the tribes Salariini (two genera, *Entomacrodus* and *Ophioblennius*, in study area) and Nemophini do not possess ventral midline melanophores associated with the bases of the anal-fin elements, a common pigment pattern among other blennioid larvae (Leis and Rennis, 1983). References cited in Introduction should be consulted for detailed early life history information on species outside of the study area.

BLENNIIDAE

Chasmodes bosquianus bosquianus (Lacépède)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	24-26
Total	34-36
Number of fin spines and rays	
First Dorsal	X-XII
Second Dorsal	17-20
Total	28-31
Anal	II, 16-20
Pectoral	11-13
Pelvic	I,3
Caudal	
Dorsal Secondary	4 or 5
Principal	10-13
Ventral Secondary	3-5
Total	(4 or 5+11+3-5)
Gill rakers on first arch	
Upper	
Lower	
Total	11-13
Branchiostegals	6

LIFE HISTORY

Range: New York to Marineland, Florida
Habitat: Salinity of 15-25 ppt; grassbeds, oyster or rocky reefs, sand or muddy bottom areas
ELH pattern: demersal eggs, tended by male, planktonic larvae
Spawning
Season: April-August (in Chesapeake Bay)
Area: throughout area
Mode: laid in empty shells or other substrate
Migration: hypothesized that specimens collected above Maryland migrated with warm summer waters or larvae were transported to northern areas
Fecundity:
Age of first maturity:
Longevity:

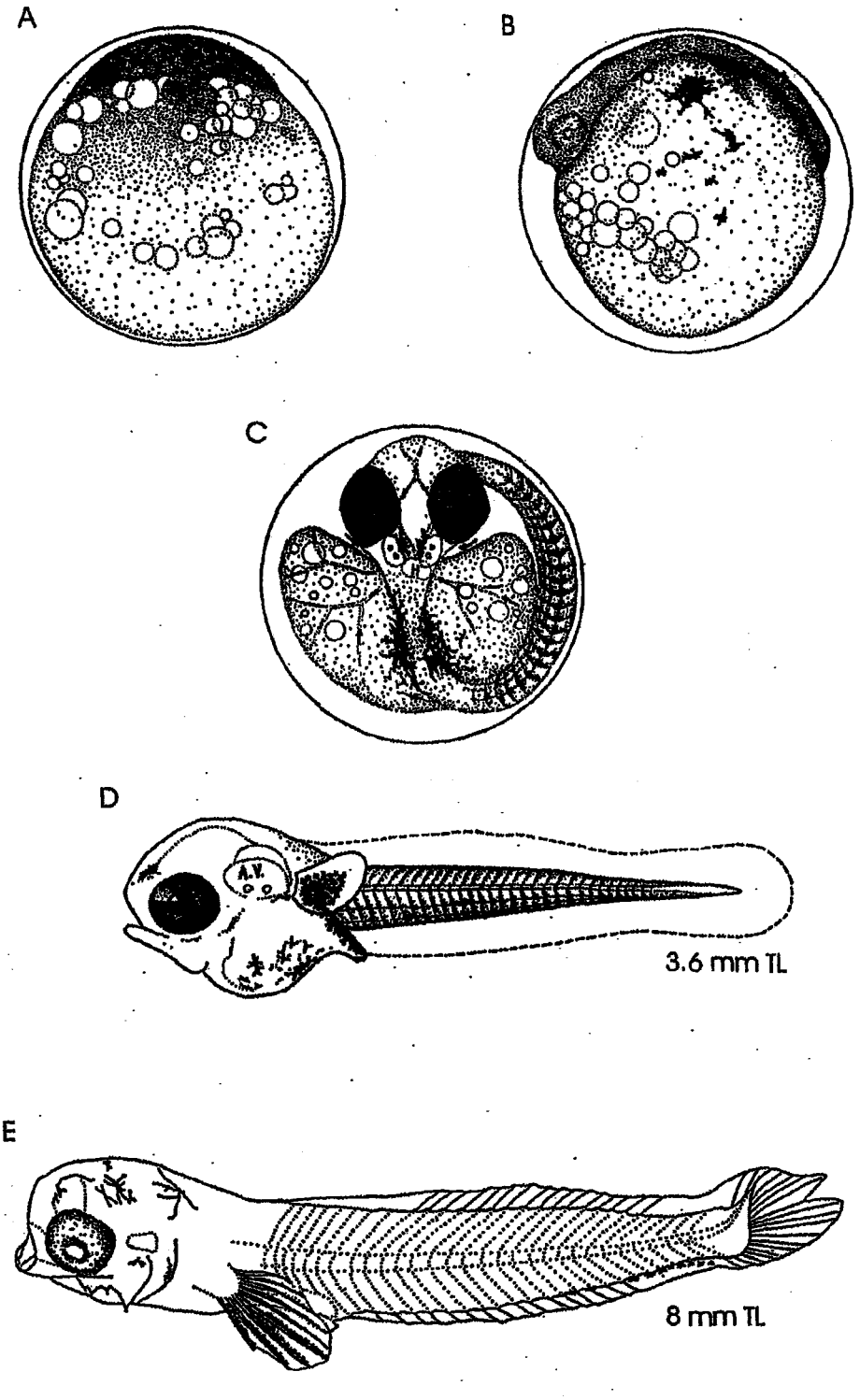
Literature: Fritzsche, R.A., 1978; Hildebrand and Cable (1938); Hildebrand and Schroeder (1928); Lippson, A.J. and R.L. Moran, 1974; Springer, V.G. 1959; Williams, J.T. 1983

EARLY LIFE HISTORY DESCRIPTION

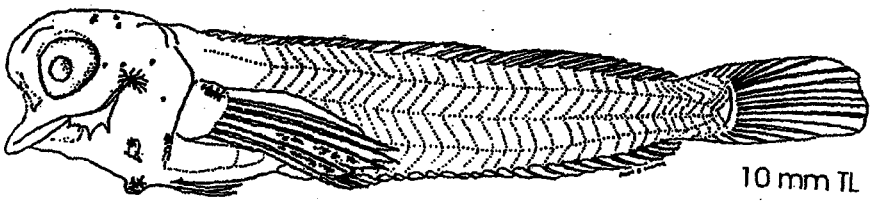
EGGS
Diameter: major axis 0.92-1.1 mm, avg. 1.04 mm; minor axis 0.8-0.9 mm
No. of Oil Globules: numerous
Oil Globule Diameter: varied
Yolk: granular
Shell: pale yellow (usually) to orange in color
Incubation: 11 days at 24.5-27°C
Pigment: yolk with grayish to black pigment blotches; near end of incubation, embryo with pigmentation at auditory vesicles, between eyes, and on pectoral-fin membranes
Diagnostic characters: Eggs laid in single layer and attached to surface of shell via adhesive disk; adhesive disk diameter greater than diameter of egg; egg slightly flattened on side near adhesive disk.

LARVAE
Size at hatching: 3.56-3.78 mm TL
Length at flexion:
Length at transformation:
Sequence of fin development:
Pigment: *Yolk-sac larvae-* paired melanophores on snout, upper margin of abdomen covered with melanophores (extending from upper pectoral fin base to anus), lower area of abdomen with scattered melanophores, ventral midline of trunk pigmented, inner surface of pectoral fins with melanophores on basal 3/4 of fin. *Post yolk-sac larvae-* heavy pigmentation on ventral 3 or 4 pectoral-fin rays, membrane covering brain with several large pigment spots, two pairs of melanophores on anterior section of upper jaw, melanophores on cleithral symphysis, abdomen, preopercle, and dorsal edge of opercle.
Diagnostic characters: Pigment on pectoral fins

Illustrations: A-D from Hildebrand and Cable, 1938; E-H from Lippson and Moran, 1974

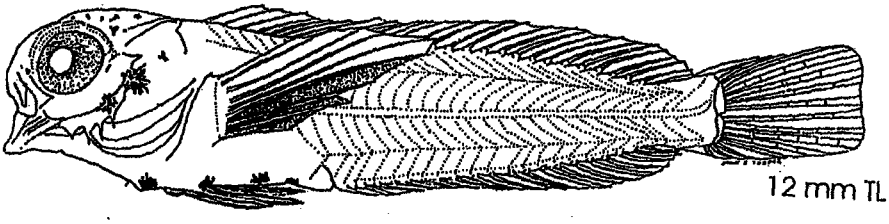

A
B
C
D
A.V.
3.6 mm TL
E
8 mm TL

F



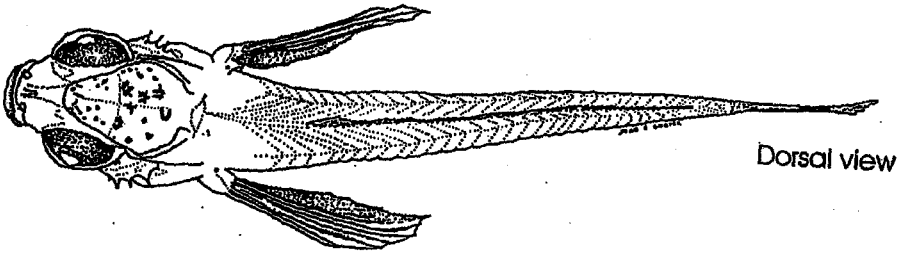
10 mm TL

G



12 mm TL

H



Dorsal view

BLENNIIDAE

Chasmodes saburrae Jordan and Gilbert

MERISTICS

Vertebrae	
Precaudal	10
Caudal	24-26
Total	34-36 total
Number of fin spines and rays	
First Dorsal	X-XII
Second Dorsal	16-20
Total	27-31 total
Anal	II, 17-20
Pectoral	11-13
Pelvic	I,3
Caudal	
Dorsal Secondary	4,5
Principal	10-13
Ventral Secondary	3-5
Mode	4-5+11+3-5
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: Florida coast, Alabama, Mississippi
Habitat: oyster shells, sponges, holes in rocks
ELH pattern: demersal eggs, tended by male, planktonic larvae
Spawning:
Season: early March to early November with spring and fall spawning peaks; multiple spawning events per female
Area:
Mode: many eggs deposited in single layer on substrate
Migration:
Fecundity: 120 eggs/cm^2, total fecundity depended on surface area available (e.g., 1,000-2,000 eggs on oyster shell, ca. 11,000 eggs in a discarded can),
Age of first maturity:
Longevity:

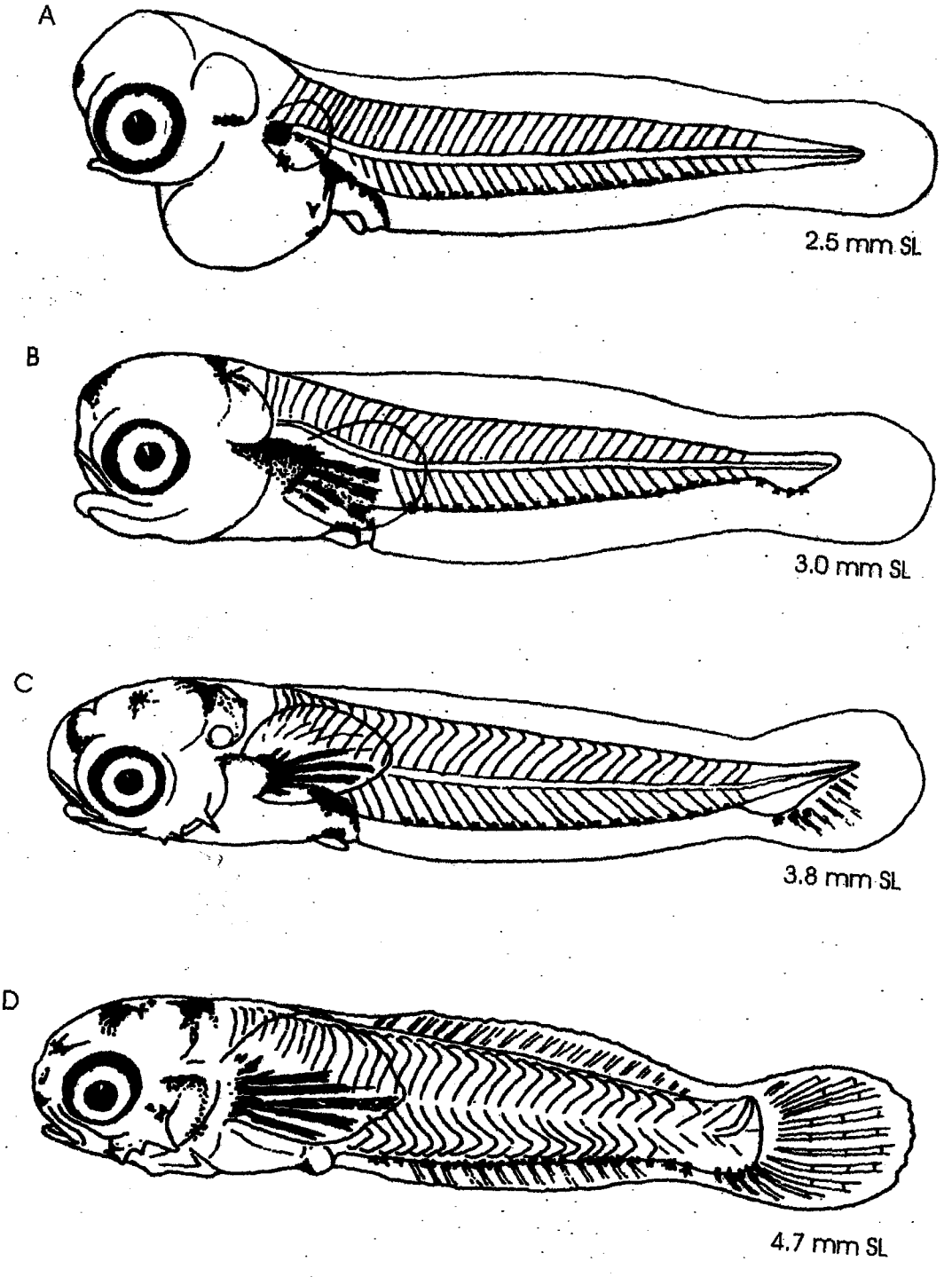
Literature: Hoese and Moore, 1977; Peters, 1981; Springer, 1959b; Williams, 1983

EARLY LIFE HISTORY DESCRIPTION

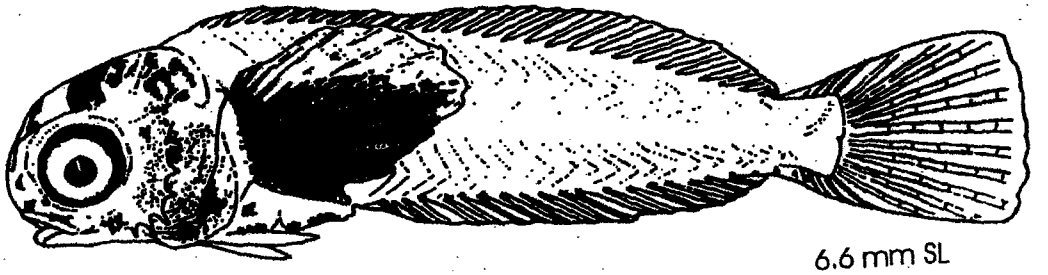
EGGS
Diameter: 0.71-0.92 mm (avg. 0.82), perivitelline space 0.06 mm
No. of Oil Globules:
Oil Globule Diameter:
Yolk:
Shell:
Incubation: six days at 27°C in laboratory
Pigment: erythrophores on yolk in two day old embryos; yolk of four day old embryos with few erythrophores, but many small melanophores, eyes pigmented; number of melanophores decreasing by day six
Diagnostic characters:

LARVAE
Length at hatching: 3.2-3.7 mm NL, avg. 3.4 mm NL
Length at flexion: 3.9 mm NL; fully flexed by 4.7 mm SL
Length at settlement: 6.4 mm SL (21 days)
Sequence of fin development: pectoral, caudal, dorsal, anal, pelvic
Pigment (number of melanophores in parentheses): *Newly-hatched larvae-* melanophores on snout (1), below auditory vesicle (1), ventral margin of body where anal fin will develop (20-27), yolk sac (2-7), dorsally on gut (3 pairs), over midsection of hindgut (1), pectoral-fin base (4-6), pectoral-fin membrane near base (7 or 8), and yellow pigment over snout, dorsally on gut, and hindbrain; *2.5 day old larvae-* pigment more extensive in areas mentioned above, additional melanophores on ventral midline extending to partially formed hypural plate; *6.5 day old larvae-* one melanophore over each orbit; *10.5 day old larvae-* melanophores scattered on snout, preopercle, and below opercle; *13.5 day old larvae-* melanophores covering most of head, ventral half of pectoral fins completely pigmented.
Diagnostic characters: pigmented pectoral fins

Illustrations: A-G from Peters, 1981


A
2.5 mm SL
B
3.0 mm SL
C
3.8 mm SL
D
4.7 mm SL

E

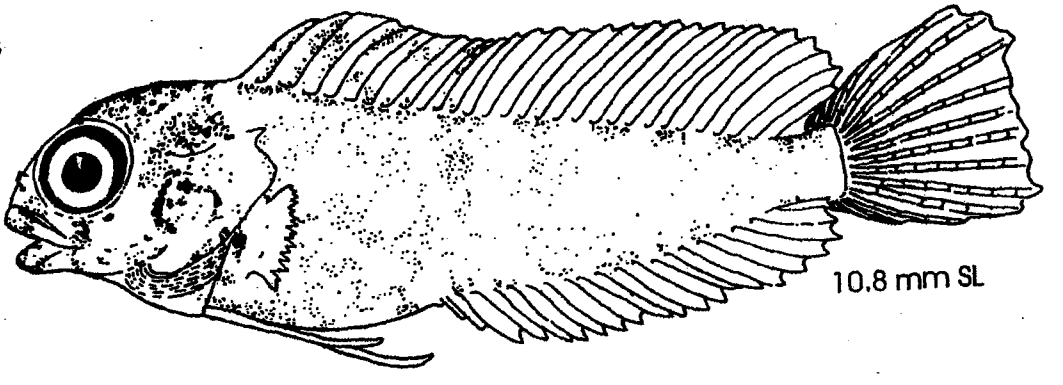


6.6 mm SL

F

6.4 mm SL

G



10.8 mm SL

BLENNIIDAE

Hypleurochilus geminatus (Wood)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	23
Total	33
Number of fin spines and rays	
Dorsal	XI or XII, 15 or XIII,14 26 or 27 total
Anal	II, 17 or 18
Pectoral	14
Pelvic	I,3 or I,4
Caudal	
Dorsal Secondary	
Principal	
Ventral Secondary	
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: North Carolina to Texas, including south Florida

Habitat: among marine growths attached to pilings and rocks of breakwaters.

ELH pattern: eggs attached to structure (e.g. rocks, ascidians, shells), planktonic larvae

Spawning:

Season: May - September, possibly early October

Area:

Mode: eggs layed in single layer; eggs do not touch one another; nest area may cover area of 2-3 square inches; one nest may contain eggs of several different developmental stages

Migration:

Fecundity: eggs of several different sizes present within the ovary at one time.

Age of first maturity:

Longevity:

EARLY LIFE HISTORY DESCRIPTION

EGGS

Diameter: 0.60-0.75 mm (measured in same plane as the surface to which they were attached); avg. 0.694 mm

No. of Oil Globules: several

Oil Globule Diameter:

Yolk:

Shell:

Incubation: 6-8 days at 26-28 °C with some eggs hatching a full day before others in the same batch

Pigment: eggs with purple bodies that disappear in advanced stage of development; oil globules bright golden yellow to orange; after embryo becomes well differentiated two darkly pigmented bands appear across yolk; at ca. 72 hours after fertilization the eyes are completely pigmented and the two dark bands on the yolk have broken up into scattered dark spots; at ca. 96 hours there are several large irregularly shaped dark spots

Diagnostic characters: adhesive disk larger in diameter than egg; pigment

LARVAE

Length at hatching: ca. 2.4 mm TL (not in preservative)

Length at flexion: ca. 4 mm TL

Length at transformation: ca. 15 mm TL

Sequence of fin development: pectoral and caudal fins appear first, followed by the dorsal and anal fins, with the pelvic fins being last to form. By 8.0 - 1- mm TL, the dorsal- and anal fins nearly fully developed.

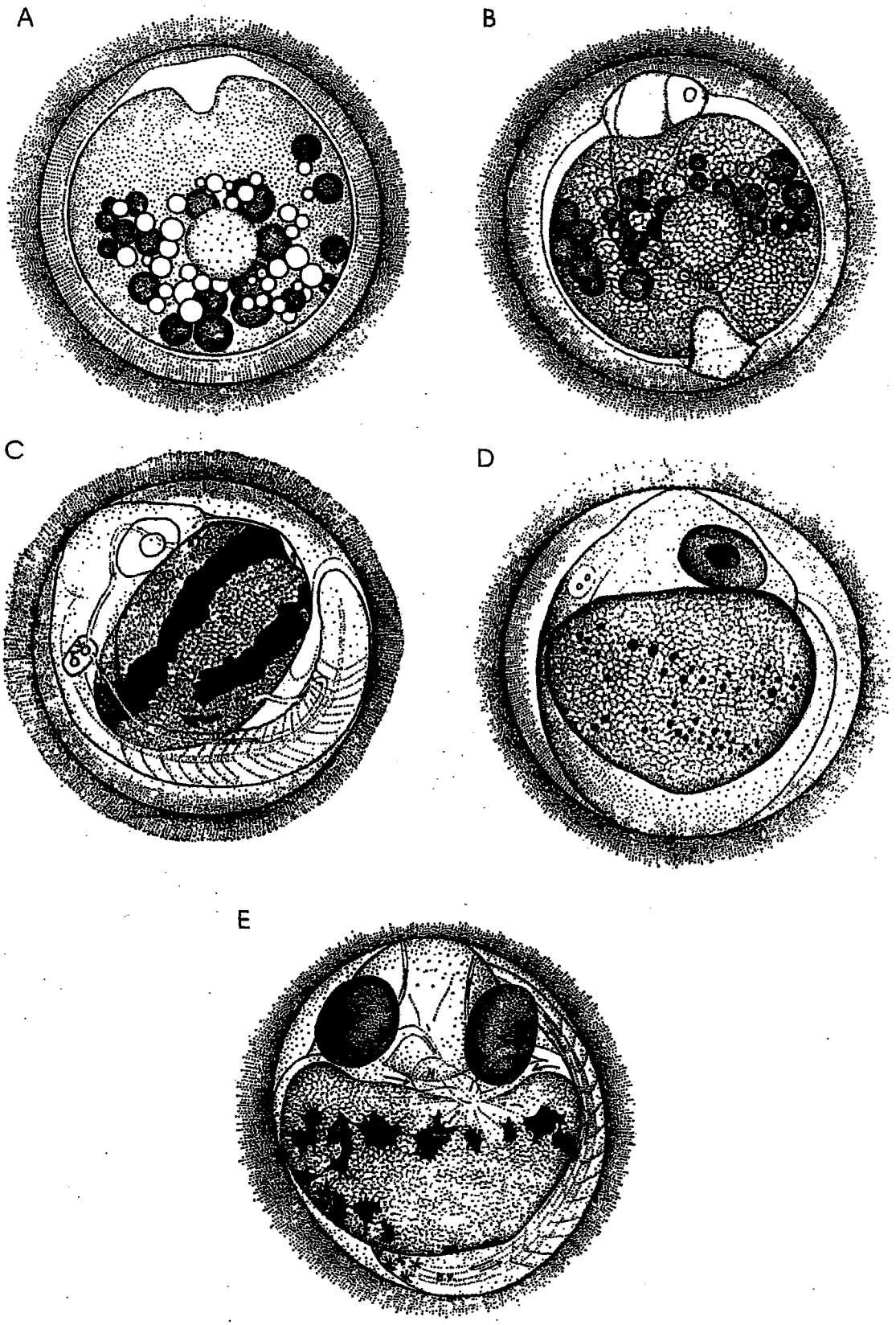
Pigment: *Newly hatched*: two irregularly-shaped dark spots (or one blotch) below auditory vesicle; dorsal area of abdominal mass heavily pigmented; several melanophores on ventral edge of abdomen; and bar- shaped melanophores on the ventral edges of several caudal myomeres. *At 1.5 mm TL* (smaller than newly hatched fish; most likely due to shrinkage from preservative): dorsal surface of gut pigmented from axil of pectoral fin to area just above vent; ventral surface of abdomen with few to several

melanophores; dark bar across forehead between the eyes; melanophores on ventral edge of caudal myomeres; base of the rudimentary pectoral fin covered with melanophores. *At 2.0 - 3.0 mm TL* (in preservative): same as in 1.5 mm TL larvae except occiput or nape usually with one or more melanophores and inner surface of pectoral fin with melanophores. *At 4.0 - 4.5 mm TL* (in preservative): same as in smaller larvae except several melanophores present on head and nape, as well as the ventral surface of the abdomen; base of pectoral fin pigmented on inner surface only. *At 5.0 - 6.0 mm TL* (in preservative): same as in smaller larvae except pigment on pectoral fins now extends to lower rays of fin; sides of the head with few very small melanophores; increased pigment on occiput and nape; melanophores on ventral midline now situated between the bases of the anal-fin rays. *At 8.0 - 10 mm TL* (in preservative): same as in smaller larvae except the dark band of pigment on the dorsal surface of the gut (ranging from the pectoral fin axil to the area just above the vent) is no longer distinct; ventral midline melanophores becoming elongate. Pigment remains the same in larvae of ca. 12 mm TL (in preservative). Pigmentation similar to adults in specimens 20 - 22 mm TL.

Diagnostic characters: small yolk sac present at hatching; ventral midline melanophores at bases of anal-fin rays; pectoral fin pigmented on inner side and only at base and lower rays.

Illustrations: A-K from Hildebrand and Cable (1938)

Literature: Bath, 1976; Breder, 1939; Hildebrand and Cable, 1938; Hoese and Moore, 1977; Randall, 1966; Robins et al., 1986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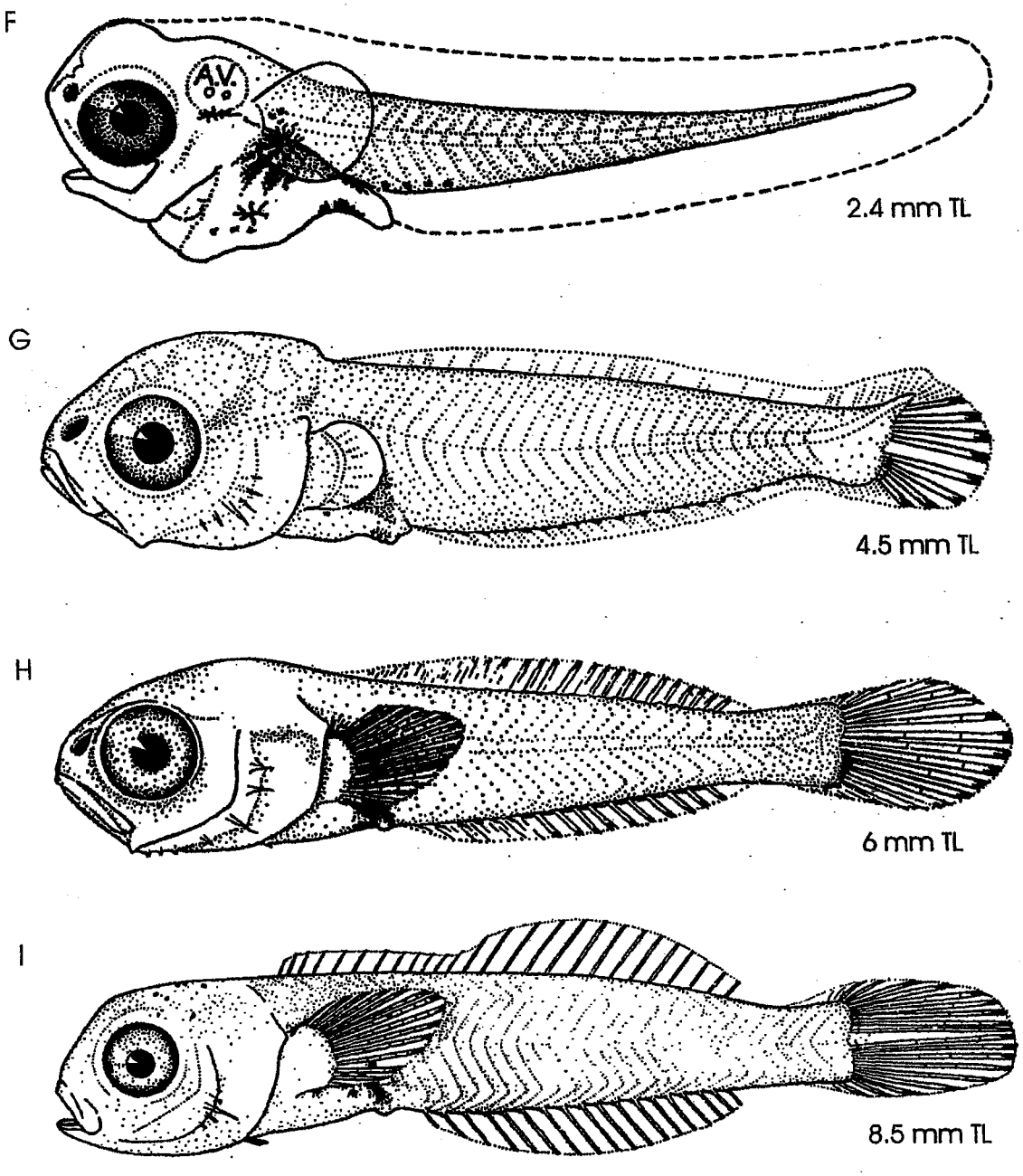
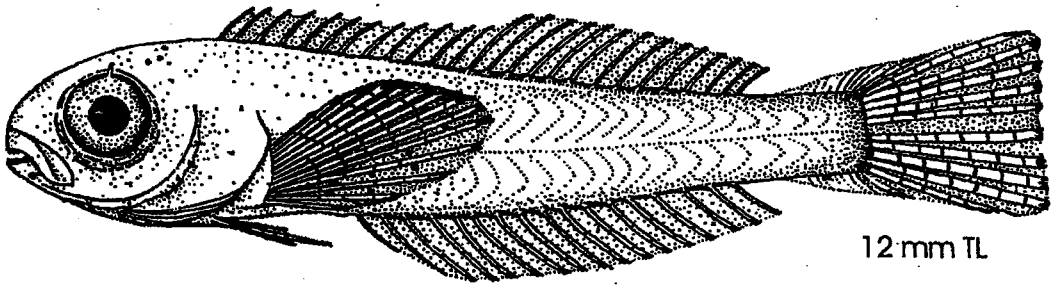
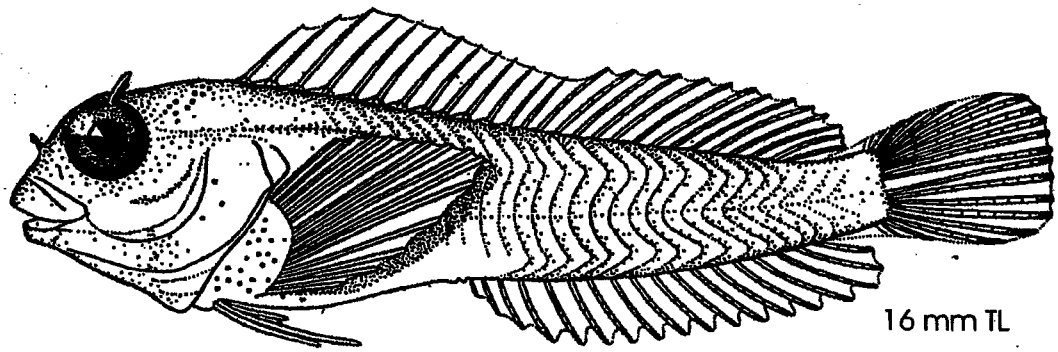

F
AV.
2.4 mm TL
G
4.5 mm TL
H
6 mm TL
I
8.5 mm TL

J



12 mm TL

K



16 mm TL

BLENNIIDAE

Hypsoblennius hentz (LeSueur)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	21-24
Total	31-34
Number of fin spines and rays	
First Dorsal	XI-XIII
Second Dorsal	13-17
Total	25-28 total
Anal	II,14-17
Pectoral	13-15
Pelvic	I,3
Caudal	
Dorsal Secondary	5,6
Principal	13
Ventral Secondary	5,6
Total	23-25
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: New Jersey to Yucatan; two specimens collected in Shelburne Harbour, Nova Scotia
Habitat: oyster reefs, rocky shores, grass flats
ELH pattern: demersal eggs laid in empty oyster shell or other shells, planktonic larvae, settlement by 24 mm SL
Spawning:
Season: May-August
Area:
Mode: several batches of eggs deposited in shell in early morning; male guards nest until hatching; nests containing up to 3,750 eggs.
Migration:
Fecundity: not known, but eggs of several sizes present in ovary at one time.
Age of first maturity:
Longevity:

EARLY LIFE HISTORY DESCRIPTION

EGGS
Diameter: 0.72-0.80 mm (major axis), 0.64-0.68 mm (minor axis)
No. of Oil Globules: many
Oil Globule Diameter: varied
Yolk: pinkish, granular
Shell: unsculptured, slightly flattened near adhesive disk
Incubation: 10-12 days at 24.5-27.0 °C
Pigment: yolk with pinkish colored bodies and golden-yellow oil globules; embryo with dark blotches on yolk during early development; blotches disappear one to two days before hatching; large pigmented area between eyes; numerous melanophores on pectoral-fin membrane; melanophores in cross-line pattern on ventral midline in caudal region.
Diagnostic characters: pinkish colored bodies in yolk; adhesive disk diameter greater than egg diameter.

LARVAE
Length at hatching: 2.6-2.8 mm TL
Length at flexion: 4-4.5 mm TL
Length at transformation:
Sequence of fin development: pectoral, caudal, dorsal and anal (correspond), pelvic
Pigment: *Yolk-sac larva*: pigmentation corresponds to that of advanced embryo; eye dark with greenish sheen above pupil; irregularly outlined dark spot on head between anterior part of eyes; black melanophores ranging from snout to interorbital in some; dendritic pigmentation at auditory vesicle; abdominal region with many melanophores; inner surface of pectoral fin with dark melanophores ranging from basal two-thirds of fin to entire fin; ventral midline melanophores in cross-line pattern. *At 2.5-3.0 mm TL*: gut region pigmented dorsally (extends from pectoral axil to area above hindgut); several melanophores on occiput and nape; majority of pectoral fin covered with melanophores; abdomen with several melanophores; distinct pigmented bar crosses forehead between eyes; ventral midline melanophores vertically elongate

and not in cross-line pattern. *At 4.0-4.5 mm TL*: same as 2.5-3.0 mm TL larvae except dorsally-located gut region pigment extends from pectoral axil to vent, melanophores cover pectoral fin rays excluding the two or three uppermost rays, and the ventral midline melanophores are small and round and associated with the bases of the anal-fin rays. *At 5.0-6.0 mm TL*: similar to smaller specimens with the addition of a few melanophores present on the abdomen and sides of the head. *At 8.0-10 mm TL*: similar to smaller larvae with the addition of a few melanophores behind the articulation of the lower jaw, a pair of melanophores anterior to the pelvic fins, a pair of melanophores in the axils of the pelvic fins, brownish spots with dark center and dark outline on the occiput, pectoral fins completely covered with melanophores or with the two to four dorsalmost rays without melanophores, and the dorsally-located gut region pigment is obscure in 10 mm TL larvae. *At ca. 12 mm TL*: similar to 10 mm TL larvae except the occipital melanophores and spots have increased somewhat in size and number in some specimens, ventral midline melanophores are no longer evenly spaced, melanophores present anteriorly on upper jaw, posterior to axil of mouth, and on chin.

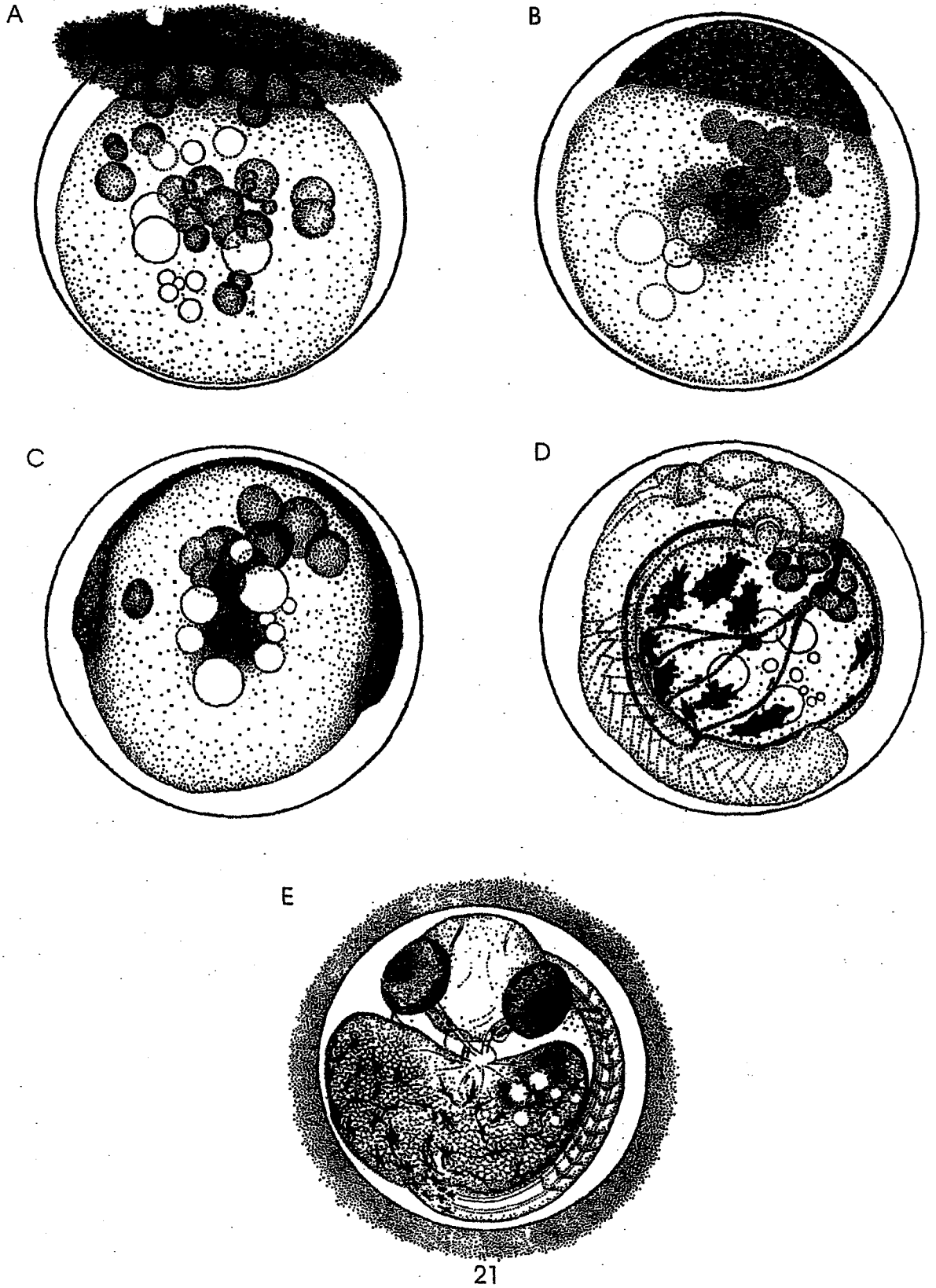
Diagnostic characters: pigmented pectoral fins; preopercular spines (3-5 depending on length; 5 present by 6.5 mm TL); dark band of melanophores extending between eyes.

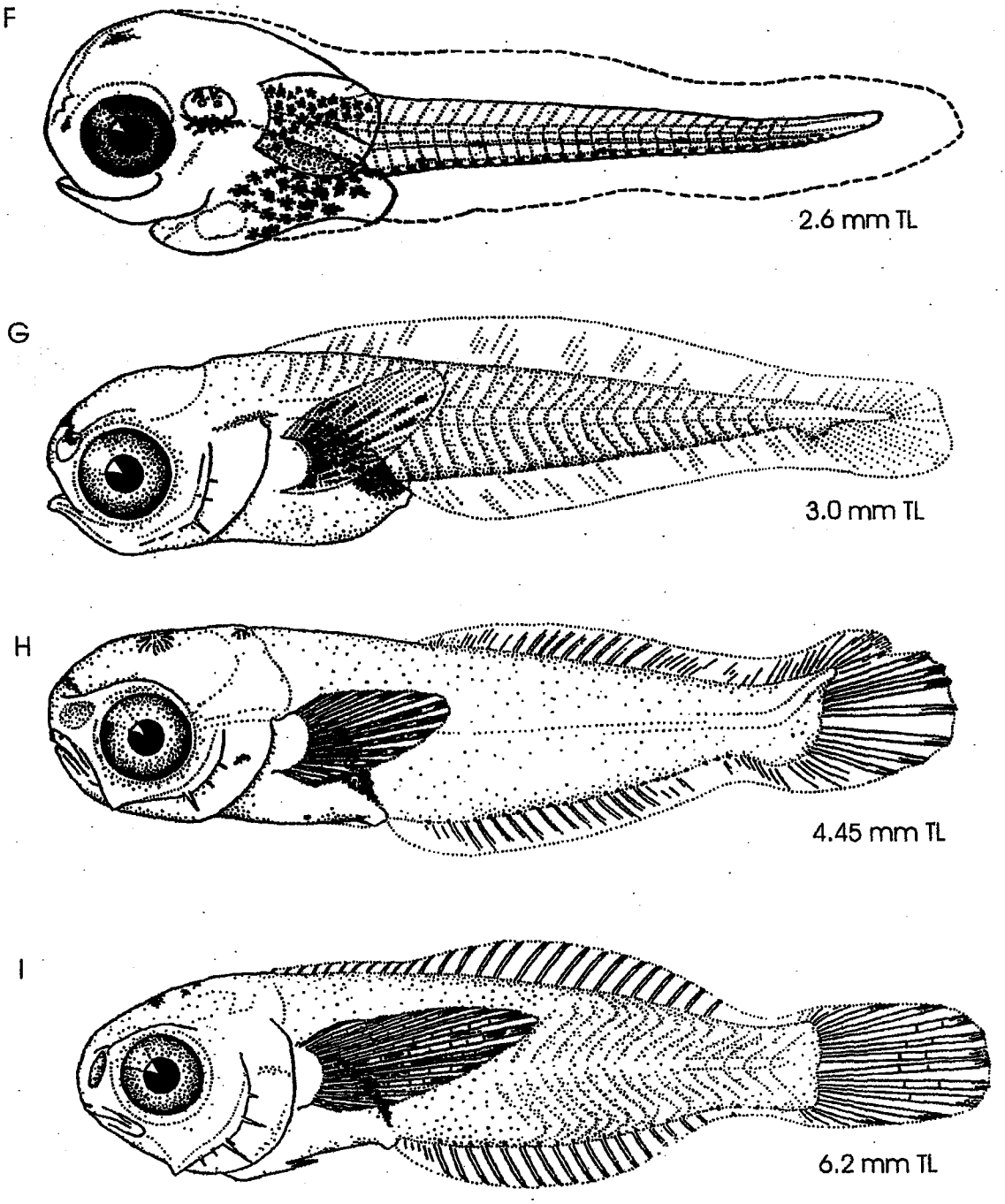
Illustrations: A-J from Hildebrand and Cable, 1938

Literature: Bath, 1976; Breder, 1939; Fahay, 1983; Fritzsche, 1978; Gilhen et al., 1976; Hildebrand and Cable, 1938; Hoese and Moore, 1977; Lippson and Moran, 1974; Peters, 1985; Smith-Vaniz, 1980; Wang and Kernehan, 1979

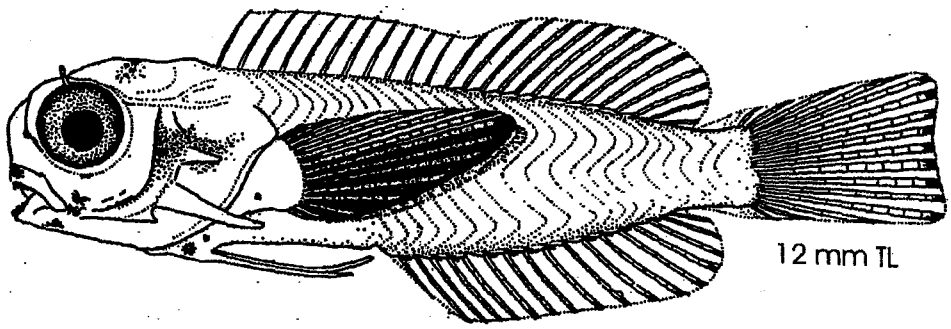
Note: Peters (1985) believes that the original description by Hildebrand and Cable (1938), and therefore this description, represents a mixture of two species, *H. hentz* and *Chasmodes saburrae*. Peters identifies Hildebrand and Cable's figure 88 (p. 587) as *C. saburrae* (omitted from this description). Peters (1985) lists this and other errors in the literature regarding the original description: Fritzsche (1978), Lippson and Moran (1974), and Wang and Kernehan (1979), all

mislabelled two figures borrowed from Hildebrand and Cable (1938). In Fritzsche, the 6.2 mm TL and 12 mm TL specimens as illustrated by Hildebrand and Cable are labeled 12 mm and 6.2 mm, respectively. In Lippson and Moran, and Wang and Kernehan, the 9.8 mm TL and 12 mm TL specimens as illustrated by Hildebrand and Cable are labeled 12 mm TL and 9.8 mm TL, respectively.


A
B
C
D
E


F
2.6 mm TL
G
3.0 mm TL
H
4.45 mm TL
I
6.2 mm TL

J



BLENNIIDAE

Lupinoblennius nicholsi (Tavolga)

MERISTICS

Vertebrae	
Precaudal	11-12
Caudal	21-23
Total	32-35
Number of fin spines and rays	
First Dorsal	XII-XIII
Second Dorsal	13-15
Total	
Anal	II,16-17
Pectoral	13
Pelvic	I,3
Caudal	
Dorsal Secondary	
Principal	13-14
Ventral Secondary	
Mode	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range:
Habitat:
ELH pattern:
Spawning:
Season:
Area:
Mode:
Migration:
Fecundity:
Age of first maturity:
Longevity:

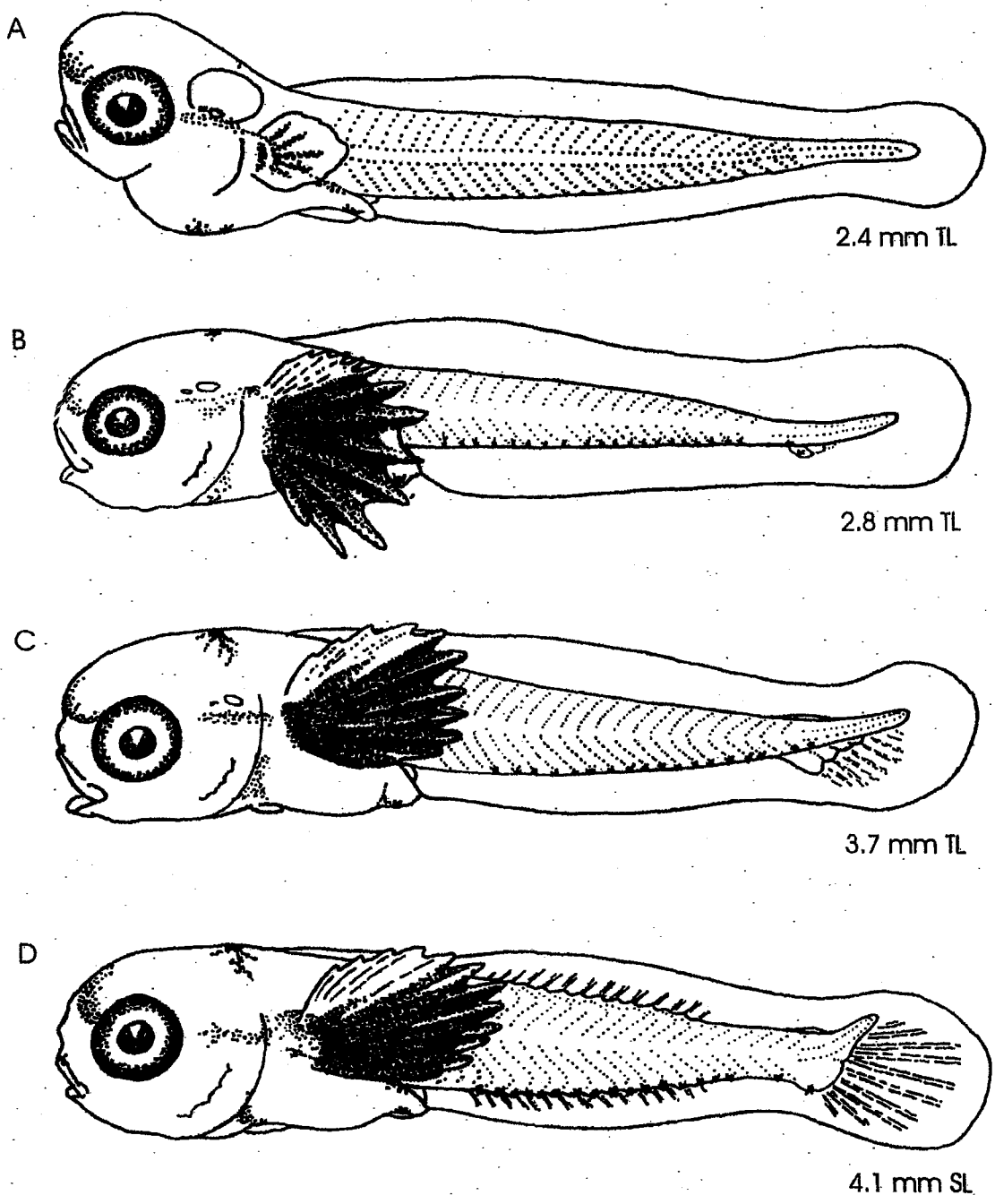
Literature: Greenfield and Johnson (1981); Peters (1985); Tavolga (1954)

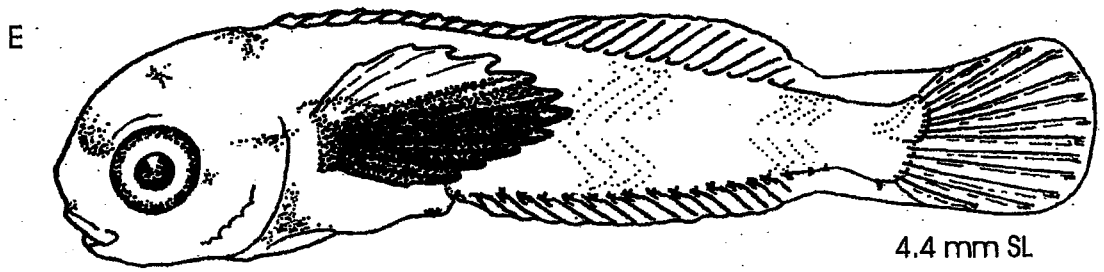
EARLY LIFE HISTORY DESCRIPTION

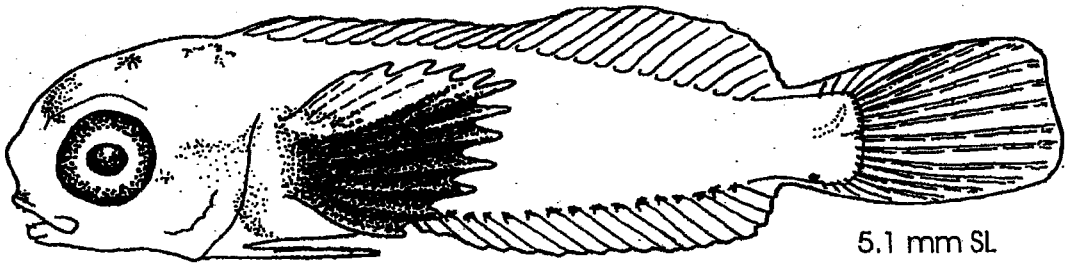
EGGS
Diameter: major axis 0.67-0.74 mm; minor axis 0.46-0.53; mean size 0.72 x 0.50 mm
No. of Oil Globules:
Oil Globule Diameter:
Yolk:
Shell:
Incubation: 6-7 days at 24-27 °C
Pigment: *At 3-4 days*: embryo with lightly pigmented eyes. *At 4-5 days*: pale yellow yolk covered with many small melanophores (only a few remain by hatching). *At 5-6 days*: embryos with "patches of light dendritic melnophores anterior to the forebrain and covering the dorsal surface of the gut from the anus to the pharyngeal region" (Peters, 1985); ventral midline of tail with two rows of melanophores.
Diagnostic characters: double row of melanophores on ventral midline

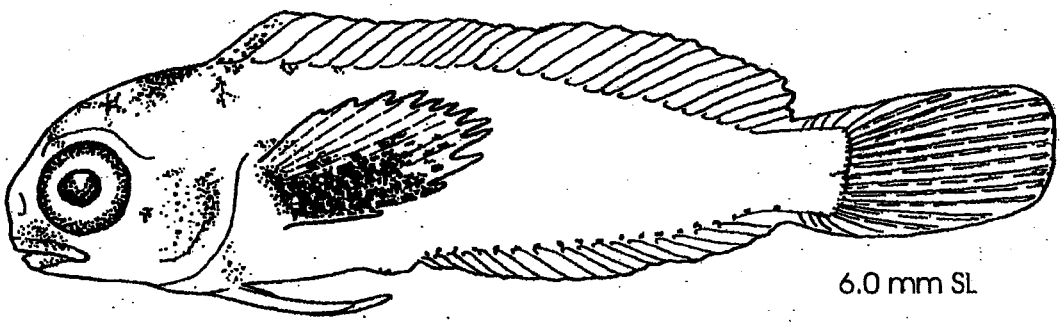
LARVAE
Length at hatching:
Length at flexion:
Length at settlement:
Sequence of fin development:
Pigment (number of melanophores in parentheses):
Newly-hatched larvae-
Diagnostic characters:

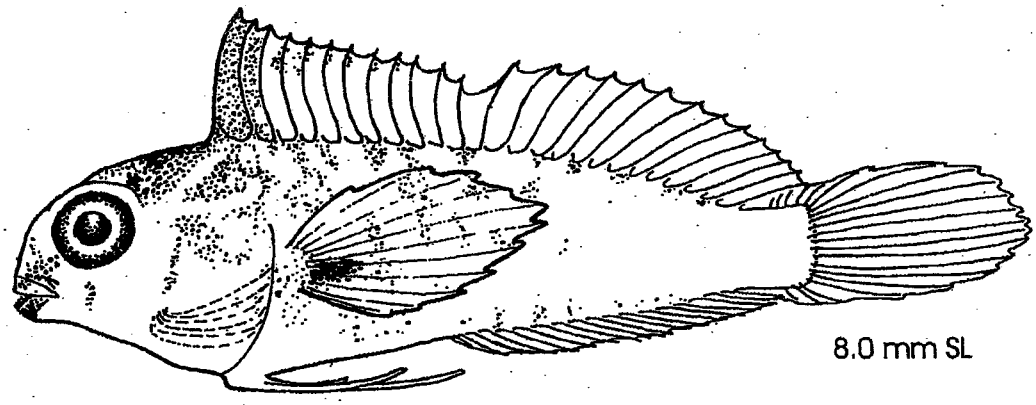
Illustrations: A-H from Peters, 1985


A
2.4 mm TL
B
2.8 mm TL
C
3.7 mm TL
D
4.1 mm SL


E
4.4 mm SL


F
5.1 mm SL


G
6.0 mm SL


H
8.0 mm SL

BLENNIIDAE

Ophioblennius atlanticus macclurei Silvester

MERISTICS

Vertebrae	
Precaudal	
Caudal	
Total	
Number of fin spines and rays	
First Dorsal	XII
Second Dorsal	19-21
Total	31-33
Anal	II, 20-22
Pectoral	14-16
Pelvic	I,4
Caudal	
Dorsal Secondary	
Principal	13 segmented
Ventral Secondary	
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: Throughout Caribbean including Greater and Lesser Antilles, Belize, Honduras, Panama, Nicaragua, Yucatan, Venezuela, and Curacao. Also Bermuda and North Carolina south to Florida
Habitat: rock and coral reefs in shallow water
ELH pattern: eggs laid on substrate, pelagic larvae (often captured in area of adults or over deep barrier reefs near shore); length in plankton six to eight weeks
Spawning:
Season: year-round, 10 days prior to the full moon until six days after; peaks in spawing in April and May
Area: nests located in shallow water (surface to 3 m at mean low tide)
Mode: spawning in nests held by males.
Migration: none
Fecundity: during April through August, monthly fecundity 794-4,390 eggs per female. Males spawn with multiple females and nests may have 1,638-11,490 eggs contained in up to four cohorts
Age of first maturity:
Size of first maturity: smallest mature female and male, 61 and 56 mm, respectively
Longevity: majority of population dies within three years

EARLY LIFE HISTORY DESCRIPTION

EGGS
Diameter: 0.68-0.75 mm
No. of Oil Globules: at 8 hours after fertilization, one large oil globule, numerous small ones
Oil Globule Diameter:
Yolk: pale yellow at 8 hours, dark yellow at 24 hours; yolk occupies 50, 40, and 30 % of egg volume at 58, 70, and 90 hours, respectively
Shell:
Incubation: 106-112 hours at 29° C
Pigment: *At 40 hours*: optic vesicles partially pigmented, body and yolk sac with black, irregular blotches of chromatophores; *At 50 hours*: eyes black, scattered chromatophores on yolk sac and trunk; *At 58 hours*: chromatophores along entirelength of tail; *At 96 hours*: melanophores in 'Y' pattern, extending from both sides of yolk sac to ventral midline posterior to anus
Diagnostic characters: eggs adhered to wall of nest, embryo with melanophores forming 'Y' pattern ventrally

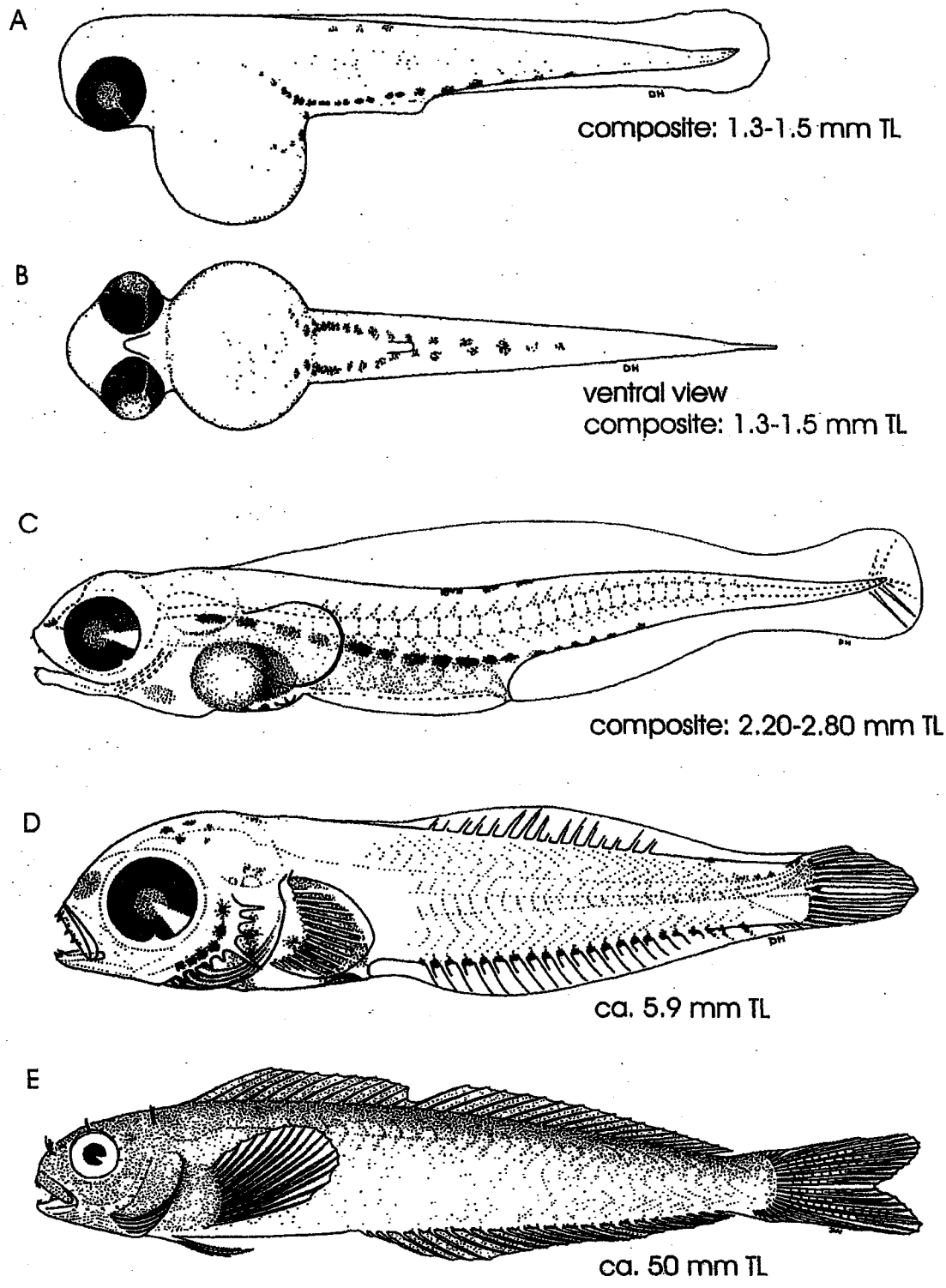
LARVAE
Length at flexion:
Length at transformation:
Sequence of fin development: caudal fin, pectoral fins, dorsal and anal fins (simultaneous), pelvic fins
Pigment: *Newly hatched larvae* (1.3-1.5 mm TL): with melanophores forming 'Y' pattern: four to eight melanophores on ventral midline posterior to the anus, although those nearest the anus are sometimes paired; eight to 12 pairs of melanophores extending from the sides of the anus to the yolk sac; up to six pairs of

melanophores dorsolaterally on the yolk sac; up to four pairs of melanophores posteriorly on yolk sac, extending from a position near the ventral finfold ventroanteriorly toward the center of the yolk sac; two or three melanophores at the base of the dorsal finfold at midbody. *At 24 hours* (2.20-2.80 mm TL): five to 10 melanophores on the ventral midline posterior to the anus, although those occupying the four closest positions to the anus may be paired; eight to twelve pairs of melanophores on each side of gut extending from the anus to or just beyond the pectoral fin origin; two to four melanophores at dorsal midlineat midbody; four to six melanophores on the abdomen. *At ca.5.9 mm TL*: peritoneum heavily pigmented dorsally and laterally; six large melanophores on the hyoid arch; up to 10 melanophores on the cranium; melanophores present at the bases of the pectoral- and caudal-fin rays; ventral midline melanophores present at the base of each anal-fin ray. *At ca. 50 mm TL*: body pale; peritoneum silvery; bases of dorsal, anal and caudal fins heavily pigmented; head with red, brown and silver chromatophores.

Diagnostic characters: During ophioblennius stage, larvae are characterized by the possession of four curved, strong, canine teeth located anteriorly in each jaw (lost during metamorphosis), one recurved canine posteriorly on each side of lower jaw, two canine teeth located posteriorly in the upper jaw, and a relatively long body (up to 58 mm SL). Metamorphosing larvae also with comblike teeth of adult and ventral midline melanophores at bases of anal-fin rays.

Illustrations: A-E from Labelle and Nursall, 1985. A: composite drawing of 1.3-1.5 mm TL larvae. B: composite drawing of three 24-hour-old larvae of 2.20-2.80 mm TL.

Literature: Greenfield and Johnson, 1981; LaBelle and Nursall, 1985 and 1992; Randall, 1983; Springer, 1962


A
composite: 1.3-1.5 mm TL
B
ventral view
composite: 1.3-1.5 mm TL
C
composite: 2.20-2.80 mm TL
D
ca. 5.9 mm TL
E
ca. 50 mm TL

BLENNIIDAE

Scartella cristata (Linnaeus)[1]

MERISTICS

Vertebrae	
Precaudal	10
Caudal	23
Total	33
Number of fin spines and rays	
First Dorsal	XI-XIII
Second Dorsal	13-15
Anal	II, 15-17
Pectoral	14
Pelvic	I,3
Caudal	
Dorsal Secondary	
Principal	
Ventral Secondary	
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	17-21
Branchiostegals	

LIFE HISTORY

Range: Belize, Honduras, Bermuda, Bahamas, Florida, Greater and Lesser Antilles, Brazil, Venezuela, Gulf of Mexico; also in eastern Atlantic and Mediterranean

Habitat: coral rubble, rock, algae, pilings, tidepools, and rocky slopes in shallow water (shoreline to 3.3 m)

ELH pattern: benthic eggs, planktonic larvae

Spawning:
- Season:
- Area:
- Mode:
- Migration:

Fecundity:

Age of first maturity:

Longevity:

Literature: Bath, 1976; Böhkle and Chaplin, 1993; Cervigon, 1966; De Leo et al., 1976; Greenfield and Johnson, 1981; Randall, 1983

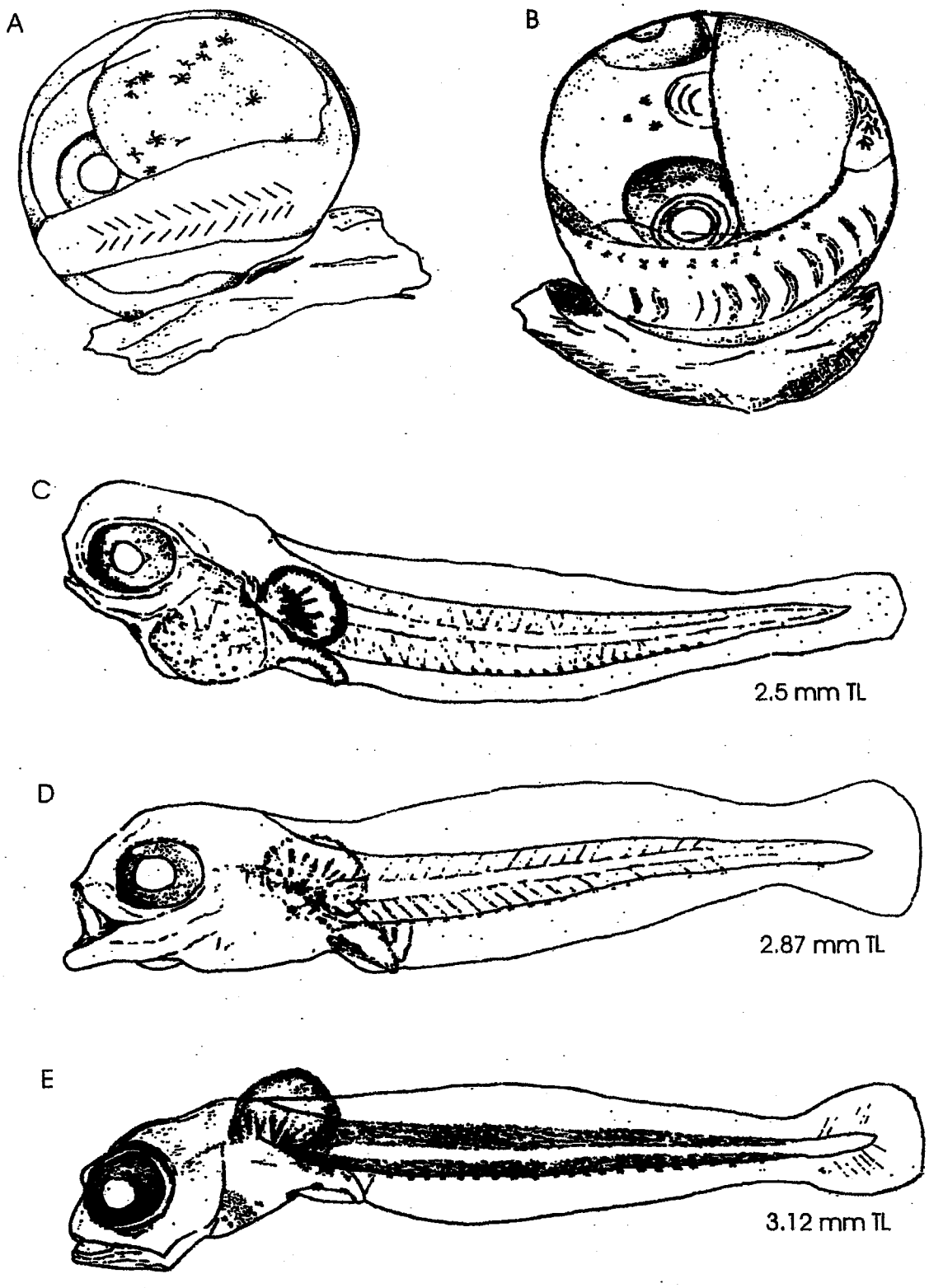
EARLY LIFE HISTORY DESCRIPTION

EGGS
- Diameter: 0.7-1.3 mm
- No. of Oil Globules:
- Oil Globule Diameter:
- Yolk:
- Shell:
- Incubation:
- Pigment:
- Diagnostic characters:

LARVAE
- Length at flexion:
- Length at transformation:
- Sequence of fin development:
- Pigment: melanophores on ventral midline of body; dorsal and ventral walls of gut are pigmented; bases and rays of pectoral fins are pigmented. At 3.12 mm TL melanophore over brain
- Diagnostic characters:

Illustrations: A-E from De Leo et al., 1976. C-E photographically reversed

[1]. Although the description of *Scartella cristata* larvae by De Leo et al. (1976) is cited in previous works (e.g., Olivar and Fortuño, 1991), the identification of these larvae is treated as tentative here. De Leo et al. (1976) describe fish identified as *Blennius cristatus* (= *Scatella cristata*) with the following counts: Dorsal XI or XII, 14 or 15; Anal II or III, 15 or 16; Pectoral 13; Pelvic I, 2. The counts for the anal fin (two spines), pectoral fin (13), and pelvic fin (two rays) do not correspond with those of currently recognized counts for the species (listed above) and warrant this identification as tentative.


A
B
C
2.5 mm TL
D
2.87 mm TL
E
3.12 mm TL

Family Chaenopsidae

The amphi-American family comprises 11 genera and about 65 species (Springer, 1995). Most of these species occur in the study area; represented by 10 genera, 40 species, and 2 subspecies for which larvae have been described for only two species (*Stathmonotus hemphilli*, *S. stahli tekla*). *Stathmonotus* was recently reassigned to the Chaenopsidae by Hastings and Springer (1994). Chaenopsidae is the second most speciose family, exceeded by the Labrisomidae with 42 species.

Commonly known as tube-, pike-, or flag blennies, adults inhabit empty invertebrate tubes, holes from burrowing molluscs, living coral heads, coral or rock formations, rocky ledges, and reefcrest pools at depths of less than 1 m to 33 m (e.g., Böhlke and Chaplin, 1993; Greenfield and Johnson, 1981; Hastings and Springer, 1994). Little is known about reproduction in these fishes, although fecundity is low, with females containing few, large eggs. Food items vary among species and range from plankton to small fishes, crustaceans, and worms. Monophyly is based on two characters involving the lateral line and the infraorbital bones (Springer, 1993) and within family relationships have been hypothesized by Hastings and Springer (1994).

Practically nothing is known about the early life history of the chaenopsids in the study area. References cited in Introduction should be consulted for detailed early life history information on species outside of the study area.

CHAENOPSIDAE

Stathmonotus hemphilli Bean

MERISTICS

Vertebrae	
Precaudal	20-25
Caudal	30-34
Total	50, 52-58
Number of fin spines and rays	
First Dorsal	XLV-LIII
Second Dorsal	0
Anal	II,23-29
Pectoral	4 or 5
Pelvic	I,2
Caudal	
Dorsal Secondary	
Principal	10-12 segmented
Ventral Secondary	
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: Bahamas, Florida, Haiti, St. Croix, Yucatán, Nicaragua, Antigua, Honduras, Belize
Habitat: demersal, depth range < 2 m to 28 m, varied habitat, including coral heads, coral and rocky reefs, limestone rubble
ELH pattern: planktonic larvae
Spawning:
Season:
Area:
Mode:
Migration:
Fecundity:
Age of first maturity:
Longevity:

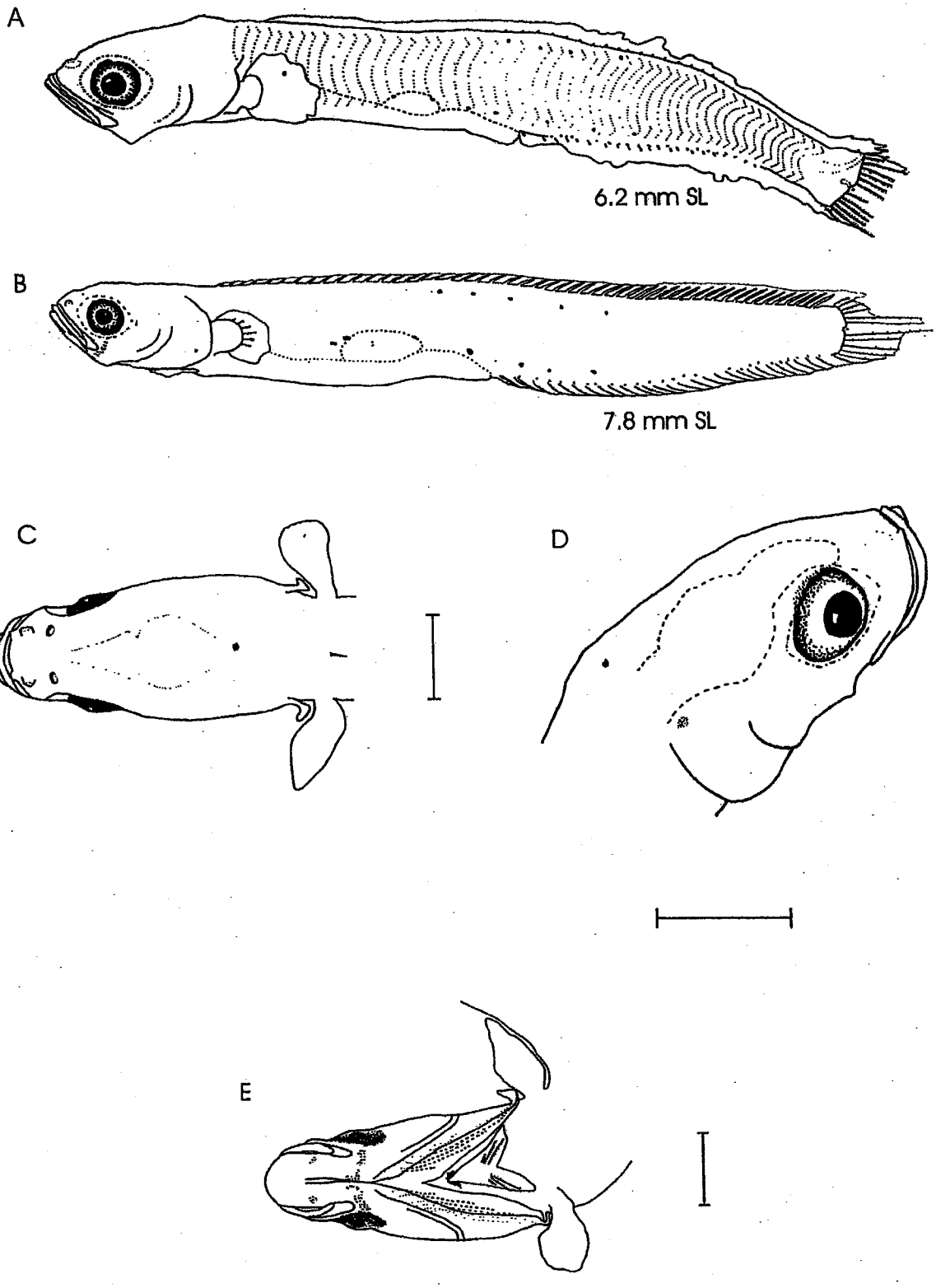
Literature: Böhlke and Chaplin, 1993; Greenfield and Johnson, 1981; Hastings and Springer, 1994

EARLY LIFE HISTORY DESCRIPTION

EGGS
Diameter:
No. of Oil Globules:
Oil Globule Diameter:
Yolk:
Shell:
Incubation:
Pigment:
Diagnostic characters:

LARVAE
Length at flexion: <6.2 mm SL
Length at transformation:
Sequence of fin development:
Pigment: *At 6.2 mm SL*: melanophores at bases of anal-fin soft rays; three melanophores located proximally on the caudal fin; one melanophore each on cleithral symphysis, occiput, and otic capsules; melanophores dorsoanteriorly (apparent through pectoral fin) and dorsoposteriorly on gut; interneural and interhaemal melanophores located at midbody; melanophores located dorsoanteriorly and dorsoposteriorly on gas bladder. *At 7.8 mm SL*: same pigment as smaller larva except only one melanophore proximally on caudal fin (between dorsal and ventral primary rays); melanophore on anterior tip of dentary; several melanophores midlaterally on dentary; several melanophores in band extending from posterior portion of lower jaw toward eye; pigment patch located immediately posterior to eyes; addtional pigment anteriorly on gut (apparent through opercle); melanophore located midlaterally on gas bladder.
Diagnostic characters: elongate body; long gut; interneural and interhaemal melanophores; only spines in dorsal fin, myomere counts unique to genus.

Illustrations: A-E from Cavalluzzi, 1997. Scale bars = 0.5 mm


A
6.2 mm SL
B
7.8 mm SL
C
D
E

CHAENOPSIDAE

Stathmonotus stahli tekla Nichols

MERISTICS

Vertebrae	
Precaudal	16-19
Caudal	27-31
Total	44-48
Number of fin spines and rays	
First Dorsal	XXXIX-XLIV
Second Dorsal	0
Anal	II,21-25
Pectoral	8 or 9
Pelvic	I,2
Caudal	
Dorsal Secondary	
Principal	10-12 segmented
Ventral Secondary	
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: Bahamas, Florida, Cuba, Haiti, Mona Island (Puerto Rico), Cayman Islands, Yucatán, Providencia Island, Belize, Panama, Colombia, Honduras

Habitat: demersal, <3 m to 9 m, coral or rock reef formations, rocky ledges

ELH pattern: planktonic larvae

Spawning:
- Season:
- Area:
- Mode:
- Migration:

Fecundity:

Age of first maturity:

Longevity:

Literature: Greenfield and Johnson, 1981; Hastings and Springer, 1994

EARLY LIFE HISTORY DESCRIPTION

EGGS
- Diameter:
- No. of Oil Globules:
- Oil Globule Diameter:
- Yolk:
- Shell:
- Incubation:
- Pigment:
- Diagnostic characters:

LARVAE

Length at flexion:

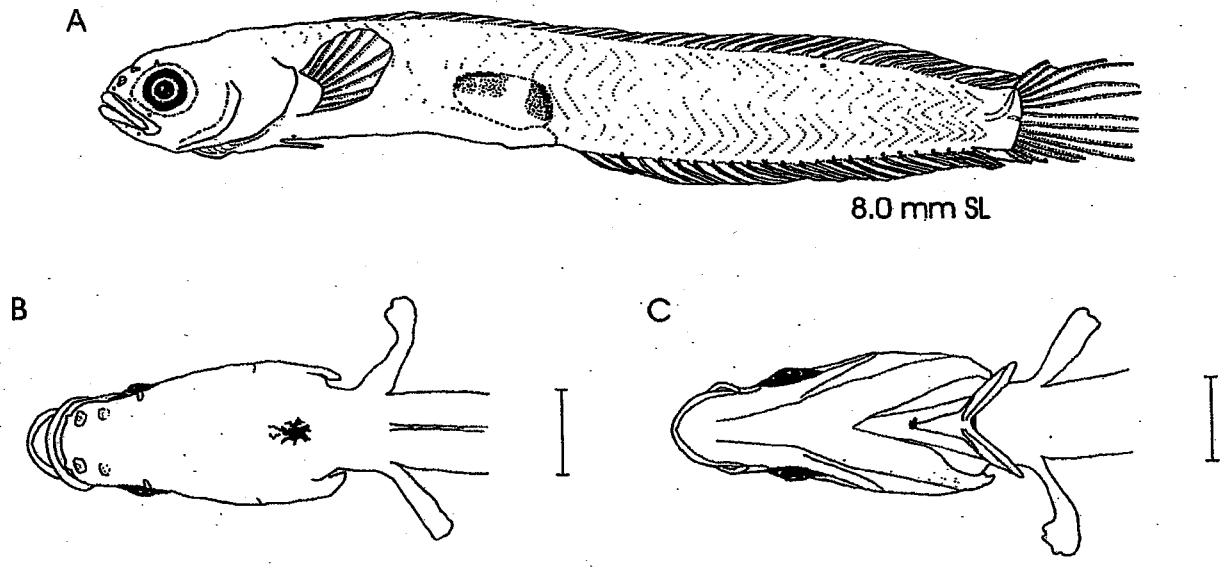
Length at transformation

Sequence of fin development:

Pigment: *At 6.5-8.4 mm SL*: 'Y'-shaped melanophores on bases of anal-fin elements;one melanophore each on occiput and cleithral symphysis; pigment patches dorsoposteriorly and dorsoanteriorly on gasbladder; pigment ventroanteriorly on gut; pigmented otic capsules. Some specimens with a melanophore on the ventral procurrent caudal-fin ray membrane. Some specimens with up to three melanophores on dorsoposterior body wall posteriorly; these melanophores are not necessarily paired with melanophores on the other side. Some specimens with melanophores associated with one or two posterioly-located dorsal-fin spines; this pigment located on the basal third of the spine.

Diagnostic characters: elongate, laterally compressed body; only spines in dorsal fin; myomere counts unique to genus; dorsal- and anal-fin membranes extend to caudal fin.

Illustrations: A-C from Cavalluzzi, 1997
Scale bars = 0.5 mm


A
8.0 mm SL
B
C

Family Dactyloscopidae

This amphi-American family comprises 9 genera and 41 species. About half of these species occur in the study area; represented by 7 genera and 17 species, for which larvae have been described for only two species (*Gillellus jacksoni, G. uranidea*). Dactyloscopidae is the fourth-most speciose family in the study area. Monophyly is based on four characters involving the ecto- and mesopterygoids, gill membranes, opercular bones, and the position of the pelvises in relation to the cleithra (Springer, 1993).

Commonly known as sand stargazers, adults inhabit either sandy-bottom areas, where they bury themselves, or are found on or near rock or coral habitats at depths of less than 1 m to 137 m, although most are in less than 30 m (Dawson, 1982). Adults are small (<15 cm; most less than 10 cm), with mouth oblique to subvertical, fimbriae on lips of most species, fimbriae on posterodorsal margin of opercle, superior and often stalked eyes, and a well-developed sensory canal system. Larvae of the two described *Gillellus* species differ from adults in lacking fimbriae on the lower lip and posterodorsal margin of the opercle, barred coloration, scales, superior eyes, and dermal flaps associated with the distal extremity of the eye. The size at which these features are attained is unknown.

Little is known about reproduction in Atlantic dactyloscopids. Some species of the genera *Dactylagnus*, *Dactyloscopus*, and *Myxodagnus* are unique in that the males carry the eggs in clusters under the pectoral fins (Dawson, 1982). The smallest transformed males seen in collections range from 19.7-67.2 mm SL (average: 38 mm SL) (Dawson, 1982). The smallest ovigorous female was 17.5 mm SL (*Leurochilus acon*- one of the smallest dactyloscopids), but other species were ovigorous at about 32 mm SL (Dawson, 1982). The number of ovarian eggs ranged from 21 eggs (ca. 1 mm in diameter) in a 17.5 mm SL female (*Leurochilus acon*) to 727 eggs in a 73 mm SL female of *Gillellus greyae* (Böhlke, 1968; Dawson, 1982). The presence of three egg sizes (ca. 0.8-0.9, 0.55-0.6, and 0.4 mm in diameter) in one specimen of *Gillellus uranidea* (Böhlke, 1968) indicates the possibility of an extended spawning season. References cited in Introduction should be consulted for detailed early life history information on species outside of the study area.

DACTYLOSCOPIDAE

Gillellus jacksoni Dawson

MERISTICS

Vertebrae	
Precaudal	(11)
Caudal	29-31
Total	(11)+29-31
Number of fin spines and rays	
First Dorsal	III
Second Dorsal	XIV-XVI
Third Dorsal	18-20
Total	36-38 total
Anal	II,28-30
Pectoral	12-14
Pelvic	I,3
Caudal	
Dorsal Secondary	
Principal	(10 segmented) 7,8 branched
Ventral Secondary	
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: Anguilla I., St. Barthelemy, Union I., Aruba, Belize
Habitat: demersal, 0-16.8 m depth range
ELH pattern: pelagic larvae
Spawning:
Season:
Area:
Mode:
Migration:
Fecundity:
Age of first maturity:
Longevity:

Literature: Cavalluzzi, 1997; Dawson 1982

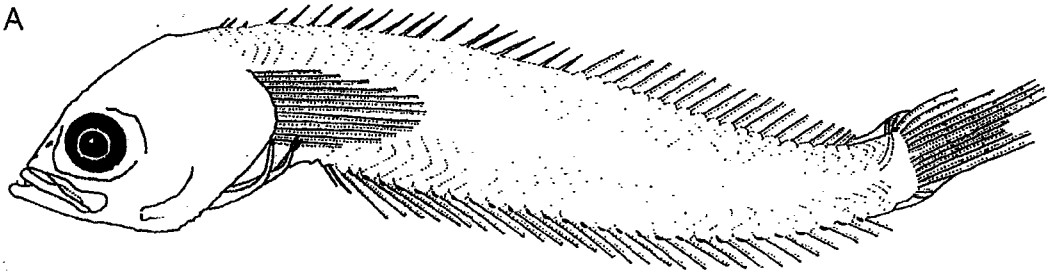
EARLY LIFE HISTORY DESCRIPTION

EGGS
Diameter:
No. of Oil Globules:
Oil Globule Diameter:
Yolk:
Shell:
Incubation:
Pigment:
Diagnostic characters:

LARVAE
Length at flexion:
Length at transformation:
Sequence of fin development:
Pigment: melanophores on bases of anal-fin soft rays ('Y'-shaped); two to four melanophores on abdomen; one melanophore on the cleithral symphysis; three pigment patches on gut (ventroanteriorly, dorsoanteriorly, and dorsoposteriorly); one melanophore on dorsoposterior area of parasphenoid.
Diagnostic characters: pigment pattern, three-spined dorsal finlet.

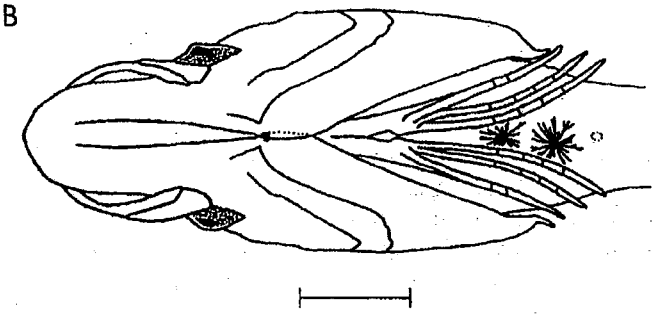
Illustrations: A and B from Cavalluzzi, 1997. Scale bar of B = 0.5 mm.

A



7.6 mm SL

B



DACTYLOSCOPIDAE

Gillellus uranidea Böhlke

MERISTICS

Vertebrae	
Precaudal	(11)
Caudal	23-26
Total	(11)+23-26
Number of fin spines and rays	
First Dorsal	III
Second Dorsal	X-XII
Third Dorsal	14-17
Total	28-32 total
Anal	II,21-24
Pectoral	12-14
Pelvic	I,3
Caudal	
Dorsal Secondary	2-4
Principal	10
Ventral Secondary	2,3
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	6

LIFE HISTORY

Range: southeastern Florida, Bahamas, Antilles, and Belize to Panama
Habitat: demersal, 1.2-12.2 m depth range, sandy areas around rocks and patch reefs
ELH pattern: pelagic larvae
Spawning:
Season:
Area:
Mode:
Migration:
Fecundity: ca. 41 ovarian eggs in three size groups in one 27.6 mm SL female.
Age of first maturity:
Longevity:

Literature: Böhlke, 1968; Cavalluzzi,1997; Dawson, 1982

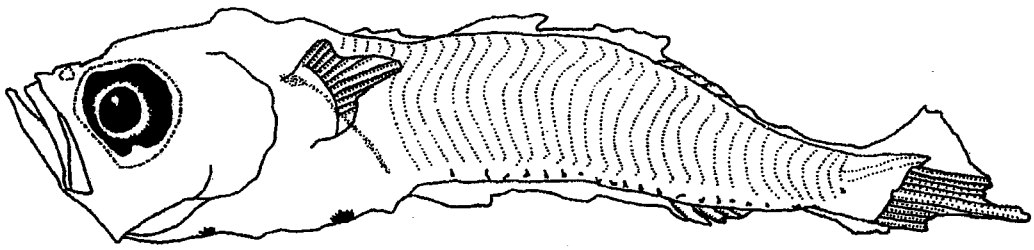
EARLY LIFE HISTORY DESCRIPTION

EGGS
Diameter: three sizes recorded from same ovary; ca. 0.8-0.9 mm, ca. 0.55-0.6 mm, ca. 0.4 mm
No. of Oil Globules:
Oil Globule Diameter:
Yolk:
Shell:
Incubation:
Pigment:
Diagnostic characters:

LARVAE
Length at flexion: <3.6 mm (based on one specimen)
Length at transformation:
Sequence of fin development:
Pigment: melanophores on bases of anal-fin rays ('Y'-shaped); in some specimens, one melanophore on ventral midline of caudal peduncle or membrane of procurrent caudal-fin rays; one to three melanophores on the abdomen; one melanophore on the cleithral symphysis; one melanophore overlying basipterygia.
Diagnostic characters: pigment pattern, three-spined dorsal finlet.

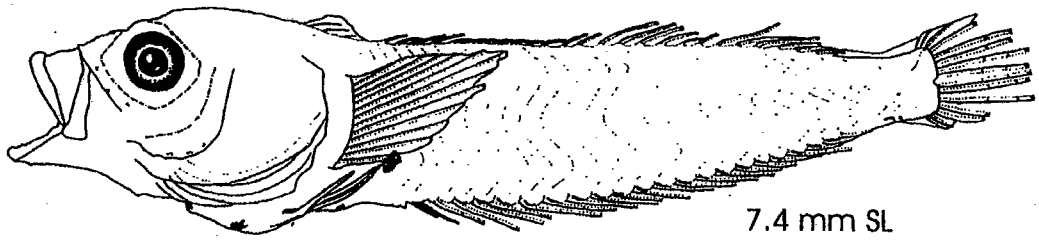
Illustrations: A-C from Cavalluzzi, 1997. Scale bar for C = 0.5 mm.

A



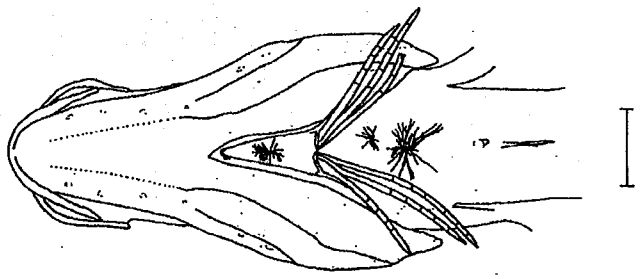
3.6 mm NL

B



7.4 mm SL

C



Family Labrisomidae

The Labrisomidae comprises 15 genera and about 96 species, primarily found in the eastern Pacific and Western Atlantic. Osteological, morphological, and molecular data do not support monophyly of this family (Springer, 1993; Stepien et al., 1993). Labrisomids are recognizable by large cycloid scales with radii only on the anterior margin (five species of *Stathmonotus* do not possess scales), cirri often present on the nape, the nostrils, and above the eyes, as well as the possession of more spines than soft rays (Nelson, 1994). This is the most speciose family in the study area, represented by 6 genera and 42 species. Surprisingly, larvae have been described for only one species (*Paraclinus marmoratus*).

Adult labrisomids are found in a variety of habitats including shallow-water coral reef crests, reef dropoff areas, patch reefs, rocky tidepools or ledges, algae-covered rocks surrounded by sand, eroded limestone slopes, turtle-grass beds, pier pilings, areas with coral rubble and algal mats, and some have been found living inquiline in sponges (Böhlke and Chaplin, 1993; Greenfield and Johnson, 1981). Labrisomids have been found at depths of less than 1 m to 45 m, but most are found at depths of less than 6 m (Böhlke and Chaplin, 1993; Greenfield and Johnson, 1981).

Little is known about the reproduction of labrisomids in the study area. Most of this information is anecdotal. For example, *Labrisomus nuchipinnis* was briefly described by Böhlke and Chaplin (1993) as having a protracted planktonic larval stage with the larva differing from the adult in being shallower, more fusiform, and lacking scales. They also stated that *Malacoctenus macropus* has filamented eggs and that a 25 mm female of *M. erdmani* with large eggs was taken in Puerto Rico on 19 November. References cited in Introduction should be consulted for detailed early life history information on species outside of the study area.

LABRISOMIDAE

Paraclinus marmoratus (Steindachner)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	25
Total	35
Number of fin spines and rays	
First Dorsal	XXVII-XXX
Second Dorsal	I
Total	28-31
Anal	II, 19-21
Pectoral	12-14
Pelvic	I,3
Caudal	
Dorsal Secondary	
Principal	12, 13 segmented
Ventral Secondary	
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: Florida, Bahamas, Cuba, Belize
Habitat: patch reefs, patches of filamentous algae within eel grass beds, cavities or lumen of the yellow sponge (*Verongia fistularis*), <4.5 m - 5.8 m depth range
ELH pattern: oviparous, demersal eggs tended by male; male may tend clutches from several females
Spawning:
Season: beginning February when water temperature reaches 21.5 °C
Area:
Mode: several large eggs deposited on substrate
Migration:
Fecundity:
Age of first maturity:
Longevity:

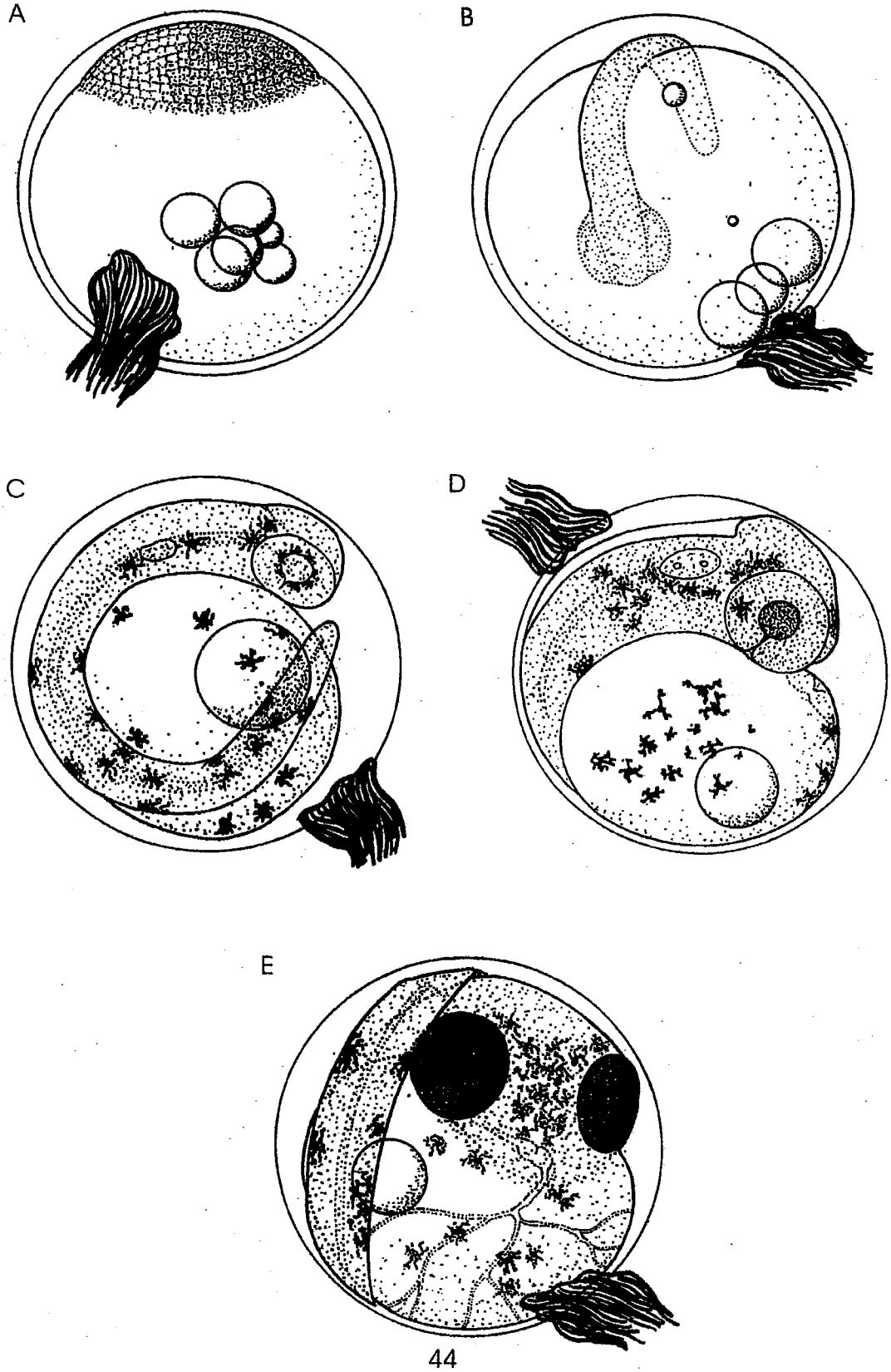
EARLY LIFE HISTORY DESCRIPTION

EGGS
Diameter: 1.15-1.30 mm (1.20 mm)
No. of Oil Globules: ca. 6
Oil Globule Diameter:
Yolk: covered with dark chromatophores at ca. 69.5 hours
Shell: with adhesive filaments
Incubation: 10 days at 21.5°C
Pigment: *At ca. 69.5 hours*: yolk covered with scattered melanophores; yellowish chromatophores laterally on embryo and around iris; *At ca. 130.5 hours*: eyes fully pigmented; scattered dark and yellowish chromatophores on body and yolk.
Diagnostic characters: eggs attached to one another by adhesive filaments; all filaments attached to a central stalk; embryo with ventral midline melanophores.

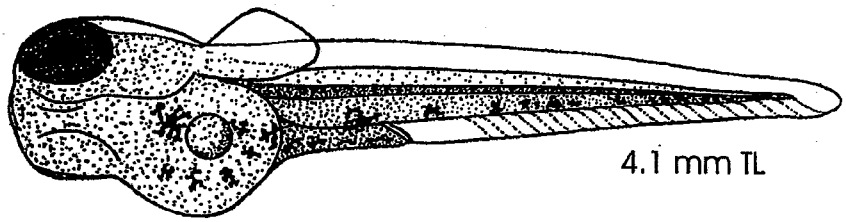
LARVAE
Length at flexion:
Length at transformation: less than 25 mm
Sequence of fin development:
Pigment: *Newly-hatched larva* (ca. 4.1 mm): scattered melanophores on ventral midline, ranging from immediately anterior to anus toward notochord tip; several scattered melanophores on yolk; yolk with oil globule; melanophores on preanal finfold; *At ca. 24 hours*: pigment patch on dorsal surface of gut; melanophores on ventral surface of gut; dorsal midline near middle of body, and ventral midline posterior to anus.
Diagnostic characters: dorsal and ventral midline melanophores.

Illustrations: A-F from Breder, 1939; G from Breder 1941. F: newly-hatched larva. G: ca. 24-hour old larva.

Literature: Breder, 1939; Böhlke and Chaplin, 1993; Greenfield and Johnson, 1981

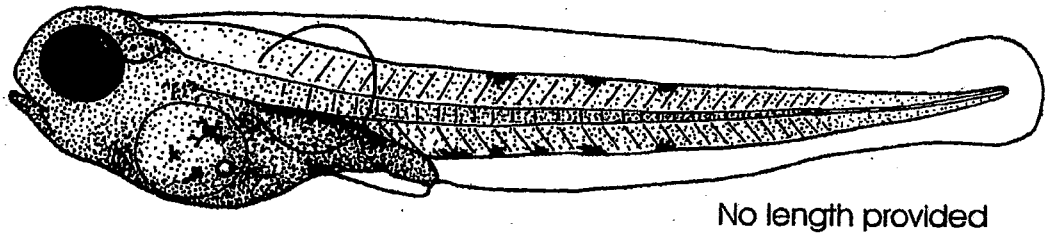

A
B
C
D
E

A



4.1 mm TL

B



No length provided
Larva less than 24 hours old

Family Tripterygiidae

This family comprises 20 genera and at least 115 species of small, bottom-dwelling fishes found in the Atlantic, Indian, and Pacific oceans. It is the least speciose family in the study area, represented by one genus (*Enneanectes*) and five species, for which no larvae have been described.

Commonly known as triplefin blennies, these fishes are easily differentiated from other blennies by their three distinct dorsal fins; the first two fins composed of spines and the last composed of rays. Monophyly is hypothesized based on two characters involving the absence of a dorsal-fin spine articulating with the pterygiophore serially associated with the first segmented ray, and the presence of a septal bone (Springer, 1993).

Tripterygiids are small fishes, less than 20 cm, although the five species in the study area are all less than 5 cm. Identification of adults is based primarily on pigmentation, placement of scales (e.g., pectoral fin base, cheeks) and presence or absence of rugosity on the orbital flanges and nasal bones (Rosenblatt, 1960). Adults inhabit areas including shallow rocky bottom, rich coral reef formations, patch reefs, and reef-front dropoff zones at depths of less than 1 m to 33 m (e.g., Böhlke and Chaplin, 1993; Greenfield and Johnson, 1981).

Practically nothing is known about reproduction and early life history of the tripterygiids in the study area. Overlapping meristic extremes in the five *Enneanectes* species makes identification of larvae more difficult. The description presented here of unidentified *Enneanectes* larvae is based on six specimens collected off of Belize. References cited in Introduction should be consulted for detailed early life history information on species outside of the study area, minimal as it may be.

TRIPTERYGIIDAE

Enneanectes Jordan and Evermann in Jordan

MERISTICS[1]

Vertebrae[2]	
Precaudal	8-10
Caudal	22-23
Total	29-31, 33-35
Number of fin spines and rays	
First Dorsal	III
Second Dorsal	X-XIII
Third Dorsal	6-9
Total	20-25
Anal	II, 14-17
Pectoral	13-16
Pelvic	I,3
Caudal	
Dorsal Secondary	5-9
Principal	13-15
Ventral Secondary	5-7
Total	
Gill rakers on first arch	
Upper	
Lower	
Total	
Branchiostegals	

LIFE HISTORY

Range: Bahamas and Central America (Belize, Nicaragua, Yucatan, Costa Rica, Honduras), Florida, Puerto Rico, Virgin Islands, Venezuela, Aruba and Martinique.
Habitat: coral reefs and rocky slopes in water 0-33.5 m deep
ELH pattern: demersal eggs, pelagic larvae, settle to reef
Spawning:
Season:extended. Larvae illustrated here were collected during the months February-April, July and August.
Area:
Mode:
Migration:
Fecundity:
Age of first maturity:
Longevity:

EARLY LIFE HISTORY DESCRIPTION

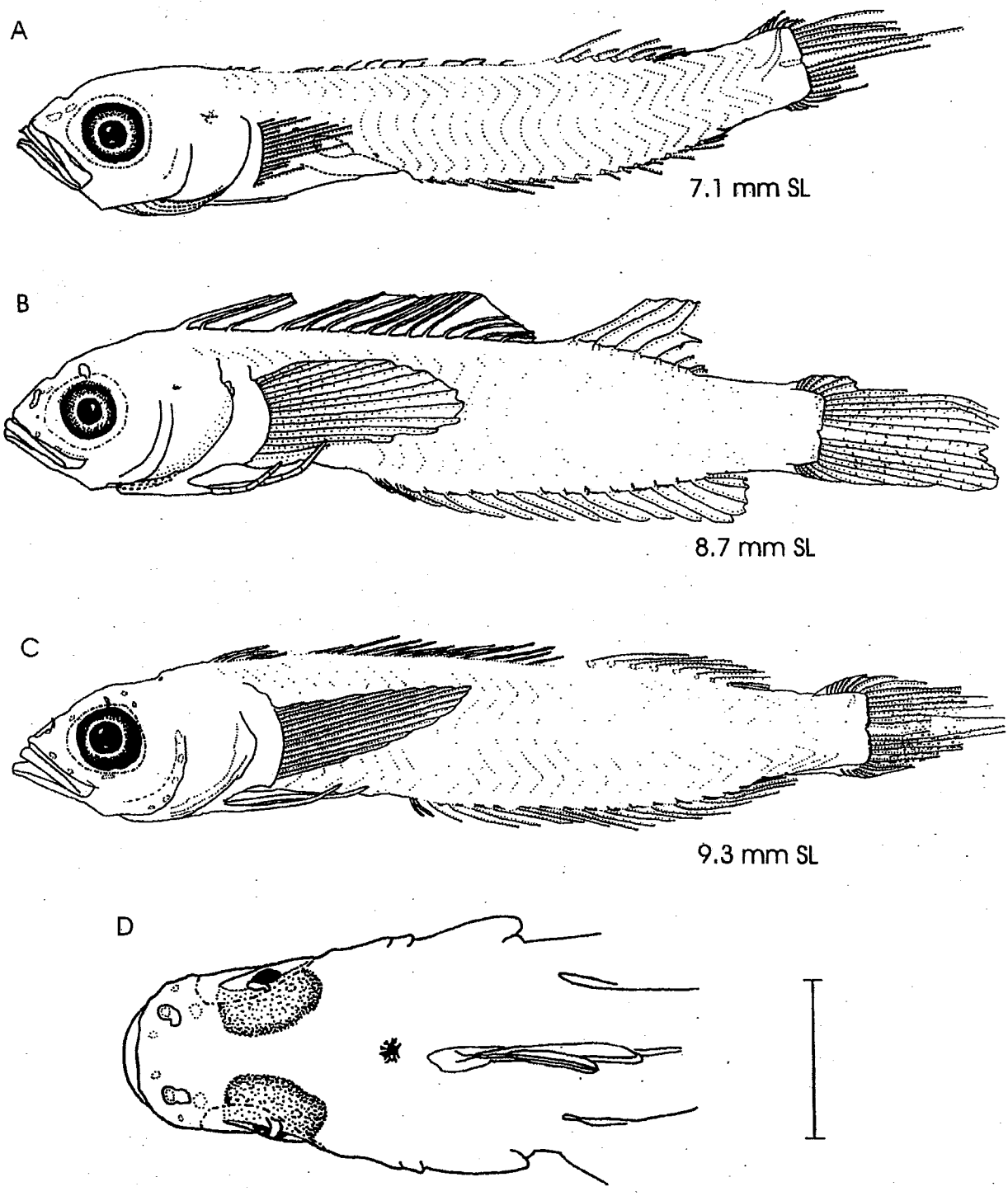
EGGS
Diameter:
No. of Oil Globules:
Oil Globule Diameter:
Yolk:
Shell:
Incubation:
Pigment:
Diagnostic characters:

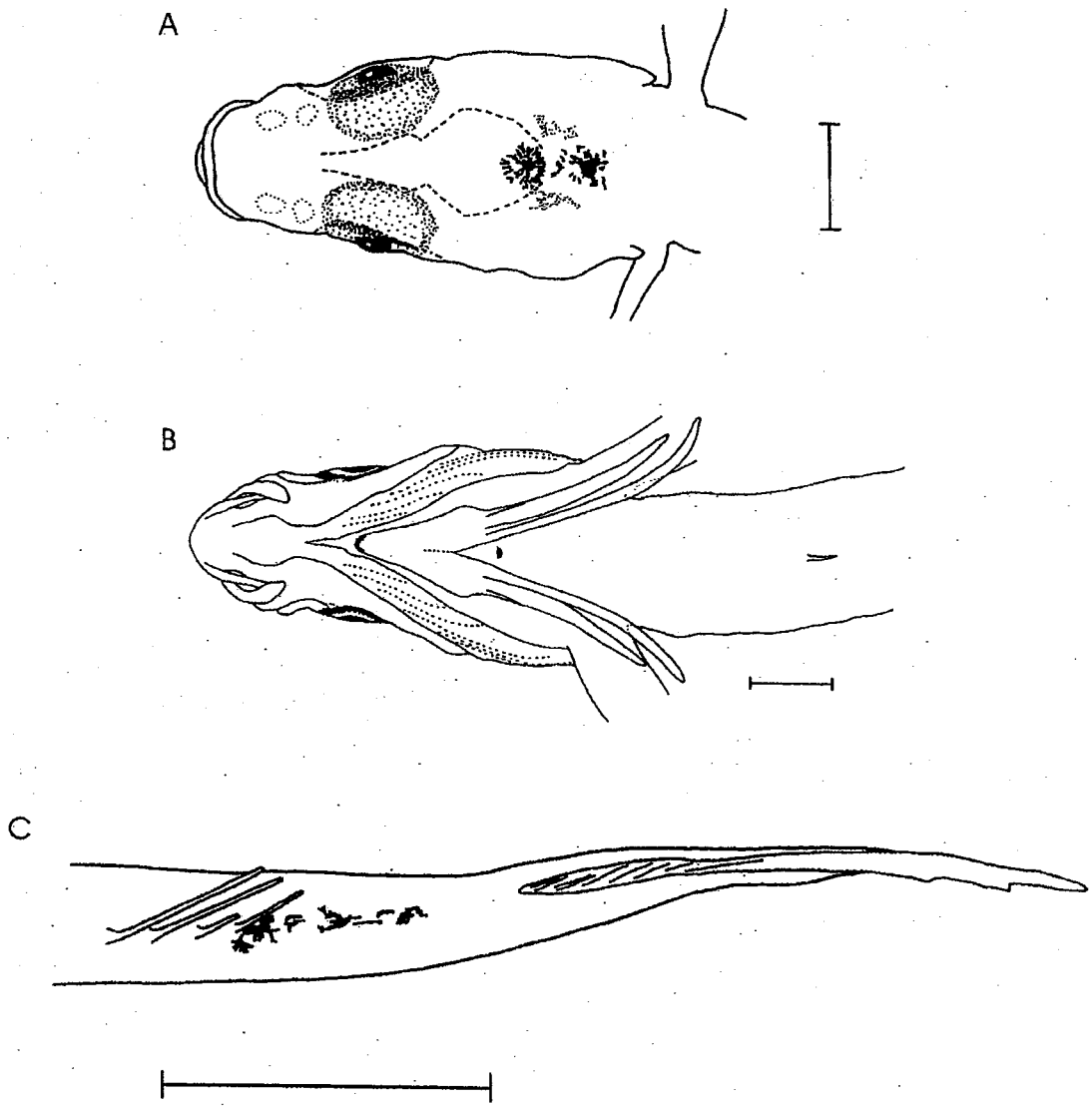
LARVAE
Length at flexion:
Length at transformation:
Sequence of fin development:
Pigment: melanophores associated with bases of anal-fin rays (becoming 'Y'-shaped in larger larvae); two melanophores on ventral midline of caudal peduncle; cleithral symphysis pigmented; dorsal midline posterior to third dorsal fin variously pigmented with scattered pigment or up to three discrete melanophores; one melanophore on occiput; one pigment patch dorsally on notochord and beneath posterior spine-like projection of supraoccipital; one pigment patch associated with each otic capsule; posterior edges of hypural plates pigmented; pigment patches on gut located dorsoposteriorly, dorsomedially, and in some, dorsoanteriorly.
Diagnostic characters: three distinct dorsal fins

Illustrations: A-G, Original. Scale bars for D and G = 1 mm. Scale bars for E and F = 0.5 mm.

Literature: Böhlke and Robins, 1974; Cervigon, 1966; Greenfield and Johnson, 1981; Randall, 1983; Rosenblatt, 1960; radiographs and cleared and stained material

[1]. Meristic data are pooled for the entire genus. See Appendix XII for species data.
[2]. Counts are vertebrae are not complete. Some sources list precaudal and caudal counts, others list only the total number of vertebrae; therefore precaudal + caudal counts do not completely correspond with the total.


A
7.1 mm SL
B
8.7 mm SL
C
9.3 mm SL
D


A
B
C

LITERATURE CITED

Acero, P.A. 1984a. A new species of *Emblemaria* (Pisces: Clinidae: Chaenopsinae) from the southwestern Caribbean with comments on two other species of the genus. Bull. Mar. Sci., 35(2):187-194.

Acero, P.A. 1984b. The chaenopsine blennies of the southwestern Caribbean (Pisces: Clinidae, Chaenopsinae). II. The genera *Acanthemblemaria*, *Ekemblemaria*, and *Lucayablennius*. Rev. Biol. Trop., 32(1):35-44.

Acero, P.A. 1987. The chaenopsine blennies of the southwestern Caribbean (Pisces: Clinidae, Chaenopsinae). III. The genera *Chaenopsis* and *Coralliozetus*. Boletin Ecotropica, No. 16:1-21.

Bath, H. 1976. Revision der Blenniini. Senckenbergiana Biologica., 57(4/6): 167-234.

Böhlke, J.E. 1957a. A review of the blenny genus *Chaenopsis*, and the description of a related new genus from the Bahamas. Proc. Acad. Nat. Sci. Phila. 109:81-103.

Böhlke, J.E. 1957b. The Bahaman species of emblemariid blennies. Proc. Acad. Nat. Sci. Phila. 109:25-57.

Böhlke, J.E. 1959. A new fish of the genus *Hypsoblennius* (Blenniidae) from the Bahamas. Notulae Naturae, Academy of Natural Science of Philadelphia, no. 321:1-5.

Böhlke, J.E. 1960. Two new Bahaman species of the clinid fish genus *Paraclinus*. Notulae Naturae, Academy of Natural Science of Philadelphia, no. 337:1-8.

Böhlke, J.E. 1961. The Atlantic species of the clinid fish genus *Acanthemblemaria*. Notulae Naturae, Academy of Natural Science of Philadelphia, no. 346:1-7.

Böhlke, J.E. 1968. The description of three new sand stargazers (Dactyloscopidae) from the tropical west Atlantic. Notulae Naturae, 414:1-16.

Böhlke, J.E., and F. Cervigon. 1967. Redescription, illustration, and type selection for the Venezuelan chaenopsine blenny, *Protemblemaria punctata* Cervigon. Notulae Naturae, Academy of Natural Sciences of Philadelphia, no. 401:1-8.

Böhlke, J.E., and C.C.G. Chaplin. 1993. Fishes of the Bahamas and adjacent tropical waters. Second edition. University of Texas Press, Austin, pp:i-xlvii, 1-771 pp., 36 plates.

Böhlke, J.E., and C.H. Robins. 1974. Description of a new genus and species of clinid fish from the Western Caribbean, with comments on the families of the Blennioidea. Proc. Acad. Nat. Sci. Phila., 126(1):1-8.

Böhlke, J.E., and V.G. Springer. 1961. A review of the Atlantic species of the clinid fish genus *Starksia*. Proc. Acad. Nat. Sci. Phila. 113(3):29-60.

Böhlke, J.E., and V.G. Springer. 1975. A new genus and species of fish (*Nemaclinus atelestos*) from the western Atlantic (Perciformes: Clinidae). Proc. Acad. Nat. Sci. Phila. 127(7):57-61.

Breder, C.M. Jr. 1939. On the life history and development of the sponge blenny, *Paraclinus marmoratus* (Steindachner). Zoologica, 24(4):487-496.

Breder, C.M. Jr. 1941. On the reproductive behavior of the sponge blenny, *Paraclinus marmoratus* (Steindachner). Zoologica, 26 (3):233-235.

Cavalluzzi, M.R. 1997. Larvae of *Gillellus jacksoni*, *G. uranidea* (Dactyloscopidae), *Stathmonotus stahli tekla*, and *S. hemphilli* (Chaenopsidae), with comments on the use of early life history characters for elucidating relationships within the Blennioidei. Bull. Mar. Sci., 60(1):139-151.

Cervigon, F.M. 1965. *Emblemariopsis randalli* nov. sp. Una nueva especie de Chaenopsidae de las costas de Venezuela. Contribucion No. 20, Est. Inv. Mar. Margarita, pp. 1-4.

Cervigon, F.M. 1966. Los peces marinos de Venezuela. Volumen 2. Fundacion La Salle de Ciencias Naturales, Monografia 12:449-951.

Dawson, C.E. 1970. The Caribbean Atlantic blenny *Lupinoblennius dispar* (Tribe: Blenniini), with observations on a Pacific population. Proc. Biol. Soc. Wash. 83(26):273-286.

Dawson, C.E. 1982. Atlantic sand stargazers (Pisces: Dactyloscopidae), with descriptions of one new genus and seven new species. Bull. Mar. Sci. 32:14-85.

De Leo, G., E. Catalano, and N. Parrinello. 1976. Contributo alla conoscenza del *Blennius cristatus* L. 1758 (Perciformes Blenniidae). Mem. Biol. Mar. Ocean., 6(6):209-228.

Evermann, B.W., and M.C. Marsh. 1900. Descriptions of new genera and species of fishes from Porto Rico. Rep't U.S. Comm Fish. for 1899, pt. 25:351-362.

Fahay, M.P. 1983. Guide of the early stages of marine fishes occurring in the western north Atlantic Ocean, Cape Hatteras to the southern Scotian shelf. Journal of Northwest Atlantic Fishery Science, Vol. 4, 423 pp.

Fowler, H.W. 1954. Description of a new blennioid fish from southwest Florida. Notulae Naturae, 265:1-3.

George, A. and V.G. Springer. 1980. Revision of the clinid fish tribe Ophiclinini, including five new species, and definition of the family Clinidae. Smithson. Contrib. Zool. 307:31 pp.

Gilbert, C.R. 1965. *Starksia y-lineata*, a new clinid fish from Grand Cayman Island, British West Indies. Notulae Naturae, 379:1-6.

Gilbert, C.R. 1971. Two new Atlantic clinid fishes of the genus *Starksia*. Quart. Jour. Florida Acad. Sci., 1970 (1971), 33(3):193-206.

Gilhen, J., C.G. Gruchy, and D.E. McAllister. 1976. The sheepshead, *Archosargus probatocephalus*, and the feather blenny, *Hypsoblennius hentzi*, two additions to the Canadian Atlantic ichthyofauna. Canadian Field-Naturalist, 90:42-46.

Greenfield, D.W. 1972. Notes on the biology of the arrow blenny, *Lucayablennius zingaro* (Böhlke) from British Honduras. Copeia 1972(3):590-592.

Greenfield, D.W. 1975. *Emblemariopsis pricei*, a new species of chaenopsid blenny from Belize. Copeia, 1975(4):713-715.

Greenfield, D.W. 1979. A review of the western Atlantic *Starksia ocellata*-complex (Pisces: Clinidae) with the description of two new species and proposal of superspecies status. Fieldiana Zoology, 73(2):9-48.

Greenfield, D.W.and 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 Zoology, New Series, 1324(8):1-106.

Hastings, P.A., and R.L. Shipp. 1980. A new species of pikeblenny (Pisces: Chaenopsidae: *Chaenopsis*) from the western Atlantic. Proc. Biol. Soc. Wash., 93(4):875-886.

Hastings, P.A., and V.G. Springer. 1994. Review of *Stathmonotus*, with redefinition and phylogenetic analysis of the Chaenopsidae (Teleostei: Blennioidei). Smithsonian Contributions to Zoology, No. 558, 48 pp.

Hildebrand, S.F., and L.E. Cable. 1938. Further notes on the development and life history of some teleosts at Beaufort, N.C. Bull. Bur. Fish. Wash. 48(24):505-642.

Hildebrand, S.F., and W.C. Schroeder. 1928. Fishes of the Chesapeake Bay. Bull. U.S. Bur. Fish., 43(1):366 pp.

Hoese, D.F., and R.H. Moore. 1977. Fishes of the Gulf of Mexico, Texas, Louisiana, and adjacent waters. Texas A&M Univ. Press, College Station, 327 pp.

Johnson, G.D. 1993. Percomorph phylogeny: progress and problems. Bull. Mar. Sci. 52(1):3-28.

Johnson, G.D., and E.B. Brothers. 1989. *Acanthemblemaria paula*. A new diminutive chaenopsid (Pisces: Blennioidei) from Belize, with comments on life history. Proc. Biol. Soc. Wash. 102(4):1018-1030.

Johnson, R.K., and D.W. Greenfield. 1976. A new chaenopsid fish, *Emblemaria hyltoni*, from Isla Roatan, Honduras. Fieldiana: Zoology, 70(2):13-28.

Jordan, D.S., and B.W. Evermann. 1898. The fishes of North and Middle America: a descriptive catalogue of the species of fish-like vertebrates found in the waters of North America, north of the isthmus of Panama. Part III. Bull. of the U.S. Nat. Mus., Smithsonian Inst., 47(3):2183-3136.

Labelle, M., and J.R. Nursall. 1985. Some aspects of the early life history of the redlip blenny, *Ophioblennius atlanticus* (Teleostei: Blenniidae). Copeia, 1985(1):39-49.

Labelle, M., and J.R. Nursall. 1992. Population biology of the redlip blenny, *Ophioblennius atlanticus macclurei* (Sylvester) in Barbados. Bull. Mar. Sci., 50(1):186-204.

Leis, J.M., and D.S. Rennis. 1983. The larvae of Indo-Pacific coral reef fishes. New South Wales University Press, Sydney, 269 pp.

Lippson, A.J., and R.L. Moran. 1974. Manual for identification of early developmental stages of fishes of the Potomac River Estuary. Md. Dep. Nat. Resour. Power Plant Siting Program PPSP-MP-13:282 pp.

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

Matarese, A.C., W. Watson, and E.G.Stevens. 1984. Blennioidea: Development and Relationships. *In* Ontogeny and Systematics of Fishes. H.G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahey, A.W. Kendall, Jr., and S.L. Richardson (eds.). Amer. Soc. Ichthyol. and Herpetol. Spec. Publ. No. 1, pp. 565-573.

Nelson, J.S. 1984. Fishes of the world, second edition. John Wiley and Sons, Inc., New York, New York, 523 pp.

Nelson, J.S. 1994. Fishes of the world, third edition. John Wiley and Sons, Inc., New York, New York, 600 pp.

Olivar, M.P. and J.M. Fortuno. 1991. Guide to ichthyoplankton of the southeast Atlantic (Benquela Current Region). Scientia Marina, 55 (1):1-383.

Palacio, F.J. 1974. Peces colectados en el Caribe Colombiana por la Universidad de Miami. Boletin Museo del Mar, 6:1-137.

Peters, K.M. 1981. Reproductive biology and developmental osteology of the Florida blenny, *Chasmodes saburrae* (Perciformes: Blenniidae). Northeast Gulf Science, 4(2):79-98.

Peters, K.M. 1985. Larval development of *Lupinoblennius nicholsi* with comments on larval Blenniini identification in Tampa Bay, Florida. Bull. Mar. Sci., 36(3):445-453.

Randall, J.E. 1966. The West-Indian blenniid fishes of the genus *Hypleurochilus*, with the description of a new species. Proc. Biol. Soc. Wash., 79:57-72.

Randall, J.E. 1983. Caribbean reef fishes, second edition. T.F.H. Publications, Inc., Neptune City, 350 pp.

Richards, W.J. 1990. List of the fishes of the western central Atlantic and the status of early life stage information. NOAA Technical Memorandum, NMFS-SEFC-267, 88 pp.

Robins, C.R. 1971. Comments on *Chaenopsis stephensi* and *Chaenopsis resh*, two Caribbean blennioid fishes. Caribbean Journal of Science, 11(3-4):179-180.

Robins, C.R., and 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(6):213-234.

Robins, C.R., G.C. Ray, J. Douglass, and E. Freund. 1986. A field guide to Atlantic Coast fishes of North America. The Peterson field guide series; 32. Houghton Mifflin Company. 354 pp.

Rosenblatt, R.H. 1960. The Atlantic species of the blennioid fish genus *Enneanectes*. Proc. Acad. Nat. Sci. Phila., 112(1):1-23. Scripps Contr. 1163.

Smith, C.L. 1957. Two new clinid blennies (*Malacoctenus*) from Puerto Rico. Occ. Pap. Mus. Zool. Univ. Mich., 585:1-15.

Smith-Vaniz, W.F. 1980. Revision of western Atlantic species of the blennioid fish genus *Hypsoblennius*. Proc. Acad. Nat. Sci. Phila., 132:285-305.

Smith-Vaniz, W.F., and F.J. Palacio. 1974. Atlantic fishes of the genus *Acanthemblemaria*, with descriptions of three new species and comments on Pacific species (Clinidae: Chaenopsinae). Proc. Acad. Nat. Sci. Phila., 125(11):197-224.

Smith-Vaniz, W.F., and V.G. Springer. 1971. Synopsis of the tribe Salariini, with descriptions of five new genera and three new species (Pisces: Blenniidae). Smithson. Contrib. Zool., Number 73:1-72.

Springer, V.G. 1955a. Western Atlantic fishes of the genus *Paraclinus*. Tex. J. Sci., 6(4):422-441.

Springer, V.G. 1955b. The taxonomic status of the fishes of the genus *Stathmonotus*, including a review of the Atlantic species. Bull. Mar. Sci. Gulf Caribb. 5(1):66-80.

Springer, V.G. 1958. Systematics and zoogeography of the clinid fishes of the subtribe Labrisomini. Publications of the Institute of Marine Science, University of Texas, 5:417-492.

Springer, V.G. 1959a. A new species of *Labrisomus* from the Caribbean Sea, with notes on other fishes of the subtribe Labrisomini. Copeia 1959(4):289-292.

Springer, V.G. 1959b. Blenniid fishes of the genus *Chasmodes*. Texas Journ. Sci., 11(3):321-335.

Springer, V.G. 1962. A review of the blenniid fishes of the genus *Ophioblennius* Gill. Copeia 1962(2):426-433.

Springer, V.G. 1967. Revision of the circumtropical shorefish genus *Entomacrodus* (Blenniidae: Salariinae). Proc. U.S. Natl. Mus. 122(3582):1-150, 30 pl.

Springer, V.G. 1978a. Blenniidae. *In* FAO species identification sheets for fishery purposes, western central Atlantic (fishing area 31). Vol. I. W. Fisher (ed). 4 pages.

Springer, V.G. 1978b. Clinidae. In FAO species identification sheets for fishery purposes, western central Atlantic (fishing area 31). Vol. II. W. Fisher (ed). 6 pages.

Springer, V.G. 1993. Definition of the suborder Blennioidei and its included families (Pisces: Perciformes). Bull. Mar. Sci. 52(1):472-495.

Springer, V.G. 1994. Blennies. *In* Encyclopedia of fishes. J.R. Paxton, and W. N. Eschmeyer (eds.). University of New South Wales Press, Sydney, pp. 216-219.

Springer, V.G., and M.F. Gomon. 1975a. Revision of the blenniid fish genus Omobranchus with descriptions of three new species and notes on other species of the tribe Omobranchini. Smithson. Contrib. Zool. 177:1-135.

Springer, V.G., and M.F. Gomon. 1975b. Variation in the western Atlantic clinid fish *Malacoctenus triangulatus* with a revised key to the Atlantic species of *Malacoctenus*. Smithson. Contrib. Zool. 200:1-11.

Springer, V.G., and R.H. Rosenblatt. 1965. A new blennioid fish of the genus *Labrisomus* from Equador, with notes on the Caribbean species *L. filamentosus*. Copeia 1965(1):25-27.

Stephens, J.S., Jr. 1961. A description of a new genus and two new species of chaenopsid blennies from the western Atlantic. Notulae Naturae, 349:1-8.

Stephens, J.S., Jr. 1963. A revised classification of the blennioid fishes of the American family Chaenopsidae. Univ. Calif. Pub. Zool. 68:1-165.

Stephens, J.S., Jr. 1970. Seven new chaenopsid blennies from the western Atlantic. Copeia, 1970(2):280-309.

Stepien, C.A., M.T. Dixon, and D.M. Hillis. 1993. Evolutionary relationships of the blennioid fish families Clinidae, Labrisomidae and Chaenopsidae: congruence between DNA sequence and allozyme data. Bull. Mar. Sci., 52(1):496-515.

Tavolga, W.N. 1954. A new species of fish of the genus *Blennius* from Florida. Copeia, 1954(2):135-139.

Wang, J.C.S., and R.J. Kernehan. 1979. Fishes of the Delaware estuaries. A guide to the early life histories. Ecol. Anal., Inc. Md. 410 pp.

Williams, J.T. 1983. Taxonomy and ecology of the genus *Chasmodes* (Pisces: Blenniidae) with a discussion of its zoogeography. Bull. Fla. State Mus. (Biol. Sci.), 29(2):1-37.

Williams, J.T. 1988. Revision and phylogenetic relationships of the blenniid fish genus *Cirripectes*. Indo-Pacific Fishes, Ichthyology, Bernice Pauahi Bishop Museum, Honolulu, Hawaii. 78 pp.

Williams, J.T., and A.M. Smart. 1983. Redescription of the Brazilian labrisomid fish *Starksia brasiliensis*. Proc. Biol. Soc. Wash., 96(4):638-644.

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Appendix I. Nominal species of blennioid fishes of the Caribbean Sea and the tropical western north Atlantic Ocean (33 genera, 122 species, 6 subspecies). Faunal list compiled from literature cited in Appendix II.

Blenniidae: (9 genera, 18 species, 4 subspecies)
- *Chasmodes* Valenciennes (2 species, 2 subspecies)
- *C. bosquianus* (Lacépède) (1 subspecies)
- *C. bosquianus bosquianus* (Lacépède)
- *C. bosquianus longimaxilla* Williams
- *C. saburrae* Jordan and Gilbert
- *Entomacrodus* Gill (2 species)
- *E. nigricans* Gill
- *E. vomerinus* (Valenciennes)
- *Hypleurochilus* Gill (4 species)
- *H. aequipinnis* (Günther)
- *H. bermudensis* Beebe and Tee-Van
- *H. geminatus* (Wood)
- *H. springeri* Randall
- *Hypsoblennius* Gill (4 species)
- *H. exstochilus* Böhlke
- *H. hentz* (LeSueur)
- *H. invemar* Smith-Vaniz and Acero
- *H. ionthas* (Jordan and Gilbert)
- *Lupinoblennius* Herre (2 species)
- *L. dispar* Herre
- *L. nicholsi* (Tavolga)
- *Omobranchus* Ehrenberg in Cuvier and Valenciennes (1 species)
- *O. punctatus* (Valenciennes in Cuvier and Valenciennes)
- *Ophioblennius* Gill (1 species, 2 subspecies)
- *O. atlanticus* (Valenciennes in Cuvier and Valenciennes) (2 subspecies)
- *O. atlanticus atlanticus* (Valenciennes in Cuvier and Valenciennes)
- *O. atlanticus macclurei* Silvester
- *Parablennius* Miranda-Ribeiro (1 species)
- *P. marmoreus* (Poey)
- *Scartella* Jordan (1 species)
- *S. cristata* (Linnaeus)

Chaenopsidae: (10 genera, 40 species, 2 subspecies)
- *Acanthemblemaria* Metzelaar (9 species)
- *A. aspera* (Longley)
- *A. betinensis* Smith-Vaniz and Palacio

Appendix I (cont.)

Acanthemblemaria (cont.)
A. chaplini Böhlke
A. greenfieldi Smith-Vaniz and Palacio
A. maria Böhlke
A. medusa Smith-Vaniz and Palacio
A. paula Johnson and Brothers
A. rivasi Stephens
A. spinosa Metzelaar
Chaenopsis Poey in Gill (5 species)
C. limbaughi Robins and Randall
C. ocellata Poey
C. resh Robins and Randall
C. roseolla Hastings and Shipp
C. stephensi Robins and Randall
Coralliozetus Evermann and Marsh (2 species)
C. cardonae Evermann and Marsh
C. tayrona Acero
Ekemblemaria Stephens (1 species)
E. nigra (Meek and Hildebrand)
Emblemaria Jordan and Gilbert (9 species)
E. atlantica Jordan and Evermann
E. biocellata Stephens
E. caldwelli Stephens
E. caycedoi Acero
E. culmenis Stephens
E. diphyodontis Stephens and Cervigón in Stephens
E. hyltoni Johnson and Greenfield
E. pandionis Evermann and Marsh
E. piratula Ginsburg and Reid
Emblemariopsis Longley (8 species)
E. bahamensis Stephens
E. bottomei Stephens
E. diaphana Longley
E. leptocirris Stephens
E. occidentalis Stephens
E. pricei Greenfield
E. randalli Cervigón
E. signifera (Ginsburg)
Hemiemblemaria Longley and Hildebrand (monotypic)
H. simulus Longley and Hildebrand

Appendix I (cont.)

Lucayablennius Böhlke (monotypic)
L. zingaro (Böhlke)
Protemblemaria Stephens (1 species)
P. punctata Cervigón
Stathmonotus Bean (3 species, 2 subspecies)
S. gymnodermis Springer
S. hemphilli Bean
S. stahli (Evermann and Marsh) (2 subspecies)
S. stahli stahli (Evermann and Marsh)
S. stahli tekla Nichols

Clinidae: Not known from the tropical western Atlantic

Dactyloscopidae (7 genera, 17 species)
Dactylagnus Gill (1 species)
D. peratikos Böhlke and Caldwell
Dactyloscopus Gill (7 species)
D. boehlkei Dawson
D. comptus Dawson
D. crossotus Starks
D. foraminosus Dawson
D. moorei (Fowler)
D. poeyi Gill
D. tridigitatus Gill
Gillellus Gilbert (4 species)
G. greyae Kanazawa
G. healae Dawson
G. jacksoni Dawson
G. uranidea Böhlke
Leurochilus Böhlke (monotypic)
L. acon Böhlke
Myxodagnus Gill (1 species)
M. belone Böhlke
Platygillellus Dawson (2 species)
P. rubrocinctus (Longley)
P. smithi Dawson
Storrsia Dawson (monotypic)
S. olsoni Dawson

Labrisomidae (6 genera, 42 species)
Haptoclinus Böhlke and Robins (monotypic)
H. apectolophus Böhlke and Robins
Labrisomus Swainson (9 species)
L. albigenys Beebe and Tee-Van

Appendix I (cont.)

Labrisomus (cont.)
L. bucciferus (Poey)
L. filamentosus Springer
L. gobio (Valenciennes in Cuvier and Valenciennes)
L. guppyi (Norman)
L. haitiensis Beebe and Tee-Van
L. kalisherae (Jordan)
L. nigricinctus Howell Rivero
L. nuchipinnis (Quoy and Gaimard)
Malacoctenus Gill (8 species)
M. aurolineatus Smith
M. boehlkei Springer
M. delalandei (Valenciennes in Cuvier and Valenciennes)
M. erdmani Smith
M. gilli (Steindachner)
M. macropus (Poey)
M. triangulatus Springer
M. versicolor (Poey)
Nemaclinus Böhlke and Springer (monotypic)
N. atelestos Böhlke and Springer
Paraclinus Macquard (8 species)
P. barbatus Springer
P. cingulatus (Evermann and Marsh)
P. fasciatus (Steindachner)
P. grandicomis (Rosén)
P. infrons Böhlke
P. marmoratus (Steindachner)
P. naeorhegmis Böhlke
P. nigripinnis (Steindachner)
Starksia Jordan and Evermann in Jordan (15 species)
S. atlantica Longley
S. brasiliensis (Gilbert)
S. culebrae (Evermann and Marsh)
S. elongata Gilbert
S. fasciata (Longley)
S. guttata (Fowler)
S. hassi Klausewitz
S. lepicoelia Böhlke and Springer
S. nanodes Böhlke and Springer
S. occidentalis Greenfield
S. ocellata (Steindachner)

Appendix I (cont.)

Starksia (cont.)
S. sluiteri (Metzelaar)
S. starcki Gilbert
S. variabilis Greenfield
S. y-lineata Gilbert

Tripterygiidae (1 genus, 5 species)
Enneanectes Jordan and Evermann in Jordan (5 species)
E. altivelis Rosenblatt
E. atrorus Rosenblatt
E. boehlkei Rosenblatt
E. jordani (Evermann and Marsh)
E. pectoralis (Fowler)

Appendix II. Literature used for constructing a list of the nominal species of blennioids of the tropical and subtropical western Atlantic (Appendix I).

1. Acero, 1984a
2. Acero, 1984b
3. Acero, 1987
4. Böhlke, 1957a
5. Böhlke, 1957b
6. Böhlke, 1959
7. Böhlke, 1968
8. Böhlke and Chaplin, 1993
9. Böhlke and Robins, 1974
10. Böhlke and Springer, 1961
11. Böhlke and Springer, 1975
12. Cervigon, 1965
13. Cervigon, 1966
14. Dawson, 1970
15. Dawson, 1982
16. Evermann and Marsh, 1900
17. Fowler, 1954
18. Gilbert, 1965
19. Gilbert, 1971
20. Greenfield, 1975
21. Greenfield, 1979
22. Greenfield and Johnson, 1981
23. Hoese and Moore, 1977
24. Johnson and Brothers, 1989
25. Jordan and Evermann, 1898
26. Longley, 1927
27. Nelson, 1984
28. Palacio, 1974
29. Randall, 1966
30. Randall, 1983
31. Richards, 1990
32. Robins, 1971
33. Robins and Randall, 1965
34. Rosenblatt, 1960
35. Smith-Vaniz, 1980
36. Smith-Vaniz and Palacio, 1974
37. Smith-Vaniz and Springer, 1971
38. Springer, 1955a
39. Springer, 1955b
40. Springer, 1958
41. Springer, 1959a
42. Springer, 1967
43. Springer, 1978a
44. Springer, 1978b
45. Springer and Gomon, 1975b

Appendix II (continued)

46. Stephens, 1961
47. Stephens, 1963
48. Stephens, 1970
49. Tavolga, 1954
50. Williams, 1983

Appendices III-XII

The meristic data in Appendices III-XII are summarized for the 5 families, 33 genera, 122 species, and 6 subspecies of blennioid fishes known to inhabit the tropical and subtropical western Atlantic. Data are coalesced at three levels: family (Appendix III), genus (Appendices IV-VII), and species (Appendices VIII-XII). The Appendices were organized in this fashion to facilitate the identification of fishes.

Data for the majority of species were taken from multiple sources. In some cases, counts and/or totals from these sources for a given taxon do not completely agree with one another. If there was no apparent reason for the discrepancy, all counts were listed. Some counts were published as totals only. If a subsequent paper presented actual counts, both were listed; in some cases these do not completely correspond with one another.

Multiple counts and totals may also be listed for a given taxon because of the meristic variation present. For example, *Labrisomus nigricinctus* (Appendix XI) possesses the following number of dorsal-fin elements: XVII,11; XVIII,10-12; XIX,11. It would be inaccurate and misleading to combine the extremes (i.e., XVII-XIX,10-12). In the case of Dactyloscopidae (Appendix III), the total number of dorsal fin elements are listed as 27-33 and 36-44. No species of dactyloscopid in the study area possesses 34 or 35 total elements, so the range listed is discontinuous.

Caudal-fin ray counts are listed as the total number of segmented-, principle-, or articulated rays and as ranges. It is often not obvious how these numbers correspond to one another. In these cases, all are listed and left for the reader to determine the usefullness. Ranges are listed as dorsal procurrent rays + dorsal principle rays + ventral principle rays + ventral procurrent rays. In some cases a range may be listed for each of these values. For example, the number of caudal-fin elements for *Starksia* (Appendix VII) is listed as 4-6 + 7-8 + 6-7 + 4-6. In some cases the number of dorsal and ventral primary rays is combined (e.g., *Emblemariopsis bottomei*, Appendix IX, 4+13+4).

Additional comments on the data tables: "?" = indicates data are presented as published but have been questioned but not substantiated by a subsequent author; "not complete" = data have been summarized at the family or genus level but are lacking for one or more species.

Appendix III. Summary of meristic data for the families of the suborder Blennioidei (excluding Clinidae) occurring in the tropical and subtropical western Atlantic. Data summarized from Appendices VIII-XI.

FAMILY	DORSAL	ANAL	PECTORAL	PELVIC	CAUDAL	VERTEBRAE
BLENNIIDAE	X-XIV,11-22	II,13-24	11-16	I,2-4	4-7+10-13+3-7	10-12+20-30
9 genera	23-36 total,				12-15 segmented	30-36 total
18 species	not complete				13 articulated	38-40 total
4 subspecies					not complete	not complete
CHAENOPSIDAE	XVII-XXV,10-22	II,18-31	11-15	I,2-3	3-5+11-14+3-5	10-25+25-36
10 genera	XVII-XVIII,26-28	II,33-37	3-9	not complete	1+6-7+6+0-2	20+38
40 species	XVII-XXI,30-37				10-13 segmented	39-58 total
2 subspecies	XXXIX-LIII,0				13-14 principle	not complete
	28-56 total				not complete	
DACTYLOSCOPIDAE	VII-XX,12-32	II,21-36	12-15	I,3	1-4+5-6+5-6+1-4	10-12+23-36
7 genera	27-33,36-44				not complete	
17 species	total				10-12 segmented	
LABRISOMIDAE	XVII-XXIII,6-14	II,14-23	11-17	I,2-3	1-8+7-8+6-7+2-8	10-13+21-29
6 genera	XXV-XXXI,0-1				10-14 segmented	30,32-39 total
42 species	25-33 total				not complete	not complete
TRIPTERYGIIDAE[1]	III+X-XIII,6-9	II,14-17	13-16	I,3	4-6+8+7+4-6	8 or 9+22
1 genus	20-25 total			I,2[2]	15 segmented	10+23
5 species					not complete	29-31, 33-35
						total
						not complete

[1]Tripterygiidae comprises one genus (*Enneanectes*) in the study area and is summarized here.

[2] Böhlke and Robins (1974) found that *Enneanectes altivelis*, *E. atrorus*, and *E. boehlkei* possess a greatly reduced third pelvic fin ray. They state that other species should be re-examined for the presence of the same.

Appendix IV. Summary of meristic data for the genera of the family Blenniidae occurring in the tropical and subtropical western Atlantic. Data summarized from Appendix VIII.

BLENNIIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL	PELVIC	CAUDAL	VERTEBRAE
Chasmodes 2 species 2 subspecies	X-XI,16-20 27-31 total	II,16-20	11-13	I,3	4-5+10-13+3-5	10+24-26
Entomacrodus 2 species	XII-XIII,14-15	II,15-17 (II,16)	13-14	I,4	13 articulated	
Hypleurochilus 4 species	XI-XIII,12-14 XI,15	II,14-16 II,18	13-15 not complete	I,4 not complete	13 segmented not complete	30-33 total
Hypsoblennius 4 species	XI-XIII,13-16 XI-XII,11-12 23-28 total	II,13-17	13-15	I,3-4	5-7+13+4-7 not complete	10+20-24
Lupinoblennius 2 species	XII-XIII,13-15	II,14-17	12-14	I,3-4	13-15 segmented	10-12+21-23
Omobranchus 1 species	XI-XIII,19-22	II,21-24	12-14	I,2 not complete	12-14 segmented 13 articulated	10-11+27-30 38-40 total not complete
Ophioblennius 1 species 2 subspecies	31-36 total XII,20-21	22-26 total II,20-21	14-16	I,4	13 segmented	
Parablennius 1 species	XI-XII,17-18 (XII,18)	II,19-20	14	I,3		
Scartella 1 species	XII,14-15	II,15-17	14	I,3		

Appendix V. Summary of meristic values for the genera of the family Chaenopsidae occurring in the tropical and subtropical western Atlantic. Data summarized from Appendix IX.

CHAENOPSIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Acanthemblemaria 9 species	XVIII-XXV,11-22 33-44 total	II,21-30	11-14	I,3	3-5+11-14+4-5 11-13 segmented not complete	10-14+28-36 39-49 total
Chaenopsis 5 species	XVII-XVIII,26-28 XVII-XXI,30-37 44-45,47,51-56 total	II,29-31 II,33-37	12-14	I,3	13 segmented not complete	16+32-33 20+38 48-49, 58 total not complete
Coralliozetus 2 species	XVII-XXI,10-13 28-33 total	II,18-24	11-14	I,3 not complete	4+13+3-4 not complete	11+27 not complete
Ekemblemaria 1 species	XIX-XXII,15-19 (XXI,17) 37-40 total	II,23-25 (II,24)	13-15 (14)	I,3	4+12-14+4 (4+13+4)	13+30
Emblemaria 9 species	XVIII-XXIII,13-17 32-38 total	II,19-24	12-14	I,3 not complete	4+13+3-4 13 segmented not complete	14+25 or 28 13+26 or 28 +30 40-42 total not complete
Emblemariopsis 8 species	XIX-XXI,10-14 30-35 total	II,19-23	12-15	I,3	3-4+13+4 12-13 segmented not complete	11+27-28 not complete
Hemiemblemaria monotypic	XXII-XXIII,16-17 39-40 total	II,22-23	14	I,3	4+13+4 4+8+7+4 13 segmented	15-16+29
Lucayablennius monotypic	XVIII-XX,19-21 (XIX,20) 38-40 total	II,21-23 (II,23)	13	I,3	13 segmented 5+8+7+4	40-44 total (42 total) 16+27

Appendix V (continued)

CHAENOPSIDAE	DORSAL	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE
Protemblemaria 1 species	XIX,15-17 XX,14-16 XXI,13-16 34-37 total	II,21-24 (II,23)	13-15 (14)	I,3	13-14 principle (13 principle)	
Stathmonotus 3 species 2 subspecies	XXXIX-LIII,0 39-53 total	II,21-29	3-9	I,2	10-13 segmented	16-25+27-34 44-58 total

Appendix VI. Summary of meristic values for the genera of the family Dactyloscopidae occurring in the tropical and subtropical western Atlantic. Data summarized from Appendix X.

DACTYLOSCOPIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Dactylagnus 1 species	IX-X,28-30 (X,28-29) 38-40 total	II,33-35	13	I,3	(10 segmented)	(11)+35-36 (11+36)
Dactyloscopus 7 species	IX-XIV,25-32 36-44 total	II,28-36	12-14	I,3	1-3+5-6+5-6+1 not complete (10 segmented)	(11)+29-36
Gillellus 4 species	III+XV-XVII,20-24 III+VIII-X,27-29 III+XIV-XVI,18-20 III+X-XII,14-17 28-32,36-43 total	II,21-24 II,28-35	12-14	I,3	2-4+10+2-3 not complete (10 segmented)	(11)+23-26 (11)+29-36
Leurochilus monotypic	III+XI-XIV,12-14 (XV,14) 27-30 total	II,22-24 (II,24)	13-14 (13)	I,3	11-12 segmented (11 segmented)	(10)+25-26 (10+26)
Myxodagnus 1 species	VII-IX,29-31 (VIII,30) 38-39 total	II,34-36 (II,35)	12-14 (13)	I,3	4+10+4 (10 segmented)	(12)+35-36 (12+35)
Platygillellus 2 species	XV-XVII,14-17 29-33 total	II,22-27	13-15	I,3	(11 segmented)	(10)+23 (10)+25-28
Storrsia monotypic	XIV,26[1] 40 total XIV,16[1] 30 total	II,26	13	I,3	10 segmented	11+28

[1] Dawson (1982) erroneously reports two counts for the number of segmented dorsal-fin elements (pp. 43 and 82); both counts are listed here.

Appendix VII. Meristic values for the genera of the family Labrisomidae occurring in the tropical and subtropical western Atlantic. Data summarized from Appendix XI.

LABRISOMIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Haptoclinus monotypic	III-I-XIII,14 III-I-XIV,13 31 total	II,20-21	13	I,3	6-7+7+6+5	13+
Labrisomus 9 species	XVII-XXII,10-13 28-33 total	II,16-22	12-15	I,3	2-8+8+7+4-8 12-13 segmented	10-12+22-25 32-38 total
Malacoctenus 8 species	XVIII-XXIII,8-13 28-33 total	II,17-23	13-17	I,3	1-8+8+7+2-7 13 segmented	10-11+24-29 not complete 34-39 total
Nemaclinus monotypic	XXI-XXIII,7-9 (XXII,8) 28-32 total	II,18-19 (II,19)	11-12 (12)	I,3	5-7+13+5-7	11+22-24 (11+23)
Paraclinus 8 species	XXV-XXXI,0-1 26-31 total	II,15-21	11-14	I,3	1-4+8+7+2-3 12-14 segmented	10-11+21-23 10+25 33-35 total not complete
Starksia 15 species	XVIII-XXII,6-9 25-31 total	II,14-20	11-15	I,3 I,2?	4-6+7-8+6-7+4-6 12-14 segmented not complete	10-11+21-25 30, 32-35 total not complete

Appendix VIII. Meristic values for species of Blenniidae that inhabit the tropical and subtropical western Atlantic. Numerals in parentheses beneath taxa correspond with literature cited at end of table.

BLENNIIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Chasmodes						
C. bosquianus						
C. b. bosquianus (15)	X-XII,17-20 (XI,18) 28-31 total	II,16-20 (II,18)	11-13 (12)	I,3	4-5+10-13+3-5	10+24-26
C. b. longimaxilla (10,15)	X-XII,16-19 (XI,18) 28-30 total	II,16-20 (II,18)	11-13 (12)	I,3	4-5+10-13+3-5	10+24-25
C. saburrae (6,10,15)	X-XII,16-20 (XI,18) 27-31 total	II,17-20 (II,18)	11-13 (12)	I,3	4-5+10-13+3-5	10+24-26 (10+24)
Entomacrodus						
E. nigricans (2,8,12)	XII-XIII,13-16	II,14-17 (II,16)	13-14	I,4	13 articulated	33-35 total (34 total)
E. vomerinus (12)	XII-XIV,15-17 (XIII,16)	II,15-18 (II,17)	12-15 (14)	I,4	7+6 13 segmented central 9 branched	34-36 total
Hypleurochilus						
H. aequipinnis (2,5,7)	XI-XII,13-14	II,14-16	13-15 (14)	I,4	13 segmented	31-33 total
H. bermudensis (6,7)	XI-XII,12-13 (XII,13)	II,14-15 (II,15)	13-14 (14)	I,4		30-31 total (31 total)
H. geminatus (6,7)	XI,15 XIII,14 26 or 27 total	II,18		I,3-4		
H. springeri (7)	XI-XIII,12-13 (XII,13)	II,14-16	13-15 (14)	I,4	13 segmented	32 total

Appendix VIII (continued)

BLENNIIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Hypsoblennius						
H. exstochilus (1,9)	XI-XII,13-15 (XII,14) 25-27 total	II,15-16 (II,16)	13-15 (14)	I,3	6-7+13+5-6 middle 8 or 9 usually branched	10+22-23
H. hentz (4,6,9)	XI-XIII,13-16 (XII,14) 25-28 total	II,14-17 (II,16)	13-15 (14)	I,3	5-6+13+5-6[1] middle 9 usually branched	10+21-24 (10+22)
H. invemar[2] (9)	XI-XII,11-12 XI-XII,12-13 23-24 total	II,13-14 (II,14)	13-15 (14)	I,4	6-7+13+6-7 middle 9 usually branched	10+20-22 (10+21)
H. ionthas (6,9)	XI-XIII,13-15 (XII,14) 25-27 total	II,14-17	13-15 (14)	I,3	5-6+13+4-6 middle 9 usually branched	10+20-23
Lupinoblennius						
L. dispar (3)	XII,13-14	II,14-16	12-14 (13)	I,4	13-15 segmented (13 segmented)	10+21-22
L. nicholsi (5,14)	XII-XIII,13-15	II,16-17	13	I,3	13-14	11-12+21-23 32-35 total
Omobranchus						
O. punctatus (13)	XI-XIII,19-22 (XII,21) 31-34 total	II,22-24	12-14 (13)	I,2	12-14 segmented (13 segmented)	10-11+27-30 38-40 total

[1] Smith-Vaniz (1980) contains a typographical error in the number of caudal-fin segmented rays (3) reported for this species. The number is most likely 13; the typical number for *Hypsoblennius* species.

[2] Smith-Vaniz (1980) erroneously reports two counts for the number of segmented dorsal-fin elements (pp. 288, 289, and 291); both counts are listed here.

Appendix VIII (continued)

BLENNIIDAE	DORSAL	ANAL	PECTORAL	PELVIC	CAUDAL	VERTEBRAE
Ophioblennius						
O. atlanticus						
O. a. atlanticus[1] (11,12)	33-36 total	25-26 total	14-16 (15)	I,4	13 segmented	
O. a. macclurei[1] (2,11)	31-33 total XII,20-21	22-24 total II,20-21	14-16 (15)	I,4	13 segmented	
Parablennius						
P. marmoreus (2,6,8,14)	XI-XII,17-18 (XII,18)	II,19-20	14	I,3		
Scartella						
S. cristata (2,8)	XII,14-15	II,15-17	14	I,3		

[1] Meristic values for pectoral, pelvic, and caudal fins are for the genus *Ophioblennius*.

1. Böhlke, 1959
2. Cervigon, 1966
3. Dawson, 1970
4. Gilhen et al., 1976
5. Greenfield and Johnson, 1981
6. Hoese and Moore, 1977
7. Randall, 1966
8. Randall, 1983
9. Smith-Vaniz, 1980
10. Springer, 1959b
11. Springer, 1962
12. Springer, 1967
13. Springer and Gomon, 1975a
14. Tavolga, 1954
15. Williams, 1983

Appendix IX. Meristic values for species of Chaenopsidae known to inhabit the tropical and subtropical western Atlantic. Numerals in parentheses correspond with literature cited at end of table.

CHAENOPSIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Acanthemblemaria						
A. aspera (2,5,6,11,18,22,26,30)	XIX-XXII,14-17 34-38 total	II,21-25	12-14 (13)	I,3	4+11-14+4 (4+12+4)	12-13+28-31 40-43 total
A. betinensis (2,26)	XXII-XXV,13-16 (XXIII,15) 36-40 total	II,22-26	12-14 (13)	I,3	13 segmented	13-14+28-30 42-44 total
A. chaplini (5,6,11,26,30)	XX-XXIII,17-22 (XXII,18) 38-44 total	II,25-30	12-14 (13)	I,3	5+12-13+4 (5+13+4)	12-14+32-36 44-49 total
A. greenfieldi (11,26)	XXI-XXIV,15-19 38-41 total	II,25-28	12-14 (13)	I,3	13 segmented 3+7+6+4	12-13+31-34 44-46 total
A. maria (5,6,26,27,30)	XXI-XXIII,12-15 34-38 total	II,22-26	11-14 (13)	I,3	4-5+12-13+4 (4-5+13+4)	10-11+29-32 12+30-31 rarely 10+ 40-43 total
A. medusa (26)	XXI-XXIII,15-17 37-39 total	II,25-27	12-14 (13)	I,3	12-13 segmented (13 segmented)	11-12+31-33 42-44 total
A. paula (18)	XVIII-XXI,15-19 (XIX,17) 35-37 total	II,22-25 (II,23)	12-14 (13)	I,3	11-13 segmented	12-13+28-30 40-42 total (41 total)
A. rivasi (2,26,31)	XXI-XXIII,11-14 (XXII,13) 32-36 total	II,21-24	11-14 (13)	I,3	4+12-13+4 or 4+15+4 (4+13+4)	11+28-30 39-41 total
A. spinosa (5,6,11,18,22,26,30)	XX-XXII,13-16 33-37 total	II,21-26	12-14 (13)	I,3	4-5+13+4 3-4+8+6+4-5	11-12+28-31 39-42 total
Chaenopsis						
C. limbaughi (3,21,23,25,27)	XVII-XXI,31-37 51-54 total	II,33-37 (II,35)	12-14	I,3	13 segmented	20+38

Appendix IX (continued)

CHAENOPSIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Chaenopsis (continued)						
C. ocellata (3,4,25,27)	XVII-XX,32-37 (XVIII,34)	II,33-37	12-14 (13)	I,3	13 segmented	
C. resh (3,9,10,17,24,25)	XVII-XIX,35-37 53-55 total	II,36-37	12-13 (13)	I,3	13 segmented	
C. roseolla (15)	XVII-XVIII,26-28 44-45 total	II,29-30	12-14	I,3		16+32-33
C. stephensi (15,24,25)	XVII,28 or 30 45 or 47 total	II,30-31	13	I,3		49 total
Coralliozetus						
C. cardonae (3,5,14,27,30)	XVII-XIX,10-13 (XVIII,12) 28-31 total	II,18-24 (II,20)	11-13	I,3	4+13+3-4	11+27
C. tayrona (3)	XIX-XXI,11-13	II,18-22	13-14			
Ekemblemaria						
E. nigra (2,5,27,30,31)	XIX-XXII,15-19 (XXI,17) 37-40 total	II,23-25 (II,24)	13-15 (14)	I,3	4+12-14+4 (4+13+4)	13+30
Emblemaria						
E. atlantica (1,5,27,30,31)	XIX-XXII,14-16 (XXII,15) 34-38 total	II,21-23 (II,23)	13-14 (14)	I,3	4+13+4	14+25
E. biocellata (1,31)	XXII,14-15 36-37 total	II,22-23	13	I,3	4+13+3-4	
E. caldwelli (1,8,19,27,31)	XXI-XXIII,13-15 (XXII,14) 34-37 total	II,21-23 (II,22)	14	I,3	13 segmented	14+28
E. caycedoi (1)	XIX-XXI,14-15	II,22-23	13			

Appendix IX (continued)

CHAENOPSIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Emblemaria (continued)						
E. culmenis (1,31)	XXII,15 37 total	II,24	13	I,3	4+13+4	
E. diphyodontis (1,27,31)	XX,15-16 XXI,14-16 35-37 total (36 total)	II,22-24 (II,23)	13	I,3	13 segmented	+30
E. hyltoni (1,14,19)	XXI-XXIII,14-16 36 or 37 total	II,22-23 (II,23)	14	I,3		40-42 total
E. pandionis (1,5,11,17,23,27,30,31)	XIX-XXII,13-17 (XX,14) 33-38 total	II,20-24 (II,21)	12-14 (13)	I,3	4+13+4	13+26 or 28
E. piratula (1,5,14,19,30,31)	XVIII-XX,13-16 32-34 total	II,19-21	12-13 (13)	I,3	4+13+4	
Emblemariopsis						
E. bahamensis (27,29,30,31)	XX-XXI,12-13 32-34 total	II,21-22	13	I,3	3-4+13+4	11+28
E. bottomei (10,27,29,30,31)	XX-XXI,12-13 32-33 total	II,21	13	I,3	4+13+4	
E. diaphana (5,20,27,29,30,31)	XX-XXI,12-14 32-34 total	II,21-23	12-13 (13)	I,3	3+13+4	
E. leptocirris (14,27,31)	XIX,12-13 XX,10-13 XXI,11 30-33 total	II,19-22 (II,20)	12-14 (13)	I,3	12-13 segmented (13 segmented)	11+27
E. occidentalis (8,31)	XIX,13 XX,11-12 or 14 XXI,11 31-34 total	II,20-21	13-14 (13)	I,3	12-13 segmented (13 segmented)	

Appendix IX (continued)

CHAENOPSIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Emblemariopsis (continued)						
E. pricei (13,14)	XX,13-14 XXI,12-14 (XXI,13) 33-35 total	II,22-23	14	I,3		39 total
E. randalli (9,10,27,31)	XX-XXI,12-13 32-34 total	II,20-23	14-15 (14)	I,3		11+27
E. signifera (20,27,30,31)	XIX-XXI,10-13 (XX,11) 30-33 total	II,19-21 (II,20)	12-13 (13)	I,3	4+13+4	11+27
Hemiemblemaria (monotypic)						
H. simulus (5,11,27,30)	XXII-XXIII,16-17 39-40 total	II,22-23	14	I,3	4+13+4 4+8+7+4 13 segmented	15-16+29
Lucayablennius (monotypic)						
L. zingaro (2,4,11,12,21,25,27,30)	XVIII-XX,19-21 (XIX,20) 38-40 total	II,21-23 (II,23)	13	I,3	13 segmented 5+8+7+4	40-44 total (42 total) 16+27 17+26
Protemblemaria						
P. punctata (7,9,10,14)	XIX,15-17 XX,14-16 XXI,13-16 34-37 total	II,21-24 (II,23)	13-15 (14)	I,3	13-14 principle rays (13 principle rays)	
Stathmonotus						
S. gymnodermis (10,14,16,28)	XLI-XLVI,0 41-46 total	II,21-26	8-9	I,2	10-13 segmented (11 segmented)	17-20+27-31= 46-51 total
S. hemphilli (14,16,28)	XLV-LIII,0 45-53 total	II,23-29	3-6	I,2	10-12 segmented (12 segmented)	20-25+30-34= 50, 52-58 total

Appendix IX (continued)

CHAENOPSIDAE	DORSAL	ANAL	PECTORAL	PELVIC	CAUDAL (mode)	VERTEBRAE
Stathmonotus (continued)						
S. stahli stahli (16,28)	XLI-XLV,0 41-45 total	II,23-26	6-9	I,2	11-13 segmented (12 segmented)	17-19+28-31 46-49 total
S. stahli tekla (16,28)	XXXIX-XLIV,0 39-44 total	II,21-25	6-9	I,2	10-12 segmented (11 segmented)	16-19+27-31= 44-48 total

1. Acero, 1984a
2. Acero, 1984b
3. Acero, 1987
4. Böhlke, 1957a
5. Böhlke, 1957b
6. Böhlke, 1961
7. Böhlke and Cervigon, 1967
8. Böhlke and Robins, 1974
9. Cervigon, 1965
10. Cervigon, 1966
11. Cleared and stained material
12. Greenfield, 1972
13. Greenfield, 1975
14. Greenfield and Johnson, 1981
15. Hastings and Shipp, 1980
16. Hastings and Springer, 1994
17. Hoese and Moore, 1977
18. Johnson and Brothers, 1989
19. Johnson and Greenfield, 1976
20. Longley, 1927
21. Palacio, 1974
22. Radiograph material
23. Randall, 1983
24. Robins, 1971
25. Robins and Randall, 1965
26. Smith-Vaniz and Palacio, 1974
27. Springer, pers. comm.
28. Springer, 1955b
29. Stephens, 1961
30. Stephens, 1963
31. Stephens, 1970

Appendix X. Meristic values for species of Dactyloscopidae known to inhabit the tropical and subtropical western Atlantic. Numerals in parentheses beneath taxa correspond with literature cited at end of table.

DACTYLOSCOPIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Dactylagnus						
D. peratikos	IX-X,28-30	II,33-35	13	I,3	(10 segmented)	(11)+35-36
(3)	38-40 total					(11+36)
Dactyloscopus						
D. boehlkei	IX-XI,28-31	II,32-33	12-13	I,3	(10 segmented)	(11)+32-34
(3)	(X,30)	(II,32)	(13)			
	39-41 total					
D. comptus	X-XII,25-28	II,28-30	12-14	I,3	10 segmented	(11)+29-32
(3)	(XI,27)	(II,30)	(13)			(11+31)
	36-39 total					
D. crossotus	XI-XIV,27-31	II,31-36	12-14	I,3	(10 segmented)	(11)+32-36
(2,3)	(XII,29)	(II,33)	(13)		2+6+6+1	(11+33)
	39-44 total					
D. foraminosus	X-XI,29-32	II,33-34	13-14	I,3	(10 segmented)	(11)+33-35
(3)	(X,31)	(II,33)	(13)			(11+35)
	40-42 total					
D. moorei	IX-XIII,26-30	II,30-34	12-14	I,3	(10 segmented)	(11)+31-34
(3)	38-41 total	(II,32)	(13)			(11+33)
D. poeyi	XI-XIV,26-30	II,32-35	12-14	I,3	(10 segmented)	(11)+33-36
(3)	40-43 total	(II,33)	(13)			(11+34)
	(41 total)					
D. tridigitatus	X-XIII,26-31	II,30-34	12-14	I,3	(10 segmented)	(11)+31-35
(2,3)	(XII,28)	(II,32)	(13)		1+5+5+1	(11+33)
	38-42 total				3+6+6+1	
	(40 total)					
Gillellus						
G. greyae	III+XV-XVII,20-24	II,31-35	12-14	I,3	(10 segmented)	(11)+31-36
(3)	(III+XVI,21)	(II,32)	(13)			(11+33)
	39-43 total					

Appendix X (continued)

DACTYLOSCOPIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Gillellus (continued)						
G. healae (3)	III+VIII-X,27-29 (III+IX,29) 39-41 total	II,31-33 (II,32)	13-14 (13)	I,3	(10 segmented)	(11)+32-34 (11+33)
G. jacksoni (3)	III+XIV-XVI,18-20 (III+XV,20) 36-38 total	II,28-30	12-14 (13)	I,3	(10 segmented)	(11)+29-31 (11+31)
G. uranidea (1,3)	III+X-XII,14-17 (III+XI,16) 28-32 total	II,21-24 (II,23)	12-14 (13)	I,3	(10 segmented) 2-4+10+2-3 (3+10+2)	(11)+23-26 (11+25)
Leurochilus (monotypic)						
L. acon (1,3)	III+XI-XIV,12-14 (III+XII,14) 27-30 total	II,22-24 (II,24)	13-14 (13)	I,3	11-12 segmented (11 segmented)	(10)+25-26 (10+26)
Myxodagnus						
M. belone (1,3)	VII-IX,29-31 (VIII,30) 38-39 total	II,34-36 (II,35)	12-14 (13)	I,3	(10 segmented) 4+10+4	(12)+35-36 (12+35)
Platygillellus						
P. rubrocinctus (3)	III+XII-XIV,14-17 30-33 total	II,23-27 (II,25)	13-15 (14)	I,3	(11 segmented)	(10)+25-28 (10+26)
P. smithi (3)	XV,14 29 total	II,22	14	I,3	11 segmented	10+23
Storrsia (monotypic)						
S. olsoni (3)	XIV,26[1] 40 total XIV,16[1] 30 total	II,26	13	I,3	10 segmented	11+28

[1] Dawson (1982) lists two different values for dorsal-fin soft rays; both are listed here.

Appendix X (continued)

1. Böhlke, 1968
2. Cleared and stained material
3. Dawson, 1982

Appendix XI. Meristic values for species of Labrisomidae known to inhabit the tropical and subtropical western Atlantic. Numerals in parentheses beneath taxa correspond with literature cited at end of table.

LABRISOMIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Haptoclinus (monotypic)						
H. apectolophus (2,4)	III+I+XIII,14 III+I+XIV,13 31 total	II,20-21	13	I,3	(6-7)+7+6+5	13+
Labrisomus						
L. albigenys (10,13,17)	XVIII,11 29 total	II,16 or 18	13-14 (13)	I,3	12-13 segmented 2+8+7+2	11+23
L. bucciferus (6,17)	XIX,11-12 XX,10-12 XXI,10 (XX,11) 30-32 total	II,19-21 (II,20)	12-14 (13)	I,3	7+8+7+7 13 segmented	37 total ca. 12+25
L. filamentosus (6,13,17,19)	XXI,12 33 total	II,19-22	13-14	I,3	13 segmented 7+6 7-8+8+7+4-7	37-38 total 12+25
L. gobio (6,13,17)	XVIII,12 XIX,10-12 XX,10-11 (XIX,11) 29-31 total	II,18-20 (II,19)	12-13 (13)	I,3	13 segmented 5+8+7+7	10-11+24
L. guppyi (5,6,13,17)	XVIII,11-12 XIX,10-12 (XIX,11) 29-31 total	II,18-20 (II,19)	12-14 (13)	I,3	13 segmented 2-8+8+7+4-8 (6-8+8+7+6-8)	11+24 not complete
L. haitiensis (6,13,17)	XX,10-12 XXI-XXII,10-11 30-33 total	II,18-22	13-15 (14)	I,3	13 segmented 7+8+7+7	38 total 11+25

Appendix XI (continued)

LABRISOMIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Labrisomus (continued)						
L. kalisherae (5,13,17)	XVIII,11-12 XIX,10-12 (XIX,11) 29-31 total	II,18-20 (II,19)	13-14 (13)	I,3	12-13 segmented 7+8+7+7	10+25
L. nigricinctus (6,13,17)	XVII,11 XVIII,10-12 XIX,11 (XVIII,11) 28-30 total	II,17-20 (II,18)	13	I,3	13 segmented 5-6+8+7+5-7 (6+8+7+6)	32-34 total 11+22-23 (11+23)
L. nuchipinnis (5,6,11,13,14,17)	XVII,12-13 XVIII,10-13 XIX,11-12 XX,12 (XVIII,12) 28-32 total	II,17-19	13-15 (14)	I,3	13 segmented 7+8+7+6-7	33-35 total 11+23-24
Malacoctenus						
M. aurolineatus (6,15,17,18)	XVIII,10-11 XIX-XX,10-12 XXI,10-11 28-32 total	II,17-21	13-15 (14)	I,3	13 segmented 7+8+7+6	35-39 total
M. boehlkei (6,13,17)	XX,13 XXI,11-12 XXII,11 32-33 total	II,20-23 (II,22)	(15)	I,3	13 segmented 5-8+8+7+5-7	10+28 11+27-28
M. delalandei (5,6,17,18)	XIX-XX,9-11 XXI,9 (XX,10) 28-31 total	II,17-20 (II,19)	13-15 (14)	I,3	13 segmented 6+8+7+6	35-39 total

Appendix XI (continued)

LABRISOMIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Malacoctenus (continued)						
M. erdmani (6,13,15,17)	XX,9-10 XXI,8-10 XXII,8-9 (XXI,9) 29-31 total	II,17-20	15-17 (16)	I,3	13 segmented 5-6+8+7+4-6	10-11+24-25 (11+24)
M. gilli (5,6,13,17)	XVIII,10 XIX,10-11 XX,9-11 XXI,9-10 (XX,10) 28-31 total	II,17-21	13-16 (14)	I,3	13 segmented 1-6+8+7+2-6	10+24 11+24-25
M. macropus (6,13,17)	XXI,9-11 XXII,8-10 XXIII,9-10 30-33 total	II,18-22	14-16 (15)	I,3	13 segmented 6+8+7+6	36 total 11+26
M. triangulatus (5,6,14,17,18)	XVIII,11 XIX,11-12 XX, 10-13 XXI, 10-12 29-33 total	II,18-22	13-15 (14)	I,3	13 segmented 6+8+7+6	10+26-29 (10+27)
M. versicolor (6,17,18)	XVIII-XIX,11-12 (XVIII,12) 29-31 total	II,18-19	13-14	I,3	13 segmented 7+8+7+6-7	34-36 total
Nemaclinus (monotypic)						
N. atelestos (4)	XXI-XXIII,7-9 (XXII,8) 28-32 total	II,18-19 (II,19)	11-12 (12)	I,3	5-7+13+(5-7) (6+13+5-7)	11+22-24 (11+23)

Appendix XI (continued)

LABRISOMIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Paraclinus						
P. barbatus (10,12,13,16)	XXVIII-XXIX,1 29-30 total	II,19-20	13	I,3	12-13 segmented 2+8+7+2	+23
P. cingulatus (2,6,10,13,16)	XXVII-XXIX,0 27-29 total	II,15-16	11-12	I,2	13 segmented 1-3+8+7+2-3	11+22-23
P. fasciatus (2,5,6,14,16)	XXVIII-XXXI,0 (XXIX,0) 28-31 total	II,17-20 (II,19)	12-14 (13)	I,2	12-14 segmented (13 segmented) 2+8+7+3	34-35 total
P. grandicomis (13,16)	XXV-XXVII,1 26-28 total	II,16-18	12	I,3	12 segmented 2+7+7+2	10+22
P. infrons (1,6,10)	XXVI-XXVIII,1 27-29 total	II,17-18 (II,18)	12	I,3	12-13 segmented (13 segmented) 2+8+7+2 4+8+7+2	10+22-23
P. marmoratus (6,10,16)	XXVII-XXX,1 (XXIX,1) 28-31 total	II,19-21 (II,20)	12-14 (13)	I,3	12-13 segmented (13 segmented) 2+8+7+2	10+25
P. naeorhegmis (1,6,10)	XXVI-XXVII,0 26-27 total	II,15-17	12-13	I,2	13 segmented 2+8+7+2	10+21-22
P. nigripinnis (5,6,16)	XXIX-XXXI,0-1 (XXIX,1) 29-31 total	II,15-19	12-14 (13)	I,3	12-13 segmented (13 segmented) 3+8+7+3	33-34 total
Starksia						
S. atlantica (3,10,13)	XVIII-XX,7-8 25-28 total	II,15-16 (II,16)	13-15 (14)	I,3	12-13 segmented (13 segmented)	10+22-23
S. brasiliensis (9,20)	XX-XXI,7-9 (XXI,8) 27-29 total	II,16-18 (II,17)	13-14 (14)	I,3	13 segmented 5-6+7+6+4-6 (6+7+6+5)	10+23-25 (10+24)

Appendix XI (continued)

LABRISOMIDAE	DORSAL (mode)	ANAL (mode)	PECTORAL (mode)	PELVIC	CAUDAL (mode)	VERTEBRAE (mode)
Starksia (continued)						
S. culebrae (9)	XX-XXII,7-9 (XXI,8) 27-31 total	II,17-19 (II,18)	13-14 (14)	I,3	13 segmented	34-35 total (34 total)
S. elongata (8,10)	XX-XXI,8 28-29 total	II,17-18	14-15 (14)	I,2?	13 segmented 7+6	
S. fasciata (3,6)	XIX-XX,7-8 26-28 total	II,15-16 I-I,16	12-14 (13)	I,3	13 segmented 5+8+7+4	11+21 10+22
S. guttata (3,9)	XX-XXI,8-9 (XXI,8) 28-30 total	II,17-18 (II,18)	13-15 (14)	I,3	12-13 segmented (13 segmented)	33-34 total (34 total)
S. hassi (3,8)	XIX-XX,8-9 XXI,9 (XX,8) 27-30 total	II,16-18 (II,18)	12-14 (13)	I,3	13 segmented	10-11+
S. lepicoelia (3,6)	XIX-XXI,7-9 (XX,8) 26-30 total	II,16-19 (II,17)	11-14 (13)	I,3	5-6+7+6+5-6 (5+7+6+5) 13-14 segmented 4+8+7+4 articulated	10+23
S. nanodes (3,6)	XIX-XXI,7-8 (XX,7) 26-29 total	II,16-17	12-13 (13)	I,3	5+7+6+5 13 segmented 5+8+7+4 articulated	10+22-23
S. occidentalis (9)	XX-XXI,7-9 (XXI,8) 27-30 total	II,16-19 (II,17)	13-14 (14)	I,3	13 segmented	32-35 total (33 total)
S. ocellata (3,5,9,11,14)	XX-XXII,6-9 26-31 total	II,16-20	12-15 (14)	I,3	12-13 segmented (13 segmented)	33-35 total (34 total)