CHAPTER 119

SERRANIDAE: Sea basses

By W. J. Richards, C. C. Baldwin, & A. Röpke

The Family Serranidae comprises some of the most valuable commercial and recreational marine fishes in the world. The most notable as food fishes are the groupers and black sea basses. Most serranid species are tropical, but several occur in temperate waters, and a few enter freshwater. The family is very large, with about 62 genera and 449 species worldwide (Nelson 1994). We follow Johnson (1983) in dividing the Serranidae into three subfamilies: Serraninae, Epinephelinae, and Anthiinae. The Epinephelinae are divided into tribes following Baldwin & Johnson (1993). These are convenient because the larvae are distinct for each subfamily. In the following pages each subfamily is introduced, and separate accounts are given for each species for which larvae are known. Illustrations are provided if available. Tables of meristic and other counts are also provided because counts are very useful in identifying larval and juvenile serranids. Eggs are poorly known but resemble the general percoid egg of tropical waters in being about 1mm in diameter with a clear shell and very narrow periviteline space. Development is presumed to be very rapid, thus making eggs especially difficult to identify. Serranine larvae are typical basal percoid-like with slightly laterally compressed bodies and few small spines on bones of the opercular series. The head is smooth, lacking rugosity, and fin spines are not elongate. Pigmentation is variable but always found on the ventral midline. All serranid larvae have 3 opercular spines, a condition only found also in *Sphyraenops, Champsodon*, and scorpaenoids. Epinepheline larvae are distinctive in having one or more elongate dorsal-fin spines. Grouper larvae (Tribe Epinephlini) have elongate, strongly serrate second dorsal- and pelvic-fin spines that give them a kite-shaped appearance. Cave-bass or basslet larvae (Tribe Liopropomini) are laterally compressed with a deep caudal peduncle and have very long second and third dorsal spines encased in fleshy sheaths; these appendages sometimes resemble siphonophore tentacles. Soapfish, *Jeboehlkia,* and *Pseudogramma* larvae (Tribe Grammistini) are similar in body shape to the Liopropomini but have only one elongate dorsal spine. Anthiine larvae have a large deep head adorned with spines and sometimes rugosity. A large interopercular spine lies medial to the preopercular spine giving a double-spine appearance to the preopercle. Fin ray and other counts for the family are given in Table Serranidae 1.

Key to the larvae and early juveniles

1a. Head deep and wide; well-developed interopercular spine; myomeres 26 ..... Anthiinae
1b. Head laterally compressed, not wide; interopercular spine not conspicuously long; myomeres <26 (except in *Pseudogramma* with 10+16, rarely 10+15) 2
2a. One or more dorsal-fin spines elongate (stout or flexible) ..... 3 (Epinephelinae)
2b. No elongate dorsal-fin spines (third spine slightly produced in *Serranus*) ..... Serraninae
3a. Second dorsal- and pelvic-fin spines elongate, stout, and bearing spinelets; body kite-shaped ..... Tribe Epinephelini
3b. One or two elongate, flexible dorsal-fin spines; pelvic fin small, pelvic-fin spine not elongate or serrate 4
4a. One elongate dorsal-fin spine; pectoral fin usually large and pigmented ..... Tribe Grammistini
4b. Two elongate dorsal spines; pectoral fin not large or pigmented ..... Tribe Liopropomini

Table Serranidae 1. Meristic characters for the family Serranidae

Subfamily Serraninae: D. X,10-16 A.III,6-8 V. 10+14=24							**Lat. Line**	
Species	**Dorsal**	**Anal**	**Pectoral**	**Gillrakers**	**Vert**	**Br**	**Scales**	**Source**
Bullisichthys								
caribbaeus	X,13-14	III,7	14-15	9-10+21-26=30-37	10+14	7	46-49	Rivas 1971
Parasphyraenops								
atrimanus	X,10	III,6	17	9+19+?=28	10+14	7	ca. 49	Johnson & Smith-Vaniz 1987
incisus	X,10	III,7	17	8-9+20-21=28	10+14	7		Johnson & Smith-Vaniz 1987
Centropristis								
fuscula	X,12	III,7		10+10=20	10+14=24		48	Jordan & Evermann 1896
ocyurus	X,11	III,7	17(16-18)	19-21(17-22)	10+14=24	7	47(46-48)	Bullock & Smith 1991
philadelphica	X,11	III,7	18(15-20)	19-21(17-22)	10+14=24(22-23)	7	47(46-49)	Bullock & Smith 1991
striata	X,11	III,7	16-19(14-20)	22-23(20-29)	10+14=24	7	47(46-49)	Bullock & Smith 1991
Diplectrum								
bivittatum	X,12	III,7(6-8)	15-16(14)	18-24(16-25)	10+14	7	59-70(54-58)	Bortone 1971
formosum	X,12(11-13)	III,7(6-8)	16-17(18)	18-23(17-24)	10+14	7	66-70	Bortone 1971
radiale	X,12	III,7	17(16-18)	17-20(15-21)	10+14	7	59-68(54-69)	Bortone 1971
Hypoplectrus								
aberrans	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
chlorurus	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
gemma	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
guttavarius	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
indigo	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
nigricans	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
puella	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
unicolor	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
gummigutta	X,14-16	III,7	14	6-8+11-15=18-19(17-20)	10+14	7	48-53	Randall 1968
Schultzea								
beta	X,12(11-13)	III,7	15-17	9-11+20-26=29-39	24	6	48-56	Bullock & Smith 1991
Serraniculus								
pumilio	X(IX),11(10)	III,7(6)	14-15	9-13	10+14	6	40-46	Bullock & Smith 1991
Serranus								
annularis	X,12(10-12)	III,7	13(14)	15-18	10+14	7	43-50	Robins & Starck 1961, Bullock & Smith 1991
atrobranchus	X,12(13)	III,7	16(15-17)	15-20	10+14	7	44-47	Robins & Starck 1961, Bullock & Smith 1991
baldwini	X,(IX-XI),12(11-13)	III,7	13-15	14-17	10+14	7	42-48	Randall 1968
chionaraia	X,11-12	III,7	14(13)	17-20	10+14	7	45-47	Robins & Starck 1961
dewegeri	X,14(15)	III,7		10-14	10+14	7	55-63	Randall 1968
flaviventris	X,12(13)	III,7	16(17)	5-6+12=17-18	10+14	7	39-44	Robins & Starck 1961

Table SER-1. (continued)

Subfamily Serraninae: D. X,10-16 A.III,6-8 V. 10+14=24 Species	Dorsal	Anal	Pectoral	Gillrakers	Vert	Br	Lat. Line Scales	Source
Serranus (Cont.)								
luciopercanus	X,12	III,7	14	20-24	10+14	7	50-55	Robins & Starck 1961
maytagi	X,12	III,7	15-16	19-23	10+14	7	45-50	Robins & Starck 1961
notospilus	X,12(11-13)	III,7(8)	15-16(14-17)	19(16-23)	10+14	7	46-47(44-48)	Robins & Starck 1961, Bullock & Smith 1991
phoebe	X,12	III,7(8)	15-16(14-17)	16-20	10+14	7	45-51	Robins & Starck 1961
subligarius	X,13(11-14)	III,7(6)	16(14-17)	16-17(15-19)	10+14	7	42-46	Robins & Starck 1961
tabacarius	X,12(11)	III,7	15(14)	21-25	10+14	7	52(50-51)	Robins & Starck 1961
tigrinus	X,12	III,7	14	15-19	10+14	7	48-51	Robins & Starck 1961
tortugarum	X,12(10)	III,7	14(15)	26-31	10+14	7	48-49(46-50)	Robins & Starck 1961

Subfamily Epinephelinae, Tribe Epinephelini: D. VIII-XI,13-20, A.III,7-13 v. 10+14 Species	Dorsal	Anal	Pectoral	Gillrakers	Vert	Br	Lat. Line Scales	Source
Epinephelus (*Alphestes*)								
afer	XI,17-18(19)	III,9	16-17	6-8+16-17	10+14=24		55-61	Heemstra & Randall 1993
(*Cephalopholis*)								
cruentatus	IX,14(13-15)	III,8	16	10+9-11=18-25	10+14=24		47-51	Heemstra & Randall 1993
fulvus	IX,15(14-16)	III,9	18(17-19)	7-9+17(16-18)=23-27	10+14=24		46-54	Heemstra & Randall 1993
(*Dermatolepis*)								
inermis	XI,18-20	III,9(8-10)	18-19	19-22	10+14=24		Deeply embedded	Heemstra & Randall 1993
(*Epinephelus*)								
adscensionis	XI,16-18	III,8	18-20	7-9+16-19=23-28	10+14=24		48-53	Heemstra & Randall 1993
drummondhayi	XI,16(15-17)	III,9	18	9-10+17-18=26-28	10+14=24		72-76	Heemstra & Randall 1993
flavolimbatus	XI,14(13-15)	III,9	18(17-18)	8-9+15-17=23-25	10+14=24		ca. 65	Heemstra & Randall 1993
guttatus	XI,16(15-17)	III,8(7-9)	17(16-18)	8-9+16-18=24-26	10+14=24		92-104	Heemstra & Randall 1993
itajara	XI,16(15)	III,8	18-19	8-9+13-15=21-24	10+14=24		61-64	Heemstra & Randall 1993
morio	XI,15-17	III,9(8-10)	16-18	8-9+15-16=23-25	10+14=24		60-68	Heemstra & Randall 1993
mystacinus	XI,15(14)	III,9(8)	18-19	8-10+14-16=22-26	10+14=24		58-69	Heemstra & Randall 1993
nigritus	X,14(13-15)	III,9	18-19	9-11+14-16=23-25	10+14=24		62-71	Heemstra & Randall 1993
niveatus	X,14(13-15)	III,9	18(17-19)	7-10+15-17=22-26	10+14=24		64-73	Heemstra & Randall 1993
striatus	XI,16-18	III,8	17-19	8-9+15-17=23-26	10+14=24		ca. 50	Heemstra & Randall 1993, Powell and Tucker 1992

Table Serranidae 1. (continued)

Subfamily Epinephelinae, Tribe Epinephelini: D. VIII-XI,13-20, A.III,7-13 v. 10+14							Lat. Line	
Species	**Dorsal**	**Anal**	**Pectoral**	**Gillrakers**	**Vert**	**Br**	**Scales**	**Source**
Mycteroperca								
acutirostris	XI,15-17	III,10-12	15-17	16-20+32-36=48-55	10+14=24		67-77	Heemstra & Randall 1993
bonaci	XI,15-17	III,11-13	16-17	2-5+8-12	10+14=24		78-83	Heemstra & Randall 1993
cidi	XI,15-17	III,10-12	15-17	9-13+18-23	10+14=24		ca. 75	Heemstra & Randall 1993
interstitialis	XI,16-18	III,10-12	16-17	4-6+11-15=23-27	10+14=24		70-74	Heemstra & Randall 1993
microlepis	XI,16-18	III,10-13	16-18	8-9+16	10+14=24		88-96	Heemstra & Randall 1993
phenax	XI,16-18	III,10-12	15-17	8-10+17-21=26-31	10+14=24		76-82	Heemstra & Randall 1993
tigris	XI,15-17	III,11	17	8+15-17=23-25	10+14=24		82-83	Heemstra & Randall 1993
venenosa	XI,15-16	III,10-12	16-18	8-10+17-18=24-27	10+14=24		72-81	Heemstra & Randall 1993
Subfamily Epinephelinae, Tribe Epinephelini: D. VIII-XI,13-20, A.III,7-13 V. 10+14							**Lat. Line**	
Species	**Dorsal**	**Anal**	**Pectoral**	**Gillrakers**	**Vert**	**Br**	**Scales**	**Source**
Paranthias								
furcifer	IX,17-18(19)	III,8-9(10)	19-20	12-14+24-26=38	10+14=24		69-77	Heemstra & Randall 1993
Gonioplectrus								
hispanus	VIII,13	III,7	16-17	5-7+14-16=20-22	10+14=24	7	47-49	Heemstra & Randall 1993
Subfamily Epinephelinae, Tribe Liopropomini: D.VIII,12-15 A.III,8 V.10+14							**Lat. Line**	
Species	**Dorsal**	**Anal**	**Pectoral**	**Gillrakers**	**Vert**	**Br**	**Scales**	**Source**
Bathyanthias								
mexicanus	VIII,14(15)	III,8	14-15	6+12-13=18-23	10+14=24	7	45-47	Bullock & Smith 1991
Liopropoma	VIII,12-13	III,8						
aberrans	VIII,12	III,8	14	14(5r+9)	10+14=24	7	44-50	Robins 1967
carmabi	VIII,12-13	III,8			10+14=24		44-50	Randall 1968
eukrines	VIII,12	III,8	13-14	15-17	10+14=24		44-50	Robins & Ray 1986
mowbrayi	VIII,12				10+14=24		44-50	Randall 1968
rubre	VIII,12	III,8	13		10+14=24			Randall 1968
Subfamily Epinephelinae, Tribe Grammistini: D.II-III or VII-VIII,9-29 A.III,7-18 V.9-10+14-16								
Species	**Dorsal**	**Anal**	**Pectoral**	**Gillrakers**	**Vert**	**Br**	**Caudal Fin Rays**	**Source**
Jeboehlkia								
gladifer	VIII,9	III,7	15	9+1+16=26	9+15=24	7		Baldwin & Johnson 1991
Pseudogramma								
gregoryi	VII,18-19	III,15,16(14)	14(15)	5-6+9-11	10+16=26(10+15)	7	15 branched	Randall & Baldwin 1997

Table Serranidae 1. (continued)

Subfamily Epinephelinae, Tribe Grammistini: D.II-III or VII-VIII,9-29 A.III,7-18 V.9-10+14-16								
Species	**Dorsal**	**Anal**	**Pectoral**	**Gillrakers**	**Vert**	**Br**	**Caudal Fin Rays**	**Source**
Rypticus	II-IV,21-29	14-18	13-17					
bistrispinus	II,25-26(24-27)	15-16(17)	13-15(16)	7-10	10+15=25			Courtenay 1967
bornoi	II,26	16	13	2+6=8	10+14=24			Courtenay 1967
brachyrhinus	III,23-25	15(14-16)	14-16	9(7-11)	10+14=24			Courtenay 1967
macrostigmus	III,25-26	16-17	14	2+8=10	10+14=24			Courtenay 1967
maculatus	II(III),24-25(22-27)	15-16(13-17)	13-16	8-9(7-10)	10+14=24			Courtenay 1967
randalli	III(II),23-24(25)	15-16	15-16(17)	9(8-11)	10+14=24			Courtenay 1967
saponaceus	III,23-24(21-25)	16-17(14-15)	15-16(14-17)	7-9(5-11)	10+14=24			Courtenay 1967
subbifrenatus	III,21-23(24)	14-15(13-16)	14-15(16)	8(7)+10	10+14=24	7		Courtenay 1967

Subfamily Anthiinae: D.X,13-16 A.III,6-9 V.10+16								
Species	**Dorsal**	**Anal**	**Pectoral**	**Gillrakers**	**Vert**	**Br**	**Lat. Line Scales**	**Source**
Anthias								
asperilinguis	X,15	III,7	18-19	11-13+26-28=38-40	10+16=26		36-41	Anderson & Heemstra 1980
nicholsi	X,15(14)	III,7(6-8)	19(18-21)	12-13+27-31=39-44	10+16=26		31-34	Anderson & Heemstra 1980, Bullock & Smith 1991
tenuis	X,15(14)	III,8(7-9)	20(19-21)	9-11+24-28=34-39	10+16=26		51-57 (interrupted)	Anderson & Heemstra 1980, Bullock & Smith 1991
woodsi	X,14(15)	III,7(8)	18(16)	11-12+26-28=38-40	10+16=26		42-48	Anderson & Heemstra 1980
Hemanthias								
leptus	X,14(13-15)	III,8	18(17-19)	35-40	10+16=26		54-64	Bullock & Smith 1991, Baldwin 1990
vivanus	(IX)X,14 (13)	III,8(9)	19(18-20)	10+30=38-43	10+16=26		<53	Bullock & Smith 1991, Baldwin 1990
Plectranthias								
garrupellus	X,16(15)	III,7(6-8)	13(12)	4-9+9-17	10+16=26	7	28-29(27-30)	Bullock & Smith 1991, Baldwin 1990
Pronotogrammus								
aureorubens	X,15(14)	III,8(7-9)	16-17(15-17)	?+28-29	10+16=26		44-48	Bullock & Smith 1991, Baldwin 1990
martinicensis	X,15(13-16)	III,7(8)	17(16-18)	9-13+24-29=34-41	10+16=26		35-41	Bullock & Smith 1991, Baldwin 1990

SUBFAMILY SERRANINAE

This subfamily comprises 37 species in 8 genera. Most serranines are small synchronous hermaphrodites, and several are poorly known. Only the genus *Centropristis* contains species that have commercial or recreational value, but some of the small species are used in the marine aquarium trade. *Centropristis* comprises 4 species, *C. striata, C. ocyurus, C. philadelphica,* and *C. fuscula,* of which ELH stages are known only for *C. striata*. Species of *Centropristis* have similar counts and overlapping ranges; thus, ELH stages of *C. striata* may represent more than one species. *Bullisichthys caribbaeus* is a small, poorly known, pugnose species. *Parasphyraenops atrimanus* from Bermuda is known only from 2 specimens from stomach contents, and *P. incisus* is known only from a few specimens collected from steep slopes in the Caribbean. ELH stages are not known for either *Bullisichthys* or *Parasphyraenops. Diplectrum* comprises 3 species of small, shallow-water fishes generally found over sandy bottoms near reefs. *Diplectrum formosum* and the smaller *D. bivittatum* are common along U.S. coasts, whereas *D. radiale* is found along the northern South American coast. Two larval *Diplectrum* morphs have been described from U. S. waters, but species assignment is not clear. *Schultzea beta* is a small, schooling planktivore, ELH stages of which are unknown. Larvae and juveniles have been described for *Serraniculus pumilio,* a small common serranid found over sand and shell bottoms near reefs. *Serranus* is a speciose genus of small, colorful, reef fishes. One species has been reared (*tigrinus*), but ELH stages of the remaining 13 species are unknown. A few larval types have been encountered in ichthyoplankton studies. *Hypoplectrus* was recently shown to contain 11 species, whereas previous workers had recognized a single species with numerous color morphs (Domeier 1994). Reared series of 3 species of this genus plus one hybrid are morphologically inseparable. Adults are easily separated by distinctive color patterns.

Serranine larvae identified to date are characterized by shared possession of basal percoid characters rather than unique specializations (Kendall 1984). The larvae are slightly laterally compressed with few spines on the head in the opercular region. The frontal bones are smooth, lacking ridges or rugosity. Dorsal- and pelvic-fin spines are not elongated and are smooth. Pigmentation is variable but melanophores always are present on the ventral midline. Pigmentation may occur in various locations on the head, trunk, and fins.

Serranine larvae would be confused most likely with gerriids or sparids rather than with larvae of other serranid subfamilies, but serranids have 3 opercular spines. Because only 5 genera and 8 species have been described, no key to the larvae is provided for this group.

Eggs, larvae, and juveniles have been described for *Centropristis striata.* Eggs and yolksac larvae were described (Wilson 1891) from rearing attempts, and Kendall (1972) described larval stages. (Kendall provides excellent wash illustrations that cannot be duplicated clearly in this account, so one must refer to the original). Based on a larval type he referred to *C. striata,* Kendall (1979) characterized the genus as follows: morphology and development typical of other serranines; most pigment associated with the ventral midline in larvae >5mmSL; large spots (melanophores) on posterior margin of angular, cleithral symphysis, between pelvic-fin bases, near anus, and near anal-fin insertion; smaller spots of pigment at bases of anal-fin rays, between larger caudal-peduncle spots, and on bases of some caudal rays; large spots on caudal peduncle extending upward between myomeres; pigment also occuring on hindbrain and over the gut.

Larvae of *Diplectrum* sp. were described by Kendall (1979). Houde et al. (1979) considered these to be *D. formosum* as collection localities followed the known distribution pattern of adults

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in the eastern Gulf of Mexico. Development of *Diplectrum* larvae varies from the normal serranine pattern in that the spinous dorsal and pelvic fins form early (vs. spinous and soft dorsal fins forming about the same time, and the pelvic fin forming late). The body shape in late larval stages is more slender than that of other serranines, and pigment spots on the ventral midline are more uniform than those in *Centropristis*.

Serraniculus pumilio larvae also were described by Kendall (1979). In addition to the pigment on the ventral midline, they have pigment on the dorsum and lateral trunk, rendering them the most heavily pigmented of the known serranine larvae. *Serraniculus pumilio* has only 6 branchiostegals, a character shared with *Schultzea beta*.

Serranus contains 14 species and one, *S. tigrinus* has been reared by M. Domeier (pers. commun.). Kendall (1979) illustrated several larval types of *Serranus* from the North Atlantic but could not assign them to species. The known larvae have early forming pelvic fins, and the body is deeper than that of other serranines except *Hypoplectrus*. The third dorsal spine is slightly produced in some types, and the pigment spots are very intense in several locations, including the angular, cleithral symphysis, anus, on the trunk above the anal fin, on the ventral aspect of the caudal peduncle, and on the dorsum below the dorsal fins. The opercular region is relatively ornately armed *Hypoplectrus* previously was thought to comprise a single species with multiple color morphs, but Domeier (1994) has shown that the color morphs are distinct species. He has reared three species (*H. guttavarius*, *H. unicolor,* and *H. gemma*) and a hybrid (*gemma* x *unicolor*). Illustrations of these are provided in the species accounts. Unfortunately neither Dormier nor the first author could find any morphological features that distinguish the 3 species. Kendall (1979) described one species from a series reared from unknown eggs which differs slightly in pigment pattern from the Domeier specimens. Hypoplectrus larvae are the deepest bodied of any of the serranines and have pigment spots at the angular, anus, above the anal fin base, on the caudal peduncle, and on the dorsum. The head and anterior trunk become heavily pigmented quite early. There are more rays in the second dorsal fin than in the other serranines.

SERRANIDAE — *Centropristis striata* (Linnaeus 1758)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	X
Second Dorsal Fin:	11
Anal Fin:	III,7
Pectoral Fin:	16-19(14-20)
Gill Rakers:	22-23(20-29)
Lateral Line Scales:	47(46-49)

LIFE HISTORY

Range: ME to southeastern FL, and northeastern Gulf of Mexico.
Habitat: Flat and gently rolling rocky bottoms from 1-30 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Fall to spring in eastern Gulf of Mexico.
Mode: Protogynous hermaphrodites.
Size/Age at First Maturity: Females age 4 at 190 mm SL, Males age 5-7 at >200 mm SL.

LITERATURE

Hardy 1978, Bullock & Smith 1991, Kendall 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS:
Diameter: 0.9-1.0 mm.
No. of Oil Globules: One.
Oil Globule Diameter:
Yolk: transparent.
Hatch Size: 2.01 mm NL.
Incubation: 38 hrs at 23 C°.
Pigment: few melanophores on embryo and oil globule.
Diagnostic Characters: nothing distinctive.

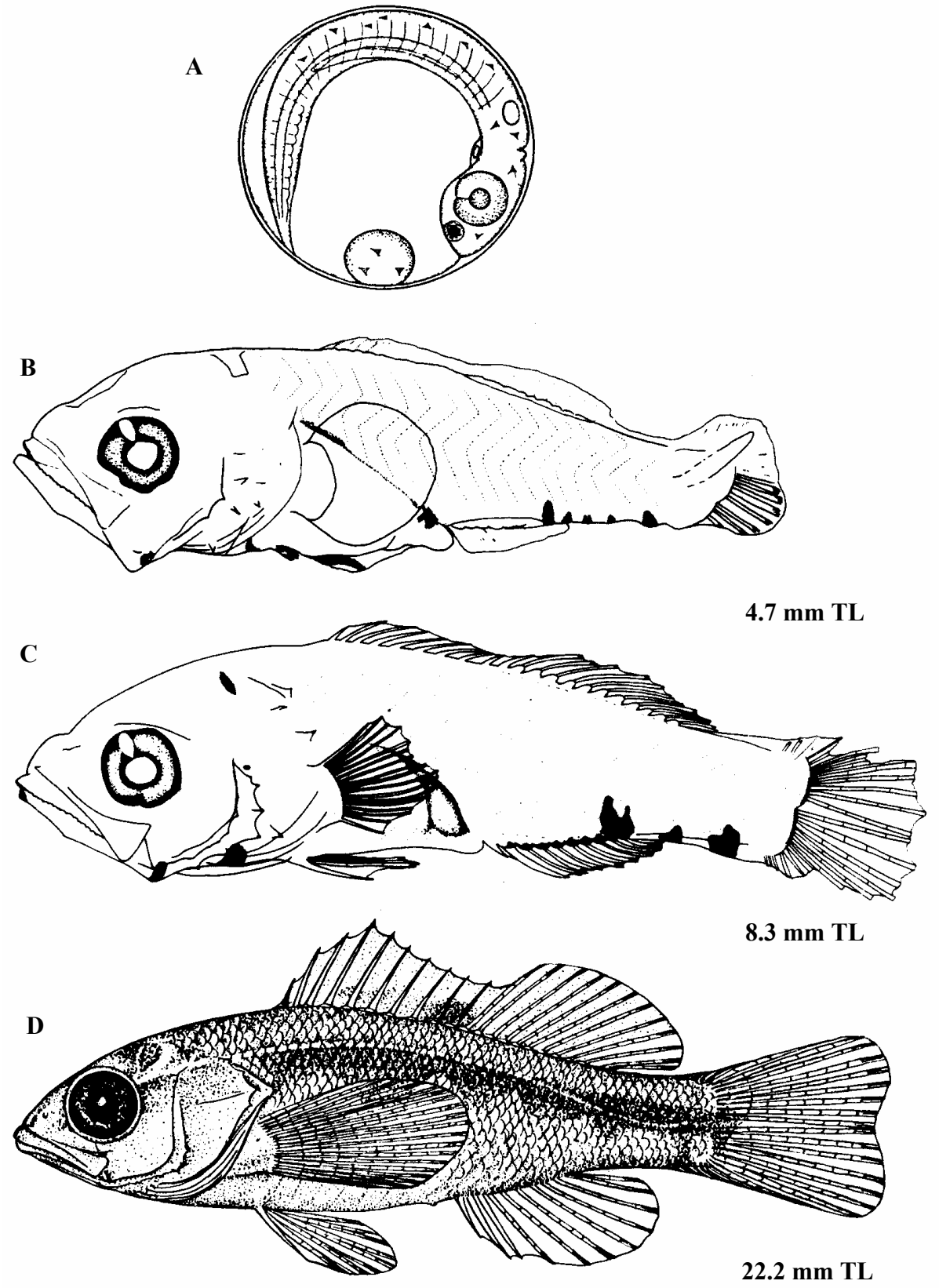
LARVAE:
Head Spination: first appears at 6.0 mm on preopercle; spines small, not prominent.
Elongate Dorsal Spines: none.
Length at Flexion: 5.5-6.0 mm SL.
Sequence of Fin Development: C, D_1 & D_2, A, P_2, P_1.
Pigmentation: angular, cleithral symphysis, and ventral midline, melanophores extending dorsally between myomeres; over gut, anus, hindbrain, & rarely on dorsal midline.
Diagnostic Characters: pigment & counts.

EARLY JUVENILES:
Pigment: Prominent black stripe from opercle to tail, Atlantic specimens with black spot on last D_1 spine, dark smudges on jaws.
Diagnostic Characters: counts & pigmentation.

ILLUSTRATIONS

Hardy 1978 (egg & juvenile); Kendall 1979 (larvae).

SERRANIDAE ***Centropristis striata* (Linnaeus 1758)**



SERRANIDAE *Diplectrum formosum* (Linnaeus 1766)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	X
Second Dorsal Fin:	12(11-13)
Anal Fin:	III,7(6-8)
Pectoral Fin:	16-17(18)
Gill Rakers:	18-23(17-24)
Lateral Line Scales:	66-70

LIFE HISTORY

Range: VA south throughout Gulf of Mexico along continental margin to Brazil, also Virgin Islands and Bahamas.
Habitat: Coastal species over sandy bottoms from 1 to 80 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Protracted winter to fall in the Gulf of Mexico.
Mode: Synchronous hermaphrodites.
Size/Age at First Maturity: Small species, largest 300 mm SL.
Longevity: To 6 years.

LITERATURE

Bortone 1977, Bullock & Smith 1991.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE:
Head Spination: preopercle and subopercle with small spines, this armature well developed relative to that of other serranine larvae.
Elongate Dorsal Spines: none.
Length at Flexion: ca. 5.5 mm SL.
Sequence of Fin Development: D_1 & P_2, D_2, A, & P_1.
Pigmentation: Small spots on ventral midline along jaw, cleithral symphysis, anus, A fin bases, caudal peduncle, few at caudal base. Spots of uniform size.
Diagnostic Characters: Counts, pigmentation, slender body.

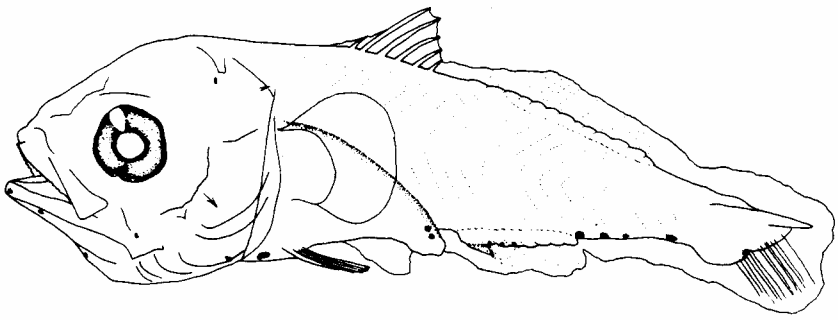
EARLY JUVENILES:

ILLUSTRATIONS

Kendall 1979 as *Diplectrum* sp. Type 1.

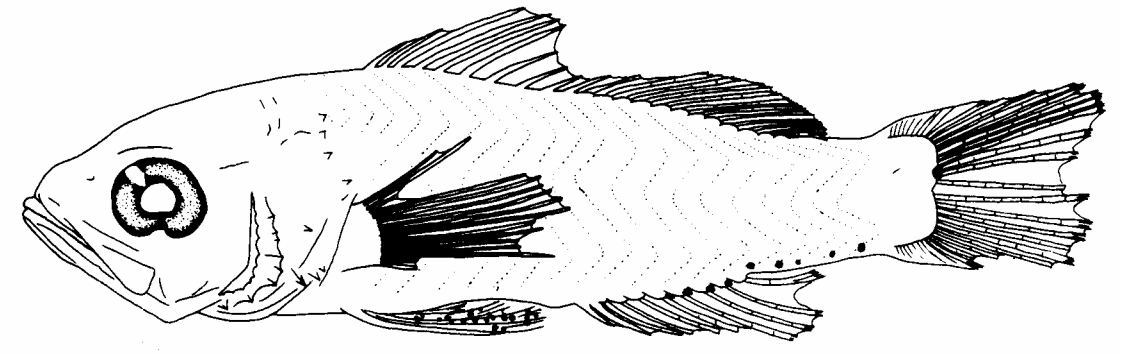
SERRANIDAE ***Diplectrum* sp.**

A



5.8 mm NL

B



10.0 mm SL

SERRANIDAE — *Hypoplectrus gemma* Goode & Bean 1882

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	X
Second Dorsal Fin:	14-16
Anal Fin:	III,7
Pectoral Fin:	14
Gill Rakers:	6-8+11-15=18-19 (17-20)
Lateral Line Scales:	48-53

LIFE HISTORY

Range: Endemic to Florida Keys.
Habitat: Coral reefs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Mode: Synchronous hermaphrodites.

LITERATURE

Domeier 1994.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

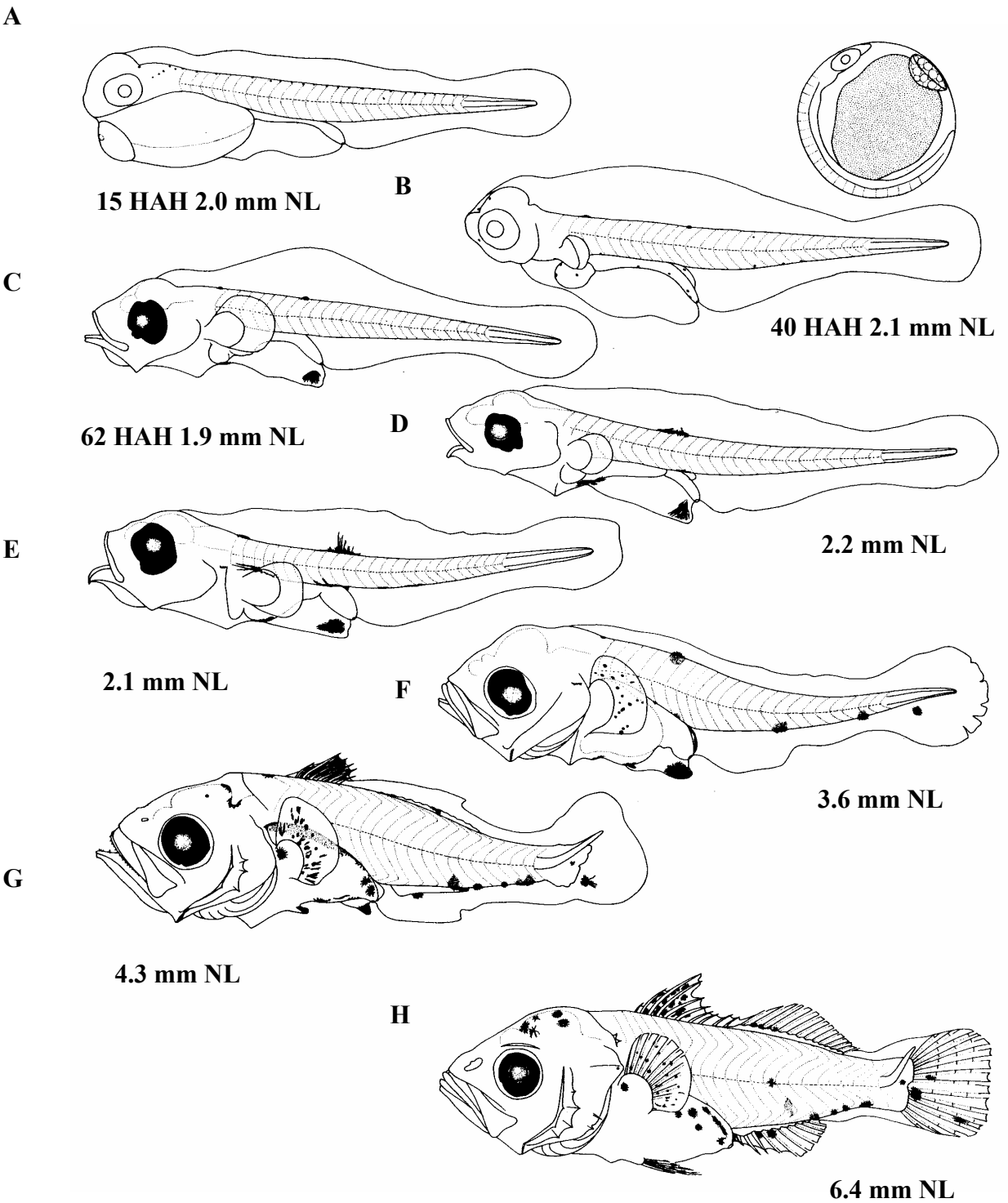
LARVAE:
Head Spination: small spines on preopercle & subopercle.
Elongate Dorsal Spines: none.
Pigmentation: Postflexion larvae with pigment on all fins, dorsum, ventral midline, posterior gut, & anus.
Diagnostic Characters: All have a lot of pigment & are deep bodied.

EARLY JUVENILES:
Diagnostic Characters: Color patterns.

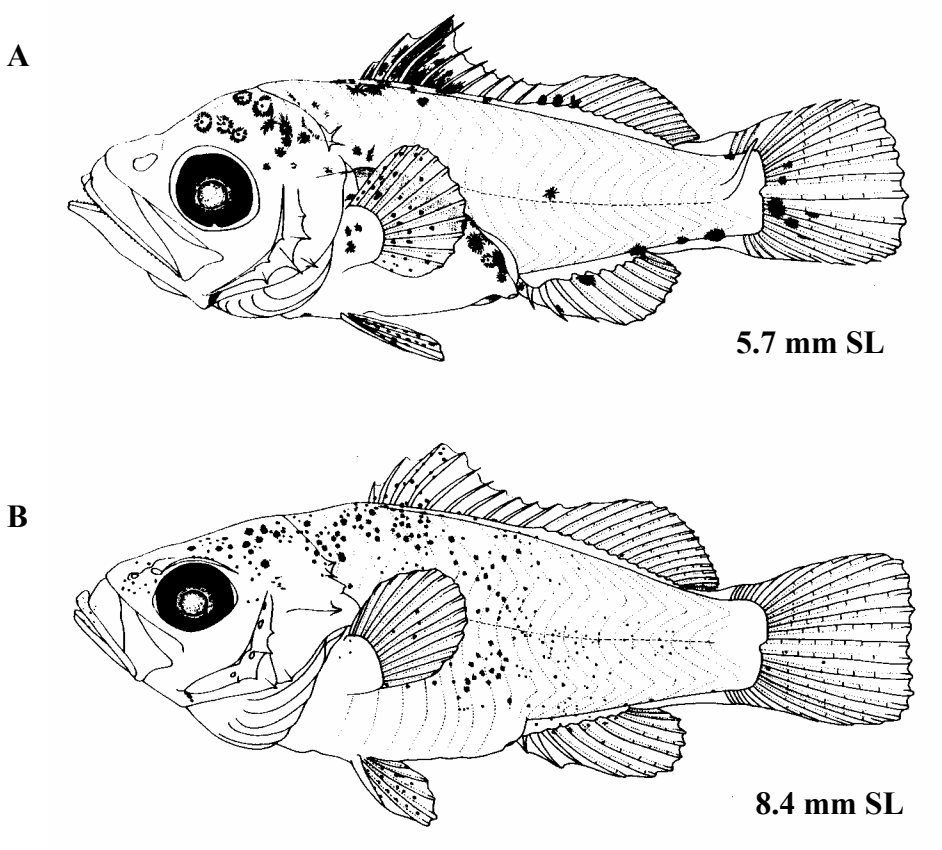
ILLUSTRATIONS

Original drawings by J. Javech, specimens from M. L. Domeier including hybrids.

SERRANIDAE ***Hypoplectrus gemma* Goode & Bean 1882**



SERRANIDAE ***Hypoplectrus gemma* x *H. unicolor***



SERRANIDAE *Hypoplectrus guttavarius* (Poey 1852)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	X
Second Dorsal Fin:	14-16
Anal Fin:	III,7
Pectoral Fin:	14
Gill Rakers:	6-8+11-15=18-19(17-20)
Lateral Line Scales:	48-53

LIFE HISTORY

Range: FL Keys, Bahamas, Cuba, Hispaniola, Jamaica, Caymans, Puerto Rico, Virgin Islands, Lesser Antilles, & Honduras.
Habitat: Coral reefs
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Mode: Synchronous hermaphrodites.

LITERATURE

Domeier 1994, Randall 1968.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

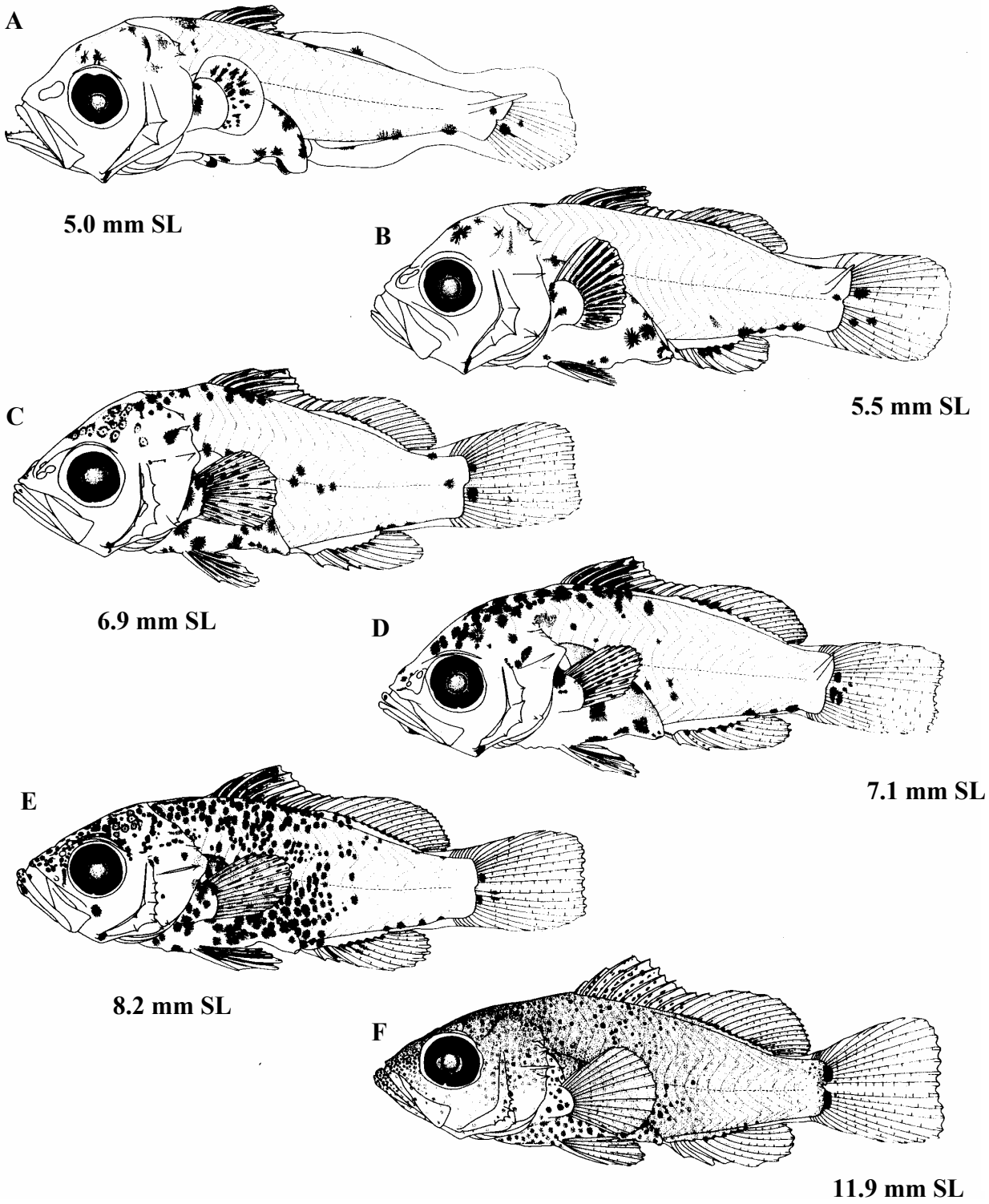
LARVAE:
Head Spination: small spines on preopercle & subopercle.
Elongate Dorsal Spines: none.
Pigmentation: See *H. gemma,* above.
Diagnostic Characters: Heavy pigment, deep body.

EARLY JUVENILES:
Diagnostic Characters: Pigment patterns.

ILLUSTRATIONS

Original drawings by J. Javech, specimens from M. L. Domeier.

SERRANIDAE ***Hypoplectrus guttavarius* (Poey 1852)**



SERRANIDAE *Hypoplectrus unicolor* (Walbaum 1792)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	X
Second Dorsal Fin:	14-16
Anal Fin:	III,7
Pectoral Fin:	14
Gill Rakers:	6-8+11-15=18-19(17-20)
Lateral Line Scales:	48-53

LIFE HISTORY

Range: FL Keys, Bahamas, Yucatan, islands and continental margin of the Caribbean Sea.
Habitat: Coral reefs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Mode: Synchronous hermaphrodites.

LITERATURE

Domeier 1994, Randall 1968.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE:
Head Spination: Small spines on preopercle & subopercle.
Elongate Dorsal Spines: None.
Pigmentation: See *H. gemma,* above.
Diagnostic Characters: Heavy pigment, deep body.

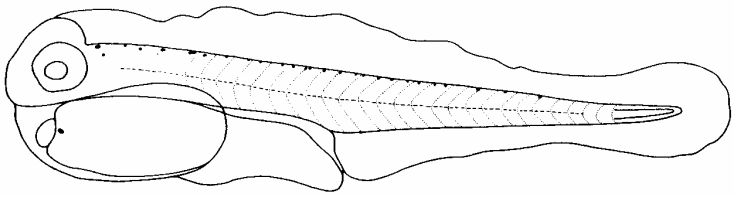
EARLY JUVENILES:
Diagnostic Characters: Color patterns.

ILLUSTRATIONS

Original drawings by J. Javech, specimens from M. L. Domeier.

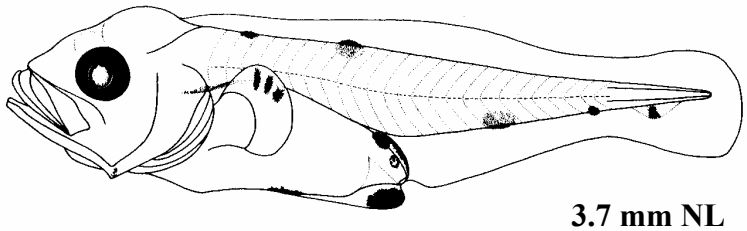
SERRANIDAE ***Hypoplectrus unicolor*** **(Walbaum 1792)**

A



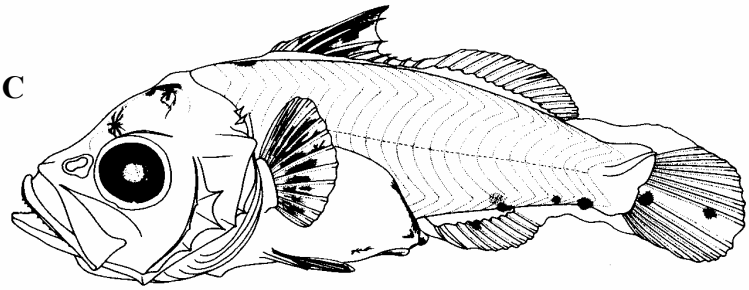
1.9 mm NL

B



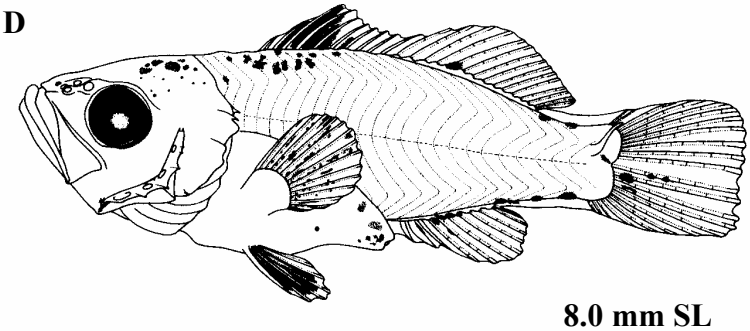
3.7 mm NL

C



5.1 mm SL

D



8.0 mm SL

SERRANIDAE — *Serraniculus pumilio* Ginsburg 1952

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	X(IX)
Second Dorsal Fin	11(10)
Anal Fin	III,7(6)
Pectoral Fin	14-15
Gill Rakers:	9-13
Lateral Line Scales:	40-46
Branchiostegals:	6 (all other serranines except *Schultzea* with 7)

LIFE HISTORY

Range: NC to FL, Gulf of Mexico, south to Venezuela. Present in Puerto Rico, but absent from other West Indies islands.
Habitat: Sand and shell bottoms near coral reefs & grass flats in 1-165 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: March - September in Gulf of Mexico.
Mode: Synchronous hermaphrodite.
Size/Age at first Maturity: Ovarian tissue matures by ca. 40mm SL, sperm tissue by as small as 23mm SL.
Longevity: unknown.

LITERATURE

Bullock & Smith 1991, Hastings 1973, Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

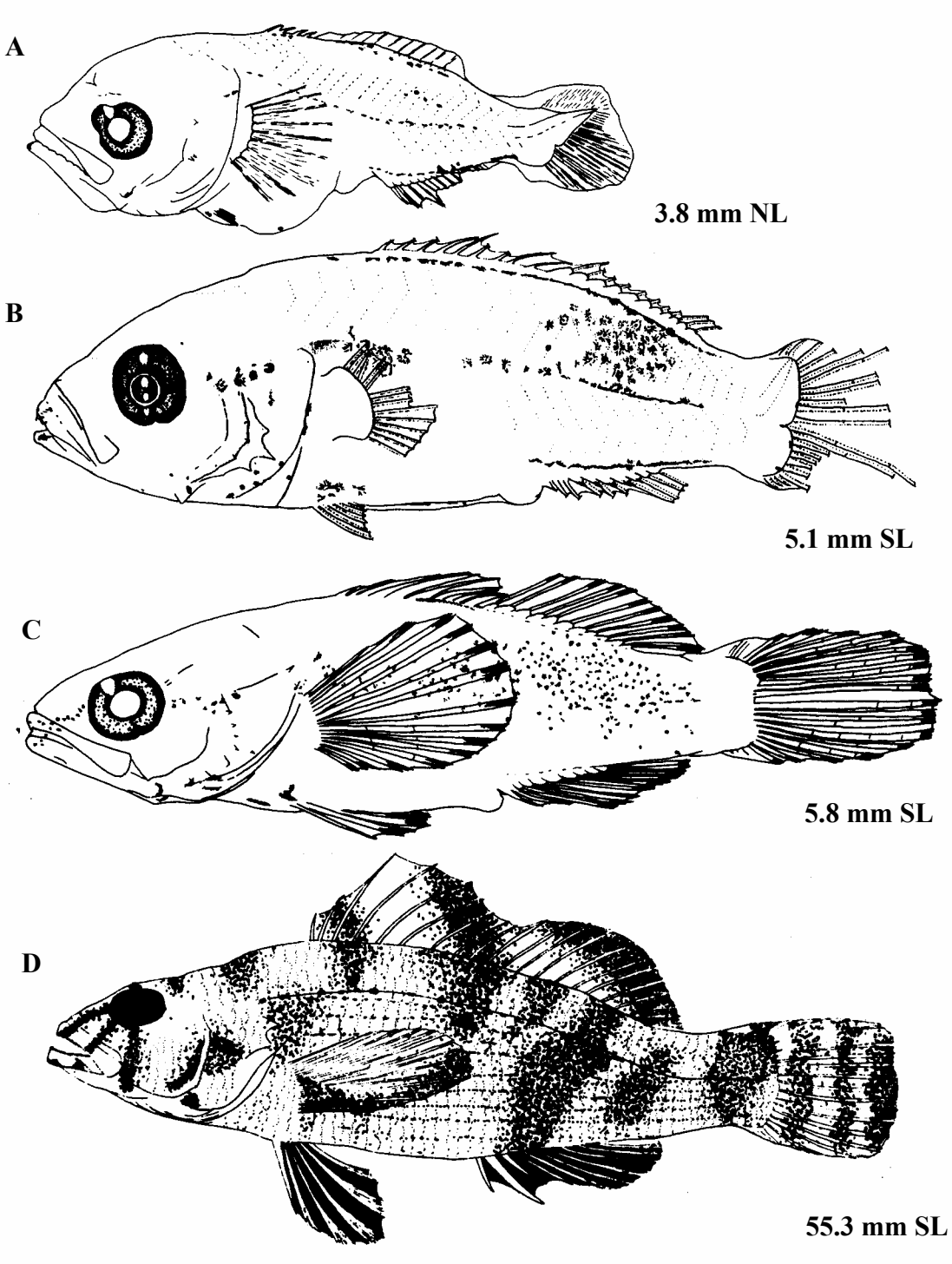
LARVAE:
Head Spination: Small spines on preopercle, less pronounced than in other serranines.
Elongate Dorsal Spines: None.
Length at Flexion: 3.8-4.3 mm NL.
Sequence of Fin Development: No precocious fin development; rays begin differentiating in all fins during flexion.
Pigmentation: Numerous small melanophores creating a pattern rather than large melanophores occupying characteristic positions as in other serranines. Pattern comprising 3 series of dashes, one along dorsum, one midlaterally, & one on ventral flank; superficial small spots over much of trunk, ventral spots small & uniform in size.
Diagnostic Characters: Pigment pattern as illustrated, counts, including branchiostegal rays.
Dorsal spines and rays of equal size.

EARLY JUVENILES:
Diagnostic Characters: Color pattern and counts.

ILLUSTRATIONS

Kendall 1979; Figure B by M. D. Greene.

SERRANIDAE ***Serraniculus pumilio* Ginsburg 1952**



SERRANIDAE *Serranus tigrinus* (Bloch 1790)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	X
Second Dorsal Fin:	12
Anal Fin:	III,7
Pectoral Fin:	14(15)
Gill Rakers:	15-19
Lateral Line Scales:	48-51

LIFE HISTORY

Range: Bermuda, NC south to east and west FL, Bahamas, Yucatan, and Caribbean.
Habitat: Coral reefs and coral rubble in shallow depths to 37m. Usually solitary or in pairs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Area: In pairs in territorial areas at sunset.
Mode: Synchronous hermaphrodites.

LITERATURE

Bullock & Smith 1991, Robins & Ray 1986, Robins & Starck 1961.

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EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

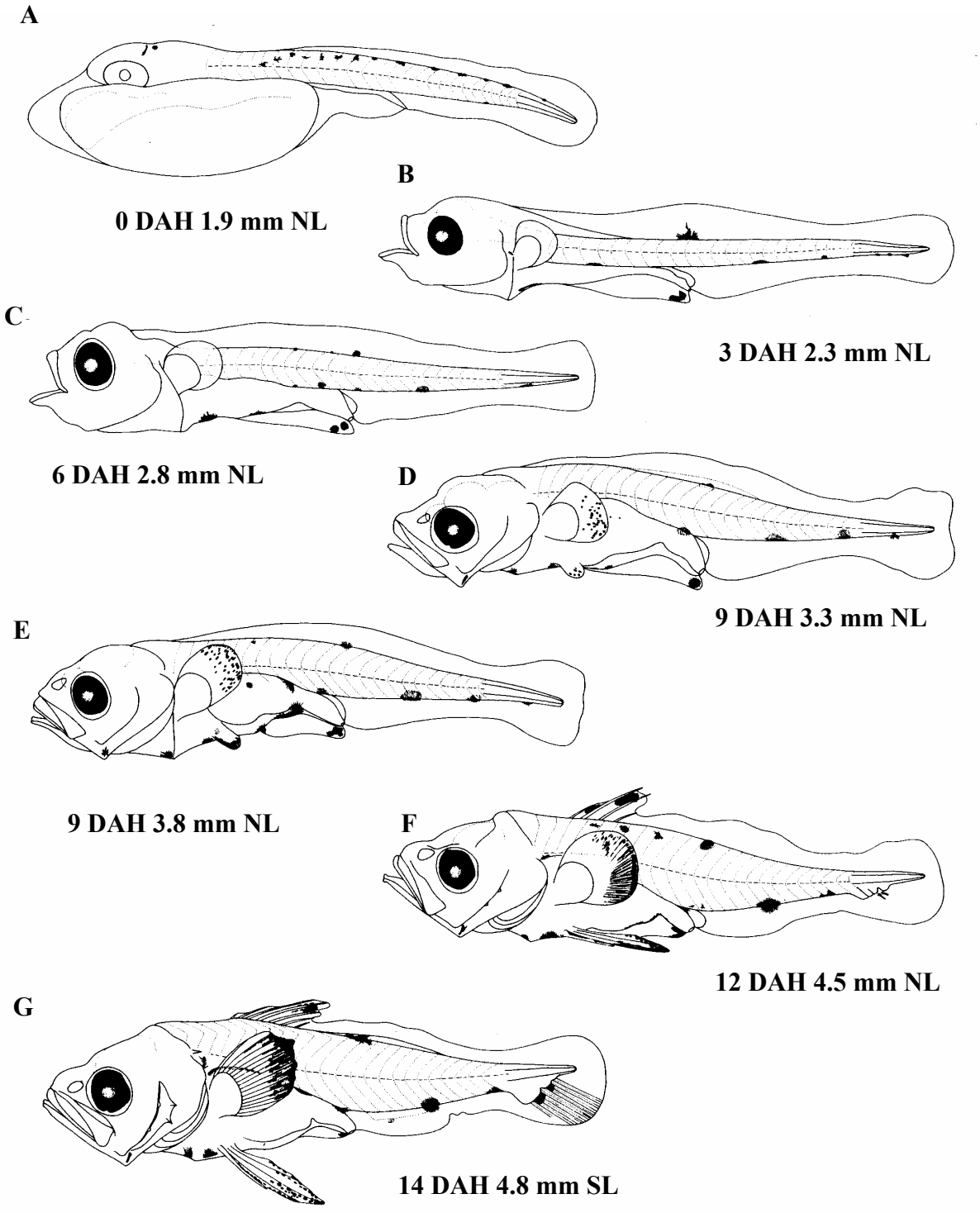
LARVAE:
Head Spination: Small spines on preopercle & subopercle, spines more prominent than in other serranines except *Diplectrum.*
Elongate Dorsal Spines: 3rd and 4th spines produced in preflexion larvae.
Length at Flexion: ca. 5 mm SL
Sequence of Fin Development: P_2, D_1, C, D_2, A, & P_1. pectoral.
Pigmentation: Characteristic spots at angular, cleithral symphysis, anus, above anal fin, on ventral caudal peduncle, & on dorsum below fins.
Diagnostic Characters: *S. tigrinus* is the only one of 14 western Atlantic species that has been reared. Precocious pelvics, produced 3rd & 4th dorsal spines, pigment pattern & counts.

EARLY JUVENILES:
Diagnostic Characters: Pigment patterns.

ILLUSTRATIONS

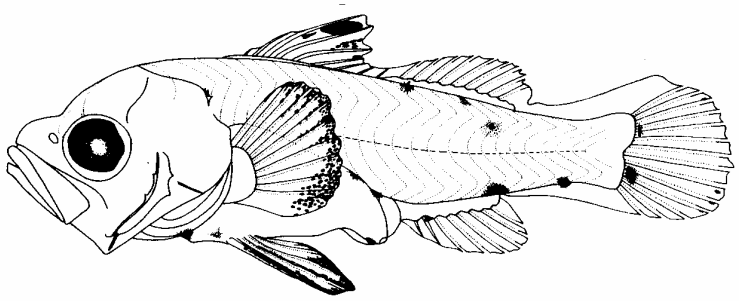
Original drawings by J. Javech from reared series, (M. L.Domeier, pers. commun.).

SERRANIDAE ***Serranus tigrinus* (Bloch 1790)**



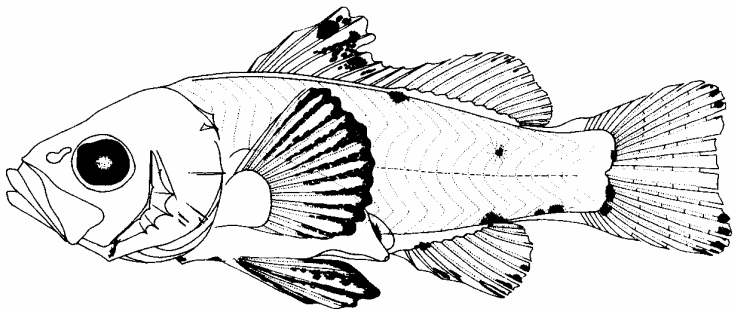
SERRANIDAE ***Serranus tigrinus* (Bloch 1790)**

H



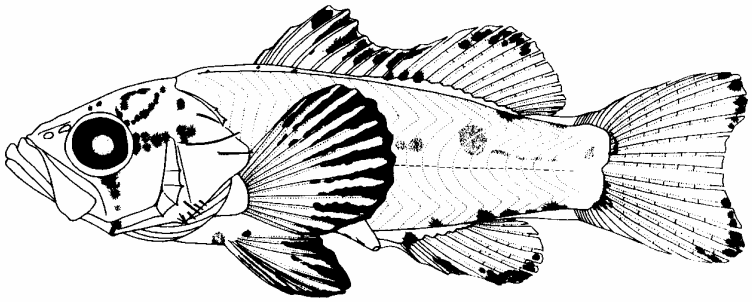
17 DAH 5.9 mm SL

I



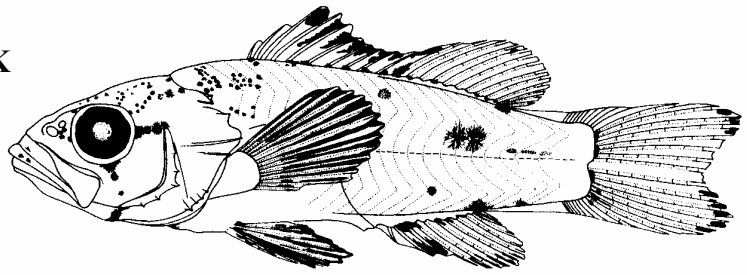
17 DAH 8.1 mm SL

J



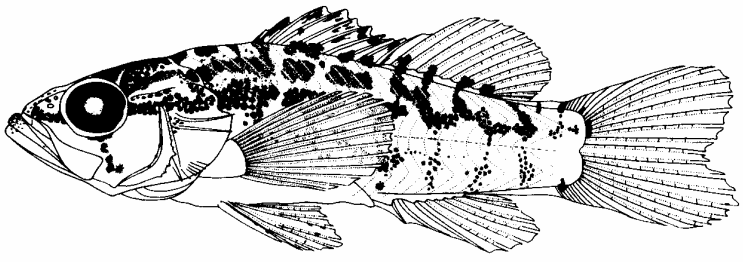
21 DAH 10.6 mm SL

K



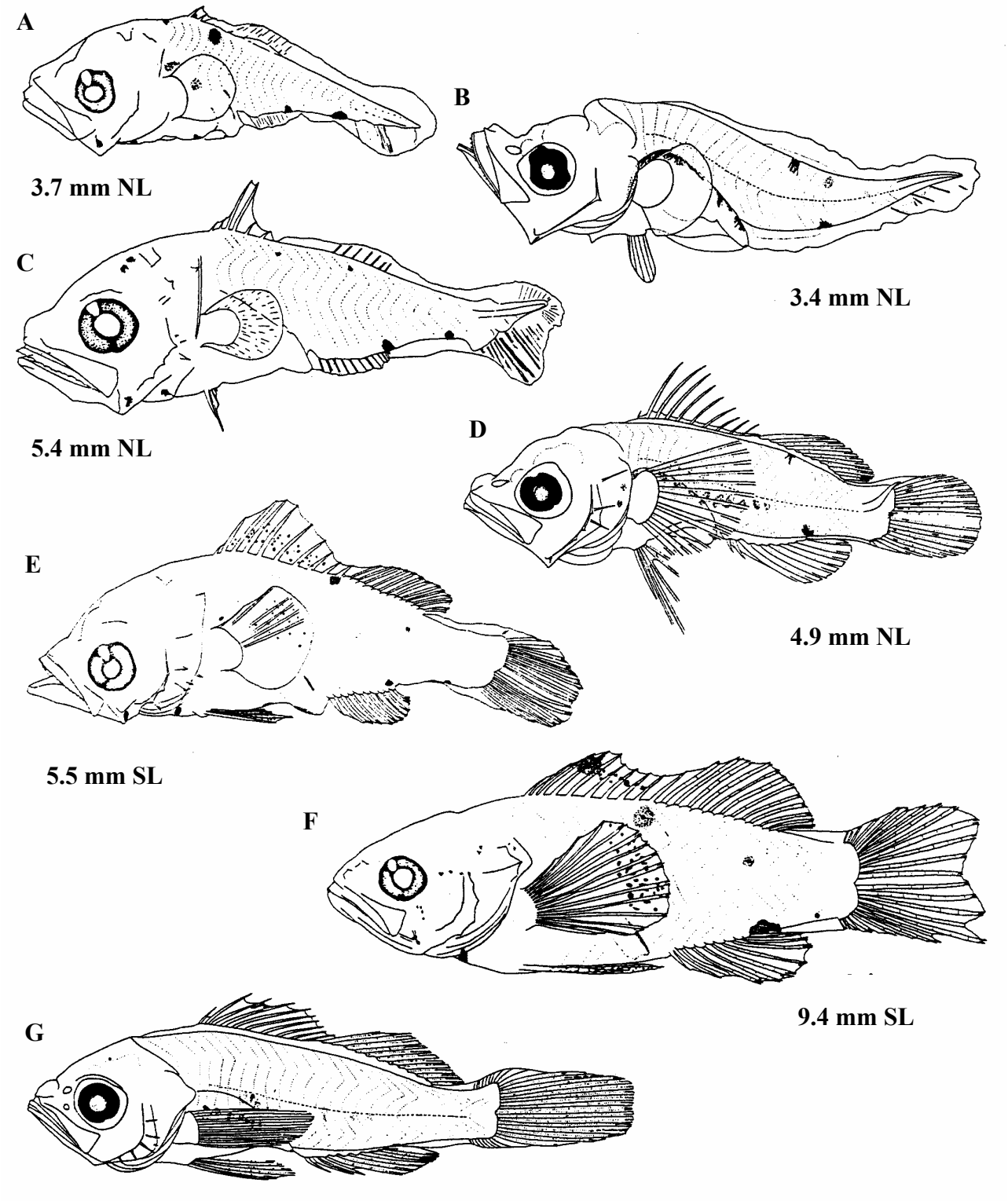
21 DAH 11.1 mm SL

L



26 DAH 14.0 mm SL

SERRANIDAE ***Serranus* sp.**



SUBFAMILY EPINEPHELINAE, TRIBE EPINEPHELINI

By W. J. Richards, C. C. Baldwin, & A. Röpke

This Tribe comprises the most commercially and recreationally important fishes in the Family Serranidae. The adults of the world have been treated by Heemstra and Randall (1993). They listed 24 species in 7 genera for our area. Many other papers on this group recognize only 4 genera, with *Alphestes*, *Cephalopholis*, and *Dermatolepis* treated as species groups within *Epinephelus*. To avoid confusion on this subjective question, we have listed these 3 as subgenera within *Epinephelus*. Adults present some identification problems due to color morphs. Juveniles also present similar difficulties, though not all are known or clearly described. A few individual accounts of eggs have appeared, but no treatment for identification exists and likely will not occur until eggs of all the species have been collected from known adults.

Grouper larvae have been rare in recent ichthyoplankton samples, possibly due to the depletion of many adult stocks from fishing. Larvae are characterized by the presence of a very short and stout, first dorsal fin spine; elongate and serrate second first dorsal fin spine that has a modified serially associated (first) pterygiophore; third first dorsal spine maybe elongate; elongate and serrate pelvic-fin spines; a moderately deep, laterally compressed body; and 24 myomeres. Kendall (1979) noted that they are kite-shaped, but they are not as strikingly kite-shaped as the gempylid *Diplospinus*. The gut is small and triangular with variable pigment over it. The head is large with a large mouth and round eye. The preopercle, posttemporal, and supracleithrum bear spines in all genera, and all but *Gonioplectrus* have spines on the interopercle and subopercle as well (Kendall & Fahay, 1979, Baldwin et al. 1991). The spine at the angle of the preopercle is large and serrate. There is little pigment on the head which is confined to the brain case. Trunk pigment is sparse but all have some pigment laterally on the caudal peduncle, and Mycteroperca and a few species of Epinephelus have a pigment spot on the cleithral symphysis. The second and third dorsal-fin spines and pelvic spine have consistent spinelet morphology that, together with numbers of dorsal- and pectoral-fin elements, have been shown by Johnson & Keener (1984) to be useful in identifying to genus larvae as small as 4-5 mm and many of the species of Epinephelus. In preparing this account, the first author noted some variation in counts as reported by Johnson & Keener (1984), Heemstra & Randall (1993), and Rivas (1964), as shown in Table Serranidae 2. The comprehensive table of serranid meristics (Table Serranidae 1) contains the counts used in the species accounts below. Counts among species are extremely similar, and great care must be taken in making counts and observing spine morphology to identify larvae. A provisional key that uses fin-ray counts, spinelet features of the second dorsal- and pelvic-fin spines, pigmentation, and cranial features to separate larvae is provided below. Characters used in the key are derived from Table Serranidae 1 and from Johnson & Keener (1984). There is much overlap and similarity among species in characters included in the key below, and it is recommended that specimens be cleared and stained to assist in accurately making counts and characterizing spinelet morphology. Specimens need not be bleached in this process so that the pigmentation may be retained. Pigmentation is so sparse that it will not interfere with observation of other characters.

In cases where counts and spinelet morphology cannot be assessed, identification is problematic. Unfortunately, the long dorsal and pelvic spines are very fragile, and it is rare to get a specimen with these spines clearly intact. In life and when intact, these spines have fleshy tips that are heavily pigmented. Elongate spines are presumed to be defensive by giving an appearance of a large size to the small larvae (Colin & Koenig 1996).

Provisional Key to Larvae of the Epinephelini.

1a. Dorsal fin VIII,13; anal fin III,7; dorsal and pelvic spines with furrowed appearance ..... *Gonioplectrus hispanus*
1b. Dorsal fin with more than 8 spines and usually more than 13 rays, anal fin with more than 7 rays, dorsal and pelvic spines with spinelets but lacking furrowed appearance 2
2a. Dorsal fin IX,17-19; anal fin III,8-10; spinelets on second dorsal fin enlarged, narrow, and curved ..... *Paranthias furcifer*
2b. Dorsal fin IX-XI,13-18; anal fin III,7-10; spinelets on second dorsal fin not enlarged, narrow or curved 3
3a. Dorsal fin XI,14-18; anal fin III,8-13; enlarged recurved spinelets on second dorsal spine and primary ridge of pelvic spine; cleithral symphysis with one or more melanpohores 4
3b. Dorsal fin XI,13-20; anal fin III,8-10; no enlarged recurved spinelets on second dorsal or pelvic spines; cleithral symphysis with no melanophores 6
4a. Dorsal fin XI,15-18; anal fin III,10-13 ..... *Mycteroperca*
4b. Dorsal fin XI,14-16; anal fin III,8 5
5a. Spinelets enlarged and bifurcate near base of second dorsal spine and base of primary ridge of pelvic spine ..... *Epinephelus cruentatus*
5b. Spinelets not bifurcate near base of second dorsal spine and pelvic spine ..... *Epinephelus itajara*
6a. Dorsal fin XI,18-20; anal fin III,9(8-10); dorsal spinelets enlarged, widely spaced, and straight ..... *Epinephelus inermis*
6b. Dorsal fin IX-XI,13-19; anal fin III,8-10; dorsal spinelets not enlarged widely spaced and straight 7
7a. Anal fin III,8; spinelets on second dorsal and pelvic spines small and straight ..... *Epinephelus striatus* & *E. adscensionis*
7b. Anal fin III,9 8
8a. Pectoral rays 17-18; dorsal fin XI,15-17; spinelets on second dorsal and pelvic spines small and straight 9
8b. Pectoral fin rays 18; dorsal fin rays XI,14; spinelets on second dorsal spine and primary ridge of pelvic spine enlarged and recurved, small and straight on secondary pelvic ridge ..... *Epinephelus niveatus* & *E. flavolimbatus*
8c. Pectoral fin rays 17-18; dorsal fin XI,15; spinelets on second dorsal and primary and secondary ridges of pelvic spines enlarged and recurved ..... *Epinephelus mystacinus* & *E. nigritus*
9a. Cranium rugose ..... *Epinephelus afer*
9b. Cranium smooth 10
10a. Pectoral fin rays 17 ..... *Epinephelus morio*, *E. guttatus*, & *E. drummondhayi*
10b. Pectoral fin rays 18 ..... *Epinephelus fulvus*

Table Serranidae 2. Fin-ray counts of groupers from Rivas 1964, Johnson & Keener 1984 (J & K), Heemstra & Randall 1993 (H & R).

Species	Source	D1	D2	A	P1
afer	Rivas				
	J & K	XI	17-18	III,9	17
	H & R	XI	17-19	III,9	16-17
cruentatus	Rivas				
	J & K	IX	14	III,8	16
	H & R	IX	13-15	III,8	16
fulvus	Rivas				
	J & K	IX	15	III,9	18
	H & R	IX	15(14-16)	III,9	17-19
inermis	Rivas				
	J & K	XI	19-20	III,9	18-19
	H & R	XI	18-20	III,8-10	18-19
drummondhayi	Rivas	XI	16(15)	III,9	18
	J & K	XI	15-17	III,9	18
	H & R	XI	15-16	III,9	18
morio	Rivas	XI	16-17	III,9(10)	17(16-18)
	J & K	XI	15-17	III,9	17
	H & R	XI	16-17	III,8-10	16-18
guttatus	Rivas	XI	16(15)	III,8(7)	17(16)
	J & K	XI	15-17	III,9	17
	H & R	XI	15-16	III,8	16-18
flavolimbatus	Rivas	XI	13-14(15)	III,9	18
	J & K	XI	14	III,9	18
	H & R	XI	13-15	III,9	17-18
niveatus	Rivas	XI	14(13)	III,9	18(19)
	J & K	XI	14	III,9	18
	H & R	XI	13-15	III,9	17-19
striatus	Rivas	XI	17(16-18)	III,8	18(17)
	J & K	XI	16-17	III,8	18-19
	H & R	XI	16-18	III,8	17-19
adscensionis	Rivas	XI	17(16)	III,8	19(18)
	J & K	XI	16-17	III,8	18-19
	H & R	XI	16-18	III,8	18-20
mystacinus	Rivas	XI	15	III,9	18-19
	J & K	XI	14-15	III,9	18-19
	H & R	XI	14-15	III,9(8)	18-19
nigritus	Rivas	X	14(13-15)	III,9	18(19)
	J & K	X	14-15	III,9	18-19
	H & R	X	13-15	III,9	18-19

Table Serranidae 2, (Continued).

Species	Source	D1	D2	A	P1
itajara	Rivas	XI	16(15)	III,8	19
	J & K	XI	15-16	III,8	18-19
	H & R	XI	15-16	III,8	18-19
Mycteroperca	Rivas				
	J & K	III,11(10-13)			
	H & R	XI	15-18	III,10-13	15-18
Paranthias	Rivas				
	J & K	IX	18-19	III,9	20
	H & R	IX	17-18(19)	III,8-9(10)	19-20
Gonioplectrus	Rivas				
	J & K	VIII	13	III,7	16
	H & R	VIII	13	III,7	16-17

SERRANIDAE *Epinephelus (E.) adscensionis* (Osbeck 1765)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	16-18
Anal Fin	III,8
Pectoral Fin	18-20
Gill Rakers:	7-9+16-19=23-28
Lateral Line Scales:	48-53

LIFE HISTORY

Range: MA to FL, Bermuda, Gulf of Mexico, Caribbean to southern Brazil.
Habitat: Rocky reefs in depths of 2-100 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Size/Age at First Maturity: Females at 25 cm TL.

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS:
Indistinguishable from *E. striatus.*

LARVAE:
2nd Dorsal Spine Length: 40% SL in one 10.5 mm SL larva.
Diagnostic Characters: Counts identical to *E. striatus*. Both species with spinelets simple, straight, & quite small. Cannot be separated from *E. morio, E. guttatus, & E. drummondhayi* until A fin complete.

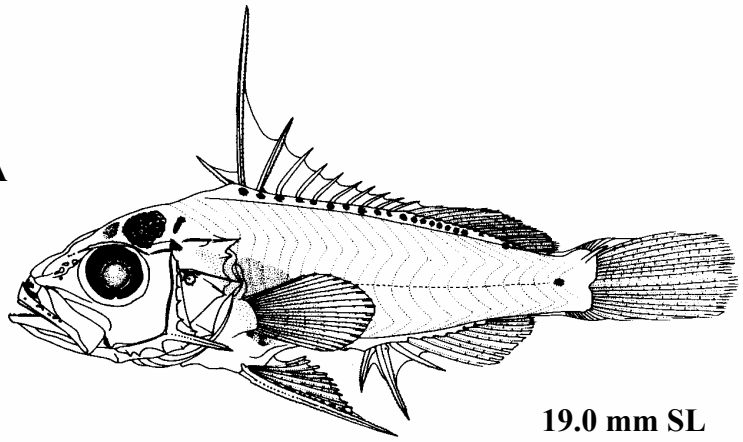
EARLY JUVENILES:
Diagnostic Characters: Color pattern like adult but with fewer and larger dark spots on head, body, & fins.

ILLUSTRATIONS

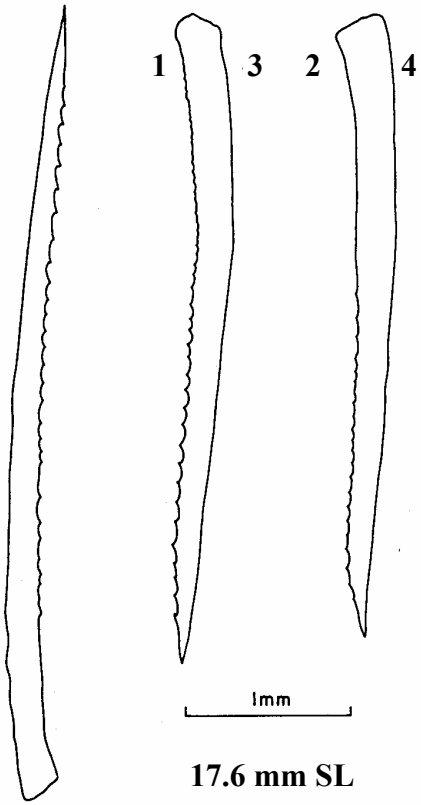
D & P_2 spines from Johnson & Keener 1984.

SERRANIDAE ***Epinephelus (E.) adscensionis* (Osbeck 1765)**

A



19.0 mm SL



17.6 mm SL

SERRANIDAE

Epinephelus (Alphestes) afer (Bloch 1793)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	17-18(19)
Anal Fin	III,9
Pectoral Fin	16-17
Gill Rakers:	6-8+16-17
Lateral Line Scales:	55-61

LIFE HISTORY

Range: South Florida, Bermuda, south through Antilles to Brazil.
Habitat: Shallow-water in seagrasses & crevices, cryptic & sedentary.
ELH Pattern: Oviparous; pelagic eggs & larvae.

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

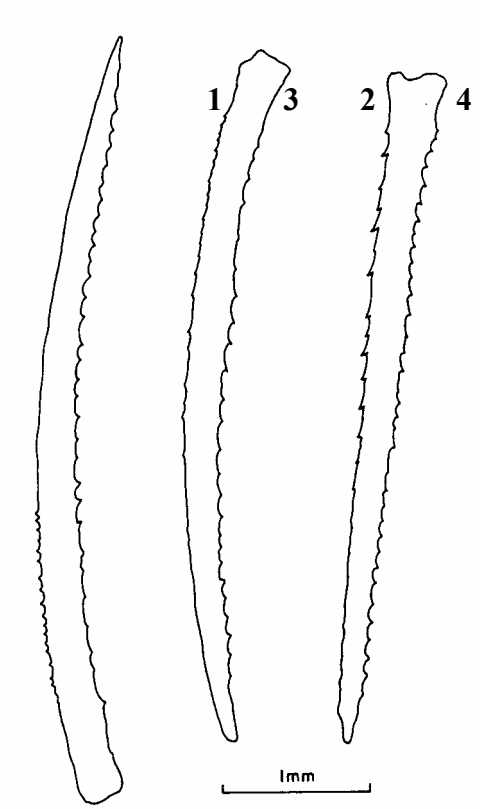
EGGS:
Number of Oil Globules: single at anterior end of yolk-sac.

LARVAE:
Head Spination: rugose at 13.5 mm SL.
2nd Dorsal Spine Length: 25-59% SL.
Diagnostic Characters: Meristics shared with *E. morio* & *E. guttatus*; spines similar to *E. morio* & *E. striatus* species groups. Wing margin spinelets somewhat more widely spaced & curved toward spine tip. Pelvic ridge spinelets small & straight, those along proximal ½ of 4th slightly enlarged & inclined toward tip. Most with 18 dorsal rays (15-17 in *E, morio* group).

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984.

SERRANIDAE ***Epinephelus (Alphestes) afer*** **(Bloch 1793)**



17.0 mm SL

SERRANIDAE

***Epinephelus (Cephalopholis) cruentatus* (Lacepède 1802)**

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	IX
Second Dorsal Fin	14(13-15)
Anal Fin	III,8
Pectoral Fin	16-16
Gill Rakers:	10+9-11=18-25
Lateral Line Scales:	47-51

LIFE HISTORY

Range: NC, Bermuda, Bahamas, Gulf of Mexico and Caribbean.
Habitat: Shallow seagrass beds & coral reefs to 170 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: August-September.
Area: Throughout range.
Size/Age at First Maturity: Females at 16cmTL. Sex change at 20-23cm.

LITERATURE

Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

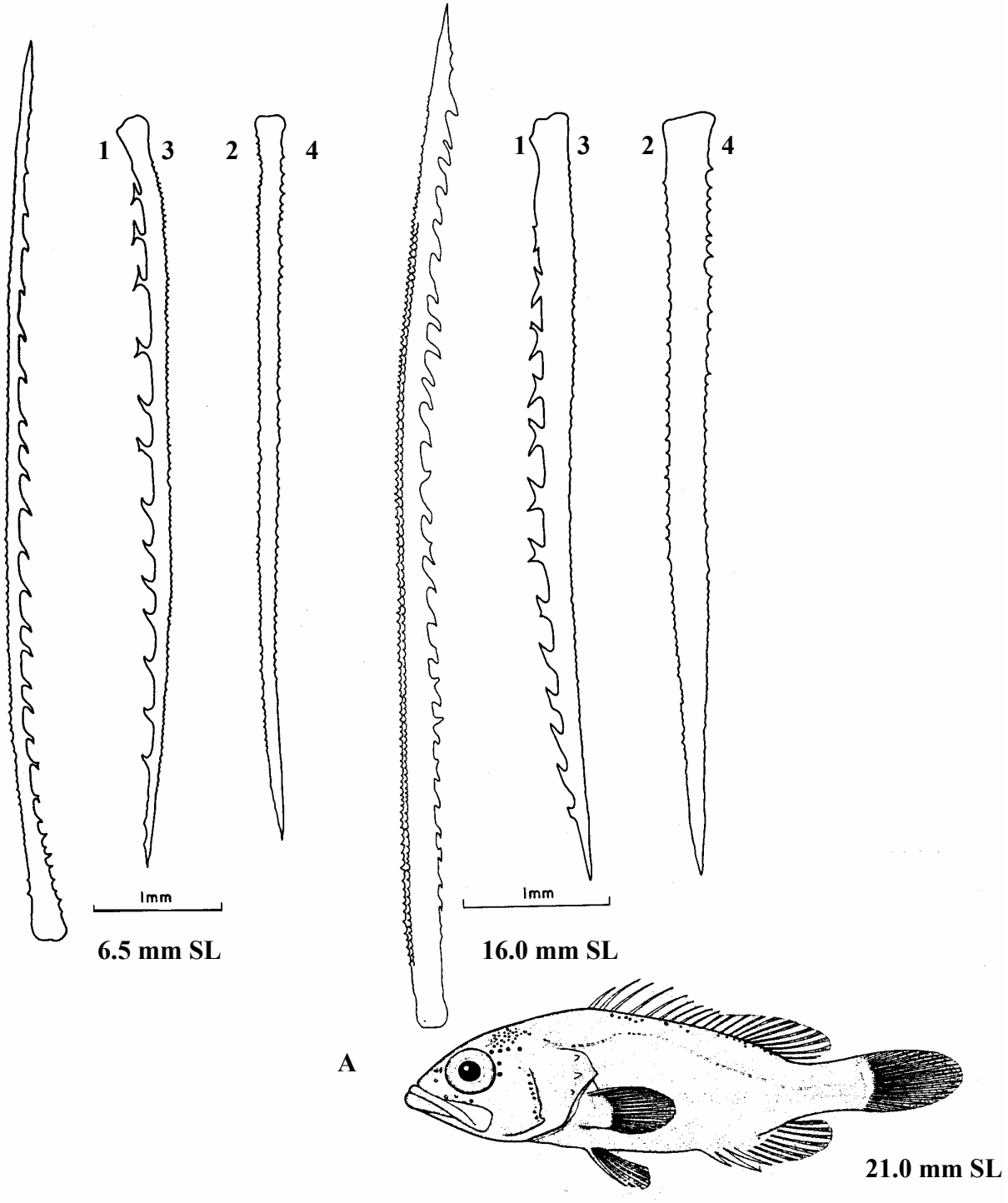
EGGS: Unknown.

LARVAE:
2nd D Spine Length: 80-105% SL in larvae <10 mm; 20-49% SL in larvae >17 mm.
Diagnostic Characters: Counts; first ridge of P_2 fin spine with several enlarged, widely spaced bifurcate spinelets proximally, followed by a series of recurved spinelets. Bifurcate spinelets occurring occasionally in a few other species. Also small pigment spot on cleithral symphysis shared with *E. itajara* & *Mycteroperca.*

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984.
Juvenile from Heemstra & Randall 1993.

SERRANIDAE ***Epinephelus (Cephalopholis) cruentatus*** **(Lacepède 1802)**



SERRANIDAE — *Epinephelus (E.) drummondhayi* G & B 1878

MERISTICS

Vertebrae	
Precaudal :	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays	
First Dorsal Fin:	XI
Second Dorsal Fin:	16(15-17)
Anal Fin:	III, 9
Pectoral Fin:	18
Gill Rakers:	9-10+17-18=26-28
Lateral line scales:	72-76

LIFE HISTORY

Range: Bermuda, NC to northern & eastern Gulf of Mexico. Reports from Cuba & Bahamas questionable.
Habitat: Rocky bottoms in 25-183m, most common in 60-120 m.
ELH Pattern: oviparous, pelagic eggs & larvae.
Spawning:
Season: August in Gulf of Mexico.
Age at First Maturity: Females at 45-60cmTL, age 4-5 years. Become males at ages 7-14.
Longevity: ca. 25 years

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown?

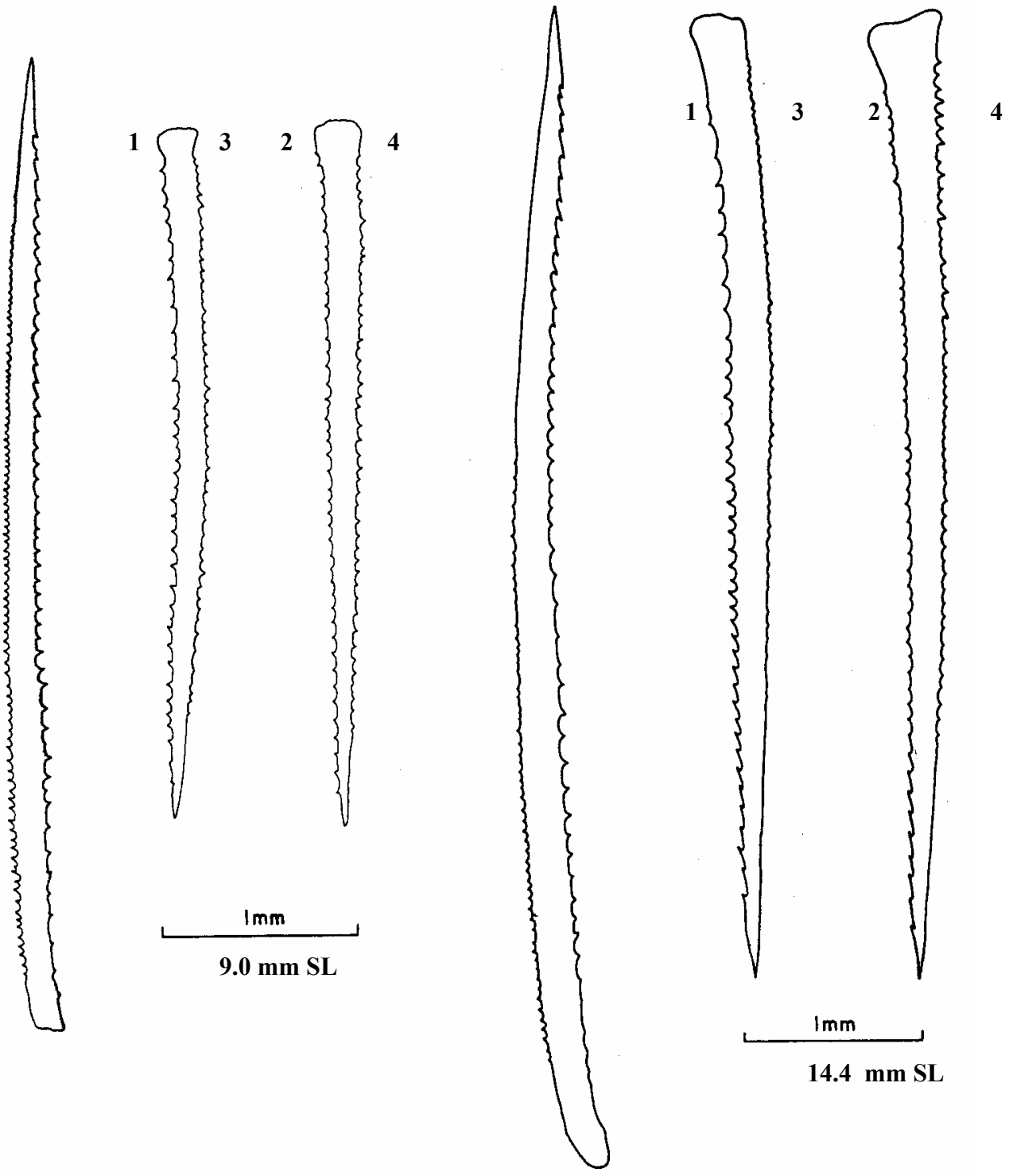
LARVAE:
2nd D Spine Length: 46-67% SL in larvae 6-14 mm SL
Diagnostic Characters: Fin-ray counts plus spinelet morphology: counts identical to those of *E. guttatus* & *E. morio* except *E. drummondhayi* usually with more P_1 rays; all spinelets simple, small, & straight.

JUVENILES:
Diagnostic Characters**:** Body bright yellow & covered with small bluish spots.

ILLUSTRATIONS

Dorsal and pelvic spines from Johnson & Keener 1984.

SERRANIDAE ***Epinephelus (E.) drummondhayi* G & B 1878**



SERRANIDAE

***Epinephelus (E.) flavolimbatus* Poey 1865**

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	14(13-15)
Anal Fin	III,9
Pectoral Fin	18(17-19)
Gill Rakers:	8-9+15-17=23-25
Lateral Line Scales:	ca. 65

LIFE HISTORY

Range: NC to southern Brazil, including Gulf of Mexico & Caribbean; absent from Bermuda.
Habitat: Rocky areas & sand/mud bottoms 64-275 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Size/Age at First Maturity: Females at 52-60 cm TL. Become males at 75 cm TL.
Longevity: ca. 20 years.

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS:

Diagnostic Characters: Indistinguishable from *E. niveatus.*

LARVAE:

2nd Dorsal Spine Length: 65-86% SL in larvae 4-19 mm SL.

Diagnostic Characters: Counts identical to those of *E. niveatus*. Both species with elongate spine morphology as in *Mycteroperca*: Large recurved spinelets with smaller spinelets proximally. Pelvic primary ridge like 2nd D_1 spine, remaining ridges with small straight spinelets, those near base of 4th slightly enlarged.

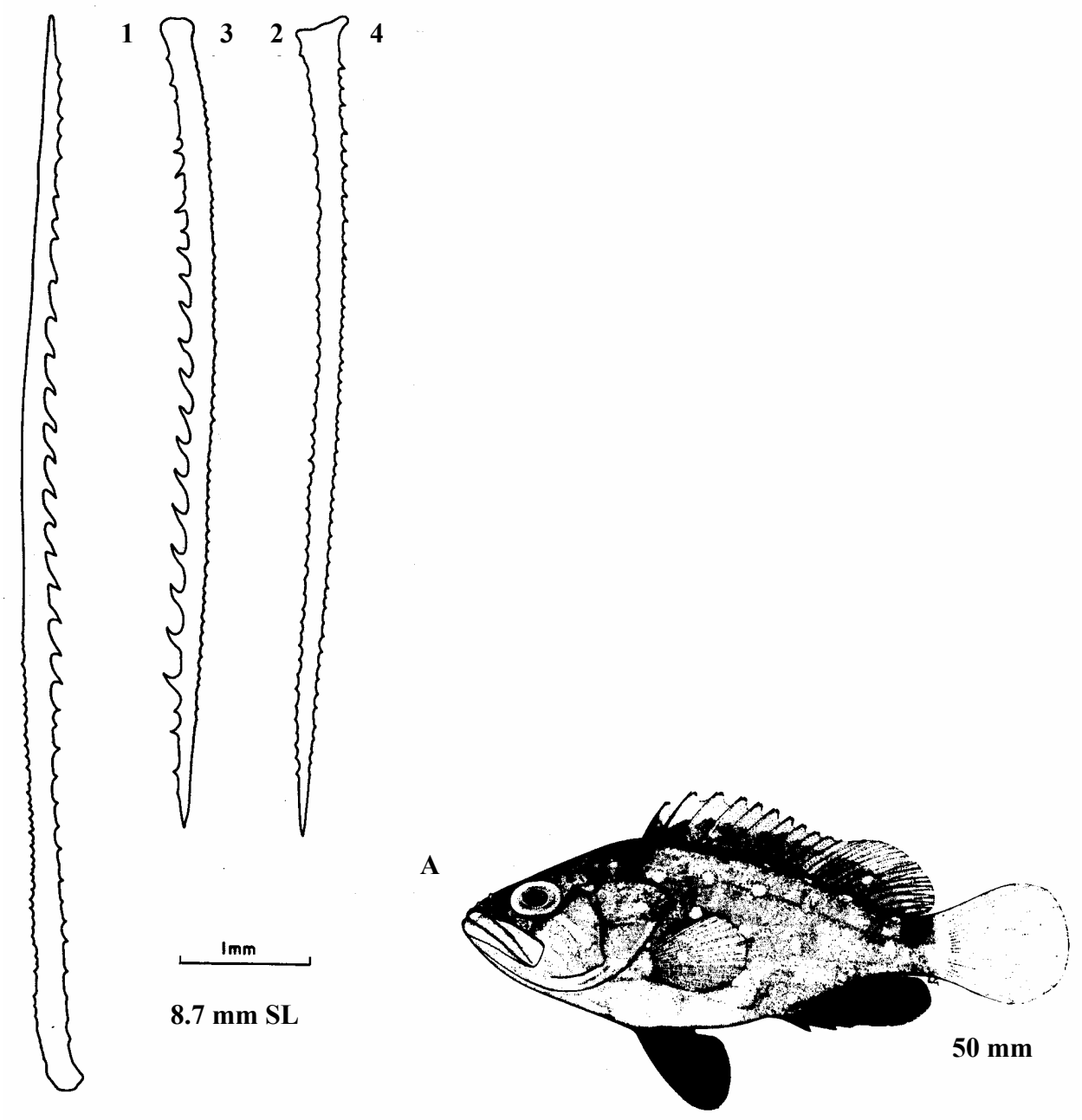
EARLY JUVENILES:

Diagnostic Characters: 5-10 cm with pearly spots in 4 longitudinal rows and 7 vertical columns, D fin with broad yellow margin, C fin white, A & P_2 fins blackish; may have caudal peduncle black saddle.

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984; juvenile from Heemstra & Randall 1993.

SERRANIDAE ***Epinephelus (E.) flavolimbatus* Poey 1865**



SERRANIDAE

***Epinephelus (Cephalopholis) fulvus* (Linn. 1758)**

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
First Dorsal Fin:	IX
Second Dorsal Fin:	15(14-16)
Anal Fin:	III,9
Pectoral Fin:	18(17-19)
Gill Rakers:	7-9+17 (16-18)=23-27
Lateral Line Scales:	46-54

LIFE HISTORY

Range: SC, Bermuda, Bahamas, Gulf of Mexico & Caribbean to Brazil & Atol das Rocas.
Habitat: Coral reefs and clear water to 45m, not in silty shallow reefs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
- Season: May to August in Bermuda. December-January in Bahamas, January-March in Jamaica.
- Area: Throughout range.
- Mode: Aggregations at sunset over several days.

Size/Age at First Maturity: Females at 16 cm TL, Sex change at 20 cm.

LITERATURE:

Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

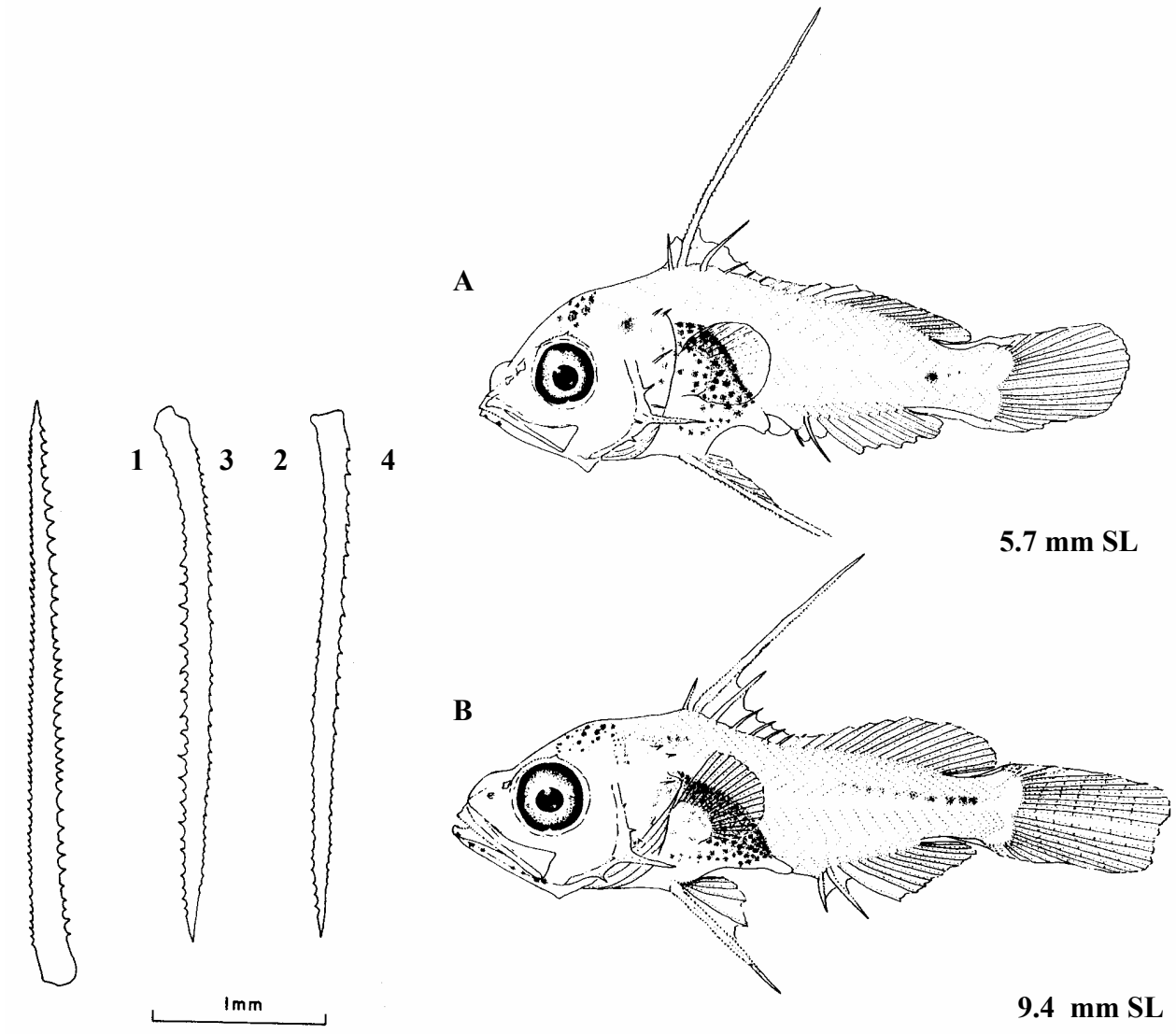
EGGS:
Diameter: 0.95 mm.
No. of Oil Globules: One.

LARVAE
Head Spination:
2nd D Spine Length: 48-55% SL in larvae 5.5-8.4 mm SL; relative size of spines decreasing in specimens ca. 22-25 mm SL.
Diagnostic Characters: Counts, especially 9 D spines.
Spines of generalized type with spinelets simple, straight & relatively small. Most spinelets on apex ridge curved toward tip.

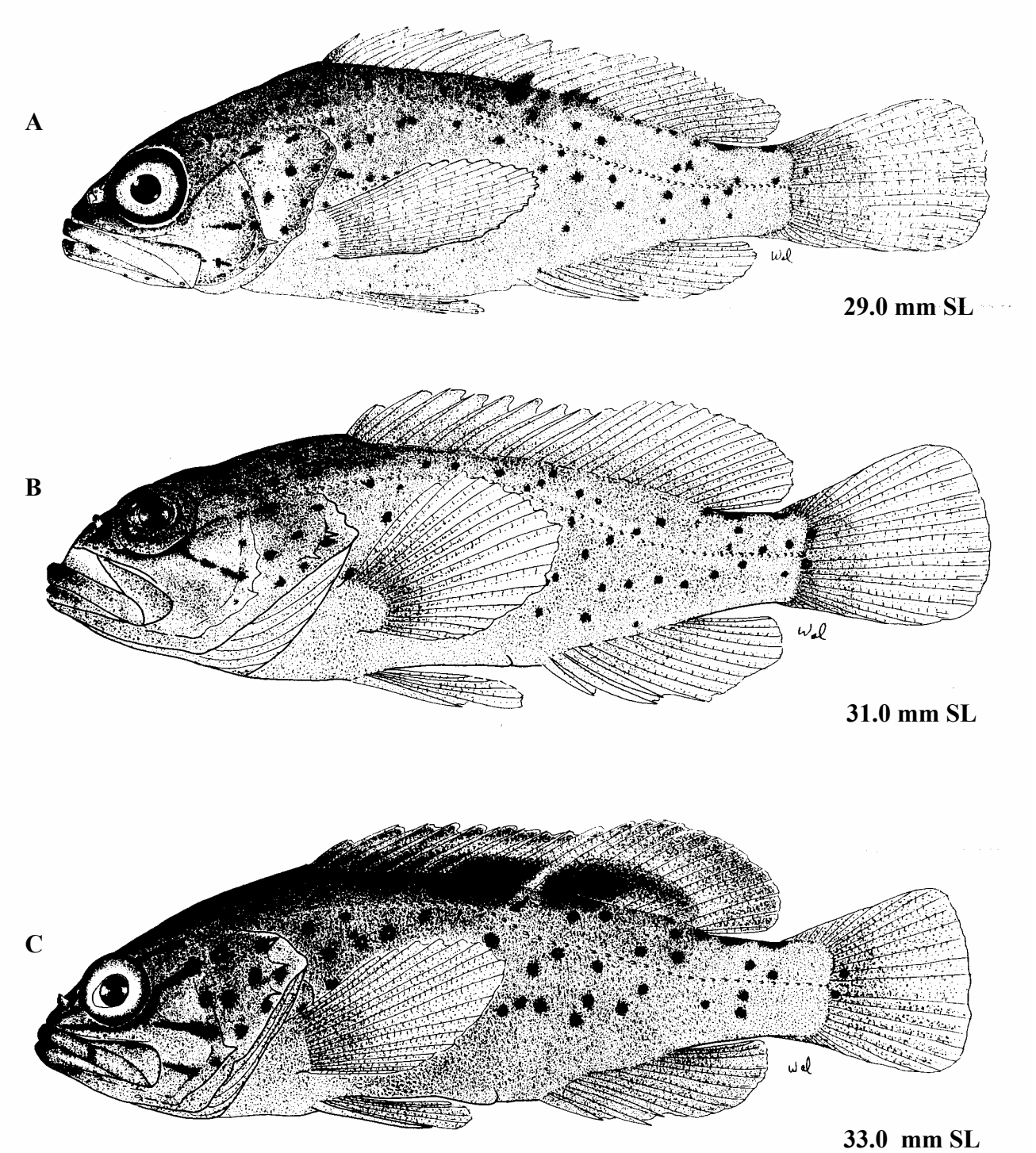
ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984;
Larvae from Laroche (orig);
Juvenile from Laroche (orig).

SERRANIDAE ***Epinephelus (Cephalopholis) fulvus* (Linn. 1758)**



SERRANIDAE ***Epinephelus (Cephalopholis) fulvus* (Linn. 1758)**



SERRANIDAE — *Epinephelus (E.) guttatus* (Linn. 1758)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
First Dorsal Fin:	XI
Second Dorsal Fin:	16(15-17)
Anal Fin:	III,8-9(7)
Pectoral Fin:	17(16-18)
Gill Rakers:	8-9+16-18=24-26
Lateral Line Scales:	92-104

LIFE HISTORY

Range: Bermuda, NC to Venezuela, Gulf of Mexico & Caribbean.
Habitat: Shallow reefs & rocky bottoms in 2-100 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: January-February in during full moon.
Area: Caribbean.
Mode: Aggregations on outer top reefs in 20 m.
Size/Age at First Maturity: Females at 22-24 cm TL, become males at 28-40 cm TL.
Longevity ca. 22 years.

LITERATURE:

Colin et al. 1987, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

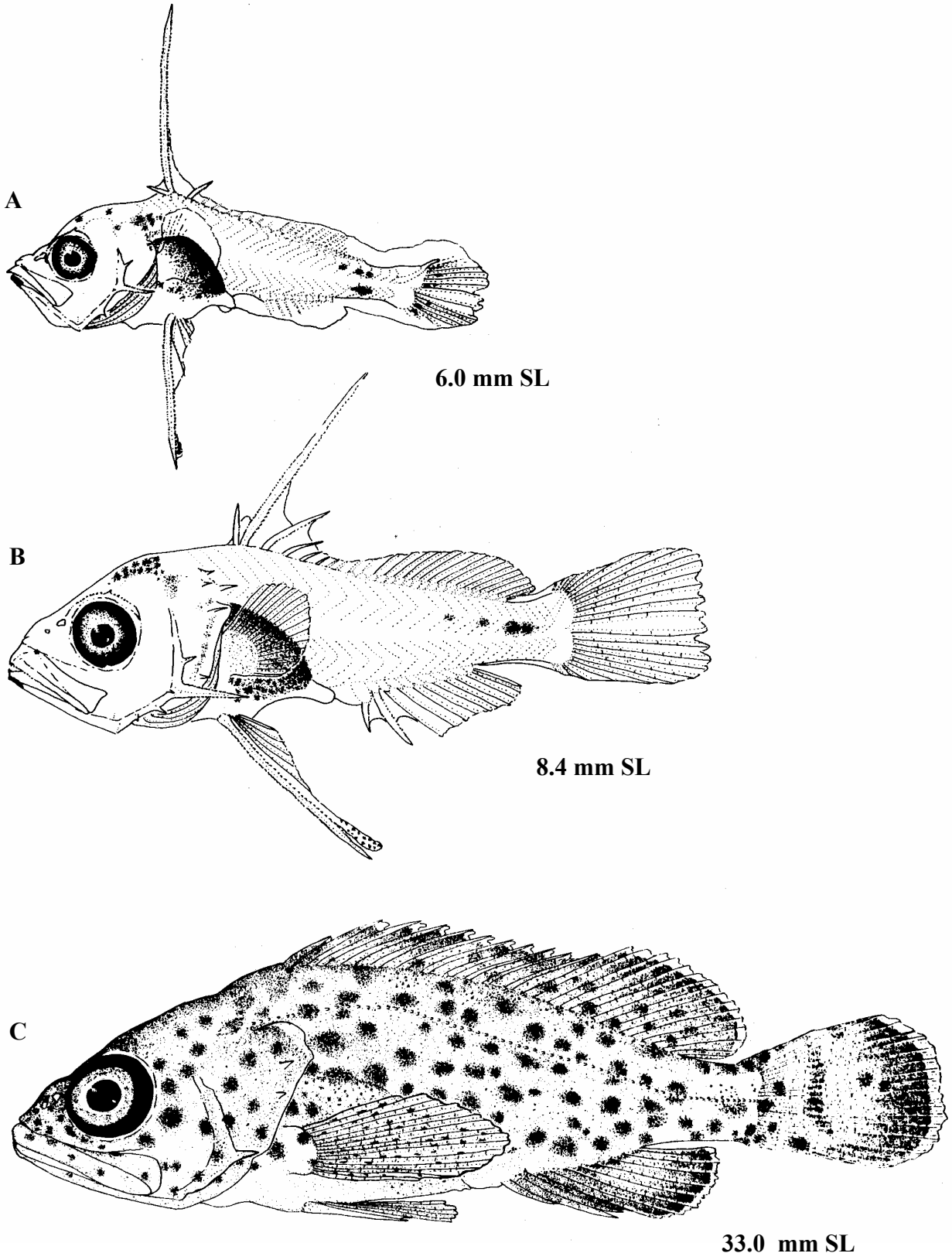
EGGS:
Diameter: 0.96-0.97 mm.
No. of Oil Globules: usually one, some with multiple smaller globules.
Oil Globule Diameter: 0.22 mm.
Yolk: clear.
Incubation: 27 hr at 26.5^{o} C.

LARVAE
2nd D Spine Length: 46-67% SL in specimens of 6-14 mm SL.
Diagnostic Characters: Counts identical to those of *E. morio* & *E. drummondhayi* except the latter usually with more P_1 fin rays. All spinelets simple, small, and straight.

ILLUSTRATIONS

Larvae from Laroche; juvenile from Heemstra & Randall 1993.

SERRANIDAE ***Epinephelus (E.) guttatus* (Linn. 1758)**



SERRANIDAE

***Epinephelus (Dermatolepis) inermis* (Val. 1833)**

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
First Dorsal Fin:	XI
Second Dorsal Fin:	18-20
Anal Fin:	III,9(8-10)
Pectoral Fin:	18-19
Gill Rakers:	19-22
Lateral Line Scales:	115-125

LIFE HISTORY

Range: NC to Rio de Janiero, Brazil including Gulf of Mexico.
Habitat: Reef caves & crevices 21-213 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.

LITERATURE:

Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

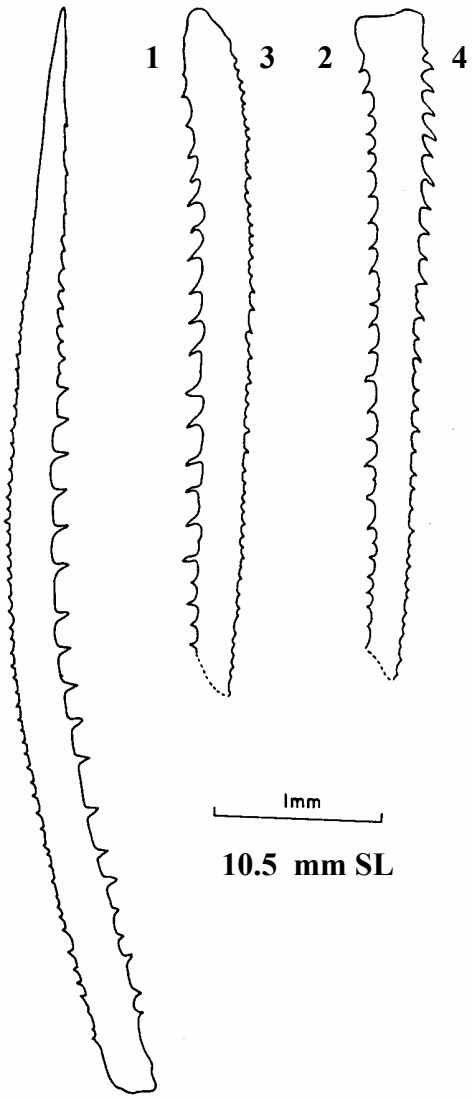
LARVAE
Head Spination: smooth.
Diagnostic Characters: Counts unique & 2nd D_1 fin spine with widely spaced, straight spinelets about 3/4 length followed distally by smaller, slightly curved ones. Single apex ridge bearing small straight spinelets. Spinelets of pelvic primary ridge fairly large, narrow, slightly curved toward spine tip. Ridges 2 & 4 bearing smaller, narrow spinelets that curve slightly toward tip, with those of 4th enlarged proximally. Ridge 3 bearing small straight/slightly curved spinelets.

EARLY JUVENILES:
Pigment: Black or dark brown covered with white spots & blotches.
Diagnostic Characters: Counts & pigmentation.

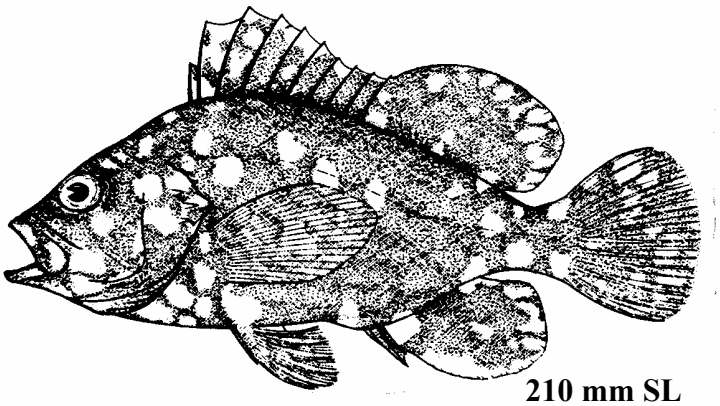
ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984; juvenile from Heemstra & Randall 1993.

SERRANIDAE ***Epinephelus (Dermatolepis) inermis*** **(Val. 1833)**



10.5 mm SL



210 mm SL

SERRANIDAE *Epinephelus (E.) itajara* (Lichtenstein 1822)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	16(15)
Anal Fin	III,8
Pectoral Fin	18-19
Gill Rakers:	8-9+13-15=21-24
Lateral Line Scales:	61-64

LIFE HISTORY

Range: SC, Bermuda, Bahamas, Gulf of Mexico & Caribbean to Brazil & Atol das Rocas.
Habitat: Coral reefs & clear water to 45 m, not in silty shallow reefs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning:
Season: May to August in Bermuda, December-January in Bahamas, January-March in Jamaica.
Area: Throughout range.
Mode: Aggregations at sunset over several days.
Size/Age at First Maturity: Females at 16cmTL, Sex change at 20 cm.

LITERATURE

Johnson & Keener 1984, Heemstra & Randall 1993.

EARLY LIFE HISTORY DESCRIPTION

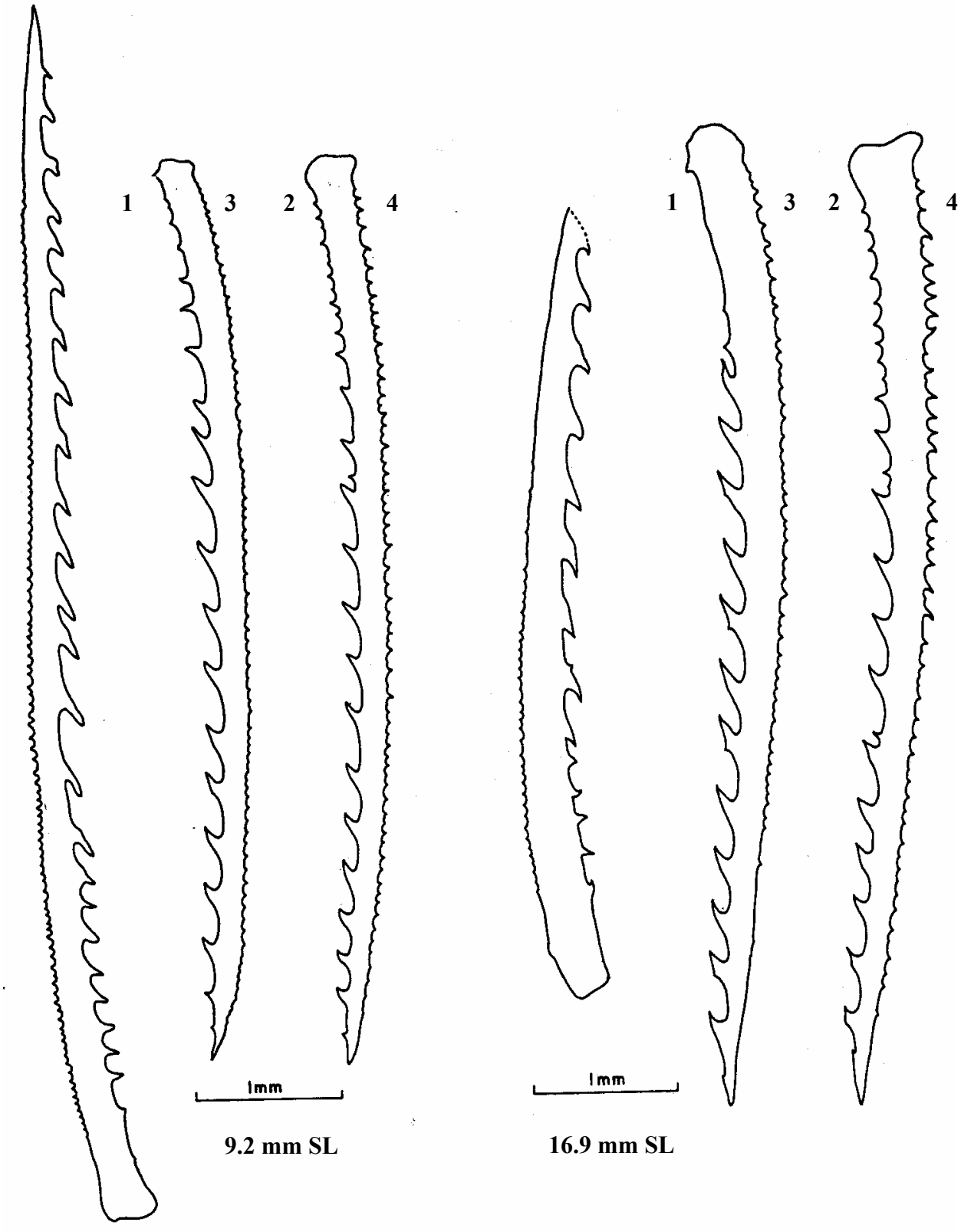
EGGS:
Diameter: 0.95 mm.
Number of Oil Globules: One.

LARVAE:
2^{nd} D_1 Spine Length: 48-55% SL in larvae 5.5-8.4 mm SL, relative size decreasing in specimens ca. 22-25 mm SL.
Diagnostic Characters: Counts. Elongate spines of generalized type with spinelets simple, straight & relatively small. Most spinelets on apex ridge curved toward tip.

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984.

SERRANIDAE ***Epinephelus (E.) itajara*** **(Lichtenstein 1822)**



SERRANIDAE — *Epinephelus (E.) morio* (Val. 1828)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	15-17
Anal Fin	III,9(8-10)
Pectoral Fin	16-18
Gill Rakers:	8-9+15-16=23-25
Lateral Line Scales:	60-68

LIFE HISTORY

Range: NC to southern Brazil, Gulf of Mexico & Caribbean present in Bermuda.
Habitat: Rocky, sand or mud bottoms in 50-300 m. Juviniles in shallow sea grass beds & inshore reefs, crevices & ledges.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: April-May in Gulf of Mexico.
Size/Age at First Maturity: Females at 40-50 cm TL, Become males at ages 7-14.
Longevity: ca. 25 years.

LITERATURE

Colin & Koenig 1996, Heemstra & Randall 1993, Johnson & Keener 1984, Moe 1969.

EARLY LIFE HISTORY DESCRIPTION

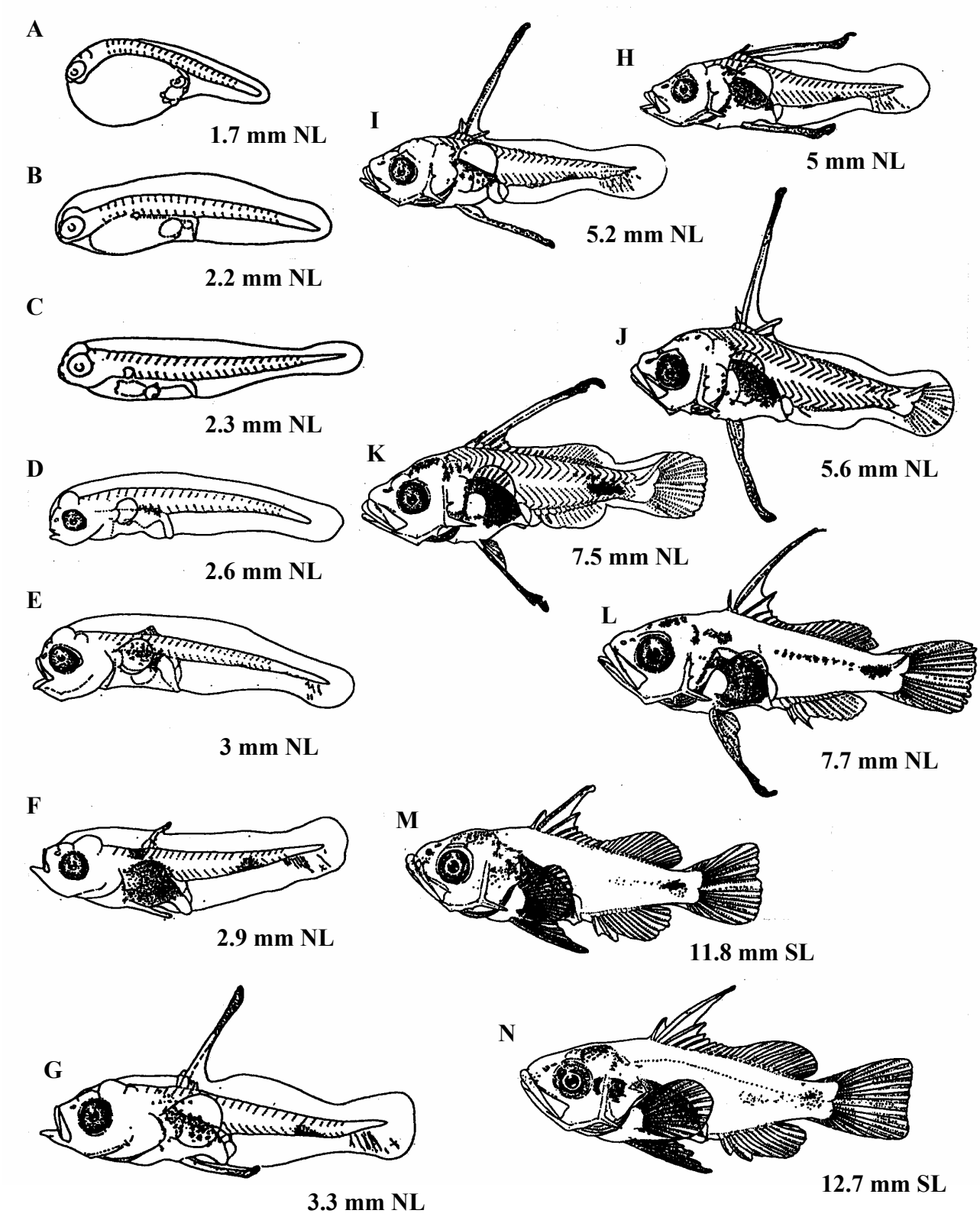
EGGS: Unknown.

LARVAE:
2^{nd} D_1 Spine Length: 46-67% SL in specimens 6-14 mm SL.
Diagnostic Characters**:** Counts same as those in *E. guttatus* & *E. drummondhayi* except latter usually with more P_1 rays. All spinelets simple, small, & straight.

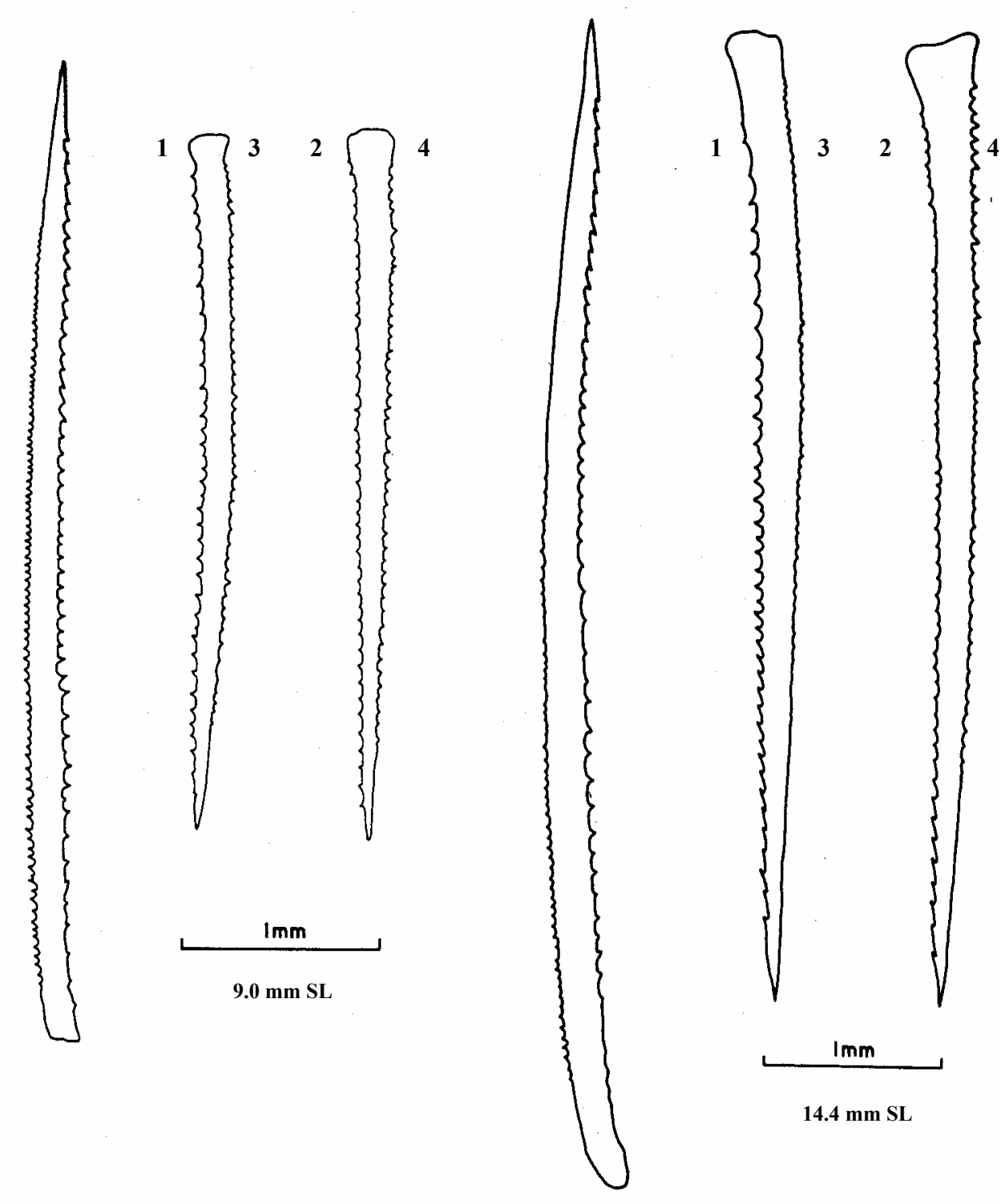
ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984, larvae from Koenig (orig).

SERRANIDAE *Epinephelus (E.) morio* **(Val. 1828)**



SERRANIDAE ***Epinephelus (E.) morio* (Val. 1828)**



SERRANIDAE — *Epinephelus (E.) nigritus* (Holbrook 1855)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	14(13-15)
Anal Fin	III,9
Pectoral Fin	18-19
Gillrakers:	9-11+14-16=23-25
Lateral Line Scales:	62-71

LIFE HISTORY

Range: MA to FL, northern Gulf of Mexico, Cuba, w. Hispaniola, Trinidad, & Rio de Janeiro.
Habitat: Rough, rocky bottoms 55-525m juveniles near jetties, shallow reefs.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Late summer(?) in the Gulf of Mexico.
Migration: Limited home ranges.
Longevity: >41 years.

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE:
Diagnostic Characters: Counts, large recurved spinelets along primary ridge of P_2 fin spine & several similar spinelets on ridge 2, perhaps similar to those of *E. mystacinus* & *E. itajara*.

EARLY JUVENILES:
Diagnostic Characters: Counts, caudal fin yellow, few scattered whitish spots on body; no dark saddle blotch on caudal peduncle.

ILLUSTRATIONS

None.

SERRANIDAE — *Epinephelus (E.) mystacinus* (Poey 1852)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	15(14)
Anal Fin	III,9(8)
Pectoral Fin	18-19
Gillrakers:	8-10+14-16=22-26
Lateral Line Scales:	58-69

LIFE HISTORY

Range: NC to FL, Bermuda, Gulf of Mexico, Yucatan, Greater & Leeward Antilles to Trinidad.
Habitat: Deep-water species 100-400m juveniles to 30 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Summer?

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

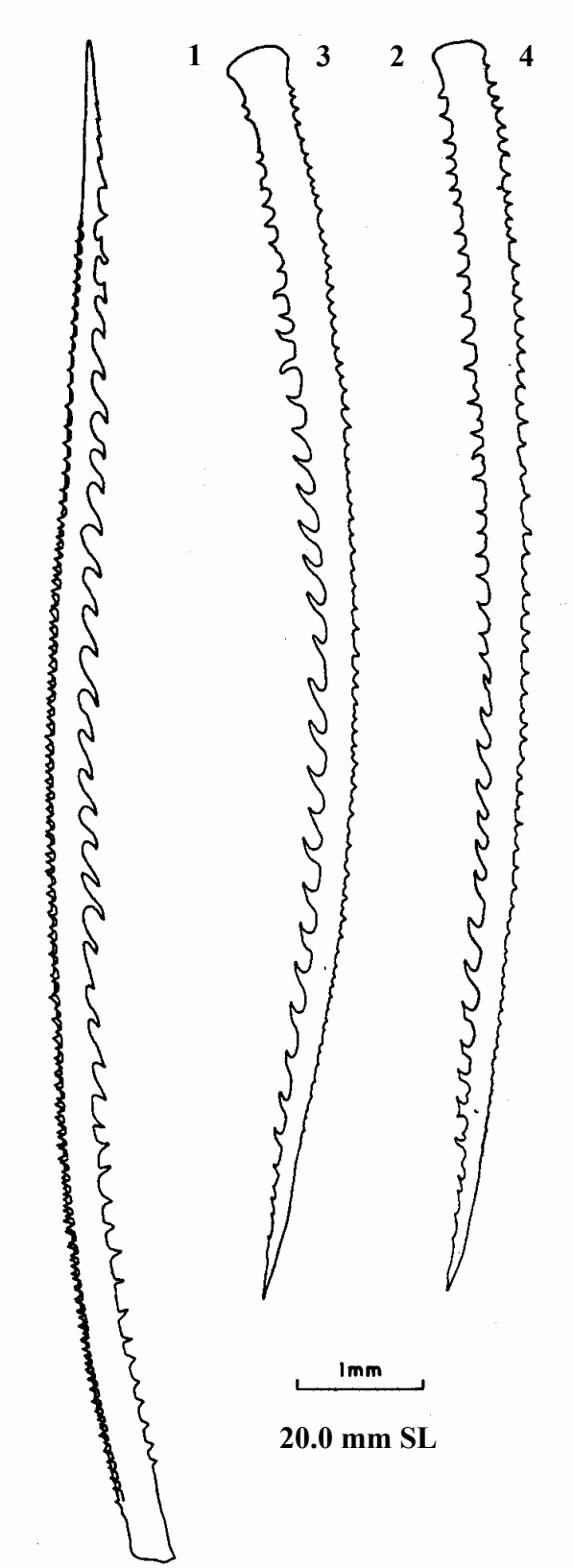
LARVAE:
2^{nd} D_1 Spine Length: 75% SL in one specimen 20.1 mm SL.
Diagnostic Characters: Counts similar to those of *E. niveatus* & *flavolimbatus*. 2^{nd} D_1 fin spine with large recurved spinelets on wing margins, 3 parallel rows of simple, straight spinelets at apex. Pelvic primary ridge with large recurved spinelets; 2^{nd} ridge with large recurved spinelets on distal half as in *E. itajara* & *nigritus.*

EARLY JUVENILES:
Diagnostic Characters: Color pattern with dark caudal peduncle saddle blotch.

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984.

SERRANIDAE ***Epinephelus (E.) mystacinus*** **(Poey 1852)**



SERRANIDAE *Epinephelus (E.) niveatus* (Val. 1828)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	14(13-15)
Anal Fin	III,9
Pectoral Fin	18(17-19)
Gill Rakers:	7-10+15-17=22-26
Lateral Line Scales:	64-73

LIFE HISTORY

Range: MA to southern Brazil, include. Gulf of Mexico & Caribbean present in Bermuda.
Habitat: Rocky bottoms in 30-525 m, juveniles found inshore.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: April-July off FL Keys.
Size/Age at First Maturity: Females at 40-50 cm TL. Become males at 70 cm TL.
Longevity: ca. 27 years.

LITERATURE

Heemstra & Randall 1993, Johnson & Keener 1984, Moore & Labiskey 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS:
Diagnostic Characters: Indistinguishable from *E. flavolimbatus*.

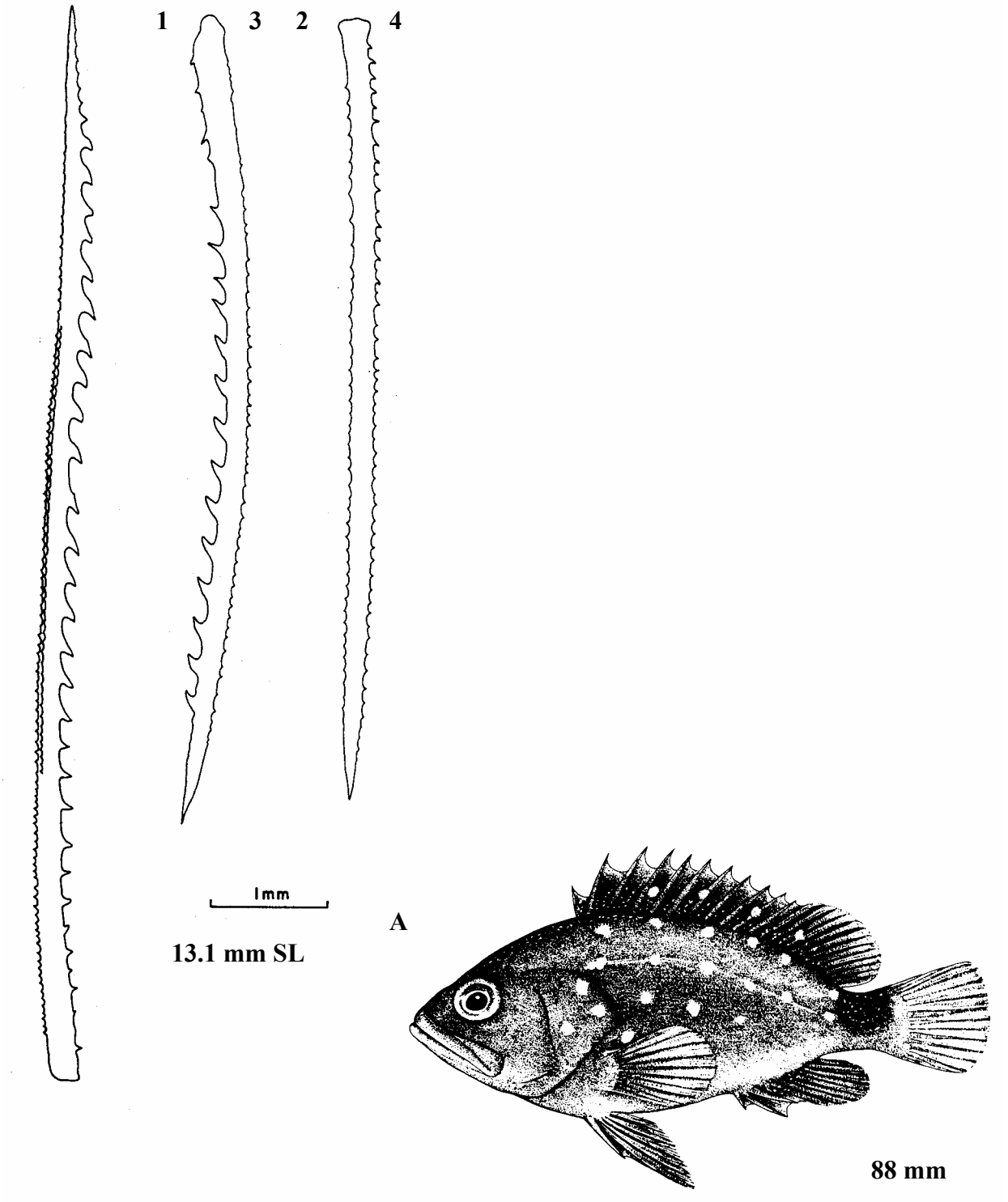
LARVAE:
2nd Dorsal Spine Length: 65-86% SL in specimens 4-19 mm SL.
Diagnostic Characters: Counts identical to those of *E. flavolimbatus*. Both species with elongate spine morphology as in *Mycteroperca:* large recurved spinelets with smaller spinelets proximally; pelvic primary ridge like second D_1 spine, remaining ridges with small straight spinelets, those near base of 4th ridge slightly enlarged.

EARLY JUVENILES:
Diagnostic Characters: dark brown with white spots in 5-6 longitudinal rows & 11 vertical columns, C & P_1 fins yellow, black saddle blotch on caudal peduncle reaching below lateral line.

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984; juvenile from Heemstra & Randall 1993.

SERRANIDAE ***Epinephelus (E.) niveatus* (Val. 1828)**



SERRANIDAE — *Epinephelus (E.) striatus* (Bloch 1792)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	16-18
Anal Fin	III,8
Pectoral Fin	17-19
Gill Rakers:	8-9+15-17=23-26
Lateral Line Scales:	ca. 50

LIFE HISTORY

Range: FL, Bermuda, Bahamas, Yucatan, Caribbean to southern Brazil
Habitat: Shallow coral reefs to 90 m. Juveniles common in seagrass beds.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: December-February at full moon.
Area: Caribbean.
Mode: Aggregations in 20-40 m at specific locations.
Size/Age at First Maturity: Females at 25 cm TL.

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984, Guitart M. & Fernandez 1966, Powell & Tucker 1992.

EARLY LIFE HISTORY DESCRIPTION

EGGS:
Diagnostic Characters: Indistinguishable from *E. adscensionis.*

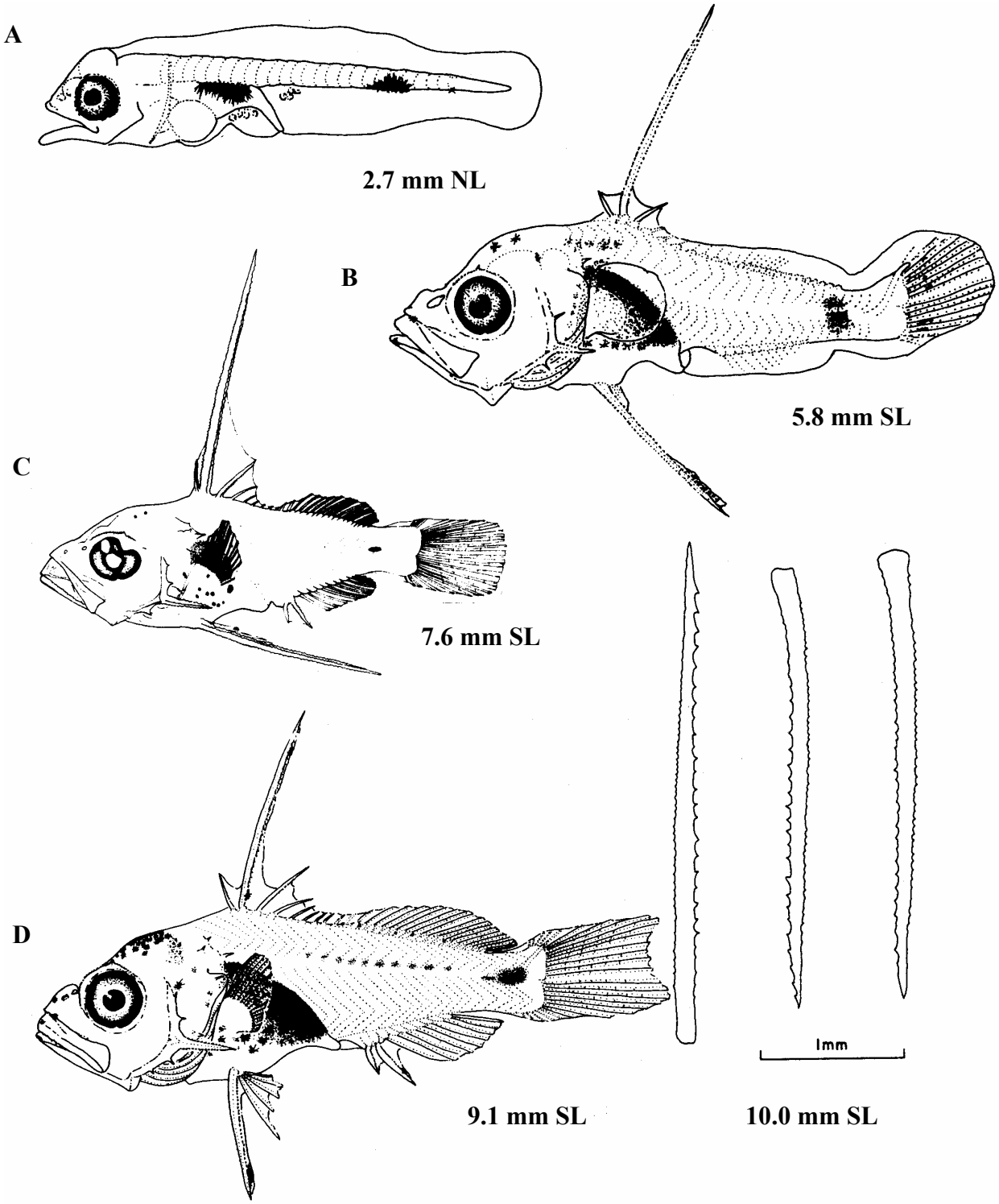
LARVAE:
2nd Dorsal Spine Length: 40% SL in one specimen of 10.5 mm SL.
Diagnostic Characters: Counts identical to those of *E. adscensionis*. Both species with simple, straight, & small spinelets. Cannot be separated from *E. morio, E. guttatus, & E. drummondhayi* until A fin complete.

EARLY JUVENILES:

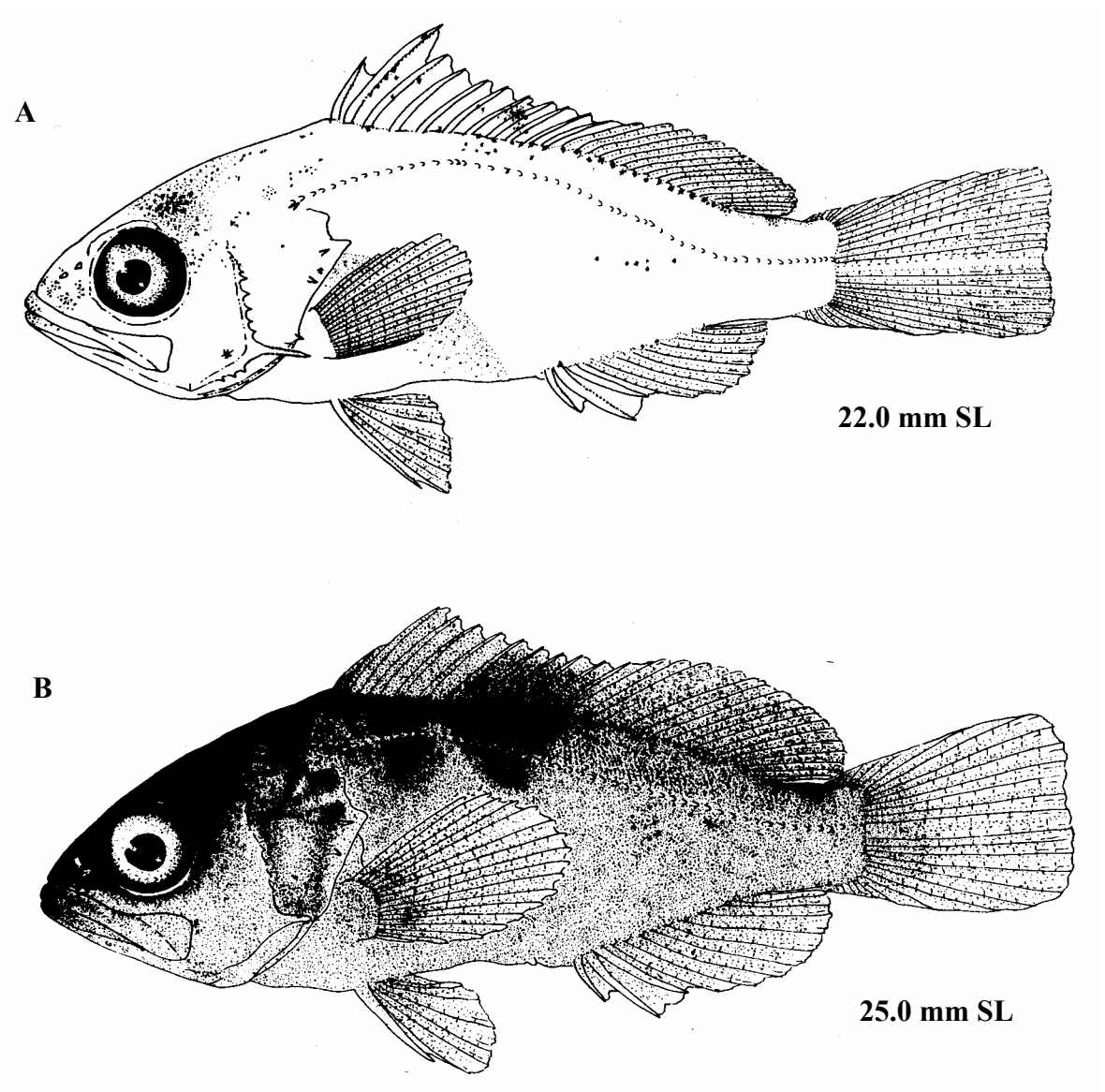
ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984; larvae & juveniles from Laroche (orig).

SERRANIDAE ***Epinephelus (E.) striatus* (Bloch 1792)**



SERRANIDAE ***Epinephelus (E.) striatus* (Bloch 1792)**



SERRANIDAE — *Gonioplectrus hispanus* (Cuvier 1828)

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	VIII
Second Dorsal Fin	13
Anal Fin	III,7
Pectoral Fin	16-17
Gill Rakers:	5-7+14-16=20-22
Lateral Line Scales:	47-49

LIFE HISTORY

Range: NC to FL, Gulf of Mexico, Caribbean to Brazil.
Habitat: Rocky bottoms in 60-365 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning:
Season: Probably summer.

LITERATURE

Heemstra & Randall 1993, Johnson & Keener 1984, Kendall & Fahay 1979.

EARLY LIFE HISTORY DESCRIPTION

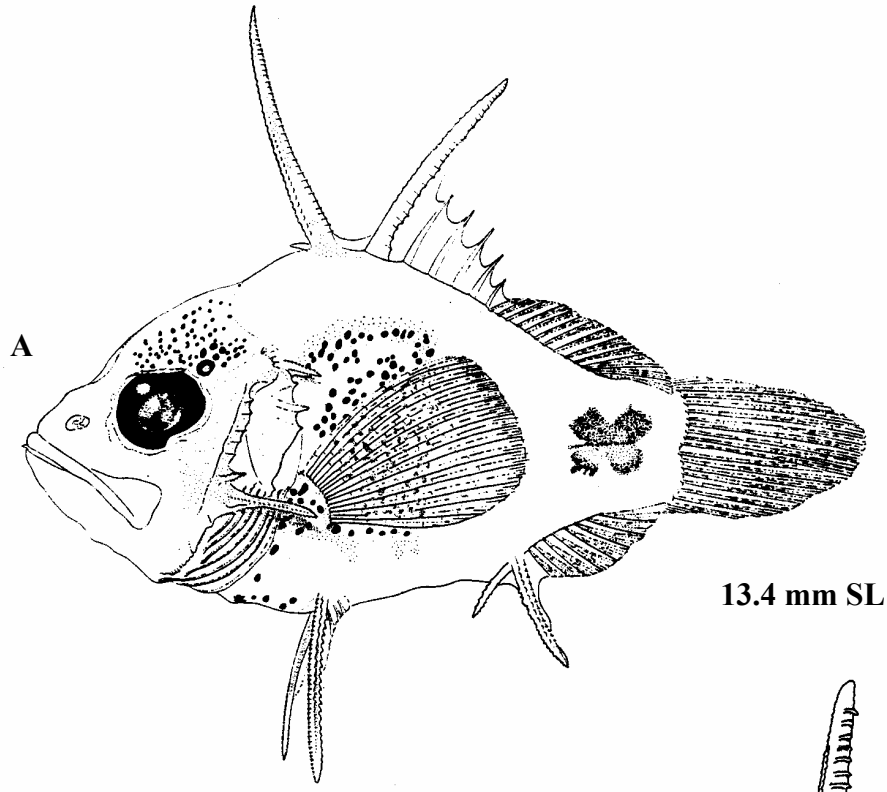
EGGS: Unknown.

LARVAE:
2^{nd} D_1 Spine Length: 36-39% SL in specimens of 13.4-14.0 mm SL.
Pigmentation: X-shaped spot on caudal peduncle.
Diagnostic Characters: Counts. 2^{nd} D_1 spine with small bump-like spinelets along primary apex ridge; ridge with similar secondary spination extending along each side of apex. Small straight spinelets on lateral wings, bases of spinelets extending anteriorly as raised ridges beyond lateral wing margins; the latter creates the diagnostic furrowed look. Morphology of 3^{rd} D_1 spine identical to that of 2^{nd}. P_2 spine stout with ridges 1, 2, & 4 bearing small straight spinelets enlarged & slightly curved near base of spine; ridge 3 with small, bump-like spinelets.

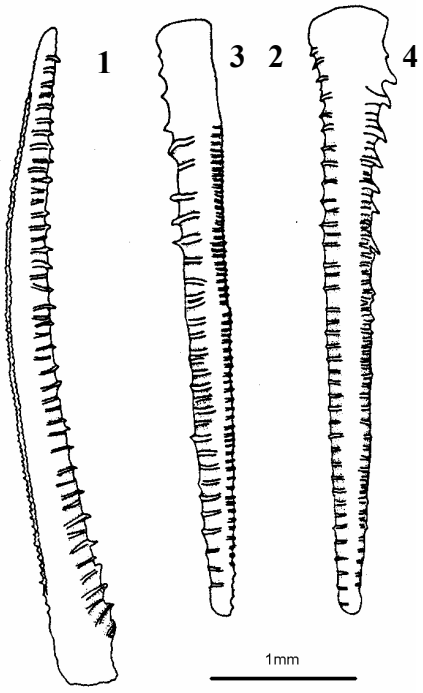
ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984; larva from Kendall & Fahay 1979.

SERRANIDAE ***Gonioplectrus hispanus* (Cuvier 1828)**



13.4 mm SL



13.4 mm SL

SERRANIDAE *Mycteroperca acutirostris* (Val. 1828)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	15-17
Anal Fin	III,10-12
Pectoral Fin	15-17
Gill Rakers:	16-20+32-36=48-55
Lateral Line Scales:	67-77

LIFE HISTORY

Range: Bermuda, northwestern Gulf of Mexico (rare); Antilles, southern coast of Caribbean, Brazil.

Habitat: Rocky bottoms of high relief. Juveniles in turtle grass beds, mangroves, shallow coral reefs.

ELH Pattern: Oviparous; pelagic eggs & larvae.

LITERATURE

Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE:

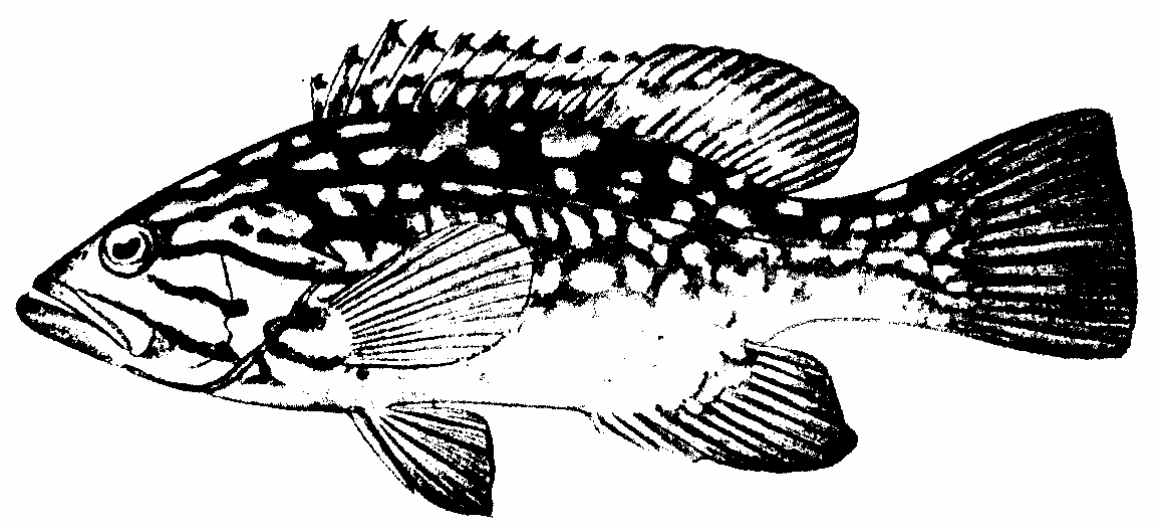
Diagnostic Characters: Counts identical for all *Mycteroperca* species. All with pigment spot at cleithral symphysis. Wing margins of 2nd D_1 spine & primary ridge of P_2 spine bearing large recurved spinelets along most of their length; at base of 2nd D_1 spine, spinelets small & straight; at base of P_2 spine, spinelets narrow & curved. Single apex ridge of dorsal & pelvic ridges 2, 3, and 4 bearing small straight spinelets.

EARLY JUVENILES:

Diagnostic Characters: Juvenile <15 cm with small black saddle on caudal peduncle.

ILLUSTRATIONS

Juvenile from Heemstra & Randall 1993.



175 mm SL

SERRANIDAE *Mycteroperca bonaci* (Poey 1860)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	15-17
Anal Fin	III,11-13
Pectoral Fin	16-17
Gill Rakers:	2-5+8-12
Lateral Line Scales:	78-83

LIFE HISTORY

Range: Bermuda, FL south to southern Brazil. Juveniles north to MA.
Habitat: Coral reefs and rocky bottoms in 10-30 m or greater in the Gulf of Mexico.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Size/Age at First Maturity: Females 50-100 cm TL; males 96-116 cm TL.

LITERATURE

Bullock & Smith 1991, Heemstra and Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

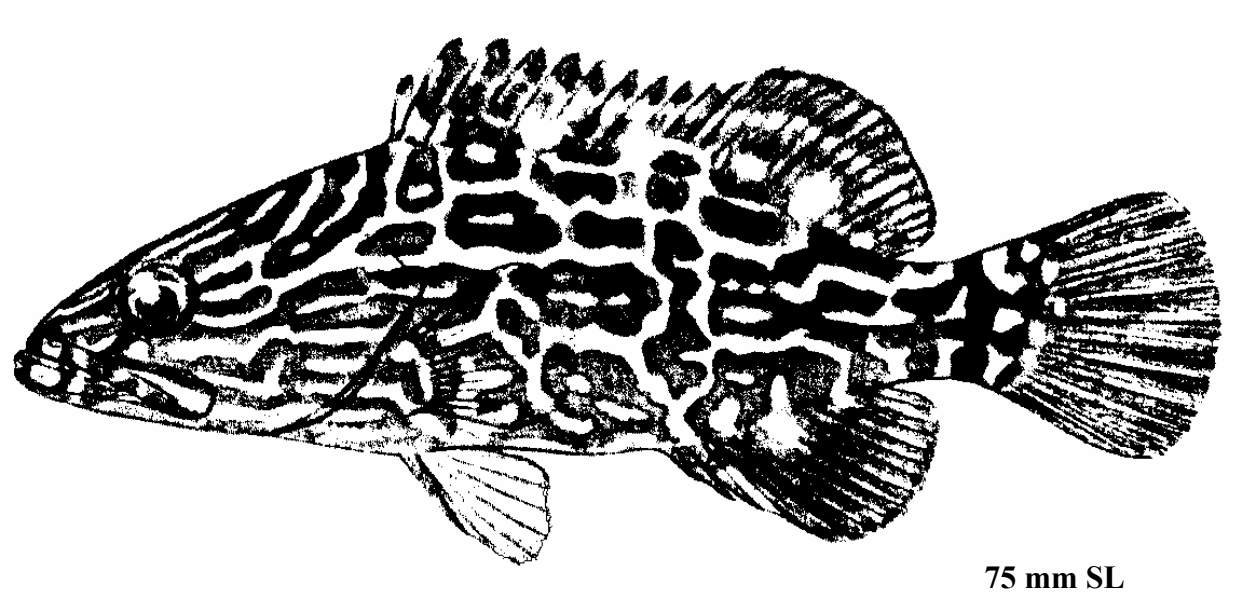
EGGS: Unknown.

LARVAE:
Diagnostic Characters: Counts identical for all *Mycteroperca* species. All with pigment spot at cleithral symphysis. Wing margins of 2nd D_1 spine & primary ridge of pelvic spine bearing large recurved spinelets along most of their length; at base of 2nd D_1 spine, spinelets small & straight; at base of P_2 spine, spinelets narrow and curved. Single apex ridge of dorsal and pelvic ridges 2, 3, and 4 bearing small straight spinelets.

EARLY JUVENILES:

ILLUSTRATIONS

Juvenile from Heemstra & Randall 1993.



75 mm SL

SERRANIDAE *Mycteroperca interstitialis* (Poey 1860)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	16-18
Anal Fin	III,10-12
Pectoral Fin	16-17
Gill Rakers:	4-6+11-15=23-27
Lateral Line Scales:	70-74

LIFE HISTORY

Range: Gulf of Mexico, Bermuda, Caribbean (mainly insular) & southern Brazil.
Habitat: Coral reefs and rocky bottom in 20-150 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: June-August in Bermuda, April in Jamaica, August-September in FL.

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

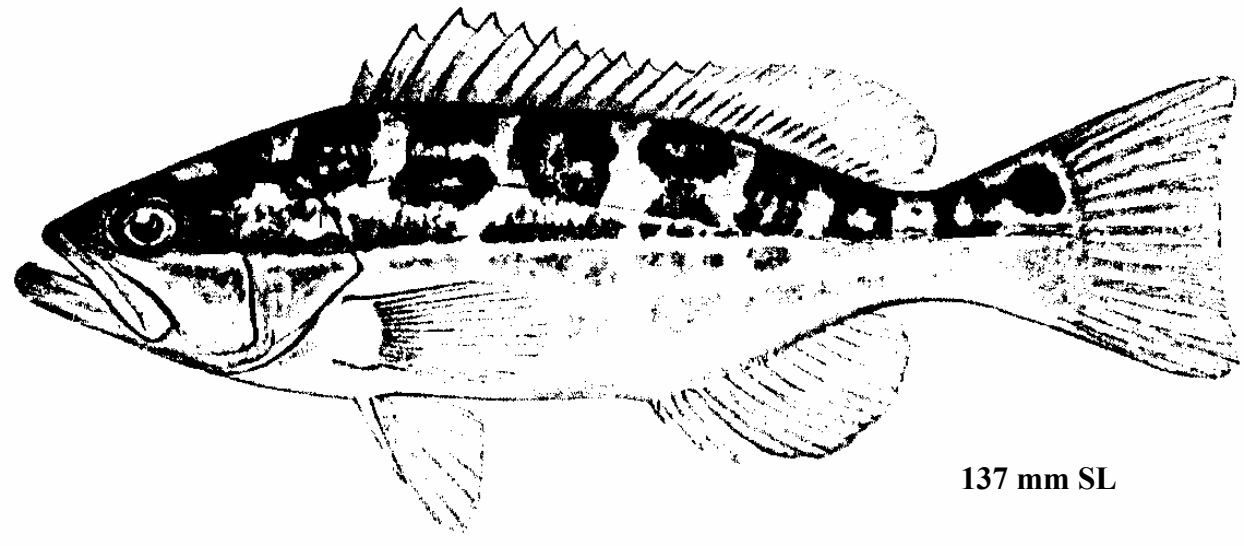
EGGS: Unknown.

LARVAE:
Diagnostic Characters: Counts identical for all *Mycteroperca* species. All with pigment spot at cleithral symphysis. Wing margins of 2nd D_1 spine & primary ridge of P_2 spine bearing large recurved spinelets along most of their length; at base of 2nd D_1 spine, spinelets small & straight; at base of P_2 spine, spinelets narrow & curved. Single apex ridge of D & pelvic ridges 2, 3, & 4 bearing small straight spinelets.

EARLY JUVENILES:
Diagnostic Characters: Bicolored – head & body dark brown dorsally, abruptly white below; white middorsal stripe from tip of jaw along top of snout, head & base of D fin.

ILLUSTRATIONS

Juvenile from Heemstra & Randall 1993.



SERRANIDAE *Mycteroperca microlepis* (G & B 1879)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	16-18
Anal Fin	III,10-13
Pectoral Fin	16-18
Gill Rakers:	8-9+16
Lateral Line Scales:	88-96

LIFE HISTORY

Range: NC to Yucatan, eastern Brazil rare in Bermuda, 1 Cuban record.
Habitat: Offshore rocky bottoms in 40-100 m (rarely 152 m). Juveniles in estuaries & seagrass beds.
ELH Pattern: Oviparous; pelagic eggs & larvae
Size/Age at First Maturity: Females at 67-75 cm TL

LITERATURE

Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

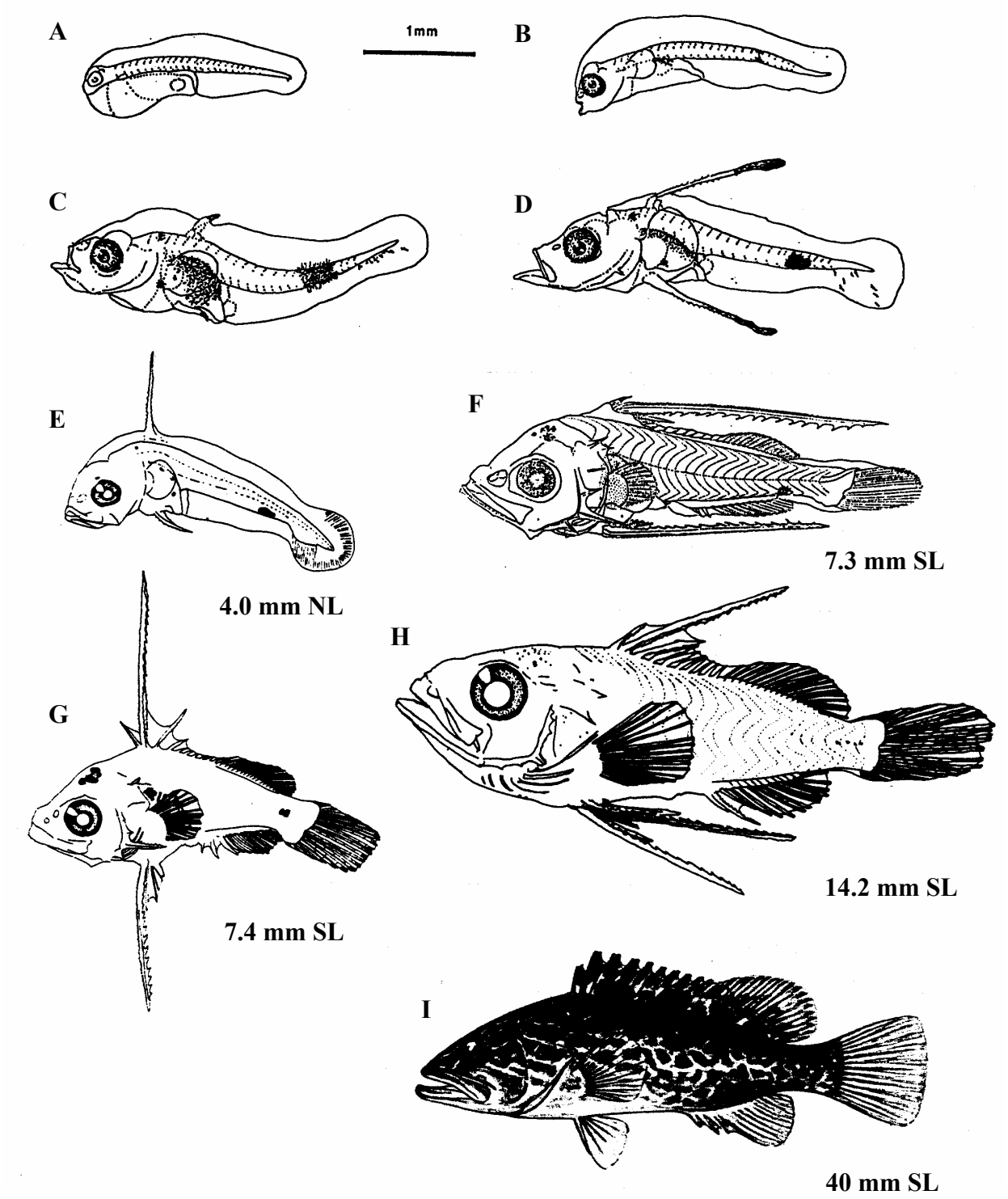
LARVAE:
Diagnostic Characters: Counts identical for all *Mycteroperca* species. All with pigment spot at cleithral symphysis. Wing margins of 2nd D_1 spine & primary ridge of P_2 spine bearing large recurved spinelets along most of their length; at base of 2nd D_1 spine, spinelets small & straight; at base of P_2 spine, spinelets narrow & curved Single apex ridge of D & P_2 ridges 2, 3, and 4 bearing small straight spinelets.

EARLY JUVENILES:
Diagnostic Characters: Juveniles <40 cm SL may not have developed distinctive notch & rounded lobe at corner of preopercle & may be confused with *M. bonaci*.

ILLUSTRATIONS

Larvae and juveniles from Koenig (orig).

SERRANIDAE ***Mycteroperca microlepis* (G & B 1879)**



SERRANIDAE — *Mycteroperca phenax* Jordan & Swain 1884

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	16-18
Anal Fin	III,10-12
Pectoral Fin	15-17
Gill Rakers:	8-10+17-21=26-31
Lateral Line Scales:	76-82

LIFE HISTORY

Range: NC to Venezuela along contishore. Absent in Bermuda & Antilles.
Habitat: Topographic complex bottoms in 30-100 m. Low relief off NC.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: April-August in Carolinas, March-May in eastern Gulf of Mexico.
Size/Age at First Maturity: Females at 35-40 cm TL
Longevity: ca. 21 years

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984

EARLY LIFE HISTORY DESCRIPTION

EGGS:
Diameter: 0.75-1.23 mm.
Number of Oil Globules: One.
Yolk: Clear.

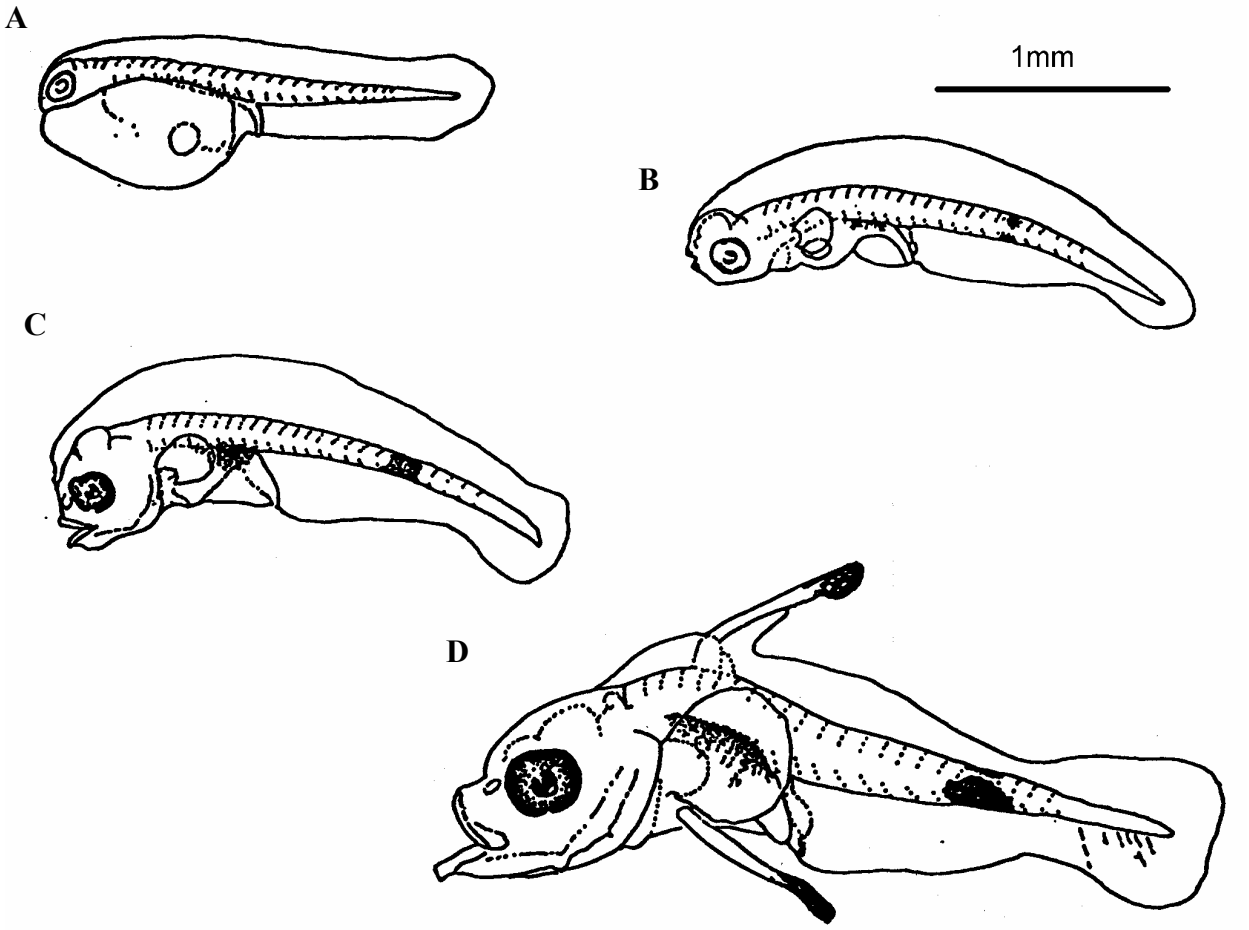
LARVAE:
Diagnostic Characters: Counts identical for all *Mycteroperca* species. All with pigment spot at cleithral symphysis. Wing margins of 2nd D_1 spine & primary ridge of P_2 spine bearing large recurved spinelets along most of their length; at base of 2nd D_1 spine, spinelets small & straight; at base of P_2 spine, spinelets narrow & curved. Single apex ridge of D & P_2 ridges 2, 3, and 4 bearing small straight spinelets.

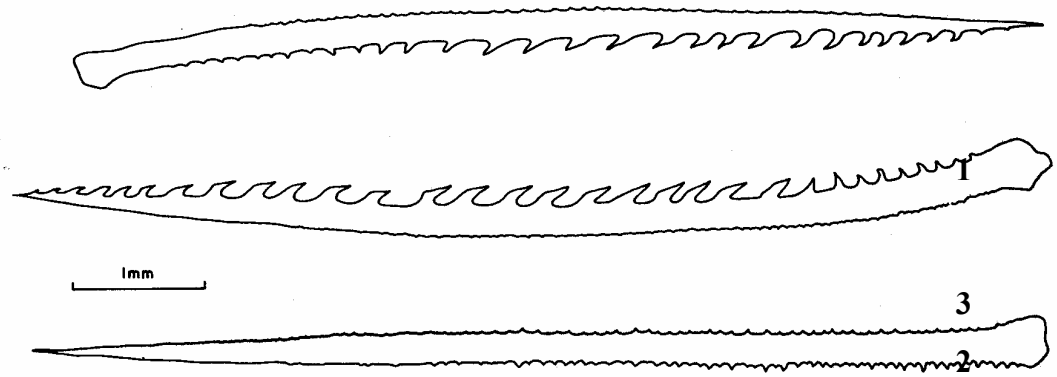
EARLY JUVENILES:
Diagnostic Characters: Juveniles not bi-colored like *M. interstitialis*.

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984; larvae & juveniles from Koenig (ms).

SERRANIDAE ***Mycteroperca phenax* Jordan & Swain 1884**





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SERRANIDAE *Mycteroperca tigris* (Val. 1833)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	XI
Second Dorsal Fin	15-17
Anal Fin	III,11
Pectoral Fin	17
Gill Rakers:	8+15-17=23-25
Lateral Line Scales:	82-83

LIFE HISTORY

Range: Bermuda, south FL, TX south through Caribbean, Antilles to southern Brazil.
Habitat: Coral reefs and rocky bottom in 10-40 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Size/Age at First Maturity: Females <37 cm TL, males >45 cm TL.

LITERATURE

Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE:
Diagnostic Characters: Counts identical for all *Mycteroperca* species. All with pigment spot at cleithral symphysis. Wing margins of 2nd D_1 spine & primary ridge of P_2 spine bearing large recurved spinelets along most of their length; at base of 2nd D_1 spine, spinelets small & straight; at base of P_2 spine, spinelets narrow & curved. Single apex ridge of D & P_2 ridges 2, 3, and 4 bearing small straight spinelets.

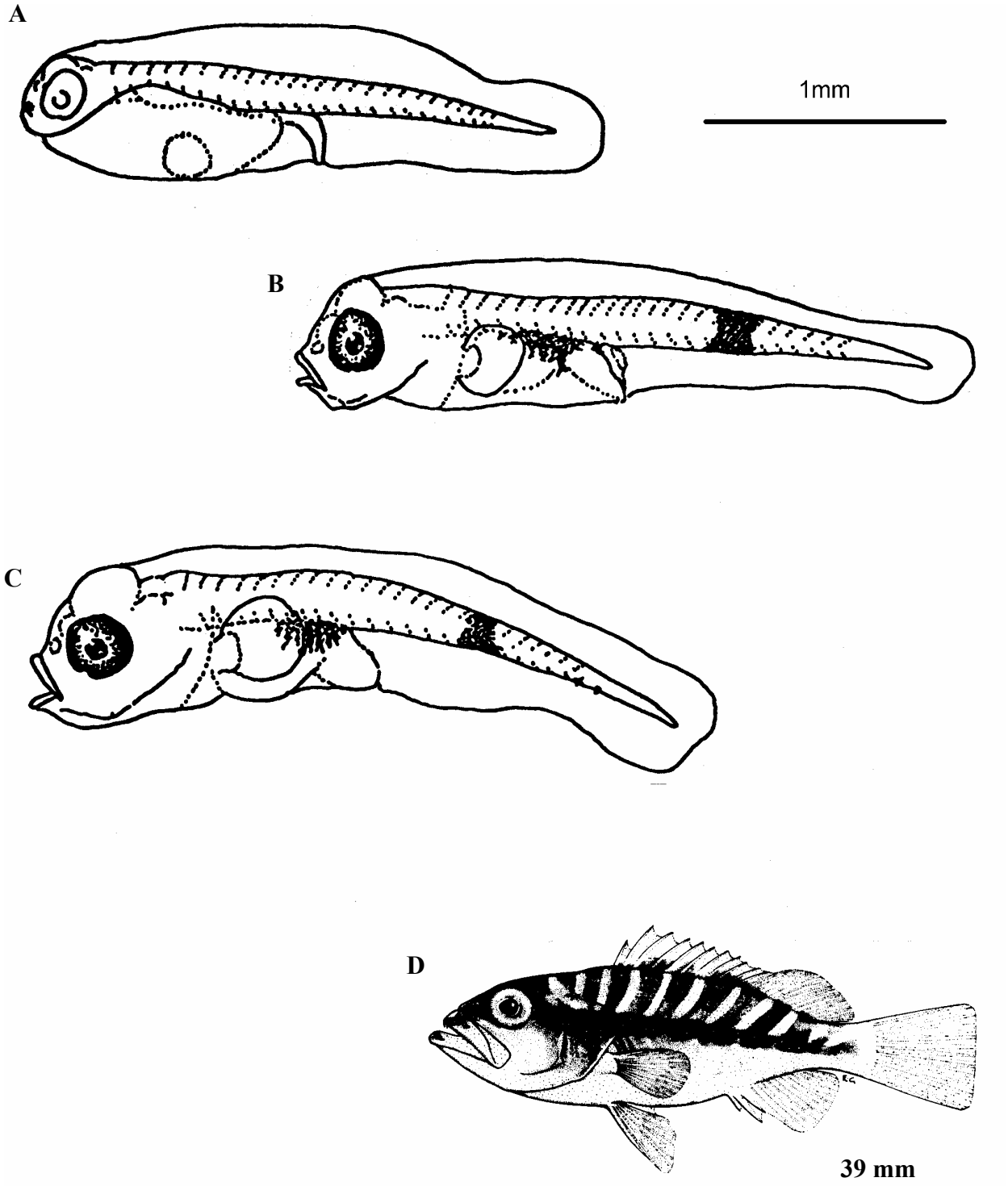
EARLY JUVENILES:
Diagnostic Characters: 25-100 mm SL yellow, with blackish brown midlateral stripe from tip of lower jaw, through eye along body almost to caudal.

ILLUSTRATIONS

Larvae from Koenig (ms); juvenile from Heemstra & Randall 1993.

SERRANIDAE

Mycteroperca tigris (Val. 1833)



SERRANIDAE *Paranthias furcifer* (Val. 1828)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	14
Total	24
Number of Fin Spines and Rays:	
First Dorsal Fin	IX
Second Dorsal Fin	17-18(19)
Anal Fin	III,8-9(10)
Pectoral Fin	19-20
Gill Rakers:	12-14+24-26=38
Lateral Line Scales:	69-77

LIFE HISTORY

Range: Bermuda, FL, Gulf of Mexico, Antilles, Caribbean to Brazil. Absent in northern Bahamas.
Habitat: Coral reefs & hard bottoms in 10-64 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: April-October in FL, January-March in Jamaica, May in Bermuda.
Size/Age at First Maturity: 223-292 mm SL in females; 263-304 mm SL in males.

LITERATURE

Bullock & Smith 1991, Heemstra & Randall 1993, Johnson & Keener 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

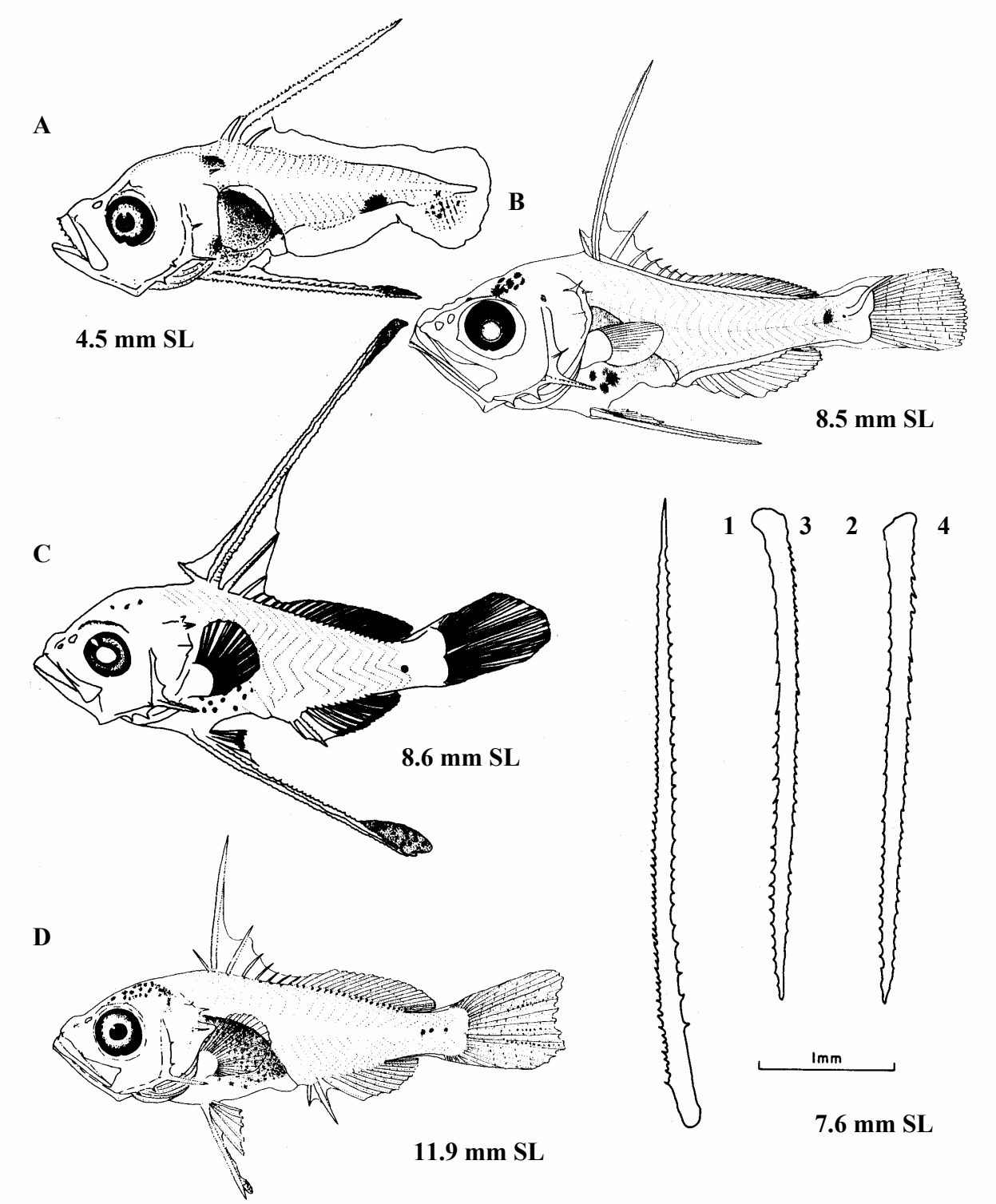
LARVAE:
2nd Dorsal Spine Length: 54-72% SL in specimens of 7.2-7.6 mm SL.
Diagnostic Characters: Counts; wing margins of 2nd dorsal & primary ridge of P_2 bearing small, straight, widely spaced spinelets.

EARLY JUVENILES:

ILLUSTRATIONS

D & P_2 spines from Johnson & Keener 1984; larvae from Kendall 1979 & Laroche (orig).

SERRANIDAE ***Paranthias furcifer* (Val. 1828)**



SUBFAMILY EPINEPHELINAE, TRIBE LIOPROPOMATINI

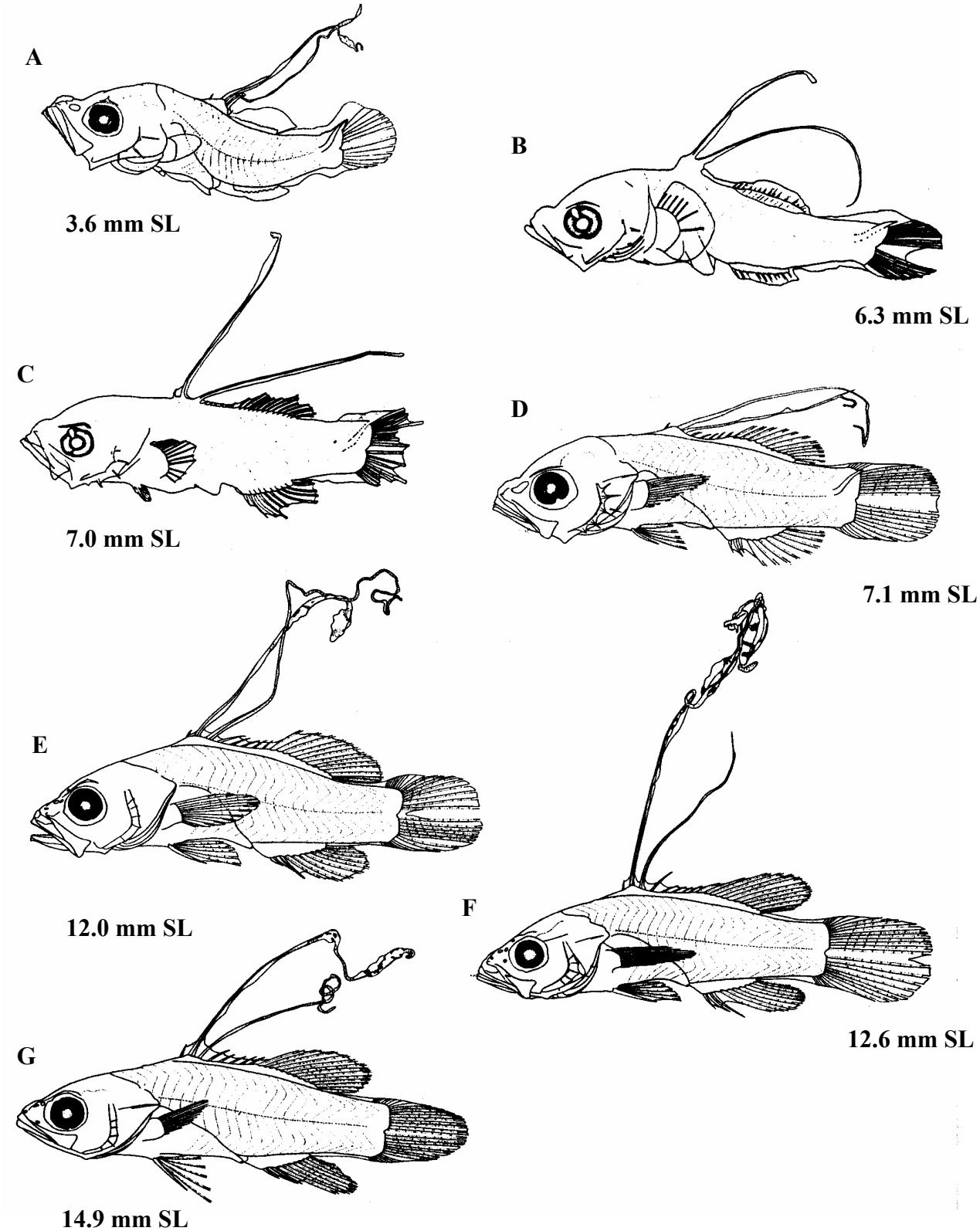
By W. J. Richards, C. C. Baldwin, & A. Röpke

The Tribe Liopropomatini as recognized here was delineated by Johnson (1983) and modified by Baldwin & Johnson (1993) to exclude *Jeboehlkia gladifer*. This tribe is represented in the area by *Liopropoma* Gill, of which *Pikea* Steindachner is a synonym. However, as noted by Randall & Taylor (1988), two Atlantic species of *Pikea, P. mexicanus* Schultz and *P. cubensis* Schultz, do not belong in *Liopropoma.* Baldwin & Johnson (1993) tentatively recognized *Bathyanthias,* which previously had been synonymized with both *Liopropoma* and *Pikea,* as a valid genus that may include *P. mexicana* and *P. cubensis.* Eschmeyer (http://www.calacademy.org/ research/ ichthy-ology/catalog/fishcatsearch.html) lists *B. mexicana* and *B. cubensis* as valid, assignments we follow here.

Larval liopropomatins are similar in shape to serranine larvae, but the gut is shorter and there is a space between the anus and anal fin. The caudal peduncle is deeper and resembles labrid and scarid larvae. The most distinctive character is the presence of two elongate dorsal spines, the second and third, which bear unusual appendages that are often lost and broken during collection. These appendages are quite spectacular and have been hypothesized to mimic siphophore tentacles (Govoni et al. 1984). Baldwin et al. (1991) showed an in situ color photo of larval *Liopropoma* taken by Rich Harbison. Pigment is found only on the head and on these dorsal spine appendages. The pectoral fin is not large or pigmented, and the pelvic fin is small and the last fin to complete development. The latter is in contrast to the groupers, in which the pelvic fin is the first or one of the first fins to complete development. Head spination is poorly developed in liopropomins, consisting of several small spines on the lateral and medial ridges of the preopercle and usually one minute spine on both the subopercle and interopercle. Adults are small, brightly colored fishes generally found in deep water, most often associated with reefs.

Larvae are known for *Liopropoma* and *B. mexicana*. *Liopropoma* is represented by 5 species in our area, but no one has been able to identify the larvae to species. Counts are similar among the species, and the larvae show no specific differences except possibly in the dorsal spine appendages. However, an intact specimen is rare, thus no comparative study has been done. Several illustrations are provided for *Liopropoma* sp., and a species account is given for *B. mexicana***.**

SUBFAMILY LIOPROPOMATINAE ***Liopropoma* sp.**



SERRANIDAE *Bathyanthias mexicana* (Schultz 1958)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
First Dorsal Fin:	VIII
Second Dorsal Fin:	14(15)
Anal Fin:	III,8
Pectoral Fin:	14-15
Gill Rakers:	6+12-13=18-23
Lateral Line Scales:	45-47
Branchiostegals:	7

LIFE HISTORY

Range: FL east coast, FL Keys, north-eastern & northern Gulf of Mexico, Guianas, & Venezuela.
Habitat: Deep-water in 70-274 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Summer.
Area: Gulf of Mexico.
Mode: Sequential hermaphrodite.
Size/Age at First Maturity: Small fishes.

LITERATURE:

Bullock & Smith 1991, Robins & Ray 1986.

EARLY LIFE HISTORY DESCRIPTION

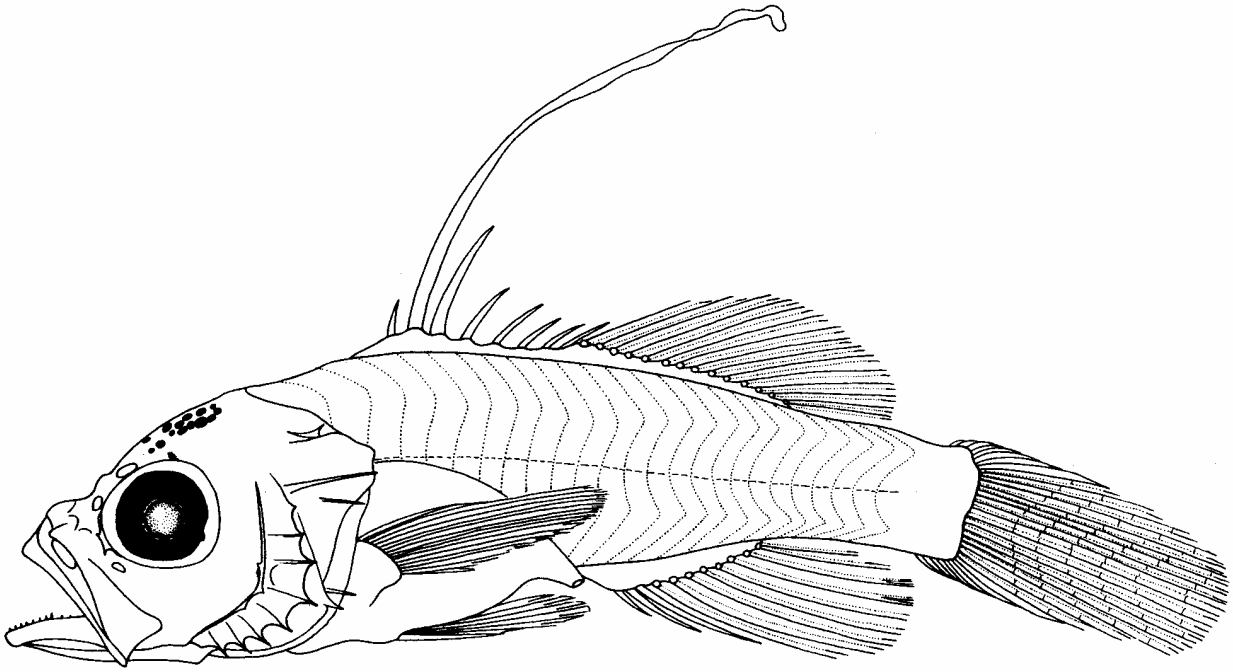
EGGS: Unknown.

LARVAE
Head Spination: Preopercle, subopercle, opercle
2nd D Spine Length: Elongate.
Pigmentation: Over brain.
Diagnostic Characters: Counts.

EARLY JUVENILES

ILLUSTRATIONS

Larva: Original.



12.8 mm SL

SUBFAMILY EPINEPHELINAE, TRIBE GRAMMISTINI

By W. J. Richards, C. C. Baldwin, & A. Röpke

This tribe comprises 3 genera in our area, *Pseudogramma,* represented in the area by a single species, the monotypic *Jeboehlkia,* and *Rypticus* with 8 species. Larvae of this group have a single elongate dorsal-fin spine, the second, rather than two as found in *Liopropoma*. As in *Liopropoma,* the elongate dorsal spine is not stout and, when intact, it is encased in a filamentous sheath. The pectoral fin is typically larged and pigmented, and the pelvic fin develops last.

Pseudogramma gregoryi larvae are quite common and easily identified based on the single dorsal-fin spine, enlarged pectoral fin, and high anal fin-ray count. *Rypticus* larvae share some of these features but have fewer dorsal spines and are moderately deep-bodied at the nape. The elongate dorsal spine, when intact, is pigmented. Overlapping counts hinder specific identification, but chromatophore patterns may be useful in distinguishing species: ongoing work by the second author and colleagues off Belize, Central America, suggests 3 distinctive morphs of *Rypticus* bearing unique patterns of orange or yellow chromatophores. *Jeboehlkia* is easily identifiable by the presence of 9 dorsal soft rays, a count unique among western Atlantic serranids to *J. gladifer*.

Adult *P. gregoryi* are small fish (75 mm SL) and are confined to areas of live coral. *Rypticus* species are much larger (15-20 cm SL) and produce a toxic mucous known as grammistin. *Jeboehlkia gladifer* inhabits relatively deep water; for example, the holotype was collected at 165 m in the Caribbean. Several additional specimens are known from submersible photographs and collections from similar depths in the western North Atlantic and Caribbean.

SERRANIDAE *Pseudogramma gregoryi* (Breder 1927)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	16(15)
Total:	26(25)
Number of Fin Spines and Rays:	
First Dorsal Fin:	VII
Second Dorsal Fin:	18-19
Anal Fin:	III,15(14-16)
Pectoral Fin:	14(15)
Gill Rakers:	5-6+9-11
Lateral Line Scales:	24-30
Branchiostegals:	7

LIFE HISTORY

Range: Bermuda, Bahamas, south FL, to northern South America.
Habitat: Live coral areas.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Size/Age at First Maturity: Small fishes.

LITERATURE

Baldwin et al. 1991, Kendall 1979, 1984, Randall & Baldwin 1997, Robins & Ray 1986.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

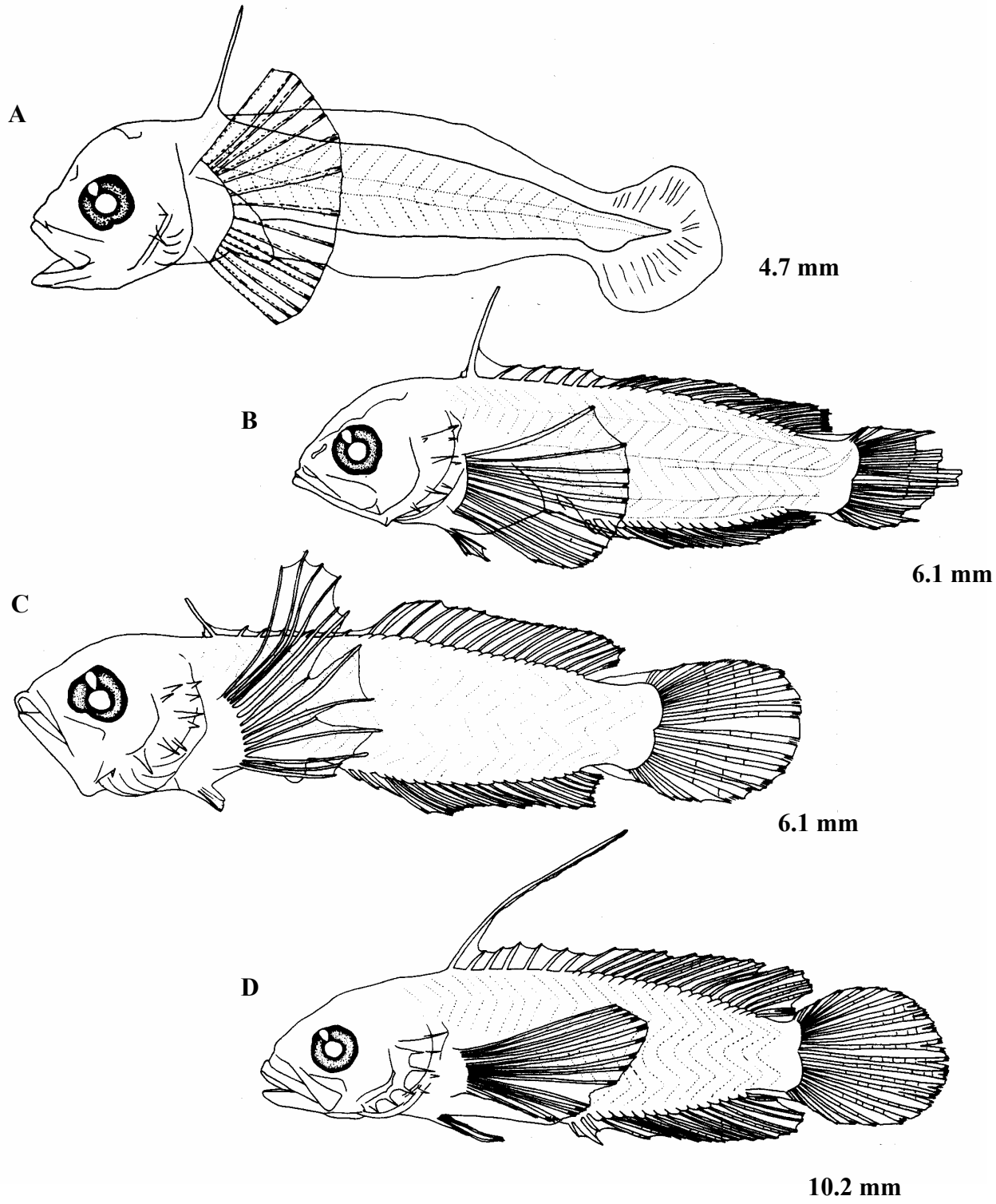
LARVAE:
Head Spination: five spines on medial preopercular ridge.
2^{nd} D Spine Length: 2^{nd} greatly elongate (first spine extremely small & easily overlooked).
Length at Flexion: ca. 5 mm SL.
Sequence of Fin Development: elongate D_1 spine, P_1, D_1, D_2, A, C, P_2.
Pigmentation: eye & P_1 fin in small larvae, sheath surrounding elongate D spine.
Diagnostic Characters: elongate D spine; counts; large, precocious P_1 fin.

EARLY JUNVENILES:
Diagnostic Characters: large, ocellated spot on opercle.

ILLUSTRATIONS

Kendall 1979.

SERRANIDAE ***Pseudogramma gregoryi*** **(Breder 1927)**



SERRANIDAE *Jeboehlkia gladifer* Robins 1967

MERISTICS

Vertebrae	
Precaudal:	9
Caudal:	15
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	VIII
Second Dorsal Fin:	9
Anal Fin:	III,7
Pectoral Fin:	15
Gill Rakers:	9+1+16=26
Lateral Line Scales:	
Branchiostegal:	7

LIFE HISTORY

Range: Off Honduras and U. S. east coast off New York.
Habitat: Deep waters ca. 165 m.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Mode: Only adult a female with ovarian eggs.
Migration: Unknown.
Size/Age at First Maturity: Small fishes.

LITERATURE

Baldwin & Johnson 1991, 1993, Robins 1967.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

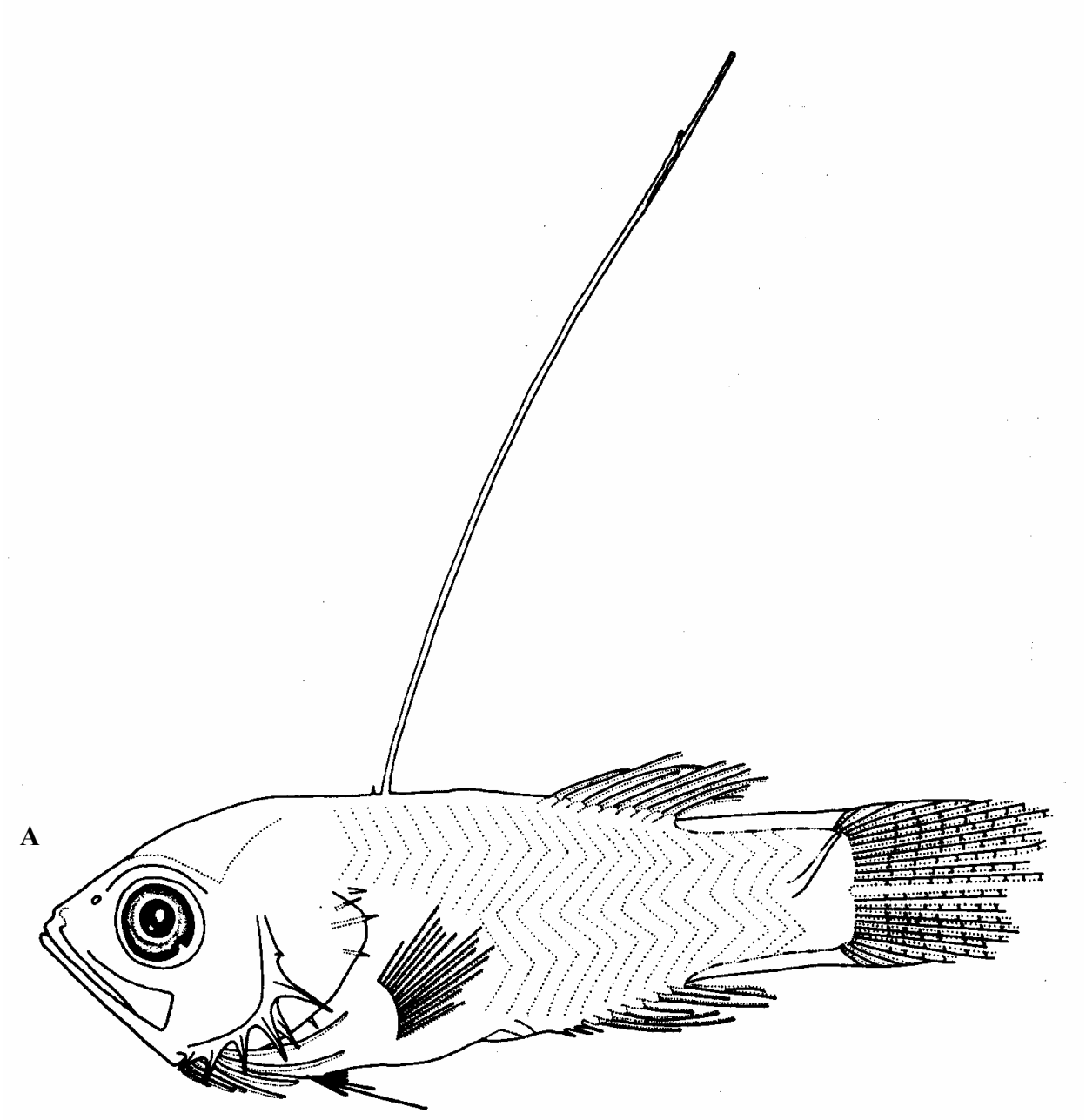
LARVAE:
Head Spination: 6 strong smooth preopercular spines, first 3 antrorse; subopercle, interopercle, & supracleithrum each with 1 spine; frontals with small pits.
2^{nd} D_1 Spine Length: elongate, > SL.
Length at Flexion: unknown.
Sequence of Fin Development: unknown.
Pigmentation: None on larva.
Diagnostic Characters: counts, particularly the presence of 9 soft D_2 fin rays, & single elongate D_1 fin spine.

EARLY JUVENILES:
Diagnostic Characters: Color patterns may be useful.

ILLUSTRATIONS

Baldwin & Johnson 1991.

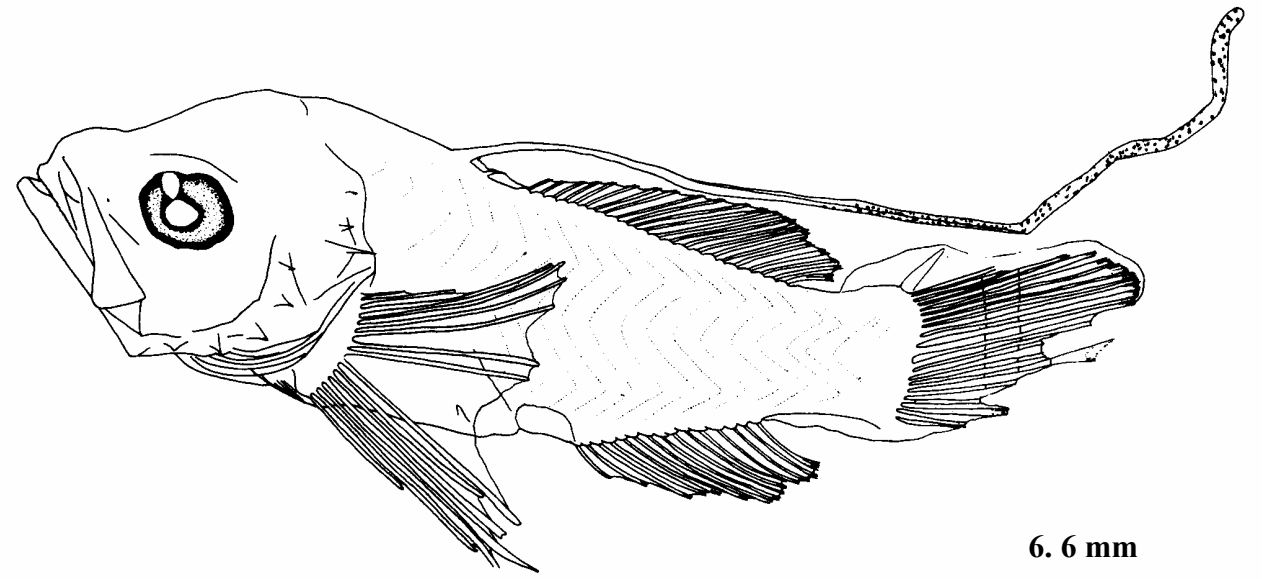
SERRANIDAE **Jeboehlkia gladifer *Robins 1967***



A

10.2 mm SL

SERRANIDAE ***Rypticus* sp.**



6. 6 mm

SERRANIDAE *Rypticus bistrispinus* (Mitchill 1818)

MERISTICS

Vertebrae
Precaudal: 10
Caudal: 15
Total: 25
Number of Fin Spines and Rays:
First Dorsal Fin: II
Second Dorsal Fin: 24-26(24-28)
Anal Fin: 15-16(17)
Pectoral Fin: 13-15(13-16)
Gill Rakers: 8(7-9)

LIFE HISTORY

Range: Bahamas, south FL, eastern Gulf of Mexico, West Indies to Brazil.
Habitat: Shallow, clear waters but 37 m or deeper in Gulf of Mexico.
ELH Pattern: Oviparous; pelagic eggs & larvae.
Spawning
Season: Spring and summer in Gulf of Mexico.

LITERATURE

Robins & Ray 1986; Kendall 1979, 1984; Courtenay 1967; Bullock & Smith 1991; Baldwin et al. 1991.

EARLY LIFE HISTORY DESCRIPTION

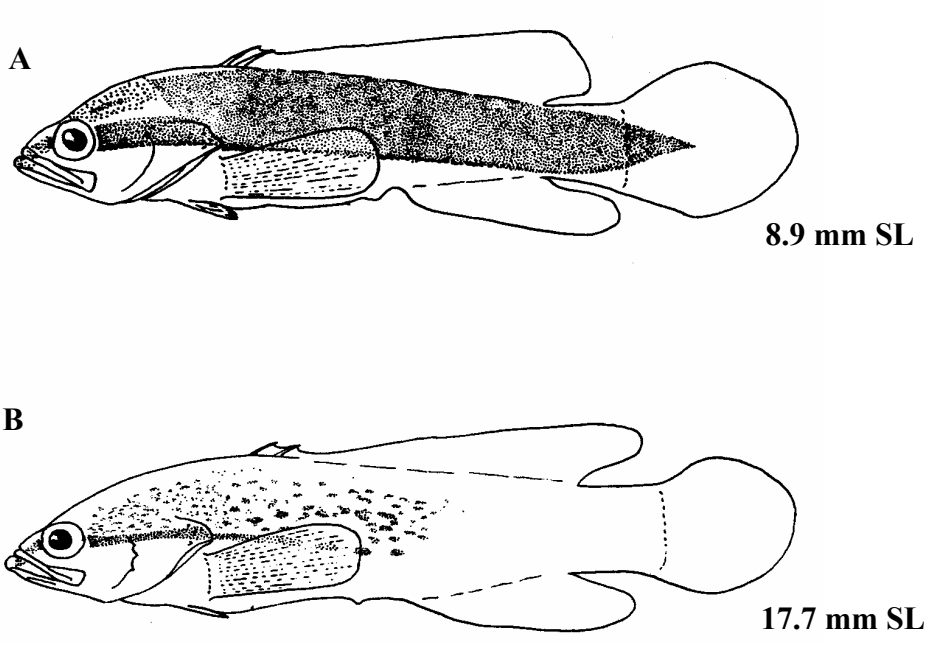
EGGS: Unknown.

LARVAE:
Head Spination: 3 spines on medial preopercular ridge.
2^{nd} D_1 Spine Length: 1^{st}, not 2^{nd}, greatly elongate.
Length at Flexion: ca. 5 mm SL.
Sequence of Fin Development: P_2 fin forms last.
Pigmentation: eye, elongate D_1 spine, P_1 fin.
Diagnostic Characters: elongate 1^{st} D_1 spine, counts, large pigmented P_1 fin.

EARLY JUVENILES:
Diagnostic Characters: Under 10 mm SL, spots lacking, but heavy pigment dorsally; this pigment extending as V-shape wedge on tail. >15 mm SL dark area breaks up into spots.

ILLUSTRATIONS

A & B) Juveniles from Courtenay 1967: Fig. 11.



SERRANIDAE *Rypticus bornoi* Beebe & TeeVan 1928

MERISTICS

Vertebrae
- Precaudal: 10
- Caudal: 14
- Total: 24

Number of Fin Spines and Rays:
- First Dorsal Fin: II(III)
- Second Dorsal Fin: 25-26(24-27)
- Anal Fin: 16-17(14-17)
- Pectoral Fin: 13(13-15)

Gill Rakers: 10(8-12)

LIFE HISTORY

Range: Bahamas & Panama based on 2 specimens.
ELH Pattern: Oviparous; pelagic eggs & larvae.

LITERATURE

Courtenay 1967.

EARLY LIFE HISTORY DESCRIPTION

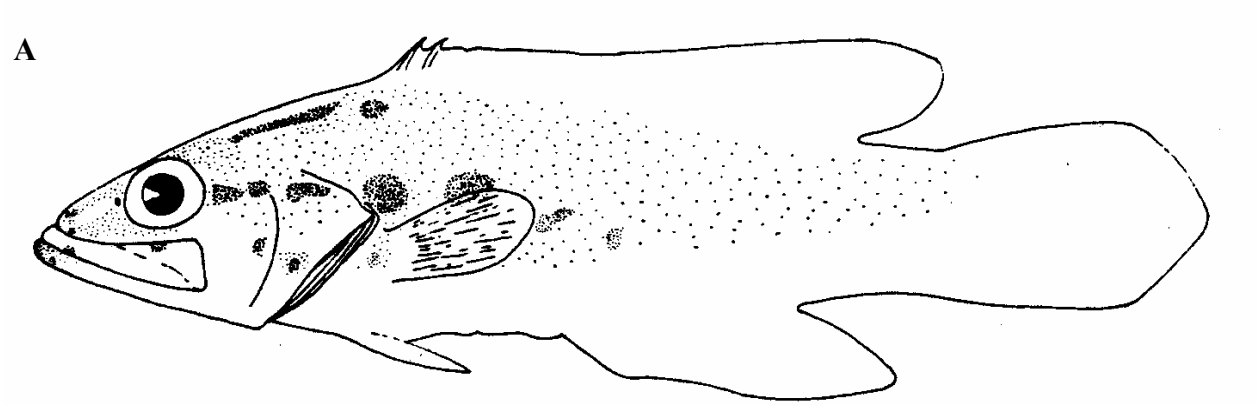
EGGS: Unknown.

LARVAE:
Head Spination: 3 spines on medial preopercular ridge.
2^{nd} D_1 Spine Length: 1^{st}, not 2^{nd}, greatly elongate.
Length at Flexion: ca. 5 mm SL.
Sequence of Fin Development: P_2 fin forms last
Pigmentation: eye, elongate D spine, P_1 fin.
Diagnostic Characters: elongate first D spine, counts, large pigmented P_1 fin.

EARLY JUVENILES:

ILLUSTRATIONS

Juvenile from Courtenay 1967: Fig. 19.



23.0 mm SL

SERRANIDAE

Rypticus saponaceous **(Bloch & Schneider 1801)**

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	III
Second Dorsal Fin:	23-25
Anal Fin:	16-17(14-17)
Pectoral Fin:	15-16(14-17)
Gill Rakers:	8-9 (5-11)[1]

LIFE HISTORY

Range: Bermuda, Bahamas, Miami & FL Keys southward to Brazil, absent from Gulf of Mexico except for record of young (Houde 1982).

Habitat: Shallow silty waters to clear waters around reefs, in holes & burrows reefs, & oil platforms; cool deep waters over sand on east coast.

ELH Pattern: Oviparous; pelagic eggs & larvae.

LITERATURE

Courtenay 1967, Houde 1982, Kendall 1979, 1984, Robins & Ray 1986.

[1] Courtenay 1967 states that gill rakers are "well-developed and numerous in juveniles below 15 mm SL" & "in larger individuals fully-formed rakers average 8 or 9".

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE:

Head Spination: 3 spines on medial preopercular ridge.

2^{nd} D_1 Spine Length: 1^{st}, not 2^{nd}, greatly elongate.

Length at Flexion: ca. 5 mm SL.

Sequence of Fin Development: P_2 fin forms last.

Pigmentation: eye, elongate D_1 spine, P_1 fin.

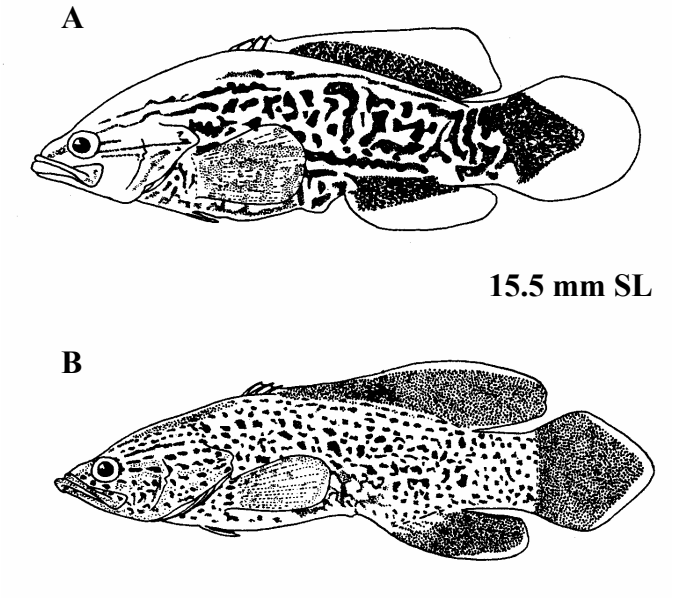
Diagnostic Characters: elongate 1^{st} D_1 spine, counts, large pigmented P_1 fin.

EARLY JUVENILES:

Diagnostic Characters: large young >65 mm with distinct, single pores on lower jaw & posterior margin of preopercle; counts.

ILLUSTRATIONS

Juveniles from Courtenay 1967: Fig. 5.



SERRANIDAE *Rypticus subbifrenatus* (Gill 1861)

MERISTICS

Vertebrae	
Precaudal:	10
Caudal:	14
Total:	24
Number of Fin Spines and Rays:	
First Dorsal Fin:	III
Second Dorsal Fin:	22-23 (20-25)
Anal Fin:	15(13-16)
Pectoral Fin:	14-15(14-16)
Gill Rakers:	9(7-10)

LIFE HISTORY

Range: Bahamas, south FL, & Caribbean.
Habitat: Clear reef water, in deep holes & burrows.
ELH Pattern: Oviparous; pelagic eggs & larvae.

LITERATURE

Courtenay 1967, Kendall 1979, 1984, Robins & Ray 1986.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

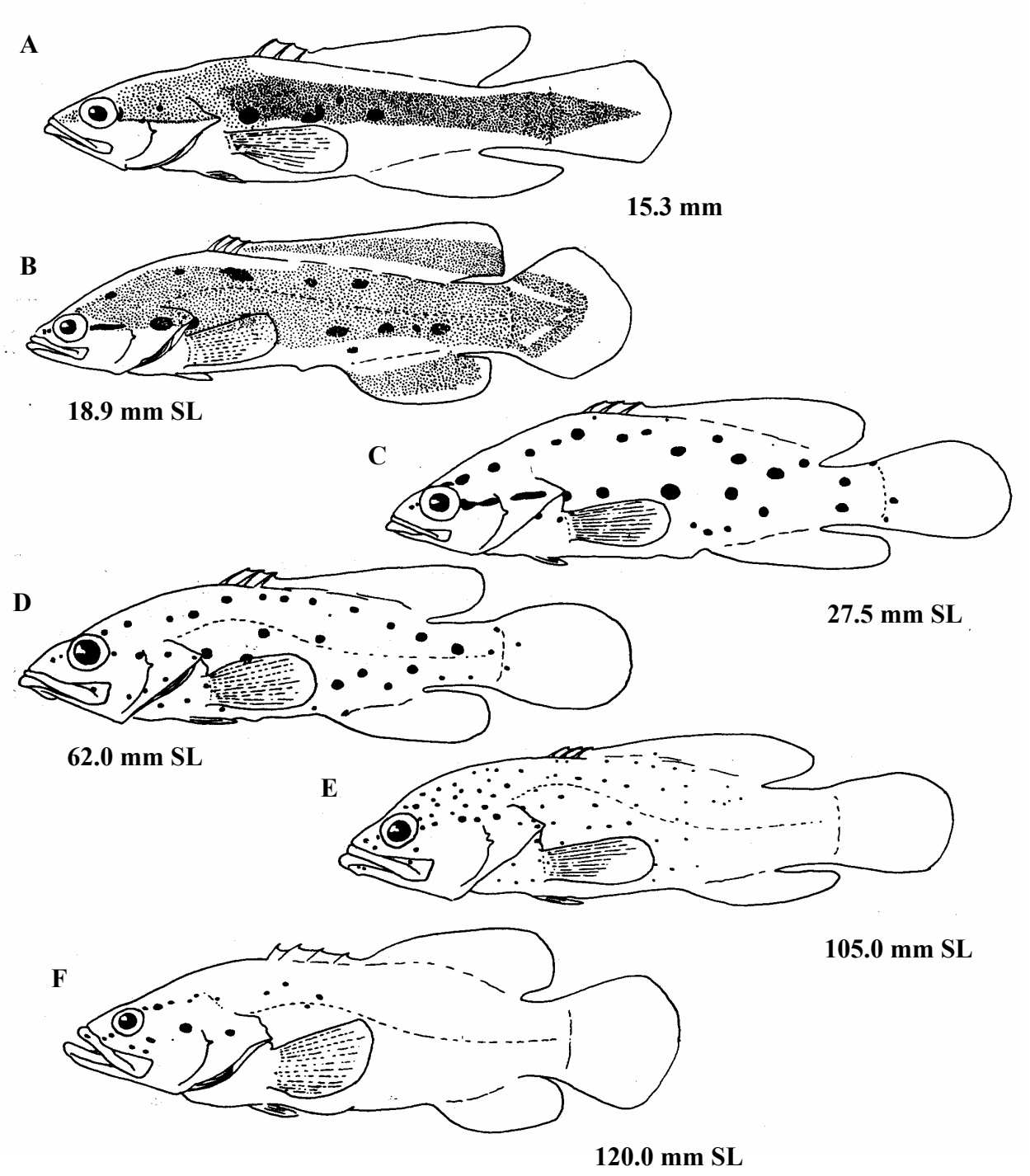
LARVAE:
Head Spination: 3 spines on medial preopercular ridge.
2^{nd} D_1 Spine Length: 1^{st}, not 2^{nd}, greatly elongate.
Length at Flexion: ca. 5 mm SL.
Sequence of Fin Development: P_2 fin forms last.
Pigmentation: eye, elongate D spine, P_1 fin.
Diagnostic Characters: elongate 1^{st} D_1 spine, counts, large pigmented P_1 fin.

EARLY JUVENILES:
Diagnostic Characters: large young >65 mm with distinct, single pores on lower jaw & posterior margin of preopercle; counts.

ILLUSTRATIONS

A-E) Juveniles from Courtenay 1967: Fig. 7-8.

SERRANIDAE ***Rypticus subbifrenatus* (Gill 1861)**



SUBFAMILY ANTHIINAE

By W. J. Richards, C. C. Baldwin, & A. Röpke

This subfamily comprises 9 species in our area allocated to 4 genera, but generic allocations will change once revisionary work is completed (Baldwin 1990). Larval stages have been described for 8 species by Kendall (1979, 1984) and Baldwin (1990). Anthiine larvae are very distinct and easily identified to subfamily. They have very large heads that are deep, wide, and usually very spinous, rugose, or rough in appearance. They have a large interopercular spine medial to the large spine at the angle of the preopercle, giving a double-spine appearance. The trunk is typically deep and short, even at very small sizes. Baldwin (1990) treated 8 of the 9 species (only *Anthias asperilinguis* larvae remain undescribed) and divided them into 4 distinct groups as follows: Group 1 comprises *Hemanthias vivanus* and *Pronotogrammus aureorubens,* characterized by a cockscomb-like supraoccipital crest, ornately spined head with serrate frontal, parietal, pterotic, and supraorbital ridges, serrate lacrimal, infraorbitals and tabulars, type A larval scales, serrate pelvic, dorsal, and sometimes anal-fin spines, and pigment on membrane of spinous dorsal fin; Group 2 comprises *Anthias nicholsi, A. woodsi*, and *Pronotogrammus martinincensis,* characterized by absence of a serrate supraoccipital crest, frontal smooth anteriorly and rough posteriorly, fin spines smooth, pigment on membrane of spinous dorsal, larval scales absent or type B, and lacrimal, infraorbitals and tabulars serrate; Group 3 comprises *Hemanthias leptus* and *A. tenuis,* characterized by a more slender body, rugose frontals, small knob-like supraoccipital crest, no larval scales, trunk with internal pigment, medial preopercular spines strongly serrate, and no pigment on membrane of spinous dorsal fin; and Group 4 comprises *Plectranthias garrupellus,* characterized by absence of a supraoccipital crest, 3rd dorsal spine elongate and smooth (also found in *A. nicholsi*), spines at angle of preopercle and dorsal margin of interopercle small and smooth, frontal smooth to slightly rough (not rugose), and no pigment on membrane of spinous dorsal fin.

All species inhabit relatively deep water and are presumed to be protogynous hemaphrodites. Descriptions of eggs are lacking. Juveniles should be easily identified using adult counts (Table Serranidae 1) and descriptions.

Anthiinae larvae are quite distinctive and would likely be most easily confused with larval Priacanthidae, which have strong supraoccipital crests, large heads, and robust bodies. The supraoccipital crest of priacanthids, however, is long and pointed, they have different fin-ray counts, and they lack a long interopercular spine. Priacanthids also have only 2 (vs. 3) spines on the opercle.

Key to the Larval Stages of the Anthiinae (excluding *Anthias asperilinguis*).

1a. Supraoccipital with well-developed cockscomb-like crest 2
1b. Supraoccipital crest absent or only a small knob-like structure present 3
2a. Frontal ridges not joined anteriorly or posteriorly, a single serrate supraorbital ridge, little pigment on 1st dorsal fin membrane, one spot of dorsal trunk pigment, dorsal fin spines II-IV serrate ..... *Hemanthias vivanus*
2b. Frontal ridges joined anteriorly and posteriorly by vertical ridges, 3 serrate supraorbital ridges, 3-5 bars of dorsal trunk pigment, pigment on membrane between almost all dorsal spines, dorsal-fin spines I-III or as many as I-VI serrate ..... *Pronotogrammus aureorubens*
3a. Supraoccipital with small knob-like crest 4
3b. Supraoccipital crest absent 6
4a. Membrane of spinous dorsal fin pigmented, frontal smooth anteriorly and rugose posteriorly, lacrimal and tabulars serrate ..... *Pronotogrammus martincenensis*
4b. Membrane of spinous dorsal fin without pigment, frontal rugose, lacrimal and tabulars smooth 5
5a. Mid-lateral dashes of internal pigment ..... *Hemanthias leptus*
5b. No mid-lateral dashes of pigment; internal blotch of pigment on midbody ..... *Anthias tenuis*
6a. Membrane of spinous dorsal fin with pigment, lacrimal and tabulars serrate 7
6b. Membrane of spinous dorsal fin without pigment, lacrimal and tabulars smooth ..... *Plectranthias garrupellus*
7a. Mid-dorsal pigment blotch present, 3rd dorsal spine elongate ..... *Anthias nicholsi*
7b. Dorsal portion of trunk without pigment, no elongate dorsal spines ..... *Anthias woodsi*

SERRANIDAE *Anthias nicholsi* Firth 1933

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	15(14)
Anal Fin	III,7(6-8)
Pectoral Fin	19(18-21)
Gill Rakers:	12-13+27-31=39-44
Lateral Line Scales:	31-34

LIFE HISTORY

Range: Nova Scotia to FL, Gulf of Mexico, Guayana to Brazil.
Habitat:
ELH Pattern: Eggs & larvae pelagic.
Spawning
Season: February-April.
Area: Gulf of Mexico.
Mode: Protogynous.
Size/Age at First Maturity: females 71-139 mm, males 106-149 mm.

LITERATURE

Baldwin 1990, Bullock & Smith 1991, Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

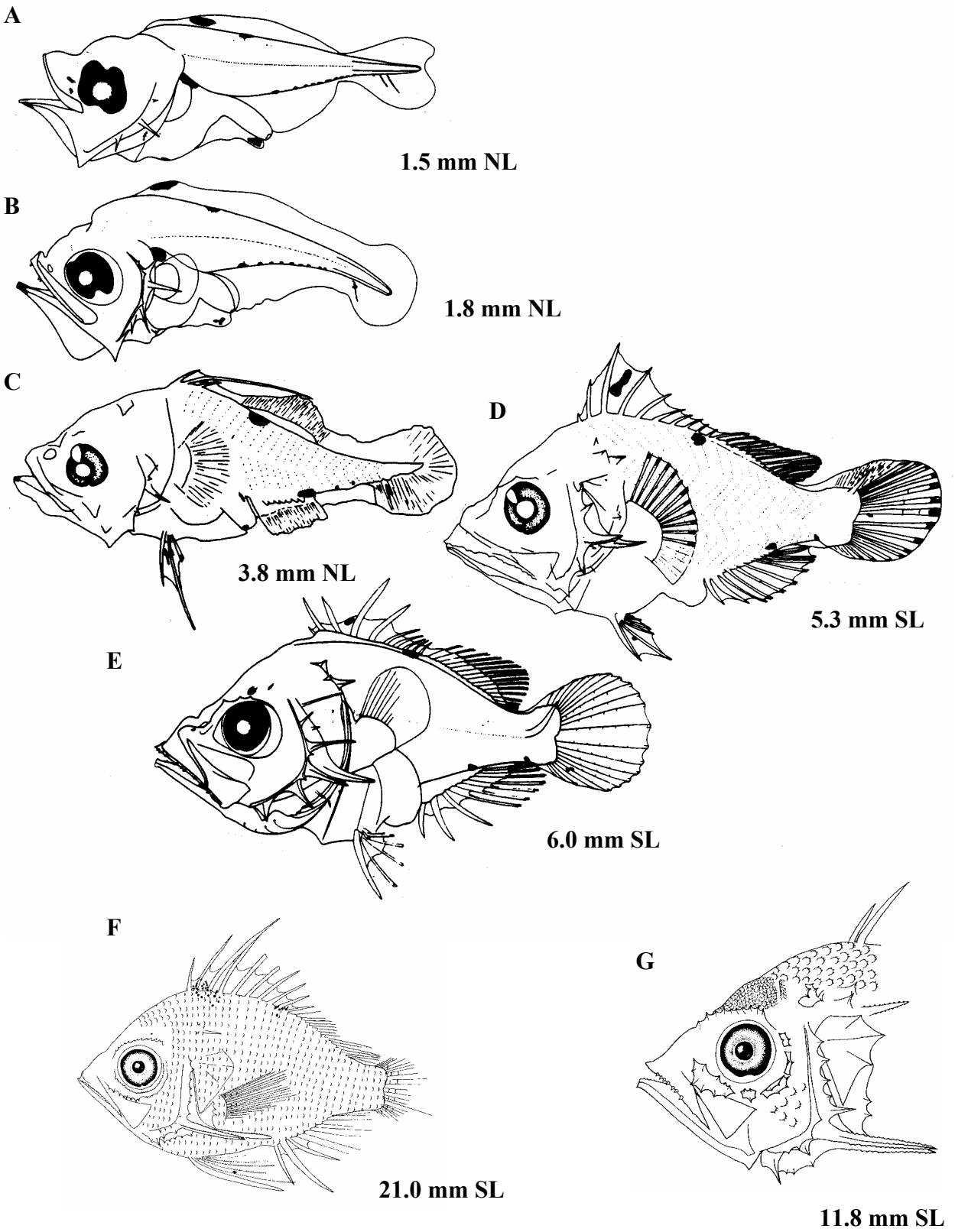
LARVAE [Baldwin 1990 Group II]:
Surpraoccipital crest: absent.
Head Spination: frontal smooth anteriorly, rugose posteriorly, serrate supraorbital ridge.
Interopercle spine: long.
Length at Flexion: ca. 4 mm SL.
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base: >
Lacrimal and infraorbitals: serrate.
Tabulars: serrate.
Pigmentation: midline of dorsal trunk opposite A fin origin, above A fin, spinous D & P_2 fin membranes
Diagnostic Characters: pigment on dorsal midline above A origin, elongate 3rd D_1 spine

EARLY JUVENILES:
Diagnostic Characters: acquire scales at ca. 6.0 mm SL.

ILLUSTRATIONS

F, G) Baldwin 1990; C, D) Kendall 1979; A, B, E) Original.

SERRANIDAE ***Anthias nicholsi* Firth 1933**



SERRANIDAE *Anthias tenuis* Nichols 1920

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	15(14)
Anal Fin	III,8(7-9)
Pectoral Fin	20(19-21)
Gill Rakers:	9-11+24-28=34-39
Lateral Line Scales:	51-57(interrupted)

LIFE HISTORY

Range: NC to Venezuela including Gulf of Mexico, Bermuda, & Puerto Rico.
Habitat:
ELH Pattern: Eggs & larvae pelagic.
Spawning
Mode: Protogynous?

LITERATURE

Baldwin 1990, Bullock & Smith 1991, Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

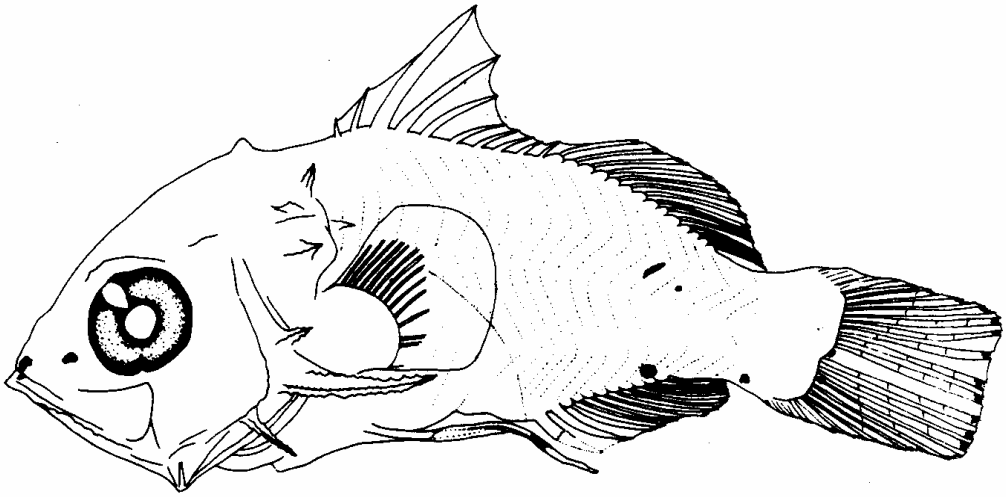
LARVAE [Baldwin 1990 Group III]
Surpraoccipital crest: small knob.
Head Spination: frontal parietal rugose.
Interopercle spine: long.
Length at Flexion: ca. 4.5-5 mm SL.
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base: >
Lacrimal and infraorbitals: smooth.
Tabulars: smooth.
Pigmentation: no pigment on spinous D_1 fin, internal blotch of pigment below D_2, little pigment on head, large melanophore below anterior D_2 rays usually only on one side.
Diagnostic Characters: Extremely similar to *Hemanthias leptus*. Separable based on pigment & 1-3 spines ventral to large interopercular spine in *A, tenuis,* 0-1 in *H. leptus.* No larval scales.

ILLUSTRATIONS

A) Kendall 1979; B) Baldwin 1990.

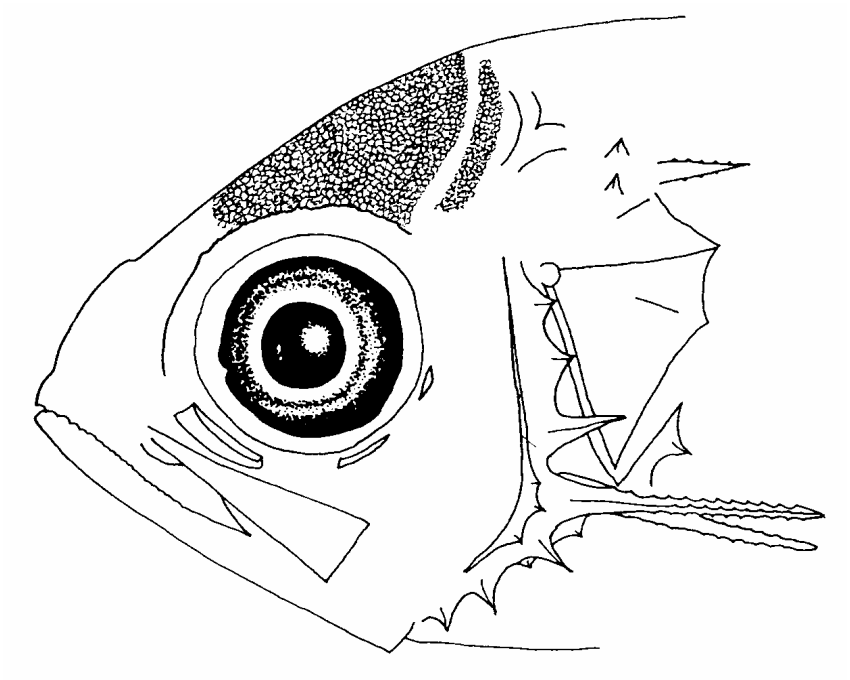
SERRANIDAE ***Anthias tenuis* Nichols 1920**

A



6.7 mm SL

B



10.4 mm SL

SERRANIDAE *Anthias woodsi* Anderson & Heemstra 1980

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	14(15)
Anal Fin	III,7(8)
Pectoral Fin	18(16)
Gill Rakers:	11-12+26-28=38-40
Lateral Line Scales:	42-48

LIFE HISTORY

Range: SC to Dry Totugas, FL.
Habitat: Deep 347-421 m.
ELH Pattern: Eggs & larvae pelagic.
Spawning:
Mode: Protogynous?

LITERATURE

Anderson & Heemstra 1980, Baldwin 1990, Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

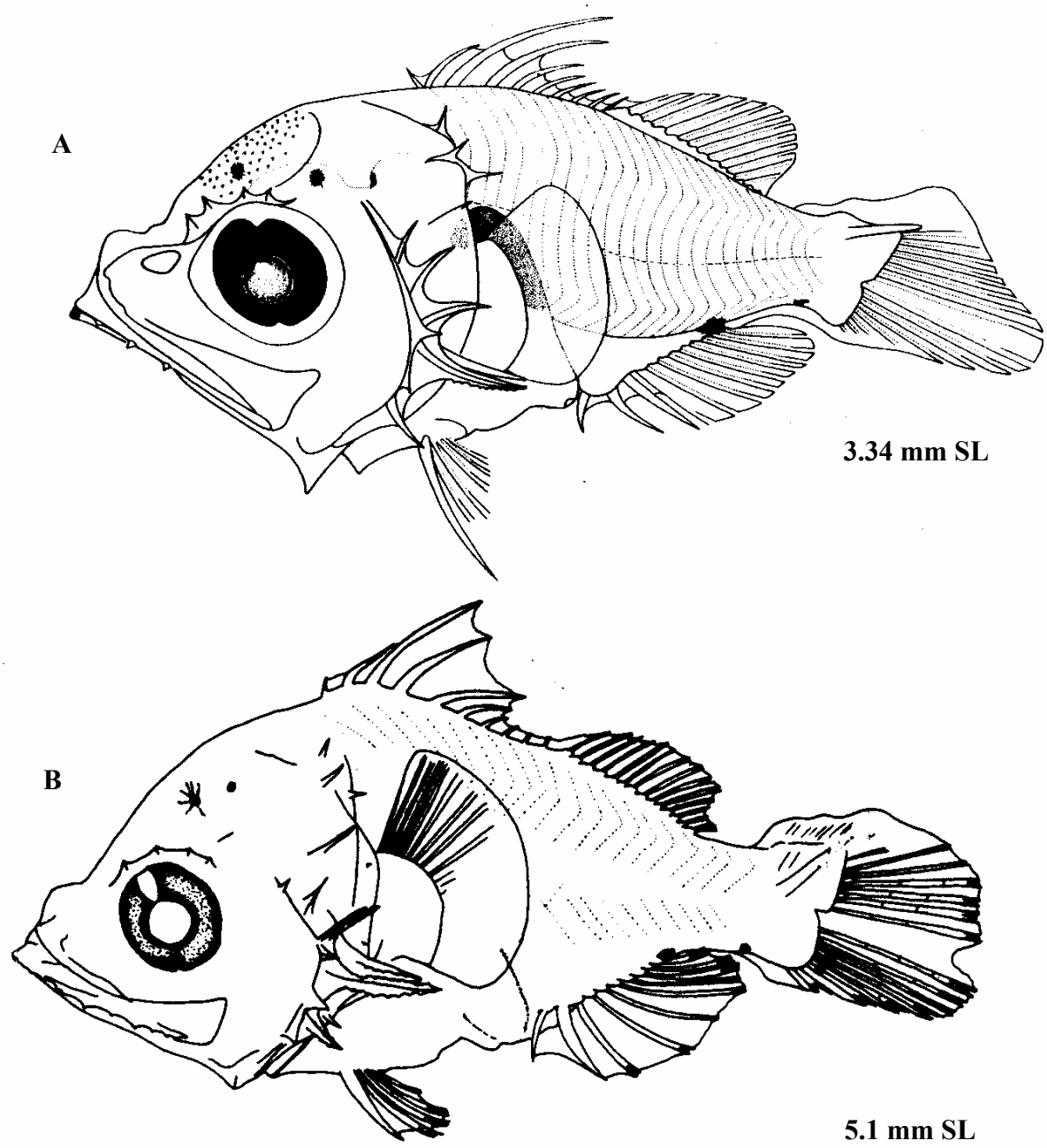
EGGS: Unknown.

LARVAE [Baldwin 1990 Group II]
Surpraoccipital crest: absent
Head Spination: frontal smooth anteriorly, rugose Posteriorly.
Interopercle spine: long.
Length at Flexion: ca. 4 mm SL.
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base: >
Lacrimal and infraorbitals: serrate.
Tabulars: serrate.
Pigmentation: spot above end of A fin, pigment on membrane of anterior spinous D & P_2 fin membrane except in very small specimens.
Diagnostic Characters: no pigment on dorsal trunk or dorsal midline.

ILLUSTRATIONS

A, B) Kendall 1979.

SERRANIDAE ***Anthias woodsi* Anderson & Heemstra 1980**



SERRANIDAE *Hemanthias leptus* (Ginsburg 1952)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	14(13-15)
Anal Fin	III,8
Pectoral Fin	18(19)
Gill Rakers:	35-40
Lateral Line Scales:	54-64

LIFE HISTORY

Range: SC to Venezuela including Gulf of Mexico.
Habitat: Deep 91-216 m.
ELH Pattern: Eggs & larvae pelagic.
Spawning
Season: Variable.
Mode: Protogynous/diandric.
Size/Age at First Maturity: Females 48-216 mm, males 43-456 mm.

LITERATURE

Baldwin 1990, Bullock & Smith 1991, Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

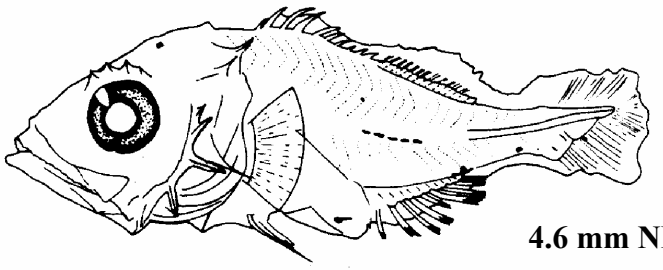
LARVAE: [Baldwin 1990 Group III]
Surpraoccipital crest: small knob.
Head Spination: frontal rugose.
Interopercle spine: long.
Length at Flexion: ca. 4.5-5 mm SL.
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base: >
Lacrimal and infraorbitals: smooth.
Tabulars: smooth.
Pigmentation: no pigment on spinous D fin, unique midlateral dashes of pigment internally, heavy pigment on head.
Diagnostic Characters: midlateral pigment, 0-1 spine ventral to large interopercular spine vs. 3 in *A. tenuis*. No larval scales.

ILLUSTRATIONS

A-C) Kendall 1979; D) Baldwin 1990.

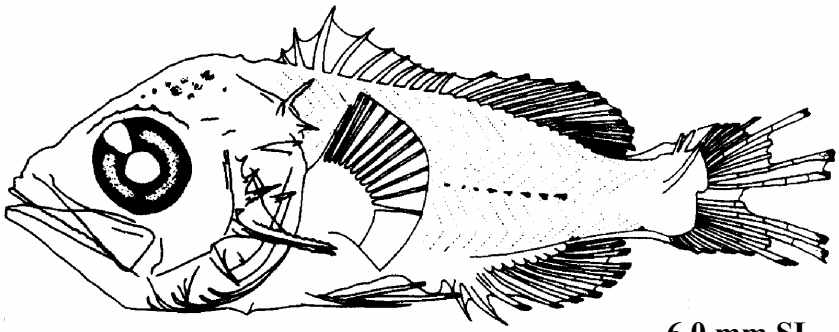
SERRANIDAE ***Hemanthias leptus*** **(Ginsburg 1952)**

A



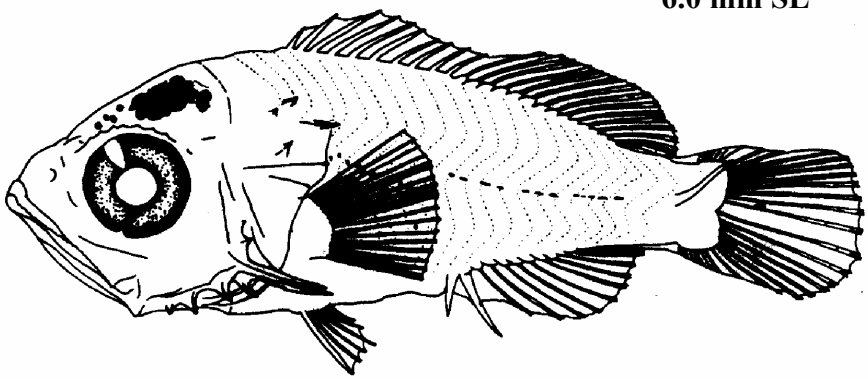
4.6 mm NL

B



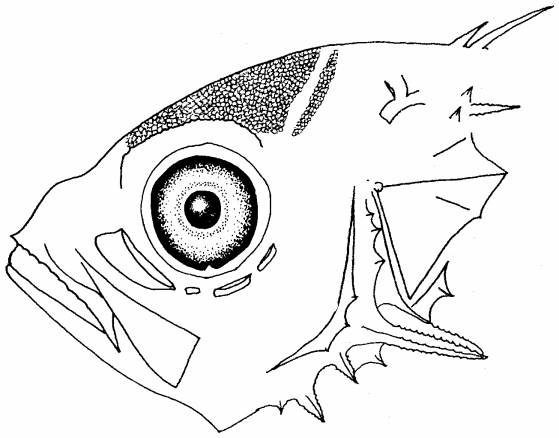
6.0 mm SL

C



9.0 mm SL

D



9.1 mm SL

SERRANIDAE *Hemanthias vivanus* (Jordan & Swain 1885)

MERISTICS

Vertebrae	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X(IX)
Second Dorsal Fin	14(13)
Anal Fin	III,8(9)
Pectoral Fin	19(18-20)
Gill Rakers:	10+30=38-43
Lateral Line Scales:	<53

LIFE HISTORY

Range: NC to Gulf of Mexico.
Habitat: Deep 73-427 m.
Off shelf edge.
ELH Pattern: Eggs & larvae pelagic.
Spawning
Season: Winter - spring in eastern Gulf of Mexico.
Mode: Protogynous.
Size/Age at First Maturity: Females 49-77 mm, transition 95-106 mm, males 113-117 mm.

LITERATURE

Baldwin 1990, Bullock & Smith 1991,Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE [Baldwin 1990 Group I]
Surpraoccipital crest: large cockscomb.
Head Spination: frontal with serrate ridges.
Interopercle spine: long.
Length at Flexion: ca. 4.5-5 mm SL.
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base: = or >
Lacrimal and infraorbitals: serrate.
Tabulars: serrate.
Pigmentation: little if any pigment on spinous D fin, spot(s) below D_2 & above A fin, on ventral caudal peduncle, and on head (frontal).
Diagnostic Characters: serrate cockscomb crest, serrate D_1 & P_2 spines, frontal ridges not joined anteriorly or posteriorly, type A larval scales.

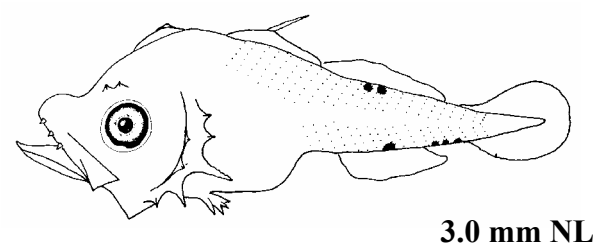
EARLY JUVENILES:
Diagnostic Characters: Larval scale type A.

ILLUSTRATIONS

A) Original; B, C & supraoccipital crests) Kendall 1979;
D, E) Baldwin 1990.

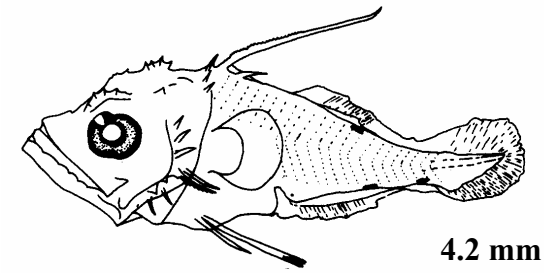
SERRANIDAE ***Hemanthias vivanus* (Jordan & Swain 1885)**

A



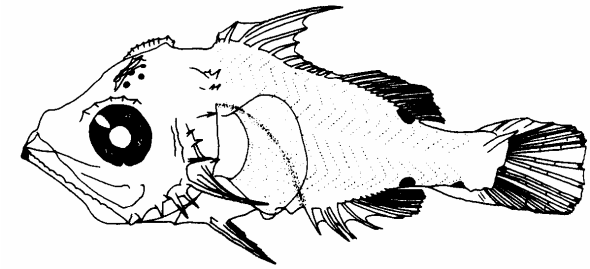
3.0 mm NL

B



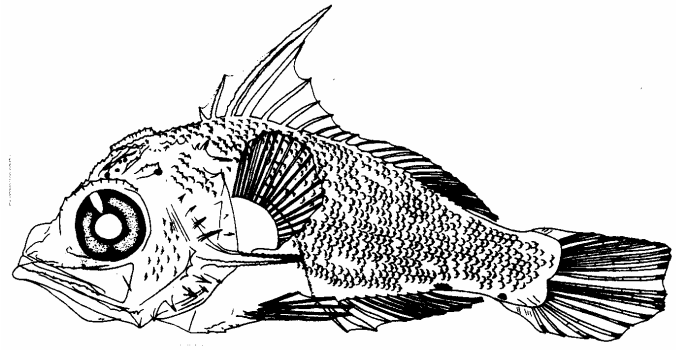
4.2 mm NL

C



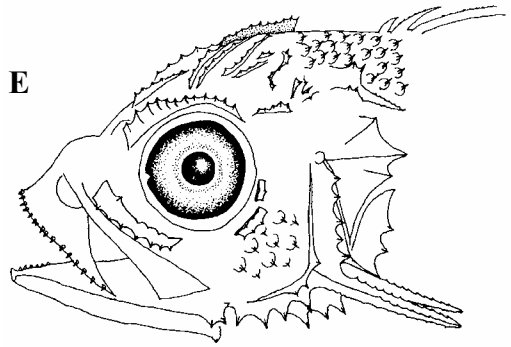
5.3 mm SL

D



6.8 mm SL

E



8.0 mm SL

SERRANIDAE — *Plectranthias garrupellus* Robins & Starck 1961

MERISTICS

Vertebrae	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	16(15)
Anal Fin	III,7(6-8)
Pectoral Fin	13(12)
Gill Rakers:	4-9+9-17
Lateral Line Scales:	28-29(27-30)

LIFE HISTORY

Range: Both coasts of FL, Cuba & Bahamas.
Habitat: 55-210 m.
ELH Pattern: Eggs & larvae pelagic.
Spawning
Season: August-November.

LITERATURE

Baldwin 1990, Bullock & Smith 1991, Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE: [Baldwin 1990 Group IV]
Surpraoccipital crest: absent.
Head Spination: smooth to slightly rough, not rugose.
Interopercle spine: long.
Length at Flexion:
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base: =
Lacrimal and infraorbitals: smooth.
Tabulars: smooth.
Pigmentation: 2 large spots on dorsal trunk, below D_1 & D_2 fins; spot on ventral caudal peduncle; none on D fin membrane.
Diagnostic characters: pigment below both D fins, preopercular spine smooth or slightly serrate, interopercular spine relatively small, supraorbital with 1 spine vs. serrate ridge, no larval scales.

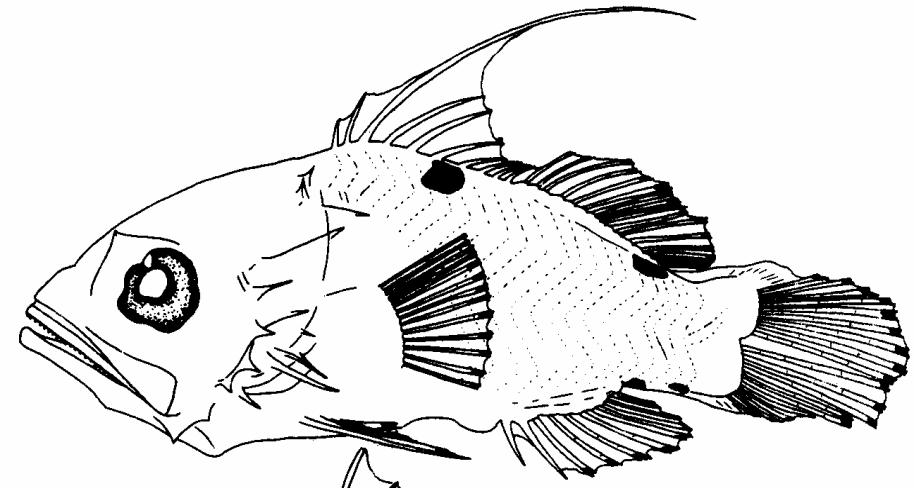
EARLY JUVENILES:
Diagnostic Characters: acquire scales at ca. 6.0 mm SL.

ILLUSTRATIONS

Upper two) Kendall 1979; lower) Baldwin 1990.

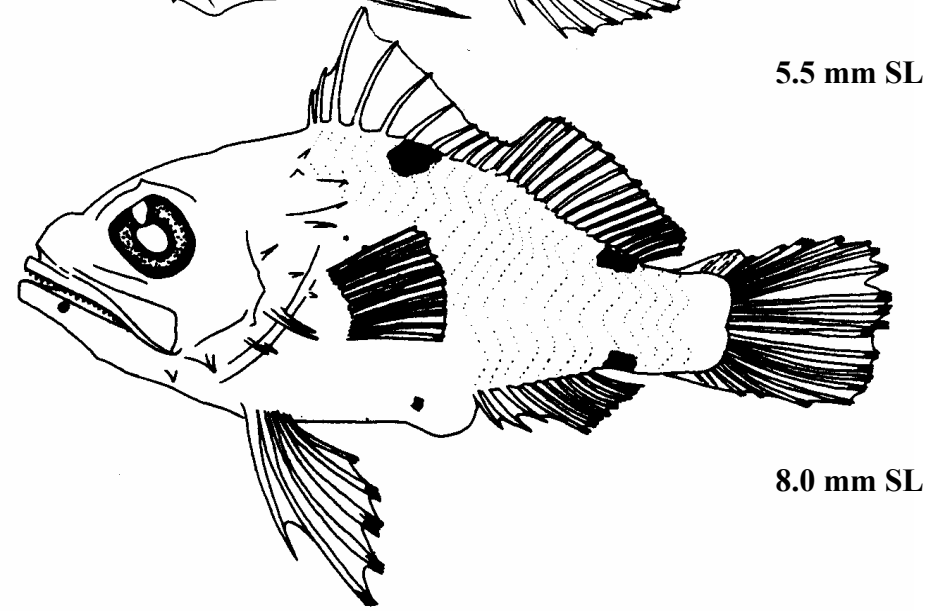
SERRANIDAE ***Plectranthias garrupellus*** **Robins & Starck 1961**

A



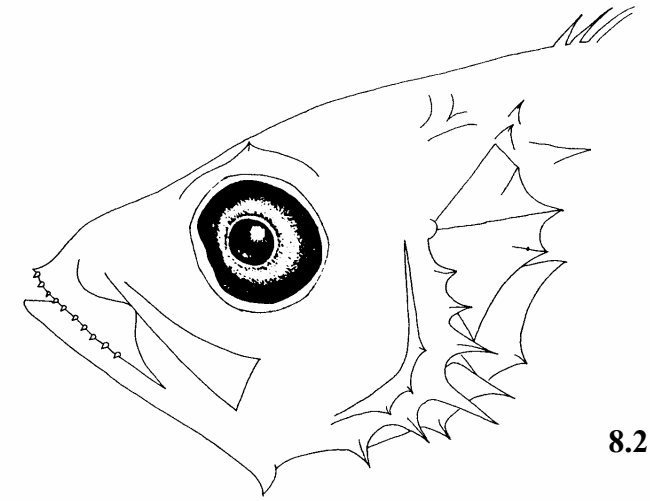
5.5 mm SL

B



8.0 mm SL

C



8.2 mm SL

SERRANIDAE *Pronotogrammus aureorubens* Longley 1935

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	15(14)
Anal Fin	III,8(7-9)
Pectoral Fin	16-17(15-17)
Gill Rakers:	+28-29
Lateral Line Scales:	44-48

LIFE HISTORY

Range: Northeastern Gulf of Mexico, FL south to Dry Tortugas, Venezuela to Suriname.
Habitat: Deep 91-457 m.
ELH Pattern: Eggs & larvae pelagic.
Spawning
Season: May off FL.
Mode: Protogynous.
Size/Age at First Maturity: Females 49-77 mm, transition 95-106 mm, males 113-117 mm.

LITERATURE

Baldwin 1990, Bullock & Smith 1991, Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE: [Baldwin 1990 Group I]
Surpraoccipital crest: large cockscomb.
Head Spination: frontal with serrate ridges.
Interopercle spine: long.
Length at Flexion:
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base:= or >
Lacrimal and infraorbitals: serrate.
Tabulars: serrate.
Pigmentation: 10 mm SL larvae with 3-5 dorsal blotches & pigment on membrane of D_1.
Diagnostic Characters: serrate cockscomb crest, serrate D & P_2 spines, frontal ridge joined anteriorly & posteriorly by vertical ridges, very deep body, type A larval scales.

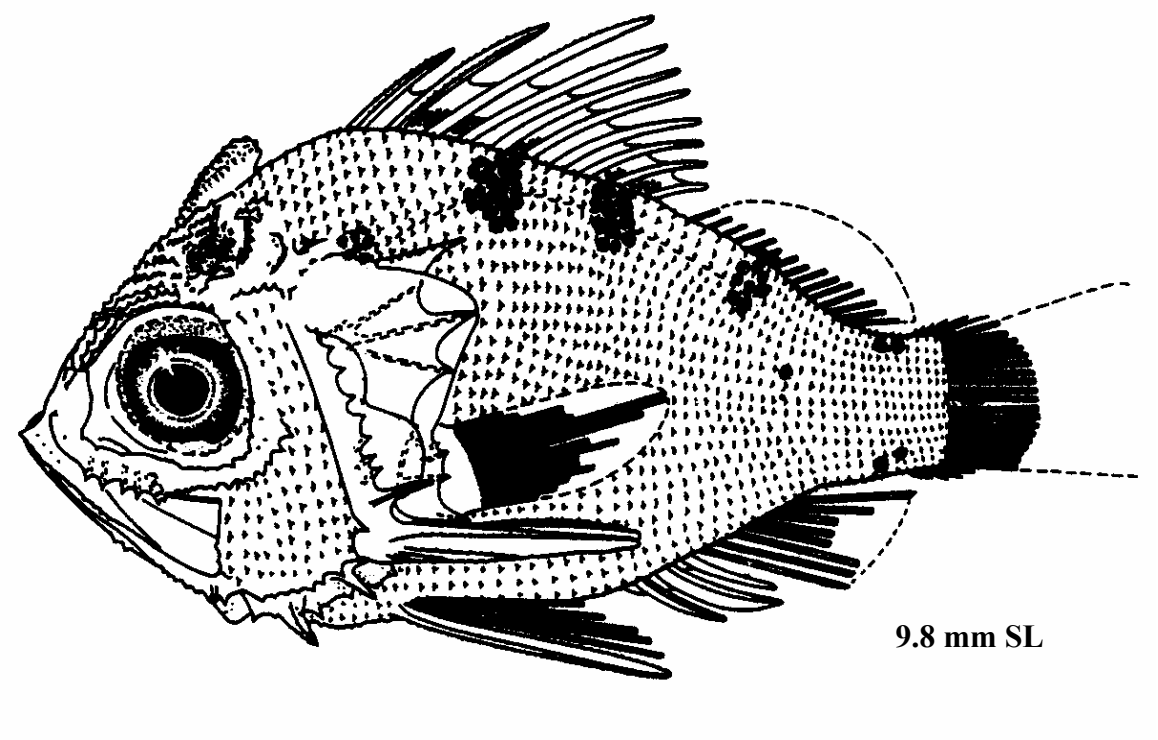
EARLY JUVENILES:
Diagnostic Characters: Larval scale type A.

ILLUSTRATIONS

A) Kendall 1984; B) Baldwin 1990.

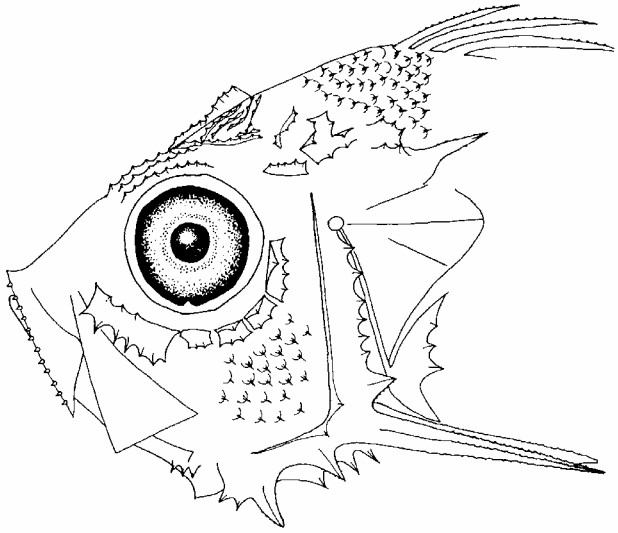
SERRANIDAE ***Pronotogrammus aureorubens*** **Longley 1935**

A



9.8 mm SL

B



14.2 mm SL

SERRANIDAE

***Pronotogrammus martinicensis* (Guichenot 1868)**

MERISTICS

Vertebrae:	
Precaudal	10
Caudal	16
Total	26
Number of Fin Spines and Rays:	
First Dorsal Fin	X
Second Dorsal Fin	15(13-16)
Anal Fin	III,7(8)
Pectoral Fin	17(16-18)
Gill Rakers:	9-13+24-29=34-41
Lateral Line Scales:	35-41

LIFE HISTORY

Range: NC to southern Brazil, Bermuda Gulf of Mexico & Caribbean.
Habitat: Benthic 65-230m, drowned reefs, rocky outcrops.
ELH Pattern: Eggs & larvae pelagic.
Spawning
Season: February - July in eastern Gulf of Mexico.
Mode: Protogynous.
Size/Age at First Maturity: Females 47-112 mm, transition 73-94 mm, males 66-132 mm.

LITERATURE

Anderson & Heemstra 1980, Baldwin 1990, Bullock & Smith 1991 Kendall 1979, 1984.

EARLY LIFE HISTORY DESCRIPTION

EGGS: Unknown.

LARVAE:[Baldwin 1990 Group II]
Surpraoccipital crest: small.
Head Spination: frontal smooth anteriorly, rugose Posteriorly.
Interopercle spine: long.
Length at Flexion: ca. 4 mm SL.
Sequence of Fin Development:
Length of Fin Development:
HL vs. BD @ P1 base: >
Lacrimal and infraorbitals: serrate.
Tabulars: serrate.
Pigmentation: distinctive streak on dorsal midline below D_2 fin, pigment on membranes of D_1 & P_2 fins, & spots on head, above posterior end of A fin, & on caudal peduncle.
Diagnostic Characters: distinctive streak below D_2 fin, type B larval scales.

EARLY JUVENILES:
Diagnostic Characters: Larval scale type B.

ILLUSTRATIONS

A-C) Kendall 1979; D) Baldwin 1990.

SERRANIDAE ***Pronotogrammus martinicensis*** **(Guichenot 1868)**