

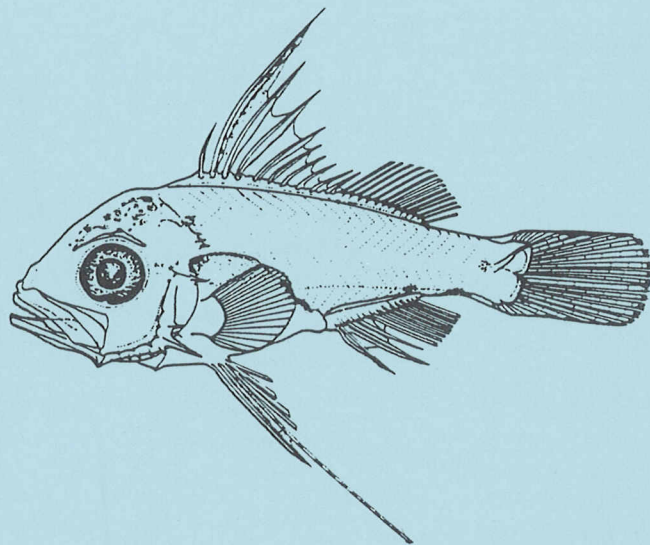


NOAA TECHNICAL MEMORANDUM
NMFS-SEFSC-345

PRELIMINARY GUIDE TO THE IDENTIFICATION
OF THE EARLY LIFE HISTORY STAGES OF LUTJANID FISHES
OF THE WESTERN CENTRAL ATLANTIC

by

WILLIAM J. RICHARDS, KENYON C. LINDEMAN,
JOANNE L. - SHULTZ, JEFFREY M. LEIS, ANDREAS RÖPKE,
M. ELIZABETH CLARKE, AND BRUCE H. COMYNS



U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHEAST FISHERIES SCIENCE CENTER
MIAMI, FLORIDA 33149

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U. S. DEPARTMENT OF COMMERCE
Ronald H. Brown, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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NATIONAL MARINE FISHERIES SERVICE
Rolland A. Schmitt, Assistant Administrator for Fisheries

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INTRODUCTION

This guide is intended for the identification of early life history (ELH) specimens of snappers (Lutjanidae) collected principally by plankton nets from marine waters of the western central Atlantic. This area is bounded by 35° north latitude on the north, 50° west longitude on the east, the Equator on the south, and the continental margins on the west. It is basically the area defined by FAO as the western central Atlantic Fishing Area 31 which includes the Gulf of Mexico and Caribbean Sea. The region is tropical and subtropical with important fishing areas and a high diversity of species. The area is also characterized by a large number of coral reefs.

The Lutjanidae is a world wide family of basically tropical fishes of high commercial and recreational importance. There are over 100 species of snappers found in tropical and subtropical waters largely confined to continental and insular shelves and with some species occupying estuaries and fresh water (Anderson 1987). In the western Atlantic there are eighteen species distributed within five genera (Robins and Ray 1986). Most authors have included Lutjanus chrysurus in the genus Ocyurus, but recent studies have shown that this species should be placed in Lutjanus and Ocyurus placed as a junior synonym of Lutjanus (Chow and Walsh 1992; Chow et al. 1993). Loftus (1992) has shown that Lutjanus ambiguus is the hybrid of L. synagris and L. ocyurus which has also been reared in the laboratory by Domeier and Clarke (1992). W. D. Anderson, Jr. (pers. comm.) cautioned against us making this nomenclature change until the status of some other genera closely related to Lutjanus are resolved. However, due to the morphological and biochemical evidence, intergeneric hybridization, and close similarity of larval forms, this decision seems logical for our purpose at this time.

Eggs, larvae, and early juveniles are only known for a few species. We provide diagnoses for the family, genera, and species given that much information is incomplete. It is a difficult group to study as meristic characters are very similar within the family. Advances in rearing series from known parents in the laboratory have greatly increased our knowledge, but more is unknown than known. For instance ELH information is essentially lacking for Apsilus dentatus and several species of Lutjanus. Recent papers have made this task easier especially the larval studies of Leis (in press) and Clarke et al. (ms).

The format of the guide summarizes ELH identification information about the family including a list of described species (Table 1), a table of adult meristics (Table 2), generic comparison of characters (Table 3), followed by accounts of individual species (same order as Table 1 followed by a comparison of small Rhomboplites and Lutjanus) with information on the left page and illustrations on the right. In some of the tables and species accounts, the following abbreviations are used: D -dorsal fin, Dsp1-first spine of the dorsal fin, P1-pectoral fin, P2 -pelvic fin, DCP-dorsad of the caudal peduncle, VCP-ventrad of the caudal peduncle, A-anal fin.

The early life history of snappers has been thoroughly reviewed by Leis (1987). The purpose of this manual is to assemble information for the species in the study area for the purpose of identifying the early life stages. This is a part of a larger effort which has been underway for sometime to develop a manual for the identification of the early life stages for all fishes from the area. This manual is tentatively scheduled for completion in 1996 and this preliminary guide is one of a series to preview progress. Scombroid fishes were treated earlier (Richards 1989) and several other groups (sciaenids, serranids, labrids, and chaetodontids, to name a few) will be treated next. We ask all users of this preliminary guide to notify us of any errors or omissions so that the final version will be accurate and complete.

Acknowledgments

We thank J. C. Javech for his excellent illustrations of many of the stages in this guide. W. D. Anderson, Jr. provided meristic data from his files. Bettina Brandt helped immeasurably with plate preparations. Sharon Kelley cleared and stained many specimens. Beth Schoppaul assisted in the life history research.

FAMILY LUTJANIDAE

Snapper larvae are distinct percoid larvae characterized by compressed bodies which are slender to deep bodied with ca. 24 myomeres. Gut begins to coil shortly after hatching and when fully coiled retains a triangular shape. Gas bladder is small located above anterior part of gut. Head large and moderately compressed, mouth is moderate to large with villiform teeth in both jaws. Eye round. Gill membranes free from isthmus. Preopercle with many spines, largest at angle of the bone and rarely serrated (Rhomboplites). Supraocular, posttemporal, supracleithral, subopercular (may be late to form) spines usually present. Postcleithral spine and interopercular spine always present at least at some stage. Pelvic spine large, often serrated, and first ray often as long or longer than spine. First dorsal spine short, second dorsal and remaining spines moderate to extremely long, sometimes serrate. Canine teeth form early in Lutjanus - one each at anterior end of premaxillary and each dentary. Scales may form as early as 6 mm. in Etelines. Lightly pigmented but usually with ventral tail pigment which may coalesce, urostyle and caudal peduncle often pigmented. Pelvic spines and rays may be pigmented, dorsal fin membrane usually pigmented. Pigment on mid-brain and over gut, often pigment on cleithral symphysis.

Very small snapper larvae may be confused with other percoid families, but compressed body and early appearance of preopercular, pelvic and dorsal spines are helpful diagnostic characters for these difficult specimens.

Snappers show substantial geographic variability in reproduction. Continental populations show extended summer spawning. Insular populations can spawn year around with spring and fall peaks. Length at first maturity is geographically and sexually variable (Grimes, 1987). Spawning aggregations have been reported (J. A. Bohnsack, pers. comm.).

All larvae are probably planktivorous and found in the water column. Demersal juveniles can feed on a variety of benthic crustaceans and fishes. Juveniles of many Lutjanus spp. can tolerate mesohaline (18-30ppt) habitats and early stages of several species have been recorded from salinities of <10ppt (Starck and Schroeder 1971). In many western Atlantic species settling juveniles occur in shallower water than adults.

GENERIC DIAGNOSES:

Table 3 compares diagnostic characters for young stages of lutjanids limited to Atlantic genera. The following accounts expand on those characters and are not necessarily limited to Atlantic species. The reason for this is that ELH stages for several species are not known, thus characters from other areas may prove useful in clarifying identifications. Characters from specimens from other areas are noted in the accounts.

Pristipomoides

Atlantic larvae and juveniles have been described by Leis (in press) for one species (aguilonaris) and tentatively for one small juvenile (freemani). Larvae (Leis, in press): Morphology: Fin spines moderate; Dsp₂ usually longer than P₂sp; internal structure present in D and P₂ fin spines from ca. 7 mm, becoming moderately strong by ca 8.5 mm; number of spines on outer border of preoperculum high; subopercular spines form early (5.5 mm); scales form late (after 9 mm); lateral-line scales 47-51 (after 9 mm); relatively few gill rakers. Pigment - melanophores present on forebrain from ca. 5 mm (only in aguilonaris); 1-6 melanophores on tip of lower jaw (>90% with 2 or more); a melanophore present on cleithral symphysis until ca. 9 mm; urostyle pigment present from ca. 7 mm; melanophores present at tips of caudal rays from at least 10.5 mm; no pigment on P₂sp; a few melanophores present anteriorly along the base of the soft dorsal fin in most specimens from ca. 10 mm. Meristics - see Table 2.

Etelis

Atlantic larvae and juveniles have not been described. Larvae (Leis, in press - not based on Atlantic specimens): Morphology - Fin spines unornamented either internally or externally; dorsal spines moderate but apparently fragile and frequently broken; Dsp₂ longest spine in specimens < 40 mm, followed by P₂sp, and Dsp₃; relatively small at flexion (flexion stage larvae 3.7-4.5 mm); spine at preopercular angle short (6-9% BL until 8.6 mm, ca. 5%BL at 14 mm decreasing to 2-3%BL after 40 mm); subopercular spines form early (ca.4.6 mm); 3 supraneurals; scales form early (before 7 mm); maxilla scaled (maxillary scales appear between 22 and 40 mm); dorsal fin deeply notched (only just becoming notched at 40 mm). Pigment - single melanophore at tip of lower jaw in one species (Pacific), otherwise no lower jaw pigment (Atlantic unknown); initially 1-2 ventral melanophores on tail, one at base of anal fin enlarged, but absent in larvae > 4.0-6.5 mm, depending on species; no urostyle pigment; pigment on dorsal fin limited to chevron groove of Dsp₂ and 3, spreading onto other spines after 7 mm and onto fin membrane sometime after 8.7 mm; pigment on pelvic fin limited to chevron groove of spine and tip of soft ray 1; Dsp and P₂sp chevron groove pigment a series of closely-spaced elongate melanophores; melanophore (occasionally 2 or 3) at cleithral symphysis until about 8 mm. Meristics - see Table 2.

Lutjanus

Larvae have been described for wild caught campechanus, and laboratory reared chrysurus, griseus, synagris, and analis. Laboratory reared hybrids of synagris and chrysurus have been made as a hybrid (ambiguus) is known from nature. Juveniles are described herein (see species accounts) for several species based on filed observations by one of us (KCL). Within the genus variation is seen in pigmentation, morphology, and meristics. Morphology - Pelvic spines often serrated,

Dsp2 serrated in some species not in others; first pelvic ray generally elongate and pigmented, but often broken; Dsp2 elongate and serrate in some species. Flexion usually ca. 5 mm. Subopercle spines numerous and not serrated. Canine teeth form early with one each on anterior end of premaxillary and each dentary. Tail pigment variable but many melanophores in small larvae, sometimes coalescing into distinct spots above anal fin base and on VCP. Urostyle spot present in some species. Pelvic fin spine or ray 1 or membrane maybe pigmented as is dorsal fin membrane; body and head pigment variable. Usefulness of laboratory specimens for descriptions maybe limited as laboratory reared specimens are often more heavily pigmented than wild caught specimens. Meristics - see Table 2.

Rhomboplites

A single Atlantic species (aurorubens) described by Laroche 1977. Morphology - Dorsal fin spines serrated; pelvic spine serrate; preopercular spine at angle serrate. Dorsal spines moderately elongate, though first is small. Pelvic spine maybe longer than first ray but first ray fragile and often damaged in field caught specimens. Pigmentation - Ventral tail pigment with many small clusters of melanophores but these clusters coalesce as development proceeds, but in larvae >6.9 mm more melanophores appear ventrally. Urostyle spot ca. 5 mm, DCP melanophores appear ca. 6.9 mm; snout and jaw tips pigmented ca. 14 mm.

Meristics: Dorsal spines XII (unique), see Table 2 for remainder.

Apsilus

Larval and early juvenile stages unknown. Meristics - Low second dorsal fin soft ray count (10, rarely 9) should be diagnostic (see Table 2).

Table 1. List of the lutjanid species from the study area and the availability of early life history information

LUTJANIDAE	E L J
Sufamily Etelinae	
<u>Etelis oculatus</u> (Valenciennes)	X
<u>Pristipomoides aquilonaris</u> (Goode & Bean)	X X
<u>Pristipomoides freemani</u> Anderson	
<u>Pristipomoides macrophthalmus</u> (Mueller & Troschel)	
Subfamily Lutjaninae	
<u>Rhomboplites aurorubens</u> (Cuvier)	X X
<u>Lutjanus analis</u> (Cuvier)	X X
<u>Lutjanus apodus</u> (Walbaum)	X
<u>Lutjanus buccanella</u> (Cuvier)	X
<u>Lutjanus campechanus</u> (Poey)	X X X
<u>Lutjanus chrysurus</u> (Bloch)	X X
<u>Lutjanus cyanopterus</u> (Cuvier)	
<u>Lutjanus griseus</u> (Linnaeus)	X X X
<u>Lutjanus jocu</u> (Schneider)	X
<u>Lutjanus mahogoni</u> (Cuvier)	X
<u>Lutjanus purpureus</u> Poey	
<u>Lutjanus synagris</u> (Linnaeus)	X X X
<u>Lutjanus vivanus</u> (Cuvier)	X
Subfamily Apsilinae	
<u>Apsilus dentatus</u> Guichenot	X

Literature: Anderson, W. D. Jr. 1987. Allen, G. R. 1987. Leis, J. M. 1987. Leis (in press). Present study.

Table 2. Meristic characters for the Family Lutjanidae. ()=rare.

Data from Anderson 1987, Leis 1994; Miller & Jorgensen 1973; Leiby (pers. comm.), Anderson (pers. comm.), Rivas 1966.

Vetebrae 10+14; caudal 9+8; branchiostegals 7; procurrent caudal ray spur absent; predorsals 3, hypurals 3-5; epurals 3; uroneurals 2
Gill Raker counts include rudiments and mostly follow Anderson (pers. comm.)

Species	First Dorsal	Second Dorsal	Anal	Pectoral	Gill rakers	Lat.line Scales
<i>Apsilus dentatus</i>	X	10(9)	III,8	15-16	7-8+15-16=22-24	58-63
<i>Etelis oculatus</i>	X	11(10)	III,8	15-17	7-11+14-18=23-28	47-50
<i>Pristipomoides aquilomaris</i>	X	11(10)	III,7-8	15-17	7-9+16-20=24-28	48-52
<i>freemani</i>	X	11(10-12)	III,8	15-17	8-10+19-23=28-32	49-51
<i>macrophthalmus</i>	X	11(10)	III,8	15-17	6-8+13-17=19-25	54-57
<i>Rhomboplites aurorubens</i>	XII	11(10-12)	III,8(9)	17-18(16-19)	8-10+19-21(22)	47-51(46-52)
<i>Lutjanus</i>	Divided into 3 species complexes (modified after Rivas 1966)					
<i>apodus</i>	X	14	III,8	16-17	5-7+11-15=17-22	40-45
<i>cyanopterus</i>	X	14	III,7-8	16-18	5-7+11-14=17-21	45-47
<i>griseus</i>	X	14	III,7-9	15-17	6-8+12-14=18-22	43-47
<i>jocu</i>	X	14(13)	III,8(7-9)	16-17	6-8+12-14=19-21	(45)46-48(49)
<i>mahogani</i>	X	(11)12	III,8	14-15	7-8+15-17=22-25	47-49
<i>chrysurus</i>	X(IX-XI)	12-13(14)	III,(8)9	15-16(17)	9-11+21-23=30-34	46-49
<i>synagris</i>	X	12(13)	III,8(9)	15-16	6-7+12-15=18-22	47-50
<i>analis</i>	X(XI)	(13)14	III,(7)8	16(15-17)	6-8+12-13=18-21	(46)47-51(53)
<i>buccanella</i>	X	14	(II)III,7-8(9)	(14)16-17(18)	7-9+17-18(19)=25-27	(47)48-49(50)
<i>campechanus</i>	(IX)X	14(13-15)	III(IV),(7)8-9(10)	(15-16)17(18)	6+14=20	(46)47-49(50)
<i>purpureus</i>	(IX)X	14(13-15)	III(IV),(7)8-9(10)	(15-16)17(18)	7+16=23	(49)50-51((53)
<i>vivanus</i>	X(XI)	14(13)	III,8(7-9)	17(16-18)	(6)7-8+16-17=22-25	(47)48-50

Table 3. Comparison of larval characters among the Atlantic genera of Lutjanidae

Characters	<i>Etelis</i>	<i>Pristipomoides</i>	<i>Rhomboplites</i>	<i>Lutjanus</i>	<i>Apsilus</i>
External ornamentation on fin spines	None	None	Yes, Dsp2-7 serrate, Pelvic spine serrate	Yes, pelvic spine serrate, Dsp2 in some species	None (presumed based on Pacific species)
Fin spine internal structure	None	Yes, intensity and initial appearance varies with species	None	None	Unknown for Atlantic species
Preopercular spine	Non serrate	Non serrate	Serrate	Non serrate	Non serrate (presumed based on Pacific species)
Relative length Dsp2 and P2sp	Dsp2 > Pelvic sp	Dsp2 > Pelvic sp until 5- > 10mm or Pelvic sp > Dsp2	Approx. =	Dsp2 long, Pelvic long	Unknown for Atlantic species
Relative length Dsp2 and Dsp3	Dsp2 > Dsp3 until 40mm	Dsp2 slightly longer than 3 becoming = @ 6-15mm depending on species	Dsp2 slightly longer	Dsp2 > Dsp3	Unknown for Atlantic species
Profile of head	Moderately steep	Moderately steep, (becoming more shallow)	Moderately steep, (becoming more shallow)	Moderately steep, (becoming more shallow)	Unknown for Atlantic species
Formation of Dsp1	?	After Dsp4	?	After Dsp4	Unknown
Size at which scales form	Before 7mm	Varies with species (6.5-9mm)	? > 14.2 mm SL	Variable (7-10 MM)	Unknown for Atlantic species
Ventral pigment on tail	Initially 1-2 melanophores reducing to none between 4-6.5mm depending on species	3-5 melanophores reducing to one at posterior AFB and possibly a second small one at mid-peduncle; size at closs of 2nd variable	Many (see figures)	Variable	Unknown for Atlantic species
Dorsal pigment on tail	None	1 to several melanophores at posterior DFB appearing before flexion complete. Spreading anteriorly and posteriorly once scales present	Present > 5.5 mm	None	Unknown for Atlantic species
Pigment on cleithral symphysis	Yes, disappears after about 7mm	Yes or no depending on species, number varies among species	Yes	Usually, species dependant	Unknown for Atlantic species
Pigment on lower jaw	No or yes depending on species, but is external	Yes or no depending on species, but is external	No	No	Unknown for Atlantic species
Internal pigment on urostyle	No	Yes, from 5-6mm	Yes, from 5-6mm	Yes, from 5-6mm	Unknown for Atlantic species
Pigment on forebrain	Yes, from 4.5-5.5mm	Absent until 7mm, but appears at 5mm in <i>aquilonaris</i>	No?	No?	Unknown for Atlantic species
Pigment on fin spines	Many dash-like closely-spaced melanophores in chevron groove of Dsp2 and pelvic sp	None (except <i>P. freemani</i> which has chevron groove pigment on pelvic sp.)	No?	Yes, on P2sp & D1 membrane in some species	Unknown for Atlantic species

SPECIES ACCOUNTS

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	11(10)
<i>Anal Fin:</i>	III,8
<i>Pectoral Fin:</i>	15-17
<i>Gill Rakers:</i>	7-11+14-18=23-28
<i>Lateral Line Scales:</i>	47-50

Life History

<i>Range:</i>	Bermuda, Bahamas, Florida to Brazil
<i>Habitat:</i>	Rocky ledges between 120-450m.
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Warmer months?
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	

Size/Age at First

Maturity:
Longevity

<i>Literature:</i>	Leis 1987; in press
<i>Illustrations:</i>	Leis (in press):15.7 mm Original: 39 mm

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	
<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	
<i>Diagnostic Characters</i>	

Larvae

No information for Atlantic,
Pacific species known

<i>Fin spination:</i>	
<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	
<i>Length of Fin Development:</i>	
<i>Pigmentation:</i>	

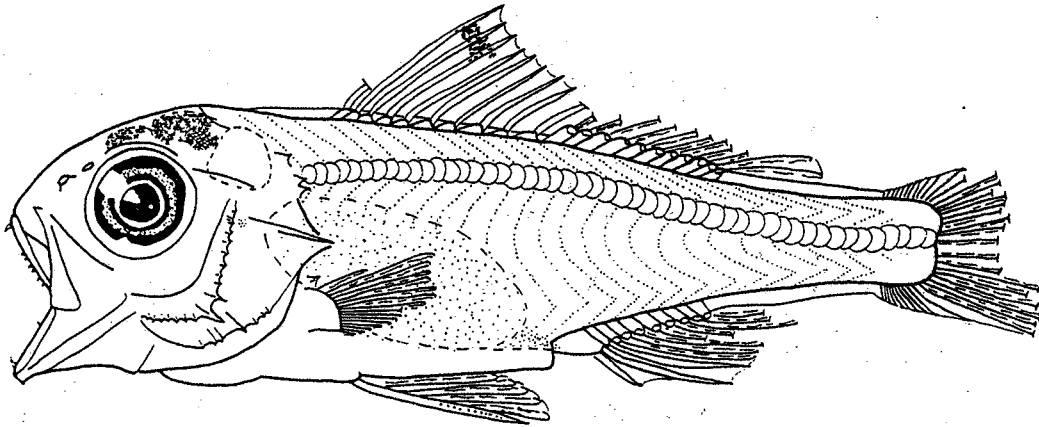
Diagnostic characters:

<i>Early Juveniles</i>	
<i>Settlement Size :</i>	
<i>Pigment:</i>	

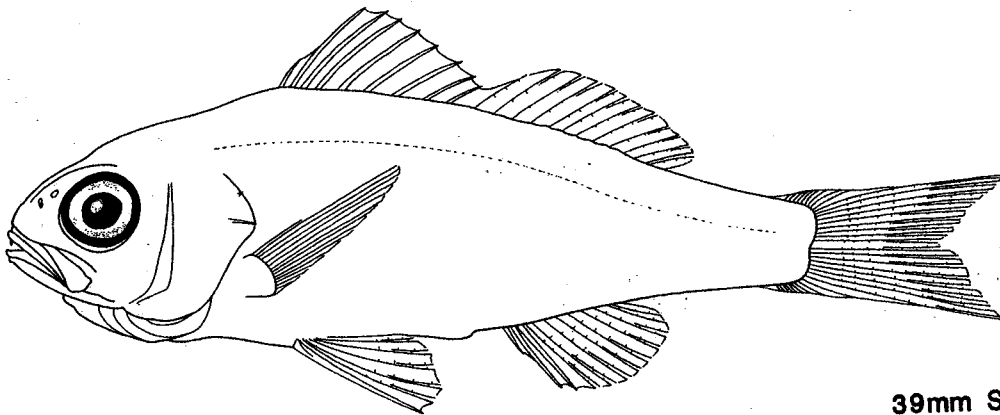
Diagnostic Characters:

Data from field caught.
ca. 25-30 mm.
No dorsal tail pigment;
no lower jaw pigment.
Pale pink/red, typically darker
on dorsum.

Scales on maxilla (>40mm);
penultimate dorsal spine <
ultimate. 11 dorsal
rays. Deep habitats.



15.7mm SL



39mm SL

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	11(10)
<i>Anal Fin:</i>	III,7-8
<i>Pectoral Fin:</i>	15-17
<i>Gill Rakers:</i>	7-9+16-20=24-28

Life History

<i>Range:</i>	Fla. (Probably N.C.), Gulf of Mexico & Antilles to Guianas
<i>Habitat:</i>	Deep slopes from 30 to 370m
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Warmer months?
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	

Size/Age at First

<i>Maturity:</i>	
<i>Longevity:</i>	
<i>Literature:</i>	Leis (in press)
<i>Illustrations:</i>	Leis (in press)

Early Life History Description

Eggs
Diameter:
No. of Oil Globules:
Oil Globule Diameter:
Yolk:

Hatch Size:
Incubation:
Pigment:

Diagnostic Characters

Larvae

Head Spination:

Preanal Length:

Length at Flexion:

Sequence of Fin Development:

Length of Fin Development:

Pigmentation:

Diagnostic Characters:

Early Juveniles

Settlement Size :

Pigment:

Diagnostic Characters:

No information

High number on preopercle, subopercle form early

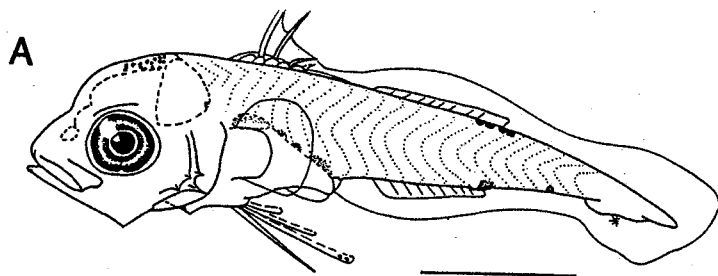
Dsp2 never longer than pelvic spine; frothy internal structure appears at ca. 7mm, strong by 8.5mm Cluster of melanoophores on posterior dorsal fin base; on forebrain (ca. 5mm), tip lower jaw, on cleithral symphysis until ca. 9mm, urostyle from ca. 7 mm no pigment on base of pectoral or on pelvic spine. Pigment on caudal rays from 10.5mm and along base of soft dorsal from ca. 10mm Frothy internal structure of fin spines; pigmentation on forebrain early

ca. 30-40 mm
 Melanophores clustered at base of soft dorsal fin.
 Pale pink/red dorsally.

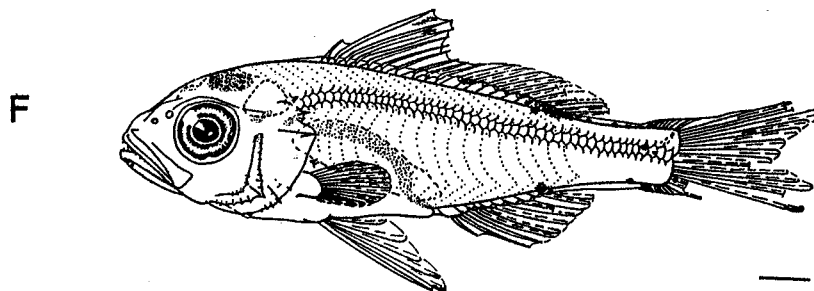
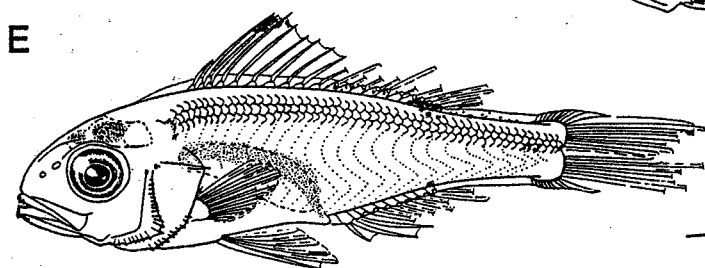
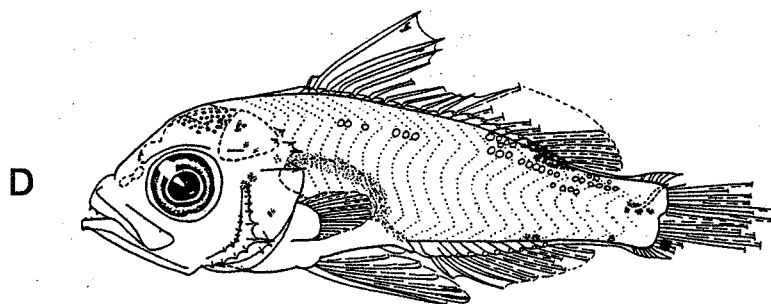
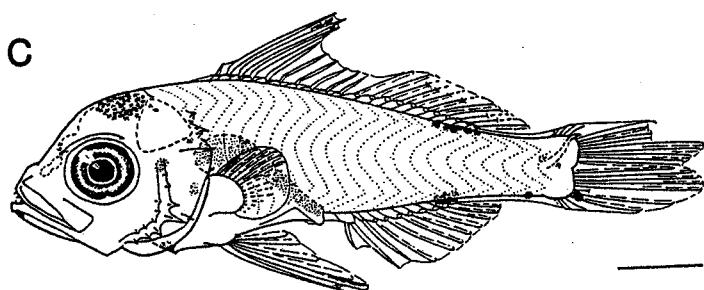
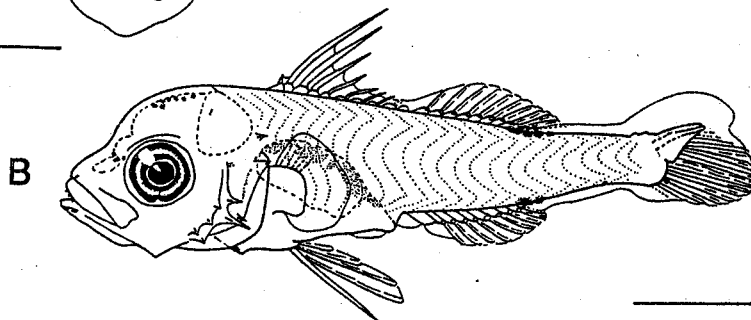
No dorsolateral spot. Deeper habitats. Similar to congeners and *Etelis. P. freemani* is more elongate.

Pristipomoides aquilonaris

LUTJANIDAE



scale bar = 1mm



Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	11(10-12)
<i>Anal Fin:</i>	III,8
<i>Pectoral Fin:</i>	15-17
<i>Gill Rakers:</i>	8-10+16-23=28-32

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	

Diagnostic Characters

Life History

<i>Range:</i>	Atlantic coasts of Panama, Columbia and Surinam
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<i>Habitat:</i>	Upper edge of the continental shelf
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<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
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<i>Spawning</i>	
<i>Season:</i>	Warmer months?
<i>Area:</i>	Throughout range
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	

<i>Size/Age at First</i>	
<i>Maturity:</i>	
<i>Longevity</i>	

<i>Literature:</i>	Leis in press
<i>Illustration:</i>	None

<i>Larvae</i>	No information
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<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	

*Length of Fin Development:**Pigmentation:*

<i>Diagnostic Characters:</i>	See text for genus
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Early Juveniles

Leis (in press) found 1 specimen (11.1mm) tentatively assigned to this species

<i>Settlement Size :</i>	
<i>Pigment:</i>	

Melanophores on forebrain, tip of lower jaw, urostyle, pelvic spines; pigment absent from cleithral symphysis, base of pectoral, or along dorsal fin base
Fin spines moderate; pelvic spine > Dsp2; moderate internal structure in fin spines; high number spines on outer border of preopercle; meristics

Diagnostic Characters:

Pristipomoides freemani

LUTJANIDAE

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	11(10)
<i>Anal Fin:</i>	III,8
<i>Pectoral Fin:</i>	15-17
<i>Gill Rakers:</i>	6-8+13-17=19-25

Life History

<i>Range:</i>	Bahamas, Greater Antilles, Atlantic coasts of Nicaragua & Panama
<i>Habitat:</i>	Deep slopes from 110-550 m
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Warmer months?
<i>Area:</i>	Throughout range
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First Maturity:</i>	18-23cm FL
<i>Longevity</i>	

Literature:
Illustration:

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	

Diagnostic Characters

<i>Larvae</i>	No information
<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	
<i>Length of Fin Development:</i>	
<i>Pigmentation:</i>	
<i>Diagnostic Characters:</i>	

<i>Early Juveniles</i>	No information
<i>Settlement Size :</i>	
<i>Pigment:</i>	

Diagnostic Characters:

Pristipomoides macrophthalmus

LUTJANIDAE

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	XII
<i>Second Dorsal Fin:</i>	11(10-12)
<i>Anal Fin:</i>	III,8(9)
<i>Pectoral Fin:</i>	17-18(16-19)
<i>Gill Rakers:</i>	8-10+19-21(22)
<i>Lateral Line Scales:</i>	(46)47-51(52)

Life History

<i>Range:</i>	S.C., Bermuda, and N. Gulf of Mexico to S.E. Brazil
<i>Habitat:</i>	

<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
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<i>Spawning</i>	
<i>Season:</i>	Peak spawning: spring and fall
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	

<i>Size/Age at First</i>	14-17cm FL
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Maturity:

Longevity:

<i>Literature:</i>	Laroche 1977
<i>Illustrations:</i>	A Original, wild caught B-F from Laroche 1977

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	

Diagnostic Characters

Larvae

Head Spination:

Supraorbitals, posttemporal, supracleithrum, 2 rows of preopercle, & opercle; preopercular spine serrated.

*Preanal Length:**Length at Flexion:*

ca. 5 mm

*Sequence of Fin Development:**Length of Fin Development:**Pigmentation:*

13 ventral tail melanophores coalescing to 2 or 3 ca. 5 mm; urostyle spot ca. 5 mm; DCP pigmented ca. 6.9 mm; mid-brain and pectoral symphysis pigmented; opercle and additional ventral tail melanophores ca. 7 mm.

Diagnostic Characters:

Pigmentation, meristics, serrated preopercular spine, serrated pelvic and Dsp 2-7

Early Juveniles

*Settlement Size:**Pigment:*

Data from field caught

Ca. 25 mm SL

Pale pink/red dorsally, may show thin yellow stripes later.

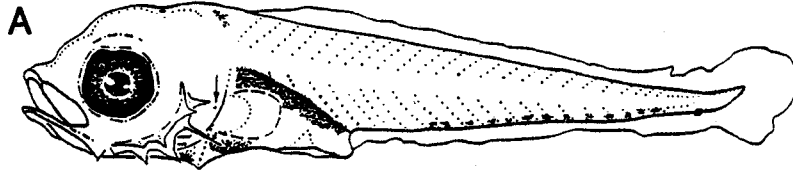
Elongate, Deep habitats.

No dorsolateral spot.

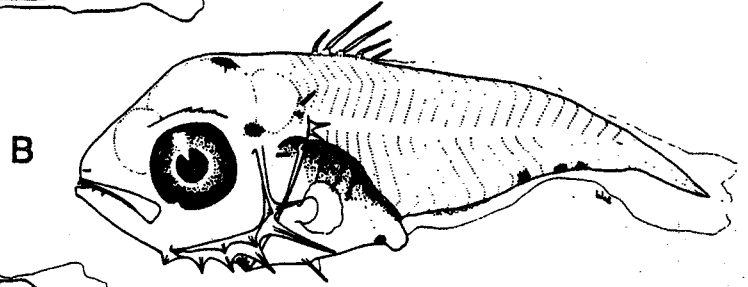
12 dorsal spines.

Rhomboplites aurorubens

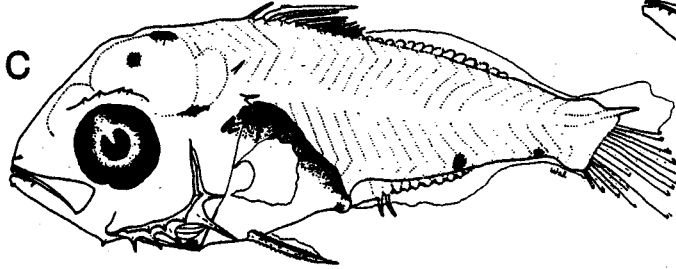
LUTJANIDAE



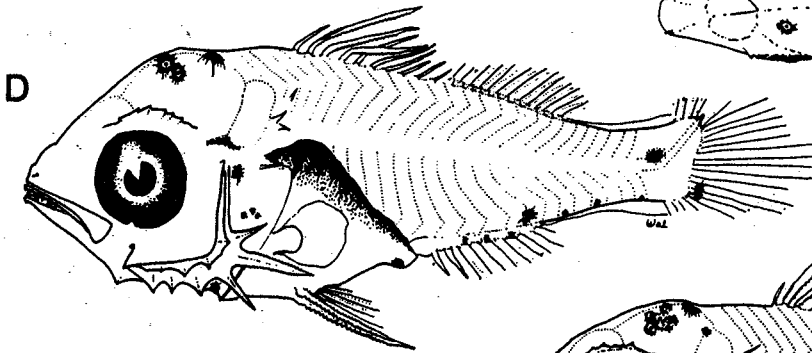
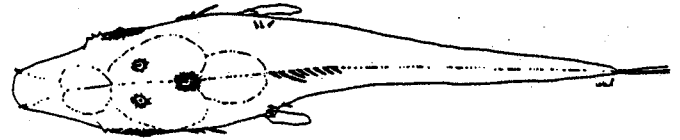
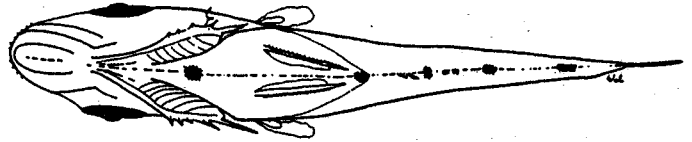
3.6mm NL



4.0mm

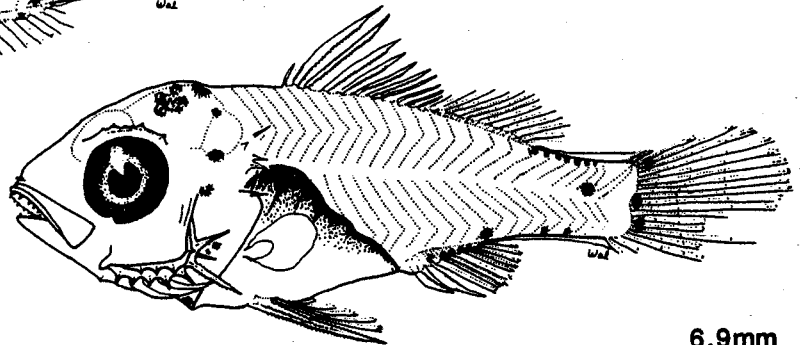


4.7mm

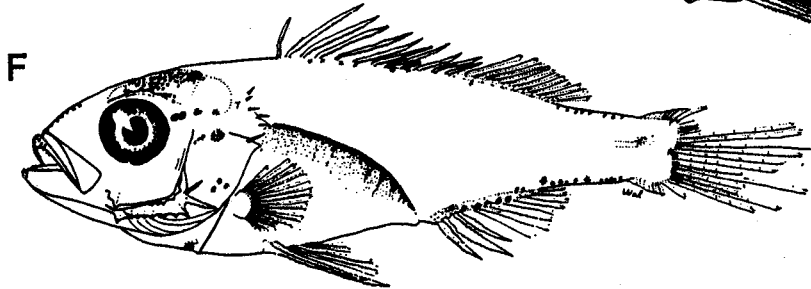


5.1mm

E



6.9mm



14.2mm

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i> X(XI)	
<i>Second Dorsal Fin:</i>	(13)14
<i>Anal Fin:</i>	III,(7)8
<i>Pectoral Fin:</i>	16(15-17)
<i>Gill Rakers:</i>	6-8+12-13=18-21
<i>Lateral Line Scales:</i>	(46)47-51(53)

Life History

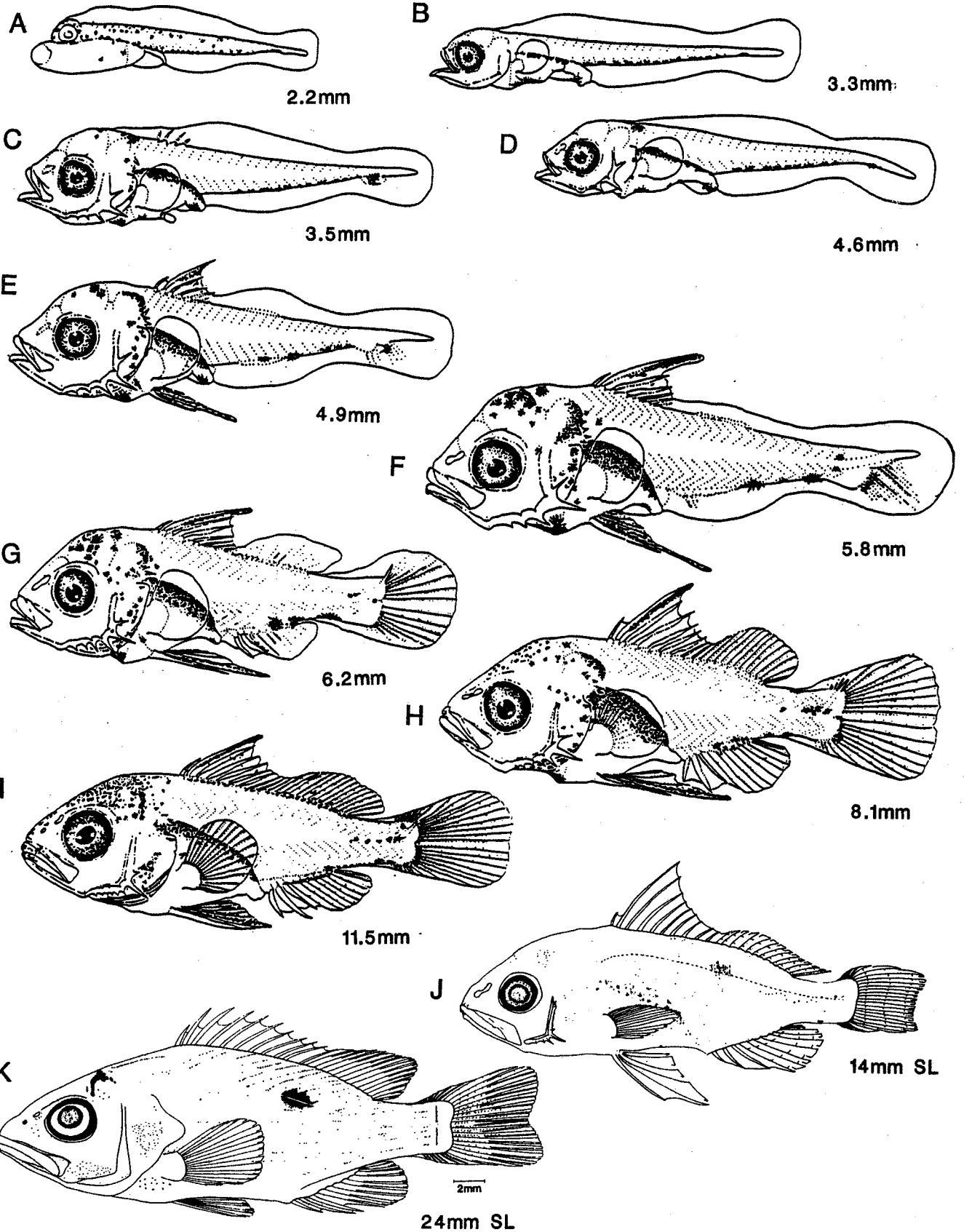
<i>Range:</i>	Mass., Bermuda & N. Gulf of Mexico to Brazil
<i>Habitat:</i>	Shallow vegetation to deep sand flats or reefs (.5-80m)
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Peak spawning early spring
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	May form large spawning aggregations
<i>Size/Age at First</i>	
<i>Maturity:</i>	ca. 40cm FL
<i>Longevity</i>	
<i>Literature:</i>	Clarke, Domeir, & Laroche (ms)
<i>Illustrations:</i>	A-I from Clarke, Domeier, & Laroche (ms) - lab reared; J-K original, wild caught.

Early Life History Description

<i>Eggs</i>	
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	single at anterior end of yolk-sac, 0.13-0.22 mm diameter
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	
<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	
<i>Diagnostic Characters</i>	
<i>Larvae</i>	
<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	
<i>Length of Fin Development:</i>	
<i>Pigmentation:</i>	16-17(13-23) melanophores along ventral tail midline with enlarged melanophore 3/4 distance to anal tip
<i>Diagnostic Characters:</i>	
<i>For genus plus pigmentation</i>	
<i>Early Juveniles</i>	
<i>Settlement Size :</i>	Data from field caught ca. 15mm SL
<i>Pigment:</i>	>5 green/brown lateral bands & transparent fins. At 22 mm SL >5 thin yellow lateral stripes. Dorsolateral spot centered or dorsad lateral line, shifts dorsad & smaller with growth.
<i>Diagnostic Characters:</i>	
<i>Similar to</i>	
<i>L. synagris</i>	
which has paler lateral bands 12 dorsal soft rays, and yellow pelvic fins, (red pelvic fins in <i>L. analis</i>).	

Lutjanis analis

LUTJANIDAE



Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	14
<i>Anal Fin:</i>	III,8
<i>Pectoral Fin:</i>	16-17
<i>Gill Rakers:</i>	5-7+11-15=17-22
<i>Lateral Line Scales:</i>	40-45

Life History

Range: Mass., Bermuda & N. Gulf of Mexico to Brazil

Habitat: Shallow vegetation and rocky areas to intermediate reefs

ELH Pattern: Oviparous; pelagic eggs and larvae

Spawning

Season: Peak spawning in spring and fall

Area: Throughout

Mode: Multiple batches

Migration:

Size/Age at First Maturity: ca. 25cm FL

Longevity:

Literature:

Illustration: Original, field caught

Early Life History Description

Eggs

Diameter:

No. of Oil Globules:

Oil Globule Diameter:

Yolk

Hatch Size:

Incubation:

Pigment:

Diagnostic Characters:

Larvae

Head Spination:

Preanal Length:

Length at Flexion:

Sequence of Fin Development:

Length of Fin Development:

Pigmentation:

Diagnostic Characters:

Early Juveniles:

Settlement Size :

Pigment:

Diagnostic Characters:

No information

No information

Data from field caught

ca. 15 mm SL

Dark black bands & fins change to yellow with growth. Often oblique black stripe through eye.

Pectoral fins yellow at 25 mm SL.

Pectoral fin longer than in *L. griseus*.

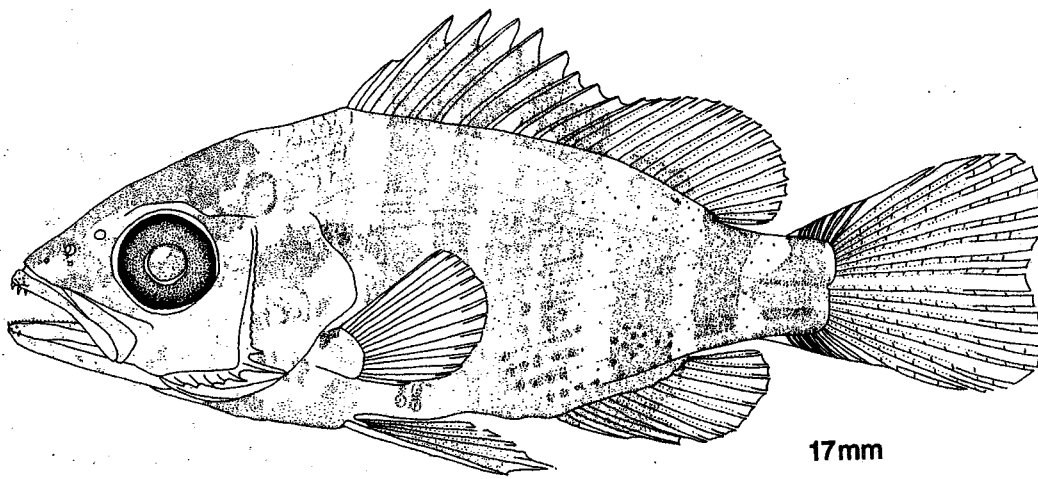
Dorsal & anal fins yellow by 35 mm SL.

Lateral bands always present.

No dorsolateral spot.

Lutjanus apodus

LUTJANIDAE



LUTJANIDAE

LUTJANUS BUCCANELLA (CUVIER)

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	14
<i>Anal Fin:</i>	(II)III,7-8(9)
<i>Pectoral Fin:</i>	(14)16-17(18)
<i>Gill Rakers:</i>	7-9+17-18(19)=25-27
<i>Lateral Line Scales:</i>	(47)48-49(50)

Life History

<i>Range:</i>	Mass.(rare N. of NC), Bahamas & N. Gulf of Mexico to SE Brazil
<i>Habitat:</i>	Reefs & ledges (5- 95m)
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Year around: spring and fall peaks
<i>Area:</i>	Throughout
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First Maturity:</i>	ca. 18-38cm FL
<i>Longevity:</i>	
<i>Literature:</i>	
<i>Illustration:</i>	Original, wild caught

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	
<i>Diagnostic Characters:</i>	

<i>Larvae</i>	No information
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<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	

<i>Length of Fin Development:</i>	
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<i>Pigmentation:</i>	
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<i>Diagnostic Characters:</i>	
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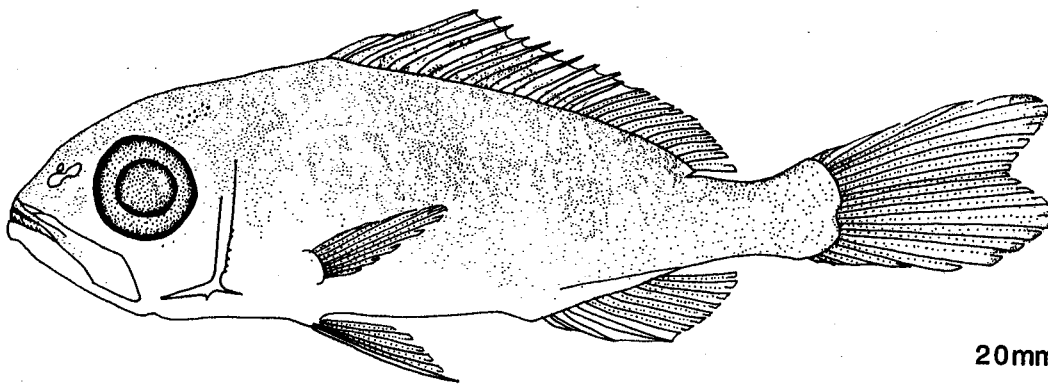
<i>Early Juveniles</i>	
<i>Settlement Size :</i>	
<i>Pigment:</i>	

<i>Diagnostic Characters:</i>	
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Data from field caught
Ca. 20 mm SL.
Pale blue with wide yellow
stripe extending from dorsal
lobe of caudal fin to middle,
or anterior, end of dorsal fin.
Dorsal yellow stripe, not
mid-lateral as in
L. chrysurus.
Dark black spot on pectoral
fin axil in older juveniles.
No dorsolateral spot.

Lutjanus buccanella

LUTJANIDAE



20mm SL

LUTJANIDAE

LUTJANUS CAMPECHANUS (POEY)

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	(IX)X
<i>Second Dorsal Fin:</i>	14
<i>Anal Fin:</i>	III,(8)9
<i>Pectoral Fin:</i>	(15-16)17(18)
<i>Gill Rakers:</i>	6+14=20
<i>Lateral Line Scales:</i>	(46)47-49(50)

Life History

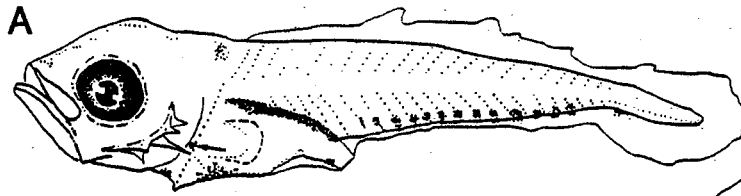
<i>Range:</i>	NC To FL Keys & Gulf of Mexico to Yucatan
<i>Habitat:</i>	Shallow sand/mud bottoms to deep rocky areas (<190m)
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Peak spawning from spring to fall
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First Maturity:</i>	ca. 23-33cm FL
<i>Longevity:</i>	ca. 16 yrs.
<i>Literature:</i>	Potthoff et al. 1988; Collins et al. 1980
<i>Illustrations:</i>	B-H from Collins et al. 1980 A-original, wild caught

Early Life History Description

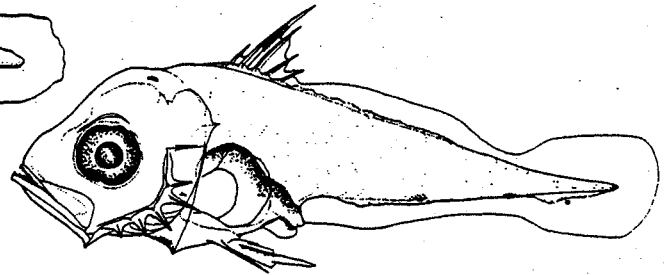
<i>Eggs</i>	
<i>Diameter:</i>	0.77-0.85 mm
<i>No. of Oil Globules:</i>	1
<i>Oil Globule Diameter:</i>	0.15-0.19
<i>Yolk:</i>	Clear, homogenous
<i>Hatch Size:</i>	
<i>Incubation:</i>	20-27 hrs. at 23o-25oC
<i>Pigment:</i>	
<i>Diagnostic Characters:</i>	
<i>Larvae</i>	
<i>Head Spination:</i>	Preopercle, opercle, post-temporal, 7 supracleithrum no serrations on head spines
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	ca. 5 mm
<i>Sequence of Fin Development:</i>	Caudal, pelvic, pectoral, dorsal, and anal; serrations only on pelvic spine ca. 4 mm
<i>Length of Fin Development:</i>	
<i>Pigmentation:</i>	13 ventral tail melanophores <4 mm; > 4 mm 2 ventral tail melanophores (1 external, 1 internal); urostyle, forebrain, opercle, pigmented ca. 7 mm; cleithral symphysis, midbrain pigmented
<i>Diagnostic Characters:</i>	Pigmentation and meristics
<i>Early Juveniles</i>	
<i>Settlement Size :</i>	Data from field caught Ca. 25 mm SL
<i>Pigment:</i>	Urostyle pigment spot and bands below dorsal fin with band below 2nd Dorsal most heavily pigmented. Pale with diffuse bands often present dorsolateral spot present. Pale body with large dorsolateral spot. As early juvenile does not frequently co-occur with other <i>Lutjanus</i> . <i>L. vivanus</i> with bright yellow iris by 50 mm SL.
<i>Diagnostic Characters:</i>	

Lutjanus campechanus

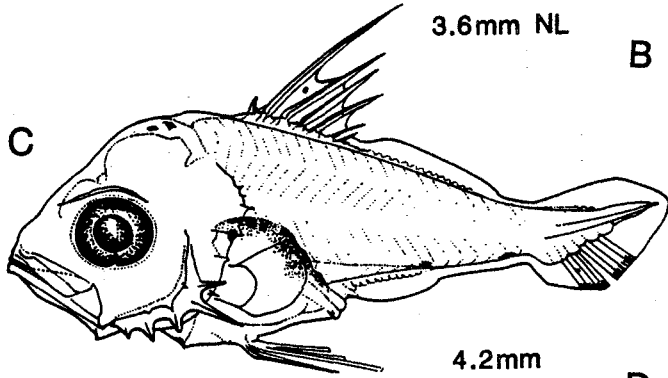
LUTJANIDAE



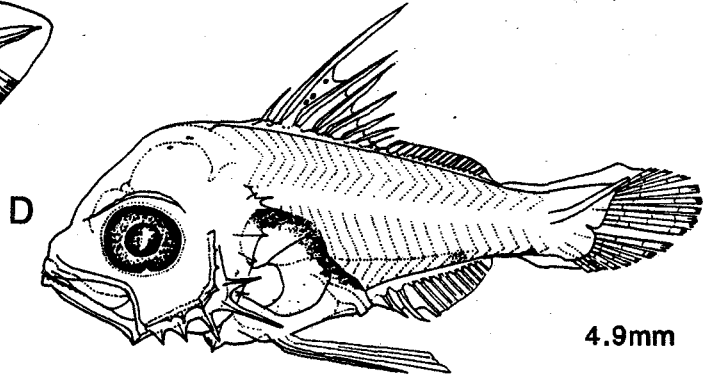
3.6mm NL



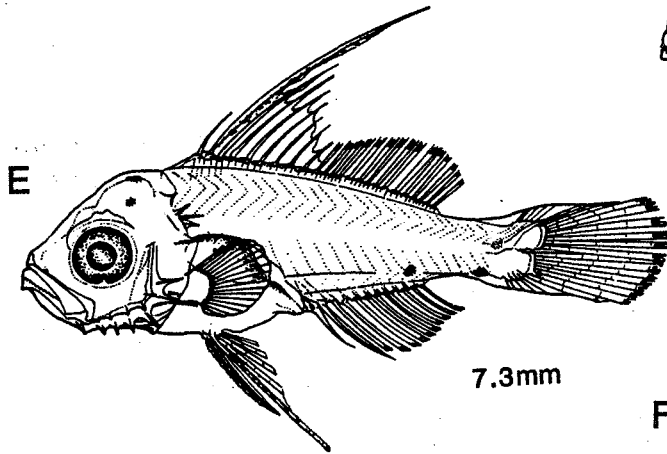
4.0mm SL



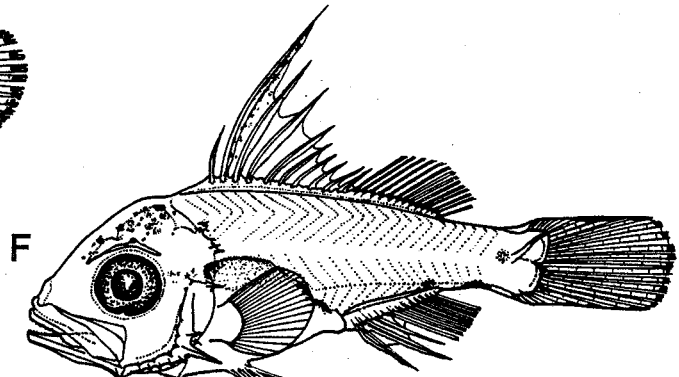
4.2mm



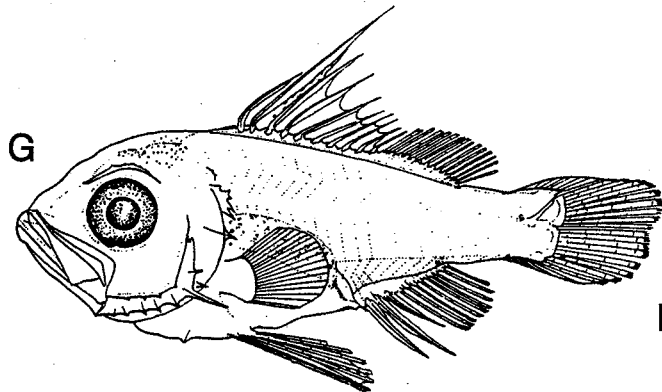
4.9mm



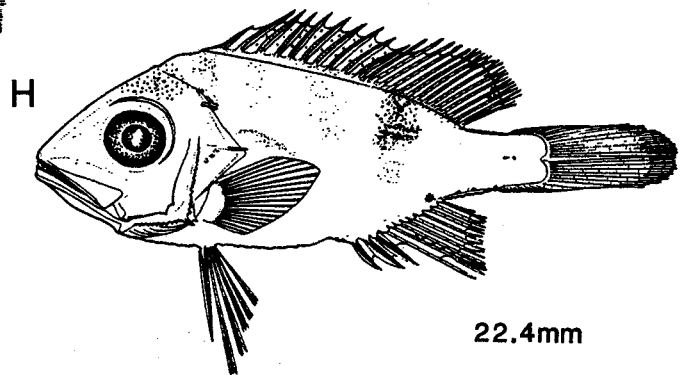
7.3mm



9.5mm SL



12.4mm



22.4mm

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X(IX-XI)
<i>Second Dorsal Fin:</i>	12-13(14)
<i>Anal Fin:</i>	III,(8)9
<i>Pectoral Fin:</i>	15-16(17)
<i>Gill Rakers:</i>	9-11+21-23=30-34
<i>Lateral Line Scales:</i>	46-49

Life History

<i>Range:</i>	Mass., Bermuda, N. Gulf of Mexico to S.E. Brazil & C. Verde Islands
<i>Habitat:</i>	Shallow vegetated areas to outer reefs (<70 m)
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning Season:</i>	Year around, peaks in spring and fall
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First Maturity:</i>	20-29cm FL
<i>Longevity:</i>	6-14 years
<i>Literature:</i>	Clarke et al. (ms)
<i>Illustrations:</i>	A-J: Clarke et al. (ms)

Early Life History Description

<i>Eggs</i>	
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	

*Diagnostic Characters**Larvae*

<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	

*Length of Fin Development:**Pigmentation:*

14-16(13-19) melanophores along ventral tail midline with no enlarged melanophores

Diagnostic Characters:

For genus plus pigmentation

Early Juveniles

<i>Settlement Size :</i>	
<i>Pigment:</i>	

Data from field caught
Ca. 15 mm SL
Pale & transparent at settlement.
Midlateral yellow stripe appears immediately after settlement.
No dorsolateral spot.
Body more elongate than congeners.
Yellow midlateral stripe (yellow stripe is dorsal & posterior in *L. buccanella*).

Diagnostic Characters:

Lutjanus chrysurus

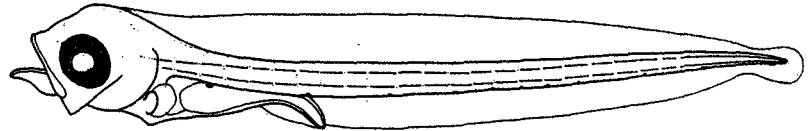
LUTJANIDAE

A



3mm NL DAH 2

B



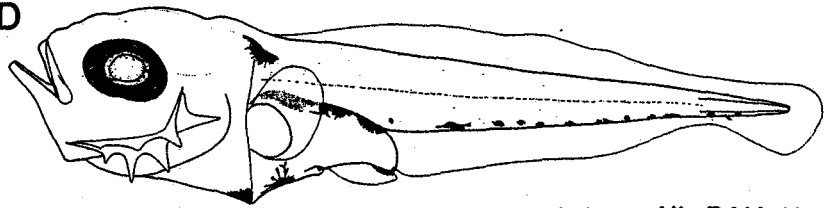
3.0mm NL DAH 3

C



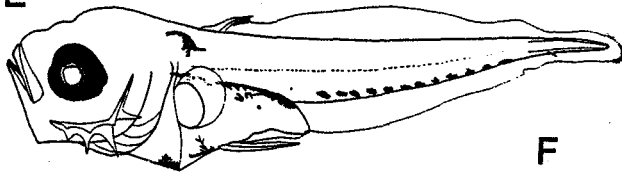
2.9mm NL DAH6

D



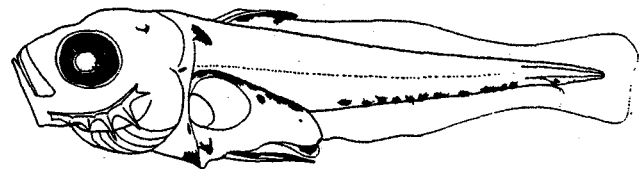
3.6mm NL DAH 11

E



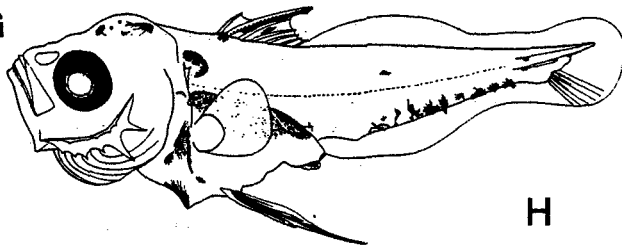
4.0mm NL DAH 11

F



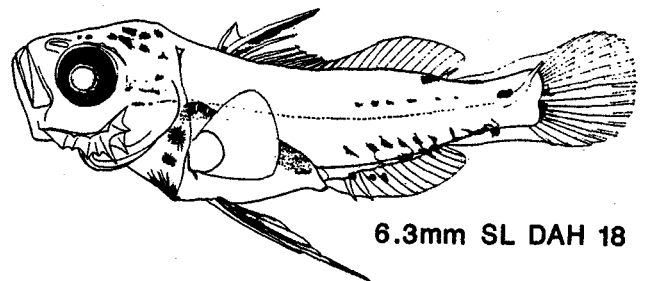
4.4mm NL DAH 11

G



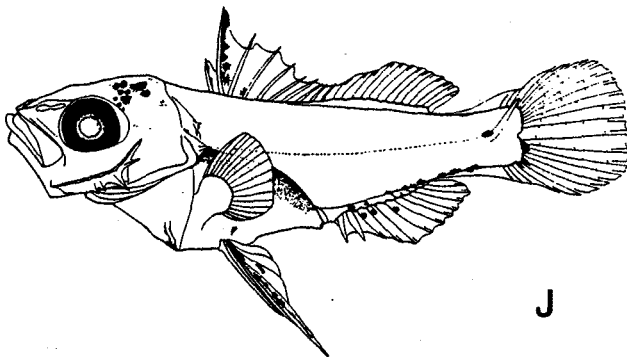
5.2mm NL DAH 18

H



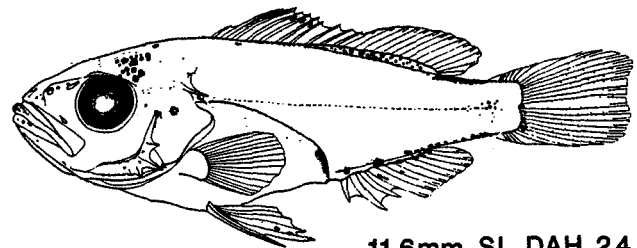
6.3mm SL DAH 18

I



7.5mm SL DAH 21

J



11.6mm SL DAH 24

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	14
<i>Anal Fin:</i>	III,7-8
<i>Pectoral Fin:</i>	16-18
<i>Gill Rakers:</i>	5-7+11-14=17-21
<i>Lateral Line Scales:</i>	45-47

Life History

Range: So. FL (occasionally to NJ), Bahamas & Cen. America to Brazil

Habitat: Deep reefs and sand

ELH Pattern: Oviparous; pelagic eggs and larvae

Spawning Season: Spring through fall

Area: Throughout area

Mode: Multiple batches

Migration:

Size/Age at First Maturity:

Longevity:

Literature:

Illustration: None

Early Life History Description

Eggs No information
Diameter:
No. of Oil Globules:
Oil Globule Diameter:
Yolk:

Hatch Size:

Incubation:

Pigment:

Diagnostic Characters:

Larvae

No information

Head Spination:

Preanal Length:

Length at Flexion:

Sequence of Fin Development:

Length of Fin Development:

Pigmentation:

Diagnostic Characters:

Early Juveniles

Data from field caught

Settlement Size:

Ca. 15 mm SL (?)

Pigment:

Unknown < 5 cm SL,

probably similar to

L. griseus.

Diagnostic Characters:

Vomerine tooth patch without

posterior extension. Possibly

thinner lips than

L. griseus.

Infrequent in relative occurrence.

Lutjanus cyanopterus

LUTJANIDAE

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	14
<i>Anal Fin:</i>	III,7-9
<i>Pectoral Fin:</i>	15-17
<i>Gill Rakers:</i>	6-8+12-14=18-22
<i>Lateral Line Scales:</i>	43-47

Life History

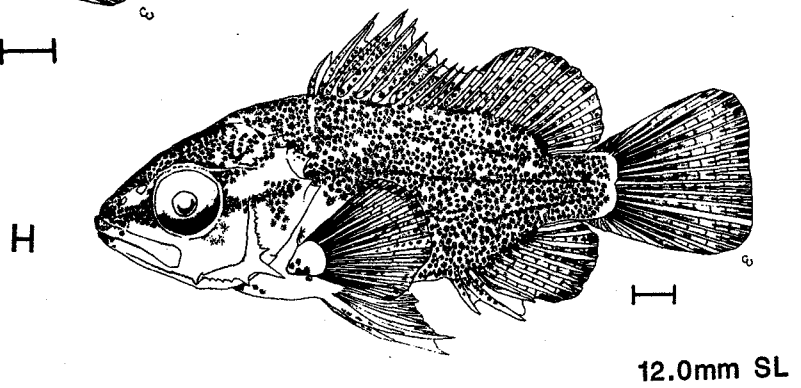
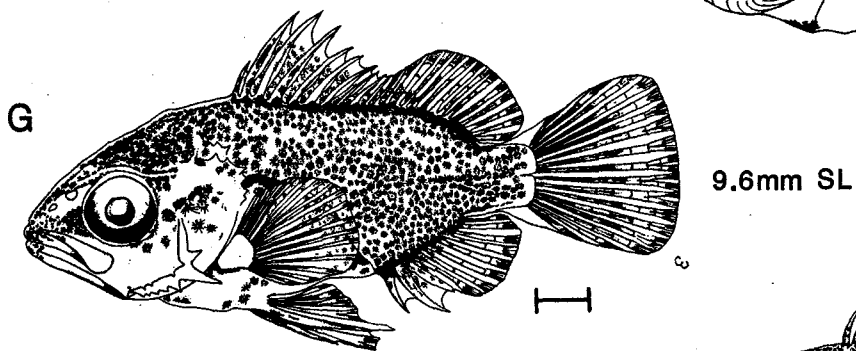
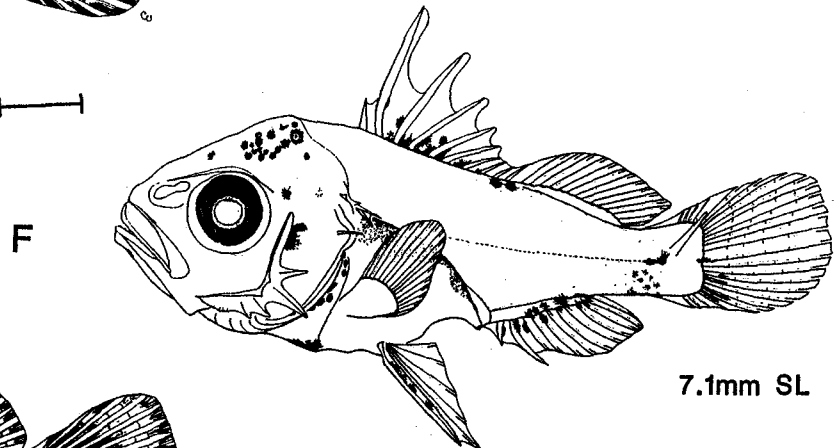
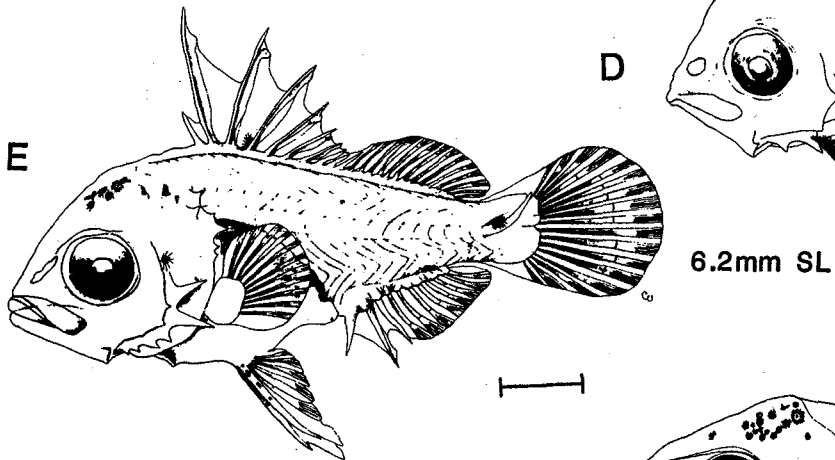
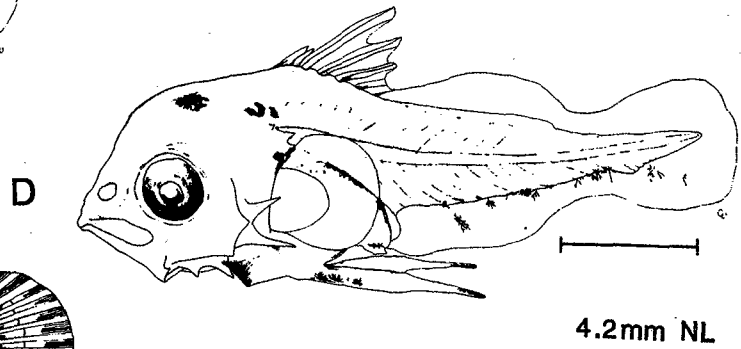
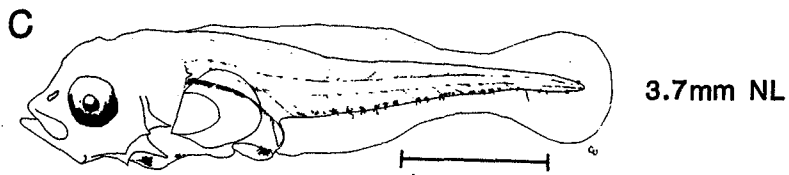
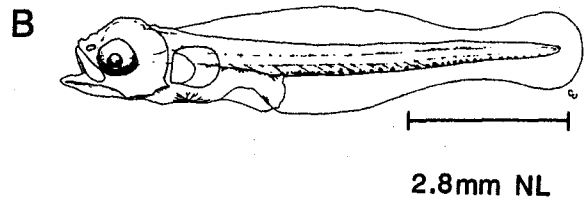
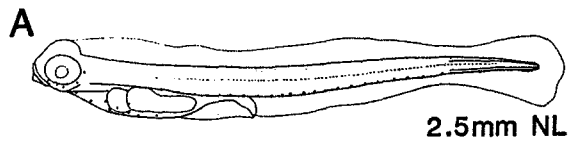
<i>Range:</i>	Mass., Bermuda & N. Gulf of Mexico to SE Brazil; also E. Atlantic
<i>Habitat:</i>	Shallow vegetated areas to deep reefs
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Spring through fall
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First</i>	
<i>Maturity:</i>	19-32cm FL
<i>Longevity:</i>	21 years
<i>Literature:</i>	Richards & Saksena 1980
<i>Illustrations:</i>	B-E, G-H: Richards & Saksena 1980; A,F: Clarke et al. (ms)

Early Life History Description

<i>Eggs</i>	
<i>Diameter:</i>	0.70-0.85 mm
<i>No. of Oil Globules:</i>	1
<i>Oil Globule Diameter:</i>	0.12-0.18 mm
<i>Yolk:</i>	Clear, homogenous
<i>Hatch Size:</i>	
<i>Incubation:</i>	20 hr at 27oC, 18 hr at 18oC, 17 hr at 30oC
<i>Pigment:</i>	
<i>Diagnostic Characters</i>	
<i>Larvae</i>	
<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	ca. 4-6 mm
<i>Sequence of Fin Development:</i>	Caudal, dorsal, pelvic anal, and pectoral. Serrations pelvic and Dsp1-6
<i>Length of Fin Development:</i>	
<i>Pigmentation:</i>	Many melanophores along ventral tail midline; cleithral symphysis, midbrain and pelvic pigmented; urostyle spot, dorsal fin membrane, and opercle ca. 6 mm; caudal peduncle, forebrain, dorsal fin notch ca. 7mm
<i>Diagnostic Characters:</i>	
<i>Pigmentaion, meristics, spine serrations</i>	
<i>Early Juveniles</i>	
<i>Settlement Size :</i>	Data from field caught 10-15 mm SL
<i>Pigment:</i>	Covered laterally by dense melanophores. Often lateral melanophores separated by narrow pale bands. Oblique eye stripe occurs often. Thin wavy stripes of red/brown spots. Fins red/orange with dark trim.
<i>Diagnostic Characters:</i>	
No dorsolateral spot, vomerine tooth patch with posterior extension. Pectoral fins shorter than <i>L. apodus</i> .	

Lutjanus griseus

LUTJANIDAE



Meristic Characters

Early Life History Description

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	(13)14
<i>Anal Fin:</i>	III,8(7-9)
<i>Pectoral Fin:</i>	16-17
<i>Gill Rakers:</i>	6-8+12-14=19-21
<i>Lateral Line Scales:</i>	(45)46-48(49)

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	
<i>Diagnostic Characters</i>	

<i>Larvae</i>	No information
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<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	
<i>Length of Fin Development:</i>	
<i>Pigmentation:</i>	
<i>Diagnostic Characters:</i>	

Life History

<i>Range:</i>	Mass., Bermuda(intro- duced?) & N. Gulf of Mexico to Brazil
<i>Habitat:</i>	Shallow vegetated areas to deep reefs
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae

<i>Spawning</i>	
<i>Season:</i>	Early spring
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	

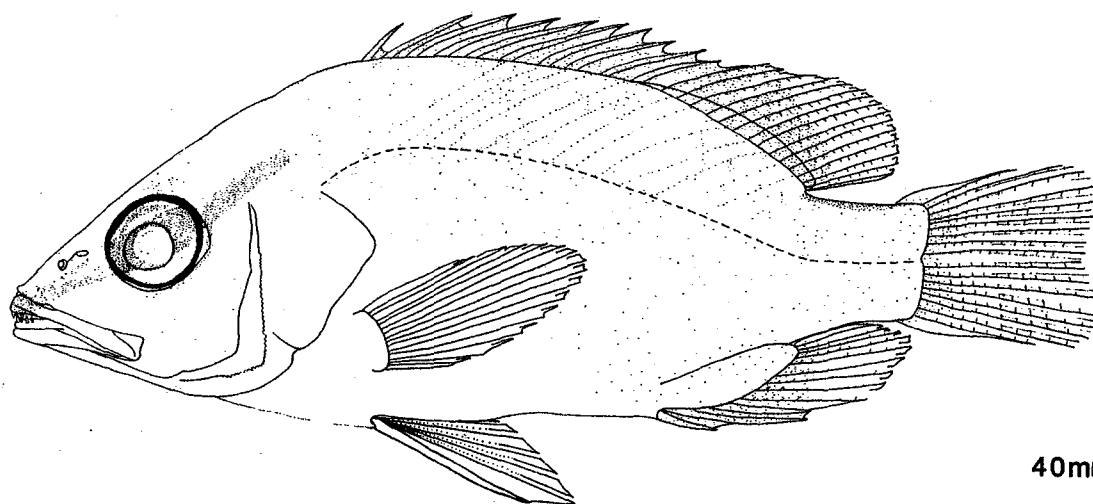
<i>Size/Age at First</i>	
<i>Maturity:</i>	ca. 32cm FL
<i>Longevity:</i>	21 years

<i>Literature:</i>	
<i>Illustration:</i>	Original, field caught

<i>Early Juveniles</i>	Data from field caught
<i>Settlement Size :</i>	Ca. 15 mm SL
<i>Pigment:</i>	Red/brown laterally and dorsally with yellow ventral fins. Oblique eye stripe often present.
<i>Diagnostic Characters:</i>	Pale triangle pattern below eye can appear by 6 mm SL. No dorsolateral spot.

Lutjanus jocu

LUTJANIDAE



Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	(11)12
<i>Anal Fin:</i>	III,8
<i>Pectoral Fin:</i>	14-15
<i>Gill Rakers:</i>	7-8+15-17=22-25
<i>Lateral Line Scales:</i>	47-49

Life History

<i>Range:</i>	N.C and Bahamas to Guianas
<i>Habitat:</i>	Shallow clearwater areas to intermediate reefs
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Spring and fall
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First</i>	
<i>Maturity:</i>	
<i>Longevity:</i>	

Literature:

Illustration: Original, field caught

Early Life History Description

Eggs No information
Diameter:
No. of Oil Globules:
Oil Globule Diameter:
Yolk:

*Hatch Size:**Incubation:**Pigment:**Diagnostic Characters*

Larvae

Head Spination: Well developed preopercular spines (?)

*Preanal Length:**Length at Flexion:**Sequence of Fin Development:**Length of Fin Development:**Pigmentation:**Diagnostic Characters:*

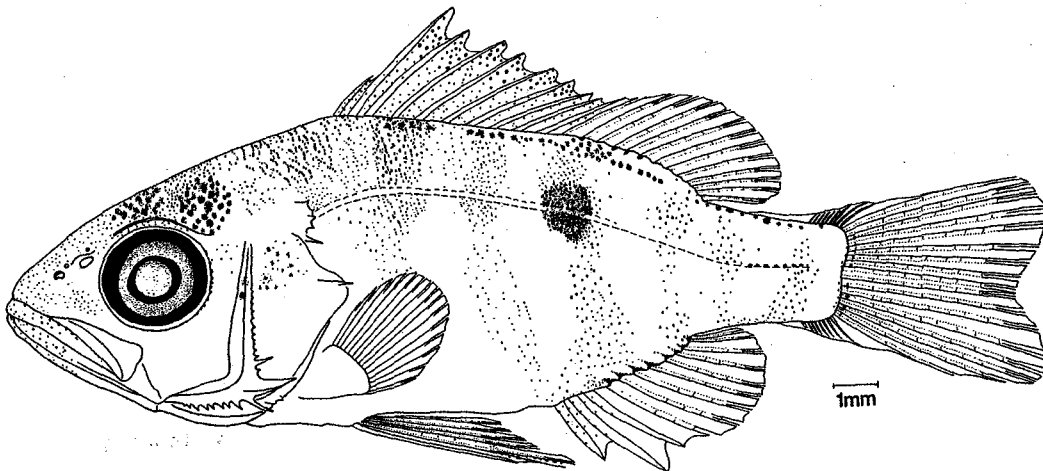
Early Juveniles

*Settlement Size :**Pigment:**Diagnostic Characters:*

Data from field caught
 Ca. 15 mm SL
 Pale with pink/red pigment on distal portions of median fins. Dorsolateral spot present.
 Lacks dark lateral pigment. Reddish fins.
 Dorsolateral spot centered on or slightly dorsad of lateral line. 12 dorsal soft rays (shared with *L. synagris* & *L. chrysurus*).

Lutjanus mahogoni

LUTJANIDAE



19.5mm SL

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	(IX)X
<i>Second Dorsal Fin:</i>	14(13-15)
<i>Anal Fin:</i>	III,8(9)
<i>Pectoral Fin:</i>	(15-16)17(18)
<i>Gill Rakers:</i>	7+16=23
<i>Lateral Line Scales:</i>	(49)50-51(53)

Life History

<i>Range:</i>	Cuba, south along Antilles and Central America to Brazil
<i>Habitat:</i>	Intermediate sand areas to deep ledges on continental or insular slopes.
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Spring through fall
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	

<i>Size/Age at First Maturity:</i>	37-42cm FL
<i>Longevity:</i>	12-18 years

<i>Literature:</i>	
<i>Illustration:</i>	None

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	

Diagnostic Characters

<i>Larvae</i>	No information
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<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	

<i>Length of Fin Development:</i>	
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<i>Pigmentation:</i>	
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Diagnostic Characters:

<i>Early Juveniles</i>	No information
<i>Settlement Size :</i>	
<i>Pigment:</i>	

Diagnostic Characters:

Lutjanus purpureus

LUTJANIDAE

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	12(13)
<i>Anal Fin:</i>	III,8(9)
<i>Pectoral Fin:</i>	15-16
<i>Gill Rakers:</i>	6-7+(11)13-14(15)=18-22
<i>Lateral Line Scales:</i>	47-50

Life History

<i>Range:</i>	N.C., Bermuda, and N. Gulf of Mexico to S.E. Brazil
<i>Habitat:</i>	Shallow vegetated areas to deep reefs
<i>ELH Pattern:</i>	eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Year around, peaks in spring and summer
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First Maturity:</i>	8.5-21cm FL
<i>Longevity</i>	ca. 10 years
<i>Literature:</i>	Clarke et al. (ms)
<i>Illustrations:</i>	A-K: Clarke et al. (ms) L-M: Original, field caught

Early Life History Description

<i>Eggs</i>	
<i>Diameter:</i>	0.65-0.80 mm
<i>No. of Oil Globules:</i>	Single at anterior end of yolksac
<i>Oil Globule Diameter:</i>	0.13-0.22 mm
<i>Yolk:</i>	Clear, homogenous
<i>Hatch Size:</i>	
<i>Incubation:</i>	23 hr at 26°C
<i>Pigment:</i>	

*Diagnostic Characters**Larvae*

<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	

*Length of Fin Development:**Pigmentation:*

19-21(15-25) melanophores along ventral tail midline with enlarged melanophore 2/3 distance to anal tip.

Diagnostic Characters:

For genus plus pigmentation.

Early Juveniles

<i>Settlement Size :</i>	10-15 mm SL
<i>Pigment:</i>	

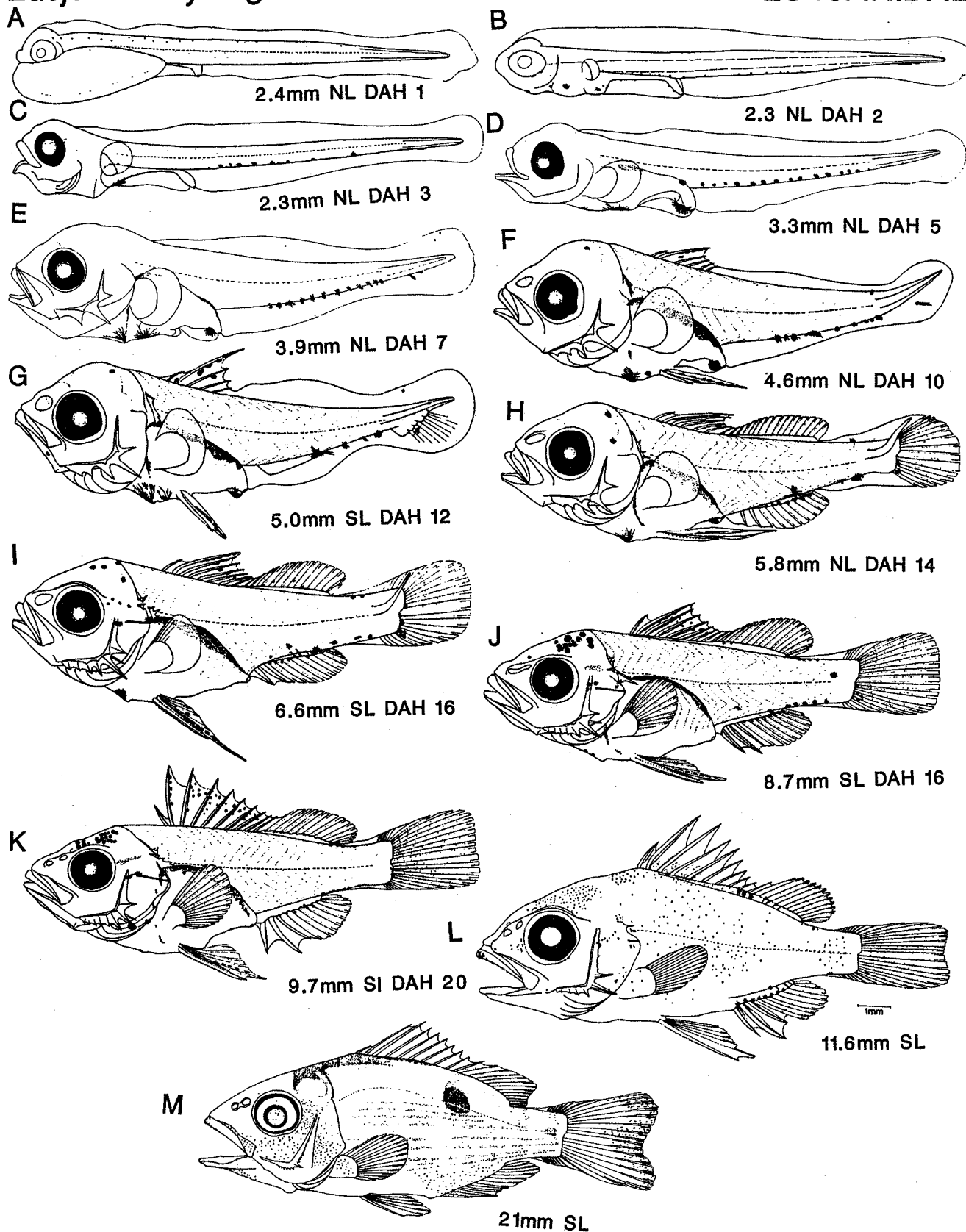
Data from field caught

Pale at settlement with dorsal fins tinged red and pelvics tinged yellow. Pale bands present. By ca. 22 mm, 5 thin yellow lateral stripes appear. Dorsolateral spot appears between 10-15 mm SL: centered or dorsad to lateral line. Similar pigment pattern including dorsolateral spot, but darker lateral bands & 14 dorsal rays in *L. analis*. (*chrysurus* & *mahogoni* only others with 12 dorsal rays).

Diagnostic Characters:

Lutjanus synagris

LUTJANIDAE



LUTJANIDAE

LUTJANUS VIVANUS (CUVIER)

Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X(XI)
<i>Second Dorsal Fin:</i>	14(13)
<i>Anal Fin:</i>	III,8(7-9)
<i>Pectoral Fin:</i>	17
<i>Gill Rakers:</i>	(6)7-8(9)+16-17=22-25
<i>Lateral Line Scales:</i>	(47)48-50

Life History

<i>Range:</i>	N.C., Bahamas, and N. Gulf of Mexico to Brazil
<i>Habitat:</i>	Between 80-220m near shelf edge drop offs.
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae
<i>Spawning</i>	
<i>Season:</i>	Year around, peaks in spring and fall
<i>Area:</i>	Throughout area
<i>Mode:</i>	Multiple batches
<i>Migration:</i>	
<i>Size/Age at First</i>	24-57cm FL
<i>Maturity:</i>	
<i>Longevity:</i>	
<i>Literature:</i>	
<i>Illustration:</i>	Original, field caught

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

Hatch Size:
Incubation:
Pigment:

Diagnostic Characters

<i>Larvae</i>	No information
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Head Spination:
Preanal Length:
Length at Flexion:
Sequence of Fin Development:

*Length of Fin Development:**Pigmentation:**Diagnostic Characters:*

Early Juveniles
Settlement Size :
Pigment:

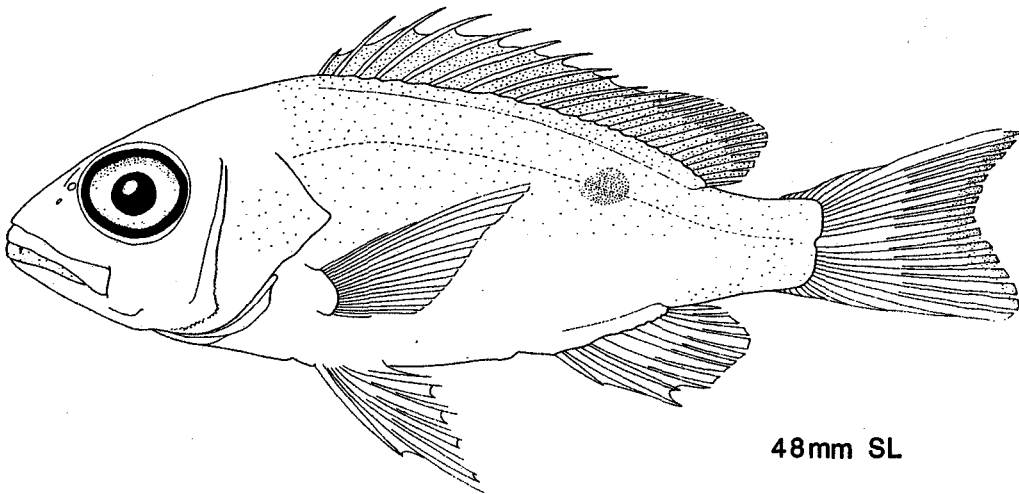
Diagnostic Characters:

Data from field caught
Ca. 30 mm SL
Pale red/pink concentrated
dorsally.
Dorsolateral spot present.

Dorsolateral spot centered
over lateral line.
Deep habitats.
Iris bright yellow in large
specimens.

Lutjanus vivanus

LUTJANIDAE



Meristic Characters

<i>Vertebrae</i>	
<i>Precaudal:</i>	10
<i>Caudal:</i>	14
<i>Total:</i>	24
<i>First Dorsal Fin:</i>	X
<i>Second Dorsal Fin:</i>	10(9)
<i>Anal Fin:</i>	III,8
<i>Pectoral Fin:</i>	15-16
<i>Gill Rakers:</i>	7-8+15-16=22-24

Life History

<i>Range:</i>	Fla Keys (rare), Bahamas to Greater Antilles
<i>Habitat:</i>	Very common in Bahamas along steep drop offs (91-242 m).
<i>ELH Pattern:</i>	Oviparous; pelagic eggs and larvae

Spawning

<i>Season:</i>	
<i>Area:</i>	
<i>Mode:</i>	Multiple batches?
<i>Migration:</i>	

Size/Age at First

<i>Maturity:</i>	
<i>Longevity:</i>	

<i>Literature:</i>	Robins & Ray 1986
<i>Illustration:</i>	Allen 1985

Early Life History Description

<i>Eggs</i>	No information
<i>Diameter:</i>	
<i>No. of Oil Globules:</i>	
<i>Oil Globule Diameter:</i>	
<i>Yolk:</i>	

<i>Hatch Size:</i>	
<i>Incubation:</i>	
<i>Pigment:</i>	

Diagnostic Characters

<i>Larvae</i>	No information
<i>Head Spination:</i>	
<i>Preanal Length:</i>	
<i>Length at Flexion:</i>	
<i>Sequence of Fin Development:</i>	

Length of Fin Development:

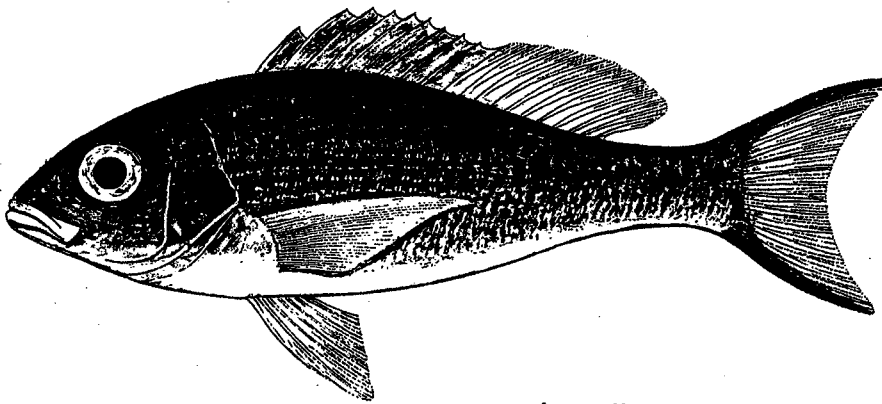
Pigmentation:

Diagnostic Characters:

<i>Early Juveniles</i>	No information
<i>Settlement Size :</i>	
<i>Pigment:</i>	Blue pigmentation sometimes confused with blue Chromis
<i>Diagnostic Characters:</i>	Meristics & blue pigmentation

Apsilus dentatus

LUTJANIDAE



Juvenile

Shaded area blue

Separating reflexion and early flexion
Rhomboplites aurorubens and Lutjanus campechanus

The following pigment and morphological characters can be used to separate larvae of small (<4 mm) Rhomboplites aurorubens and Lutjanus campechanus (J. L-Shultz and B. H. Comyns, unpublished observations from northern Gulf of Mexico collections). See illustrations on opposite page.

Rhomboplites aurorubens characters (larvae A, C, and E)

*Presence of pigment on the sternohyoidius musculature of the isthmus; developed by approximately 3 mm. This pigment is occasionally visible through the operculum (noted by the arrow on larvae A and C).

*Absence of pigment on the anterior surface of the visceral mass at the level of the pectoral fin base. (Not to be confused with melanophore located initially on the ventral body surface just behind the cleithral symphysis which by ca. 3 mm begins to migrate internally and eventually rests on the visceral mass just below the pectoral fin base.).

*Development of serrations on the longest spine of the preopercle in specimens >3.4 mm (noted by arrow on E).

*More pigment over dorsal surface of gut. This character is difficult to quantify, but is quite noticeable in the accompanying illustrations.

Lutjanus campechanus characters (Larvae B, D, and F)

*Presence of a melanophore on the anterior surface of the visceral mass in larvae >2.5 mm. This pigment is occasionally visible through the operculum (noted by arrow on larvae B & D). Recent observations of reared larvae suggest that the presence of this pigment is variable (Cecilia M. Riley, pers. comm., Marine Science Institute, University of Texas at Austin, December, 1993

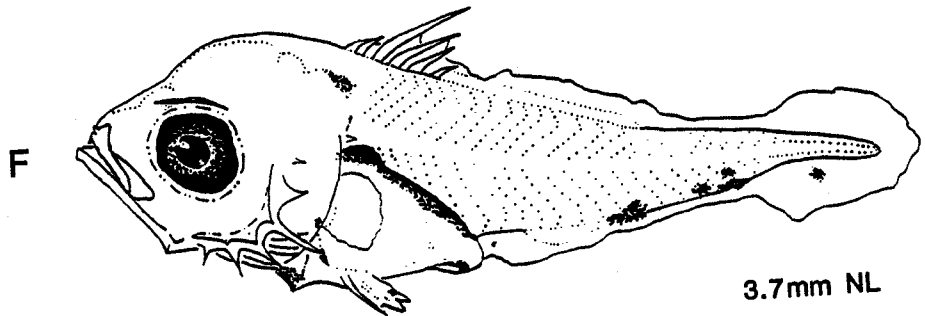
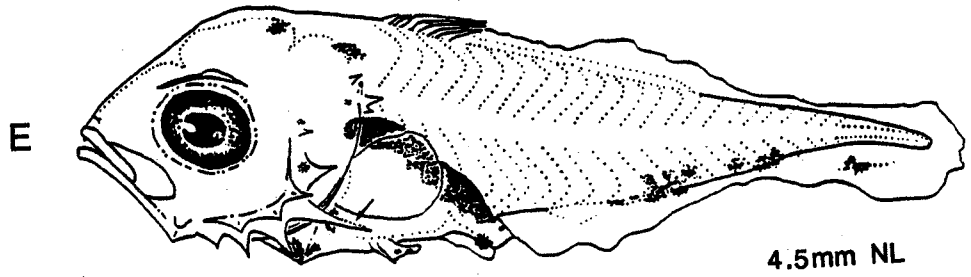
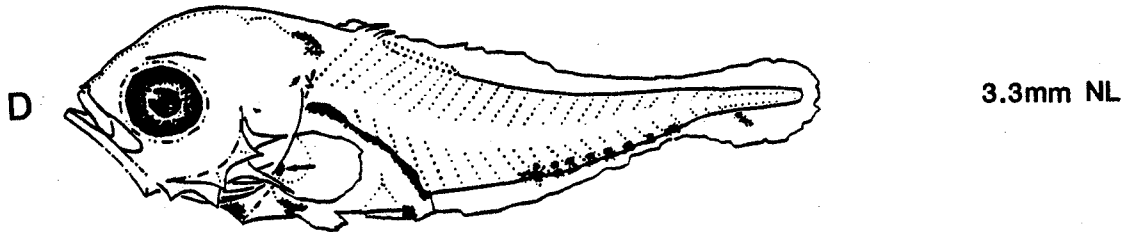
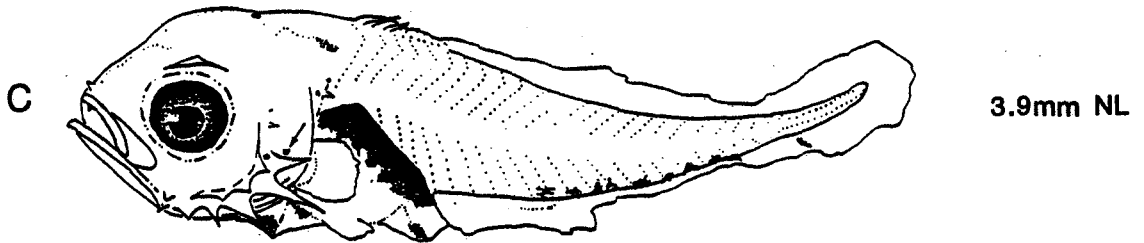
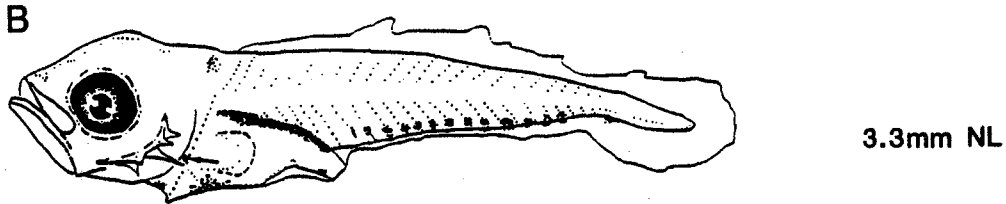
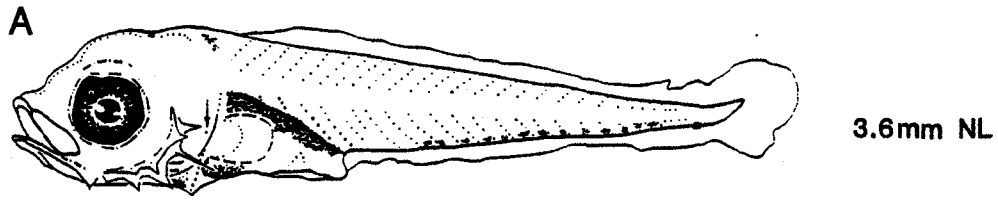
*absence of pigment on any region of the isthmus in larvae <3.8 mm

*Initial development of dorsal spines and the pelvic fin at smaller size

*Presence of dorsal finfold pigment on larvae >4 mm.

Head and ventral pigmentation was found to be similar for both species.

LUTJANIDAE



Literature Cited

- Allen, G. R. 1985. F. A. O. species catalog. Volume 6. Snappers of the World. FAO Fish. Synop. (125):208 p.
- Anderson, W. D. Jr. 1987. Systematics of the fishes of the Family Lutjanidae (Perciformes: Percoidae), the snappers. Pages 1-31 in Tropical snappers and groupers: biology and fisheries management. J. J. Polovina and S. Ralston (eds.). Westview Press, Boulder, CO. 659 p.
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