Perciformes
Suborders Trachinoidei, Blennioidei

Selected meristic characters in species belonging to the suborders Trachinoidei and Blennioidei whose adults or larvae have been collected in the study area. Composition of suborders follows Eschmeyer, 1990; sequence of families is alphabetical. Sources: R. K. Johnson, 1969; Das and Nelson, 1996; Cavalluzi and Olney, 1998; Miller and Jorgenson, 1973; Watson and Sandknop, 1996i

Suborder **Family** *Species*	Vertebrae	Dorsal Fin Rays	Anal Fin Rays	Pectoral Fin Rays	Pelvic Fin Rays
Trachinoidei					
Ammodytidae					
Ammodytes americanus	62–70	52–61	26–33	11–15	None
Ammodytes dubius	68–76	56–67	28–35	12–16	None
Chiasmodontidae					
Chiasmodon bolengeri	43–46	XI–XIII, 26–30	I, 27–29	12–15	I, 5–6
Chiasmodon niger	43–46	XI–XIII, 26–29	I, 26–29	12–15	I, 5
Dysalotus alcocki	39–40	X–XI, 26–28	I, 26–28	11–13	I, 5
Kali indica	37–41	XI–XIV, 22–24	I, 21–25	11–13	I, 5
Kali macrodon	35–40	XI–XIII, 22–26	I, 22–25	10–11	I, 5
Kali macrura	33–35	IX–XII, 18–21	I, 17–20	11–13	I, 5
Kali normani	36–41	XII–XIII, 22–26	0–I, 23–26	12–13	I, 5
Pseudoscopelus altipinnis	37–38	VI–IX, 23–26	I, 24–26	13–15	I, 5
Pseudoscopelus scriptus	36–38	VIII–IX, 20–24	I, 22–23	11–13	I, 5
Pseudoscopelus scutatus	–	–	–	–	I, 5
Percophidae					
Bembrops anatirostris	(27) 28	VI, 14–15	17–18	23–26	I, 5
Bembrops gobioides	29–30	VI, 16–17	17–18	22–26	I, 5
Uranoscopidae					
Astroscopus guttatus	25	IV–V, 13–15	13–14	19–21	I, 5
Astroscopus y-graecum	25	III–V, 13–15	12–14	19–22	I, 5
Gnathognathus egregius	28	0, 12–14	16–17	20–24	I, 5
Blennioidei					
Blenniidae					
Chasmodes bosquianus	34–36	X–XII, 17–20	II, 16–20	11–13	I, 3
Hypleurochilus geminatus	33	XI–XIII, 14–15	II, 17–18	14	I, 3–4
Hypsoblennius hentz	31–34	XI–XIII, 13–17	II, 14–17	13–15	I, 3
Parablennius marmoreus	36	XI–XII, 17–18	II, 19–20	14	I, 3

Perciformes
Suborders Trachinoidei, Blennioidei

Trachinoidei

Ammodytidae: Two species of these demersal, burrowing fishes occur in the study area: *Ammodytes dubius* occurs over much of the continental shelf, whereas *A. americanus* is restricted to shallow estuarine and coastal waters. The larvae of the former species can be very abundant in oceanic waters in some years. The adults and larvae are both long and slender and have relatively long preanus lengths. Meristic characters, including folds of skin (or plicae) along the sides, are critical for identification. Larvae are readily identified (at least to genus) based on a combination of preanus length and pigment patterns along the gut and venter of tail.

Chiasmodontidae: Meso- and bathypelagic fishes, brown to black in color, known for their ability to swallow prey much larger than themselves. The dorsal fin is continuous and may be deeply notched. *Pseudoscopelus* species have ventral photophores. Larvae from western North Atlantic Ocean not well known, those from eastern Pacific Ocean better known. Eggs are pelagic, 1.08–1.14 mm in diameter, have a single oil globule, no ornamentation, and are rose to amber in color. Larvae are long and slender, with short to very short preanus lengths (35–40% SL in *Pseudoscopelus*; <25% SL in *Chiasmodon*). Most have preopercle spines. Pectoral fin rays form early, just after the caudal fin. Larval pigment is sparse, occurring mostly on head and gut, but patches may occur on body. Spicules cover body of larvae just before or during flexion; these originate as 1 or 2 dorso- or ventrolateral rows along body; many additional rows form in *Chiasmodon*; few additional form in *Pseudoscopelus*; *Kali* larvae lack these body spicules, but form elongate P_1 and P_2 fin rays early in preflexion; *Kali* has special juvenile stage known as the "gargaropteron" (Johnson and Cohen, 1974). Early stages of *Dysalotus alcocki* are poorly known but adults of a Pacific Ocean congener have rows of strong spinules along the body, the beginnings of which are also found in a juvenile *D. alcocki* (see figure).

Percophidae: Demersal, predatory fishes, found in depths of 80–900 m. Two species occur in the study area, one (*Bembrops gobioides*) more commonly than the other. Larvae of the more rare species (*Bembrops anatirostris*) have been described. Larvae (not identified to species) are infrequently collected in the study area, usually in deep, oceanic waters.

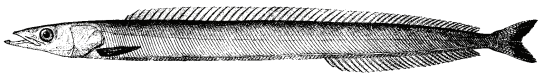
Uranoscopidae: These are solitary, carnivorous "lie-in-wait" predators that partially cover themselves with sand leaving only the eyes exposed. They are not often collected with traditional sampling gear, but low dissolved oxygen events in enclosed embayments often result in the deaths of large numbers. An electric organ develops behind the eye in the genus *Astroscopus*, beginning in individuals as small as 12 mm. The larvae (of *Astroscopus guttatus*) are characteristically stocky, well pigmented, and have blunt, rounded spines on the frontal, pterotic and preopercle bones. Larvae are undescribed for *Astroscopus y-graecum* (a species typically occurring south of the study area) or *Gnathognathus egregius* (a deep water species occurring south of Georgia, one record from Block Canyon).

Blennioidei

Blenniidae: This is the only family of the suborder Blennioidei that occurs in the study area. Blenniids are small, cryptic, demersal fishes usually found in tide pools or rocky reef habitats, less often in grass beds. Many more species occur in tropical waters south of the study area. Monophyly of the Blenniidae is based on adult characters including teeth and other osteological characters. They are very speciose, but the early stages are not well known (see Cavalluzzi and Olney, 1998 for summary of early life history information). The eggs are demersal, commonly laid in "nests". Males often mate with multiple females, then guard all resulting eggs in a single nest. Identification of larvae is difficult. Meristic characters overlap broadly in the family and are not much help for identification purposes. Larvae of the few species that occur in the study area all have heavy pigment on the pectoral fins, often beginning with an accumulation on the inner surface of the base of this fin, then spreading onto the lower several fin rays.

Ammodytes americanus DeKay, 1842
Ammodytes dubius Reinhardt, 1837
Ammodytidae

Inshore sand lance, offshore sand lance



Meristic Characters
(range in both species)

Myomeres:	62–76
Vertebrae:	62–76
Dorsal fin rays:	52–67
Anal fin rays:	26–35
Pectoral fin rays:	11–16
Pelvic fin rays:	none
Caudal fin rays:	8 + 7 PrC

(See table below)

Range: *Ammodytes americanus*: Atlantic coast of North America from Newfoundland and northern Labrador to Chesapeake Bay; *Ammodytes dubius*: Atlantic coast of North America from Greenland to Cape Fear, North Carolina

Habitat: *Ammodytes americanus*: mostly shallow, coastal or estuarine waters in depths <2 m; usually over sandy substrates; *A. dubius*: typically offshore, including shallower parts of offshore fishing banks; occurs over sandy substrates; both species capable of burrowing

Spawning: Winter-spring in *A. americanus*; fall-winter in *A. dubius*

Eggs:
- Demersal, adhesive, irregular shape
- Diameter: 0.9 – 1.0 mm
- Chorion: sculptured, rough-surfaced, brownish
- Yolk: homogeneous, amber
- Oil globule: single (posterior in yolk sac), 0.28–0.38 mm in diameter
- Perivitelline space: narrow
- No embryonic pigment

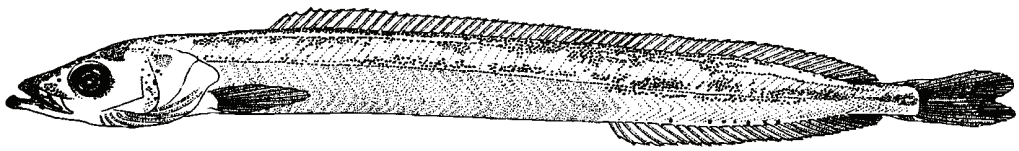
Larvae:
- Hatching occurs at about 5.7–6.3 mm
- Body very slim and elongate, anus opens at side of finfold, not margin
- Gut elongate, with internal folds; preanus length 60–70% SL
- Head shallow, elongate; lower jaw protrudes anteriorly
- Flexion occurs at about 10–12 mm
- Sequence of fin ray formation: C – D, A – P_1 (P_2 lacking); length of dorsal fin about twice that of anal fin
- Pigmentation: prominent series of melanophores along dorsum of gut; row of distinct spots along venter of tail; few spots on top of head and base of caudal fin; pigment on dorsum of body spreads forward

Note: 1. Larvae and juveniles of the 2 species that occur in the study area are best distinguished by meristic characters, including plicae (oblique folds of skin on the sides of the body) when they develop. See Table below:

	Plicae	Vertebrae	Dorsal Fin Rays	Anal Fin Rays
Ammodytes americanus	106–126	62–70	52–61	26–33
Ammodytes dubius	124–147	68–76	56–67	28–35

Early Juvenile:

F. 45.5 mmTL

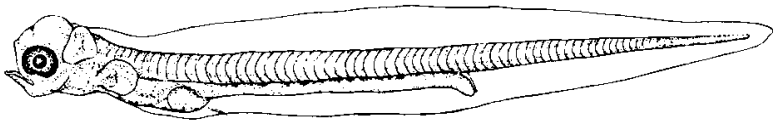


Figures: Adult (*A. dubius*): H. L. Todd (Nizinsky, 2002); **A**: Williams *et al*., 1964; **B–E**: Norcross *et al*., 1961; **F**: Nancy Arthur (Able and Fahay, 1998)

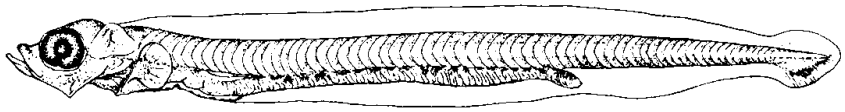
References: Richards *et al*., 1963; Reay, 1970; Smigielski *et al*., 1984; Nizinsky *et al*., 1990; Able and Fahay, 1998; Nizinsky, 2002

Ammodytes sp.

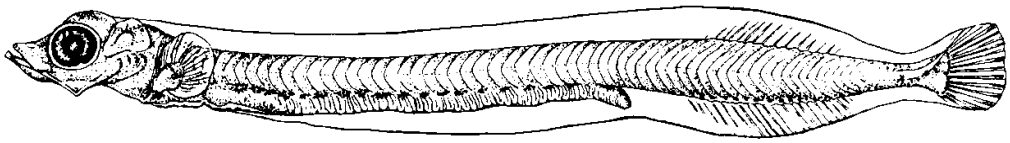
A. 4.3 mmTL



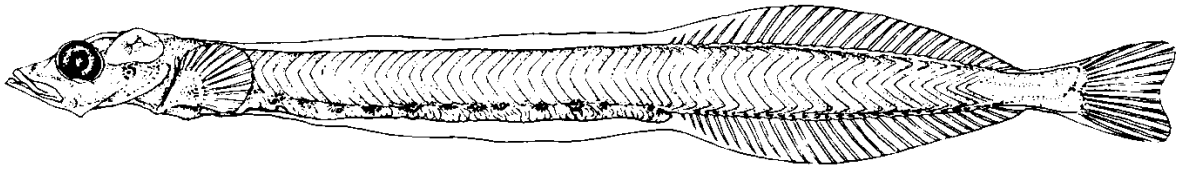
B. 5.6 mmTL



C. 8.1 mmTL Internal notochord pigment forms at about 9.0 mm, increases with development



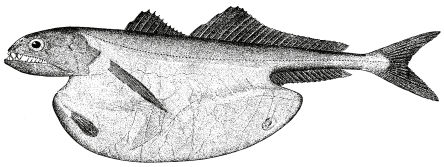
D. 13.5 mmTL Dorsal row of melanophores forms at about 15.0 mm, extends anteriorly with development



E. 22.3 mmTL

Meristic characters in *Ammodytes americanus* are relatively stable throughout its range. In *A. dubius*, however, a marked geographic variation is evident, with higher counts characterizing specimens from more northern locations. Counts of vertebrae and fin rays are higher in fishes from Quebec-Nova Scotia than in fishes from New York-North Carolina, for example. See Nizinsky *et al.* (1990) for more details of this variation.

Chiasmodon niger Johnson, 1863
Chiasmodontidae
Black swallower



Range: Worldwide in tropical and subtropical waters; in the western North Atlantic from Grand Bank and Flemish Cap to Caribbean Sea

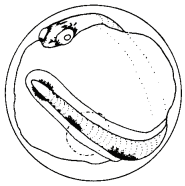
Habitat: Meso- to bathypelagic in depths >750 m

Spawning: Prolonged, possibly year-round with peaks spring and late summer

Meristic Characters

Myomeres:	42–44
Vertebrae:	43–46
Dorsal fin rays:	XI–XIII, 26–29
Anal fin rays:	I, 26–29
Pectoral fin rays:	12–15
Pelvic fin rays:	I, 5
Caudal fin rays:	10–11+9+8+10–11

Eggs:
- Pelagic, spherical
- Diameter: 1.1–1.2 mm
- Chorion: smooth; pale rose to amber
- Yolk: homogeneous
- Oil globule: 1 to >100, coalescing to 1, 0.24–0.28 mm
- Perivitelline space: narrow
- Embryonic pigment includes 3–5 patches on tail



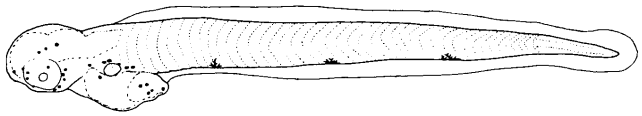
Larvae:
- Hatching occurs at length of about 3.0 mm
- Body very elongate, with small head, pointed snout, protruding lower jaw
- Mouth barely reaches anterior edge of eye in early stages, extends well beyond eye at transformation
- Eye slightly oval in earliest stages; becomes round during flexion
- Preanus length 16% SL in early stages; increases to 34% SL in larger larvae
- Flexion occurs at 9.0–12.0 mm
- Sequence of fin ray formation: C, P_1 – D_2, A – D_1, P_2 (note early P_1 formation)
- Few prominent head spines; see checklist below
- Body covered with spicules, beginning as 2 rows on dorso- and ventrolateral surfaces in larvae 5.5 mmSL; spicules spread to cover entire body and cheek
- Pigment features prominent patches on dorsal and ventral edges of tail; pigment also occurs on vomer, internally under brain, on top of head, near notochord tip and 1 to few spots on base of pectoral fin

Note:
1. Larvae of the 4 genera that occur in the study area are best distinguished by presence or absence of spicules on the body, meristic characters and pigment pattern, ranging from nearly absent in *Kali* to presence of series of prominent blotches in *Chiasmodon*

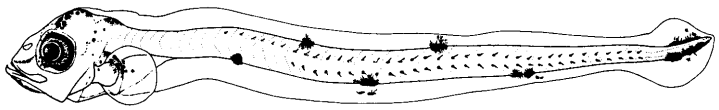
Figures: Adult: Goode and Bean, 1896; Egg, **A–C, E**: Nancy Arthur (Watson and Sandknop, 1996i); **D**: Betsy Washington (Watson *et al.*, 1984a)

References: Watson *et al.*, 1984a; Watson and Sandknop, 1996i

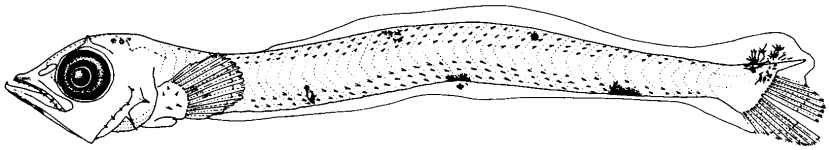
Chiasmodon niger



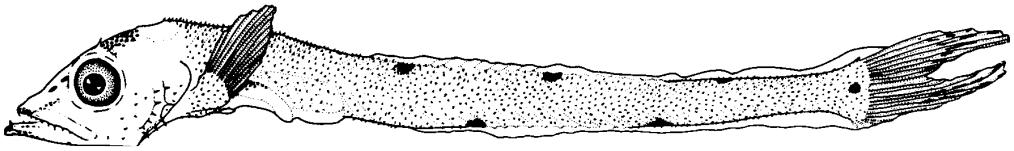
A. 3.2 mmSL



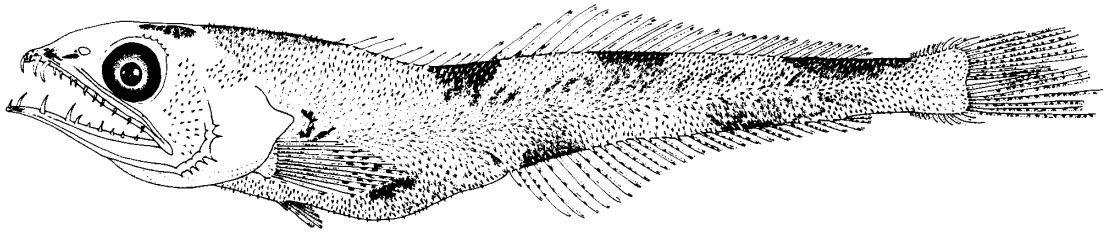
B. 6.5 mmSL



C. 10.0 mmSL



D. 14.0 mmSL



E. 22.9 mmSL

Kali indica Lloyd, 1909
Chiasmodontidae
No common name

Range: Worldwide in tropical and subtropical waters; in the western North Atlantic from Bear Seamount to Gulf of Mexico and Caribbean Sea

Habitat: Meso- and bathypelagic in depths to 2,100 m

Spawning: Undescribed

Eggs: – Undescribed

Meristic Characters

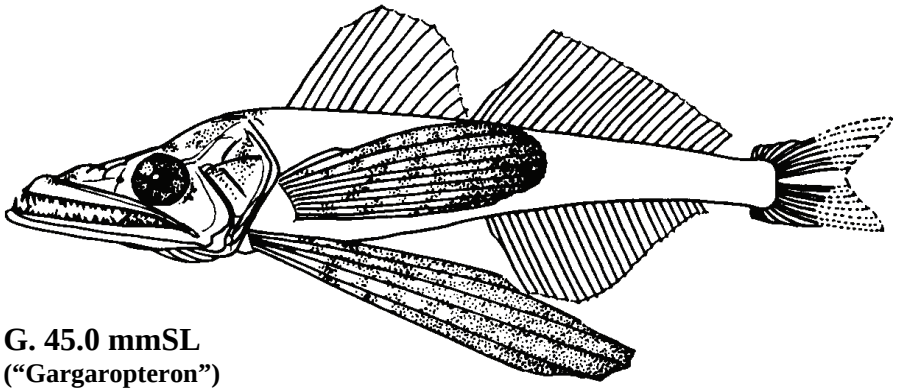
Myomeres:	37–41
Vertebrae:	37–41
Dorsal fin rays:	XI–XIV, 22–24
Anal fin rays:	I, 21–25
Pectoral fin rays:	11–13
Pelvic fin rays:	I, 5
Caudal fin rays:	8–10+9+8+8–12

Larvae:
- (Based on tentatively identified Pacific Ocean larvae of 2 species)
- Body elongate with long head and pointed snout
- Mouth barely reaches eye in early stages, becomes larger in later larvae and extends well beyond eye in juvenile
- Preanus length very short (<40% SL)
- Sequence of fin ray formation: P_1 – C – D_2, A – D_1, P_2; pectoral fin early-forming
- Late larvae have elongate pectoral and pelvic fin rays
- Fin rays of D_2 typically longer than those of A fin
- Larvae retain very shallow body until juvenile stage
- Spicules on body absent (see *Chiasmodon* and *Pseudoscopelus*)
- Head spines lacking
- Pigment very light; if present, melanophores occur on gut, opercle area, roof of mouth and internally on peritoneum and air bladder

Head Spine Checklist: None

Note: 1. Juveniles of *Kali* have a characteristic juvenile stage, known as the "gargaropteron" (Johnson and Cohen, 1974). These juveniles have long fin spines and rays in the dorsal and anal fins, and very elongate fin rays in the paired fins. The snout is long, pointy, and slightly concave and the gape is exceedingly wide. Teeth are well-formed. The body is somewhat deeper through the pectoral region than it is in larvae.

Early Juvenile:

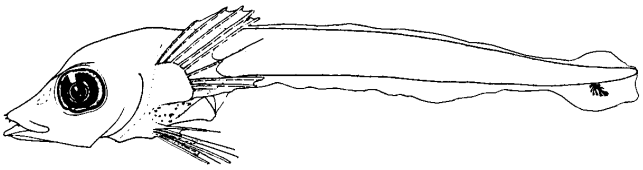


G. 45.0 mmSL
("Gargaropteron")

Figures: Adult (reversed) Lloyd, 1909; **A–F**: William Watson (Watson and Sandknop, 1996i); **G**: Johnson and Cohen, 1974

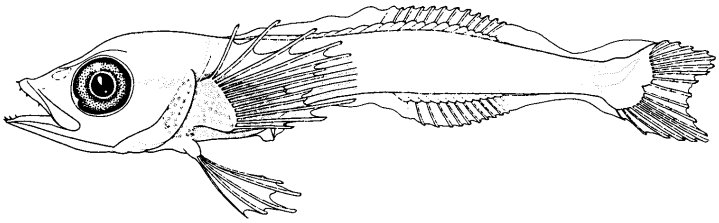
References: R. K. Johnson, 1969; Johnson and Cohen, 1974; Johnson and Keene, 1986a; 1986b; Watson and Sandknop, 1996i

Kali indica

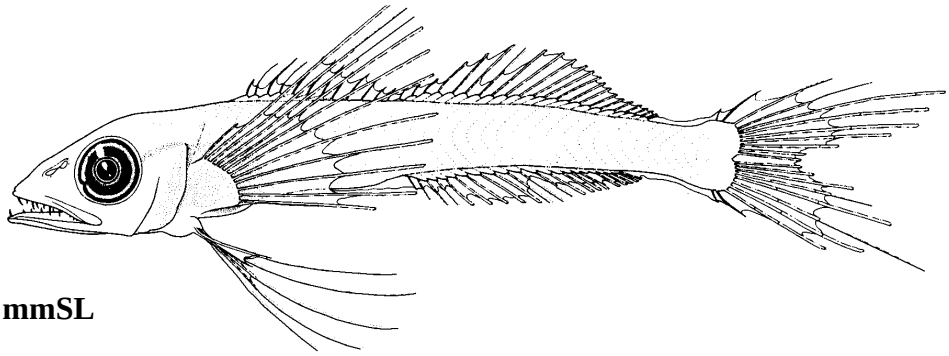


Illustrations and description based on larvae collected in central Pacific Ocean

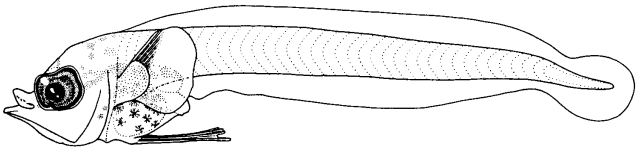
A. 5.4 mmSL



B. 6.9 mmSL

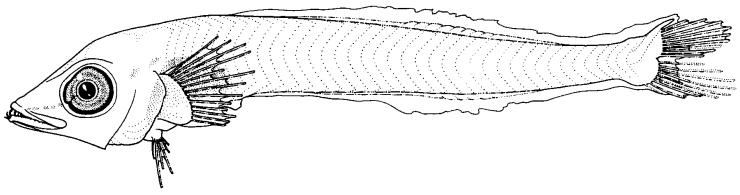


C. 11.1 mmSL

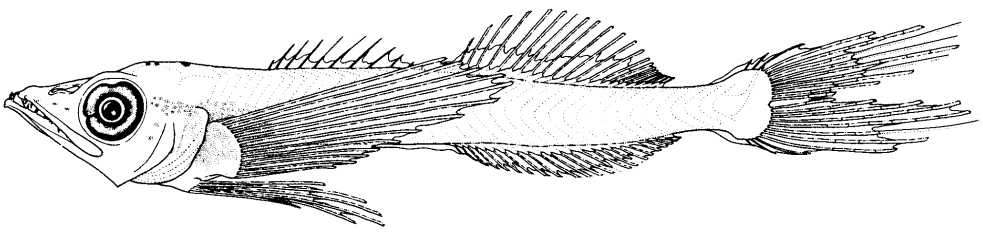


Illustrations and description based on larvae collected in eastern Pacific Ocean. This species occurs worldwide in tropical waters, but larvae have not yet been reported from study area. Adults have been collected north of Bermuda (to 33°04'N).

D. 3.9 mmSL

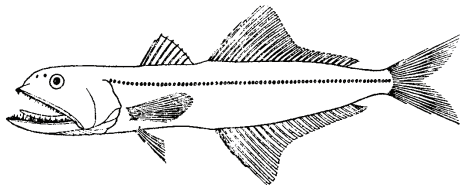


E. 7.2 mmSL



F. 10.0 mmSL

Pseudoscopelus altipinnis Parr, 1933
Chiasmodontidae
No common name



Range: North Atlantic and Pacific oceans in temperate to tropical waters; (*Pseudoscopelus scriptus* from Newfoundland to Caribbean Sea)

Habitat: Mesopelagic, maximum depth unknown

Spawning: Undescribed

Eggs: – Undescribed

Meristic Characters

Myomeres:	37–38
Vertebrae:	37–38
Dorsal fin rays:	VI–IX, 23–26
Anal fin rays:	I, 24–26
Pectoral fin rays:	13–15
Pelvic fin rays:	I, 5
Caudal fin rays:	9+8 (PrC)

Larvae:
- (Based on larvae collected in central Pacific Ocean, identified to genus level)
- Body elongate with moderate head and moderately pointed snout
- Mouth large, initially reaching anterior edge of eye, much larger in juveniles and adults
- Preanus length 35–40% SL, longer than in larvae of confamilials
- Sequence of fin ray formation: C – P_1 – D, A – P_2
- Elongate fin rays lacking
- Spicules on body begin as 2 parallel rows of small spines on dorso- and ventrolateral surface between posterior portions of dorsal and anal fins
- Head spines restricted to preopercle; see checklist below
- Pigment pattern more distinct than in larvae of confamilials; melanophores on top of head, opercle area and internally on peritoneum; 2 blotches of pigment on ventral edge of tail, 1 over origin of anal fin, a 2nd over insertion of anal fin; an accumulation of spots forms on dorsum over 2nd ventral blotch; in later larvae these last 2 accumulations merge to form a well-pigmented band across the caudal peduncle

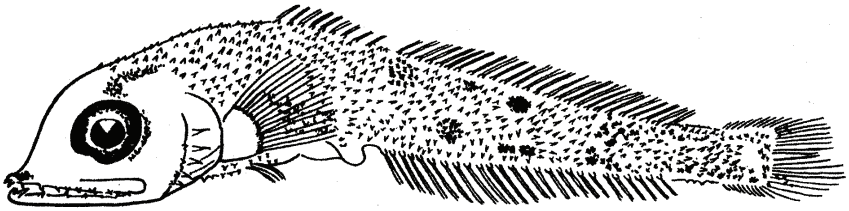
Head Spine Checklist:

Preopercle: few evenly sized spines along edge and lateral ridge

Note: 1. The larvae of the 4 genera that occur in the study area are best distinguished by presence or absence of spicules on the body, meristic characters and pigment pattern, ranging from nearly absent in *Kali* to presence of series of prominent blotches in *Chiasmodon*

Larvae of *Dysalotus alcocki* MacGilchrist, 1905, (and congeners) are poorly described. The adults have rows of strong spines along the body. Presumably the larvae begin formation of these spines in parallel rows near the posterior part of body, as in larvae of *Pseudoscopelus* and *Chiasmodon*.

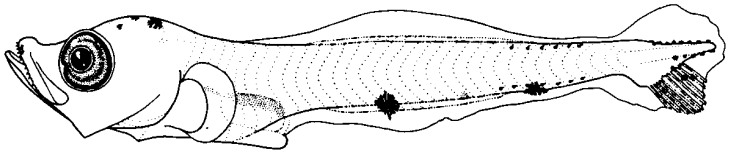
F. 14.7 mmSL
Dysalotus alcocki



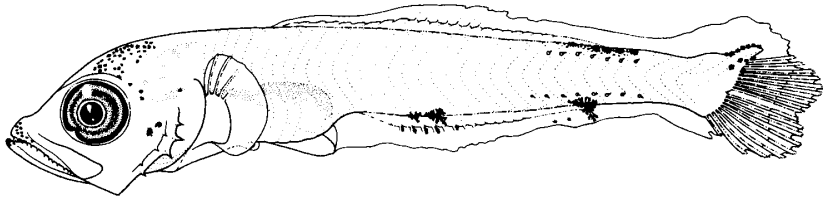
Figures: Adult: Johnson and Keene, 1986a; **A–C**: William Watson (Watson and Sandknop, 1996i); **D–E**: Jack Javech (Hardy, 2006b); **F**: Belyanina, 1982

References: Johnson and Keene, 1986a; 1986b; Richards, 1990; Watson and Sandknop, 1996i; McEachran and Sutton, 2002; Moore *et al*., 2003

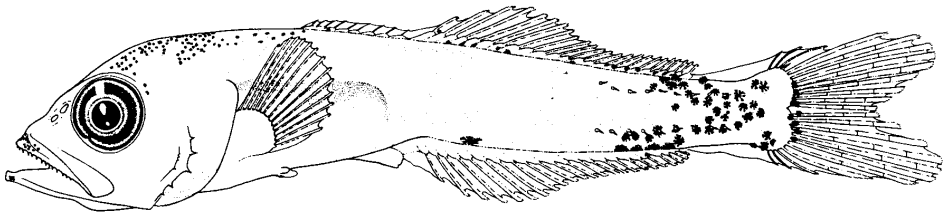
***Pseudoscopelus* sp.**



A. 6.8 mmSL

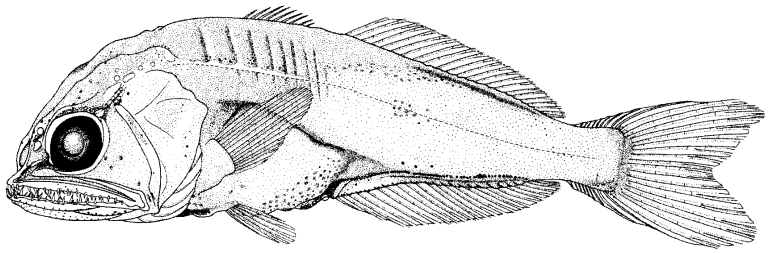


B. 7.4 mmSL



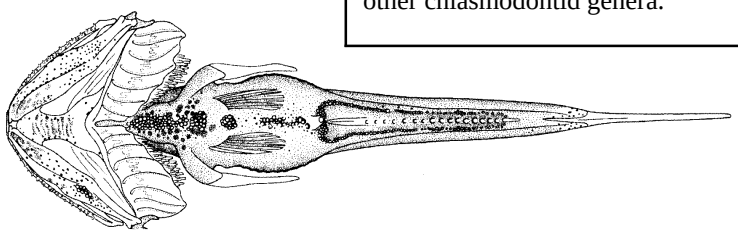
C. 9.5 mmSL

Illustrations A-C are based on a series of larvae collected in the central Pacific Ocean (Watson and Sandknop, 1996i). Most larvae of *Pseudoscopelus* have only been identified to genus. The genus is in need of revision and several undescribed species have been studied. At least one of these undescribed species occurs in the study area and has been collected off Georges Bank (Moore *et al.*, 2003 as *Pseudoscopelus* sp.). Two other described species also occur in the study area (*P. scriptus* and *P. scutatus*). The series included here (Fig. A-C) and those of *P. scriptus* (Fig. D-E) are intended to demonstrate certain characters assumed to occur in all species of *Pseudoscopelus* (presence of body spicules, few head spines, lack of elongate fin rays) but the larval pigment pattern probably differs between the species.



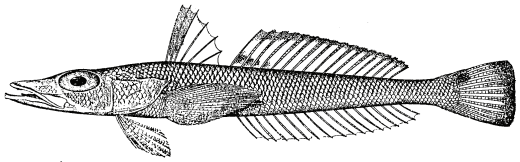
D. 16.5 mmSL

Note formation of groups of photophores on isthmus and venter of gut. Photophores are lacking in other chiasmodontid genera.



E. 16.5 mmSL (Ventral View)

Bembrops gobioides (Goode, 1880)
Percophidae
Goby flathead



Range: Western North Atlantic Ocean from vicinity of Alvin Canyon to Caribbean Sea, including Gulf of Mexico; several other records in study area as far north as 39° 59' N, 70° 52'W

Habitat: Demersal, in depths of 100–700 m

Spawning: Undescribed

Eggs: – Undescribed

Meristic Characters

Myomeres:	29–30
Vertebrae:	29–30
Dorsal fin rays:	VI, 16–17
Anal fin rays:	17–18
Pectoral fin rays:	22–26
Pelvic fin rays:	I, 5
Caudal fin rays:	7–11+7+6+5–9

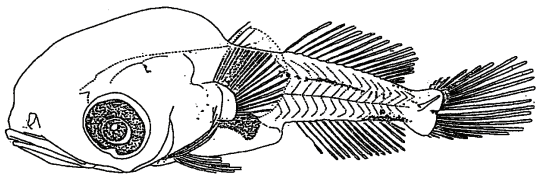
Larvae:
- Undescribed; description based on larvae of *B. anatirostris* (see note)
- Body moderately elongate, tapering only slightly to caudal peduncle
- Head large, bulbous, broad (see dorsal view); becomes depressed in later larvae
- Mouth large, extending to level of middle of eye
- Preanus length 50–60% SL
- Sequence of fin ray formation: C, P_1 – D, A – P_2
- Pectoral fin rays moderately long; other fin rays not elongate
- Head spines lacking
- Pigment includes a prominent blotch of melanophores on caudal peduncle; a blotch of dorsal pigment forms under origin of D_2; spots outline brain, dorsally; peritoneal pigment heavy; pigment on membranes of D_1 and on pelvic fin rays

Head Spine Checklist: None

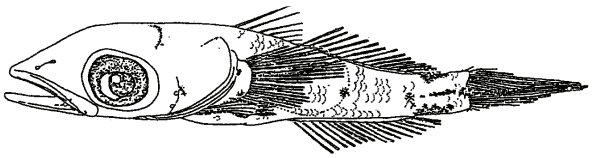
Note:

1. Larvae of *Bembrops gobioides* are undescribed (except see note box on figure page). A congener, *Bembrops anatirostris* Ginsburg, 1955, occurs in the western North Atlantic Ocean from the Bahamas and Gulf of Mexico to northern South America. There is a single record of this species from the study area, near Hudson Canyon (MCZ 156738). Although it is probably less common than *B. gobioides* in the study area (Moore *et al*., 2003) its larvae are described and the description is presented here.

2. "Bubblemorph" percophid larvae (representing 2 *Bembrops* species) have been described (Okiyama, 1997). These larvae resemble *Bembrops anatirostris* larvae, but have a greatly enlarged dermal space over the head, resulting in a bubble-like appearance (Fig. F). This transparent "bubble" disappears at transformation (about 15.0 mm) and the juveniles have very depressed and long heads (Fig. G). The head is large and broad in dorsal view (and lacks spines). Larvae of the 2 species differ only in pigmentation patterns (see Okiyama, 1997 for description of the second species). The presence of 2 larval morphs within *Bembrops* suggests that the genus may not be monophyletic. The "bubblemorph" larva has not yet been reported from the western Atlantic.



F. 10.3 mmSL

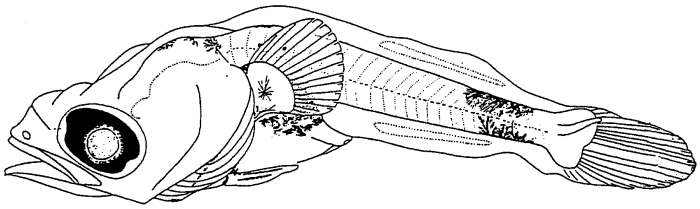


G. 15.8 mmSL

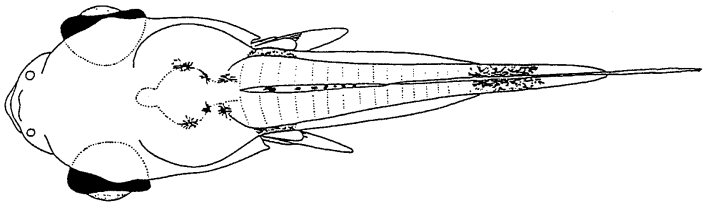
Figures: Adult: Ginsburg, 1955; **A–C, F–G**: Okiyama, 1997 (after Richards, 1990); **D–E**: Richards, 1990

References: Richards, 1990; 2006b; Das and Nelson, 1996; Thompson and Suttkus, 1998; Okiyama, 1997; Matsuura and Suzuki, 2000; Moore *et al.*, 2003

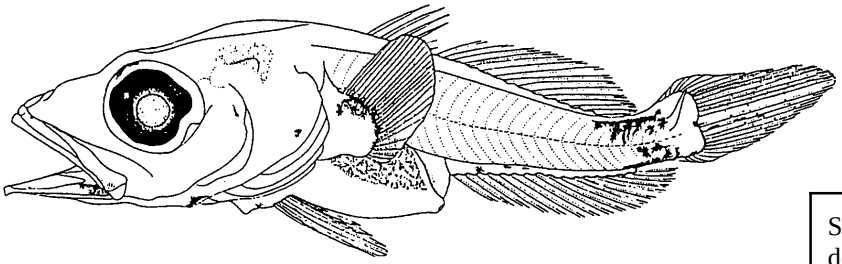
Bembrops anatirostris



A. 6.3 mmSL

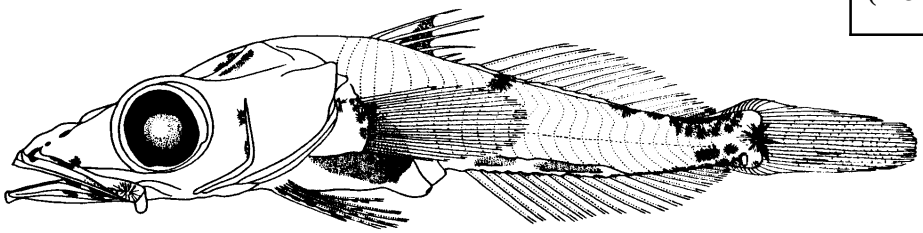


B. 6.3 mmSL
(Dorsal View)

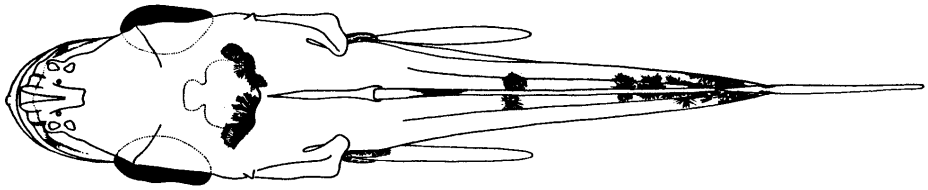


C. 9.4 mmSL

See illustration and brief description of 6.7-mm larval *Bembrops gobioides*, collected off New Jersey (Richards, 2006b)

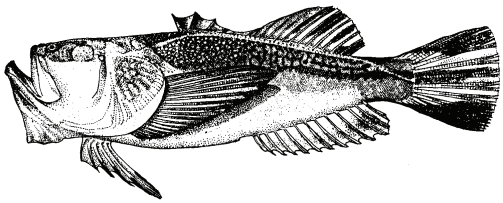


D. 15.0 mmSL



E. 15.0 mmSL
(Dorsal View)

Astroscopus guttatus Abbott, 1861
Uranoscopidae
Northern stargazer



Range: Western North Atlantic Ocean where it is endemic to the coast of the United States from New York to North Carolina

Habitat: Demersal over inshore, shallow, sandy substrates in rivers, bays and coastal areas, but has been collected to a maximum de pth of 200m; a lie-in-wait predator that buries itself with eyes and tips of jaws exposed; may occasionally congregate near mouths of bays

Meristic Characters

Myomeres:	25
Vertebrae:	25
Dorsal fin rays:	IV–V, 13–15
Anal fin rays:	13–14
Pectoral fin rays:	19–21
Pelvic fin rays:	I, 5
Caudal fin rays:	5 + 7 + 6 + 4

Spawning: Jun–Oct with most reproduction over the continental shelf between Delaware Bay and North Carolina; also May–Jun in lower Chesapeake Bay

Eggs:
- Undescribed

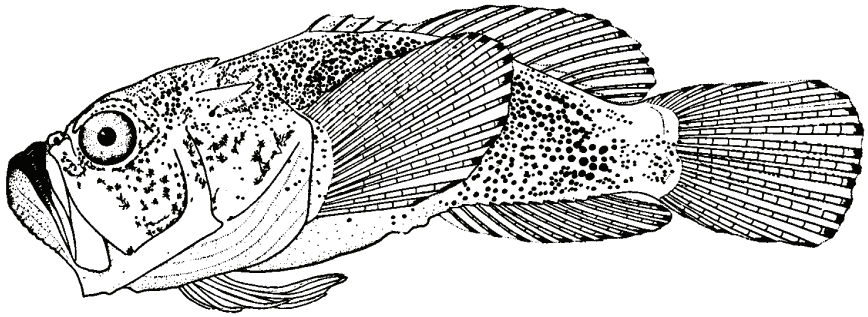
Larvae:
- Body moderately stocky, with large head and mouth, slimmer posterior to anus; in later stages, becomes very broad and dorso-ventrally flattened (Fig. C)
- Preanus length about 60% SL
- Eyes initially on sides of head, shift to dorsum of head in juveniles (about 25 mm)
- Mouth becomes oriented vertically
- Sequence of fin ray formation not well described; pectoral fins large
- Head with several knoblike protuberances; see checklist below
- Electric organs behind the eye begin to develop at sizes of about 12.0 mm; these merge to a single organ at about 33–45 mm
- Pigmentation is dense on anterior part of body, especially over gut; pigment spreads in later stages, temporarily leaving the caudal peduncle unpigmented; juveniles are more heavily pigmented

Head Spine Checklist:

Preopercle: 1 or 2 rounded, blunt spines on edge
Frontal: a pair of rounded, blunt protuberances
Pterotic: a blunt, posteriorly directed spine on each side of head in temporal region

Note:
1. Larvae most common in continental shelf waters; migrate toward coastal habitats with growth and settle to bottom at about 11–15 mmSL

Early Juvenile: Tip of lower jaw has pair of "moustache" marks; a fringe develops on lower lip

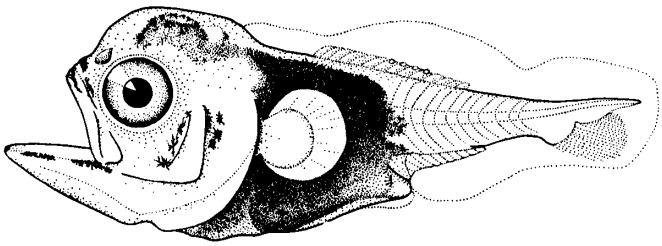


D. 23.0 mm

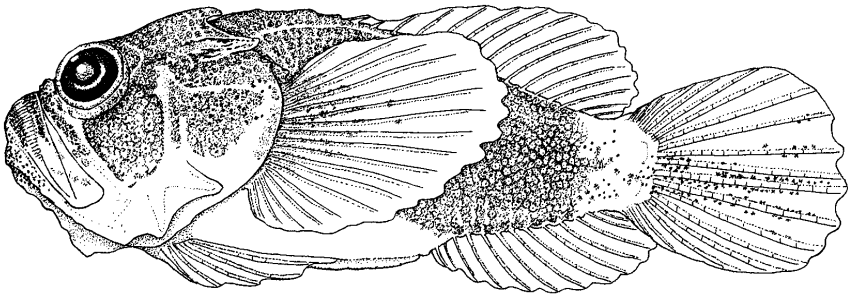
Figures: Adult: Goode, 1884; **A**, **D**: Pearson, 1941; **B**: Susan Kaiser (Able and Fahay, 1998); **C**: White, 1918

References: White, 1918; Pearson, 1941; Berry and Anderson, 1961; Fritzsche, 1978; Murdy *et al.*, 1997; Able and Fahay, 1998

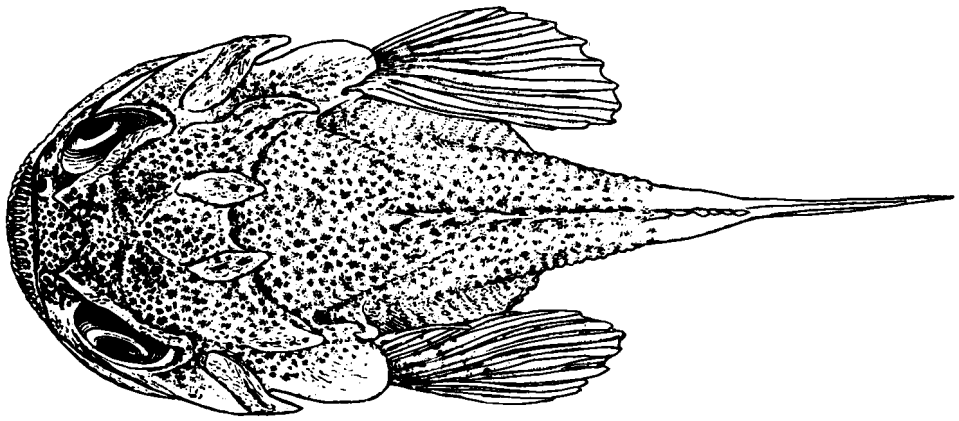
Astroscopus guttatus



A. 4.9 mm

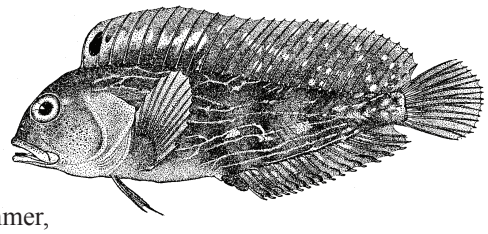


B. 17.0 mmSL



C. 20.0 mmTL
(Dorsal View)

Chasmodes bosquianus (Lacepède, 1800)
Blenniidae
Striped blenny



Range: Atlantic coast of United States from New York to Florida

Habitat: Shallow sand and mud flats and oyster reefs during spring-summer, deeper flats and reefs during fall, higher salinities in deep channels during winter

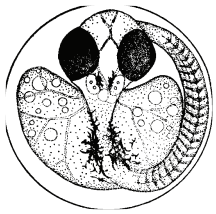
Spawning: Apr–Aug (Chesapeake Bay); eggs laid in empty bivalve shells or other structured substrates

Meristic Characters

Myomeres:	34–36
Vertebrae:	34–36
Dorsal fin rays:	X–XII, 17–20
Anal fin rays:	II, 16–20
Pectoral fin rays:	11–13
Pelvic fin rays:	I, 3
Caudal fin rays:	4–5+7+6+3–5

(possibly as few as 10 PrC)

Eggs:
- Demersal, slightly oval, with adhesive disk
- Diameter: 0.92–1.1 mm (major axis); 0.8–0.9 mm (minor axis)
- Chorion: pale yellow to orange
- Yolk: segmented, granular
- Oil globule: numerous, various diameters
- Perivitelline space: moderate



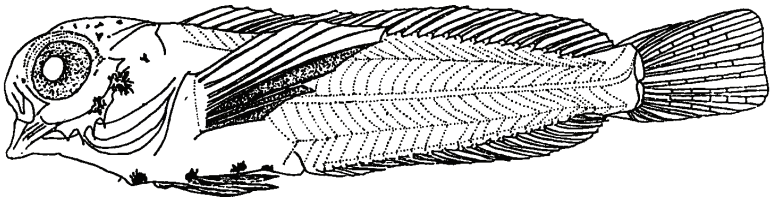
Larvae:
- Hatching occurs at lengths of 3.6–3.8 mmTL
- Body moderate with short gut, rounded head, large eyes, small mouth
- Preanus length about 35–45% SL
- Flexion occurs at unknown length
- Sequence of fin ray formation: P_1 – C – D, A – P_2 (putative)
- Number of dorsal fin spines fewer than number of dorsal fin rays
- Head spines present; see checklist below
- Tentacle lacking over eye in all stages (present in larvae of *Hypsoblennius* and *Parablennius*)
- Pigmentation includes melanophores on pectoral fins, usually early forming, spreading from inner base to lower fin rays; a row of spots along venter of tail; gut pigment heavy; early larvae with few spots on snout tip, later larvae with clusters of spots on top of head

Head Spine Checklist:

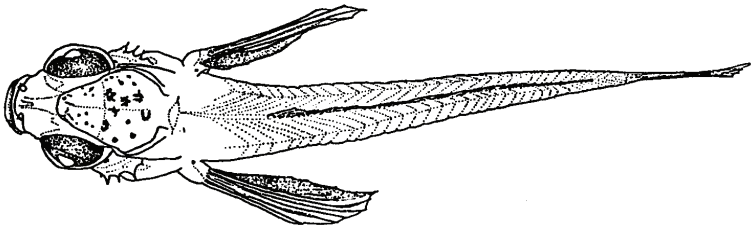
Preopercle: few small spines along edge; spine at angle slightly longer than others

Early Juvenile:

G. 12.0 mmTL



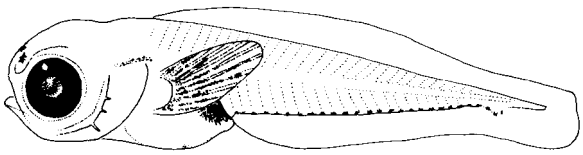
H. 12.0 mmTL
(Dorsal View)



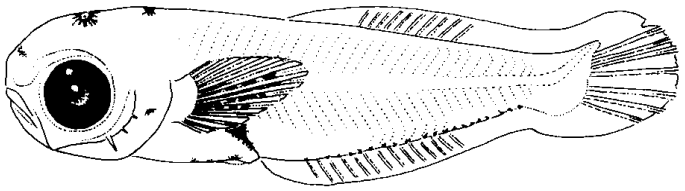
Figures: Adult, egg and **A–C**, **E**: Hildebrand and Cable, 1938 (**A–C** redrawn); **D**, **F–H**: Lippson and Moran, 1974

References: Hildebrand and Cable, 1938; Lippson and Moran, 1974; Peters, 1985; Cavalluzi and Olney, 1998; Ditty *et al.*, 2006

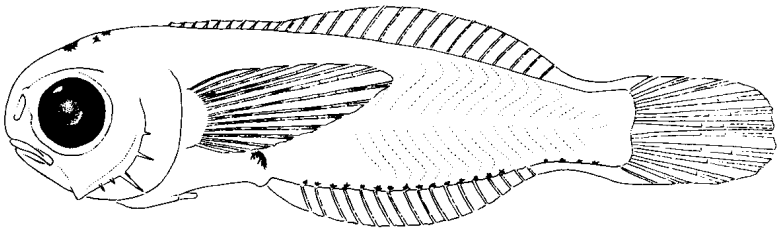
Chasmodes bosquianus



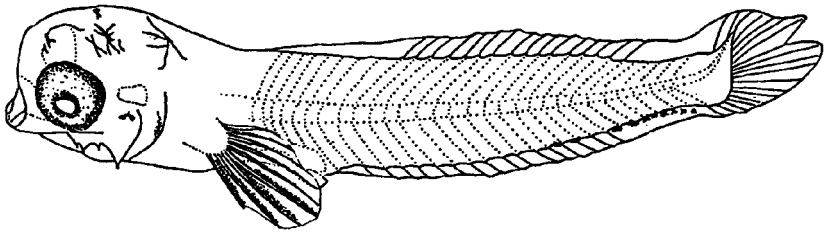
A. 3.0 mmTL



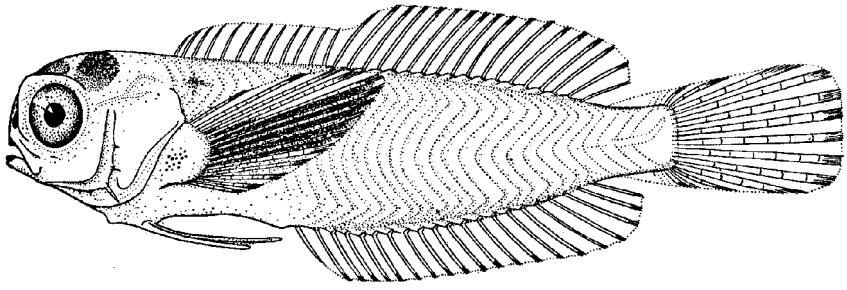
B. 4.4 mmTL



C. 6.2 mmTL

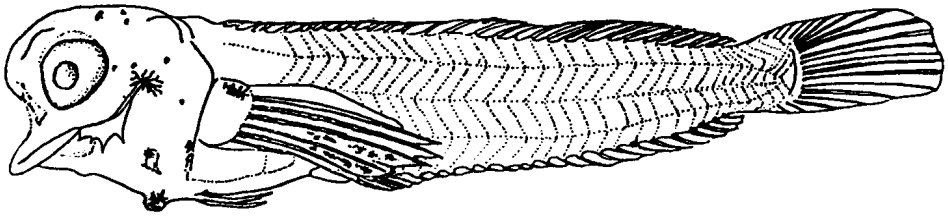


D. 8.0 mmTL



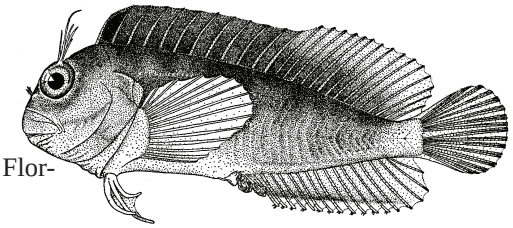
E. 9.8 mmTL

Larvae illustrated in Figs. A-C and E originally described as *Hypsoblennius hentz*. See Ditty *et al.*, 2006.



F. 10.0 mmTL

Hypleurochilus geminatus (Wood, 1825)
Blenniidae
Crested blenny



Range: Atlantic coast of United States from North Carolina to southern Florida and Gulf of Mexico to Texas

Habitat: In algal and other weed growths on pilings, rocky seawalls or other rocky substrates

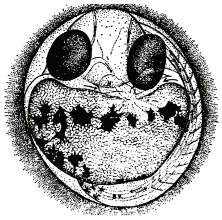
Spawning: May–Sep; eggs laid in single layer in nest

Eggs:
- Demersal, with adhesive disk
- Diameter: 0.60–0.75 mm
- Oil globules: several

Larvae:
- Hatching occurs at length of 2.4 mmTL
- Body moderate with short gut, rounded head, large eyes, small mouth
- Preanus length about 40% SL
- Flexion occurs at about 4.0 mm TL
- Sequence of fin ray formation: P_1, C – D, A – P_2; pelvic fin forms late
- Number of dorsal fin spines approximates number of dorsal fin rays
- Head spines present; see checklist below
- Tentacle forms over eye in late larvae, retained in juveniles and adults
- Pigmentation includes melanophores on pectoral fins, beginning on inner surface of base, then spreading onto lower fin rays; a row of spots along venter of tail; gut pigment heavy; few small spots on top of head

Meristic Characters

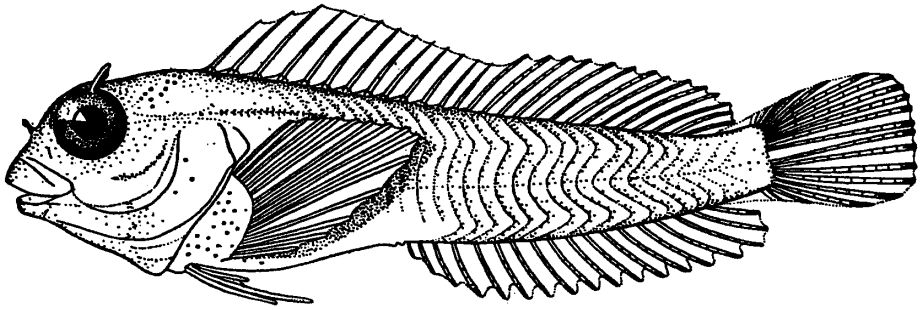
Myomeres:	33
Vertebrae:	33
Dorsal fin rays:	XI–XIII, 14–15
Anal fin rays:	II, 17–18
Pectoral fin rays:	14
Pelvic fin rays:	I, 3–4
Caudal fin rays:	4–5 + 7 + 6 + 4–5



Head Spine Checklist:

Preopercle: several small spines along edge before transformation

Early Juvenile:



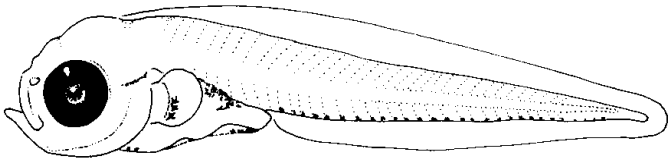
G. 16.0 mmTL

Figures: Adult, egg and **A–G**: Hildebrand and Cable, 1938 (**A–E** redrawn)

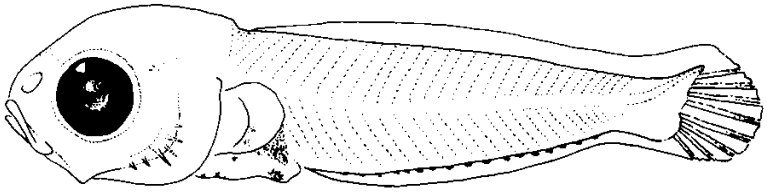
References: Hildebrand and Cable, 1938; Olney, 1983; Peters, 1985; Cavalluzi and Olney, 1998; Ditty *et al.*, 2006

Hypleurochilus geminatus

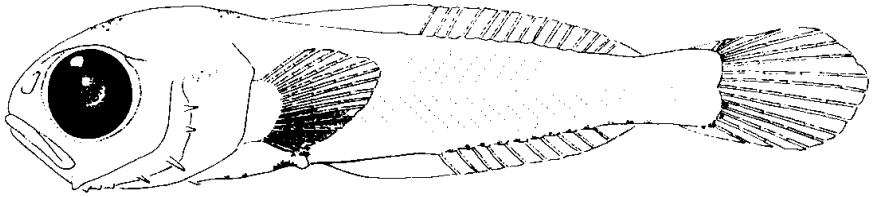
A. 2.4 mmTL



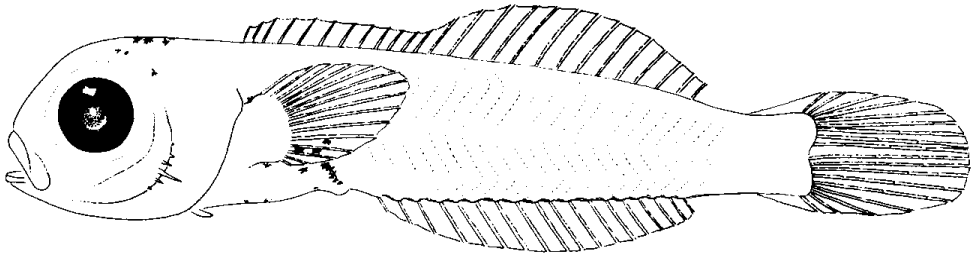
B. 2.1 mmTL



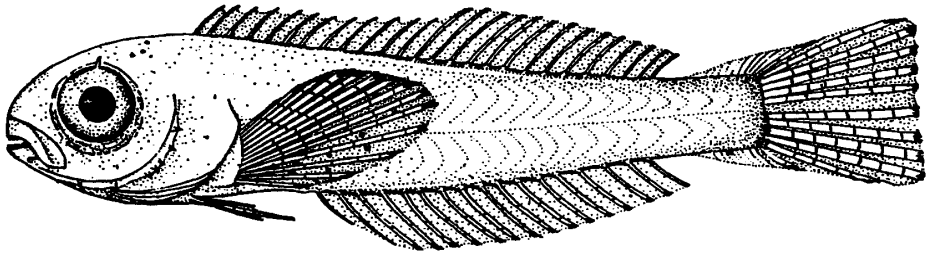
C. 4.5 mmTL



D. 6.0 mmTL

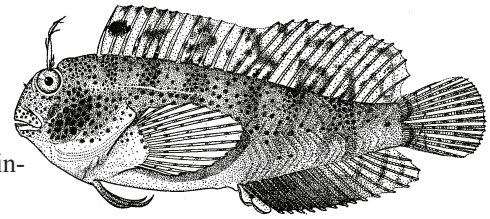


E. 8.5 mmTL



F. 12.0 mmTL

Hypsoblennius hentz (LeSueur, 1825)
Blenniidae
Feather blenny



Range: Coastal waters of North America from Nova Scotia to Yucatan Peninsula; very common in Chesapeake Bay

Habitat: Coastal ocean, bays and estuaries; often associated with oyster reefs, rocky shorelines and grass flats, but retreating to deeper channels during winter

Spawning: May–Aug; larvae moderately abundant through Oct (Chesapeake Bay); males guard nests (often in bivalve shells) containing up to 3,750 eggs

Meristic Characters

Myomeres:	31–34
Vertebrae:	31–34
Dorsal fin rays:	XI–XIII, 13–17
Anal fin rays:	II, 14–17
Pectoral fin rays:	13–15
Pelvic fin rays:	I, 3
Caudal fin rays:	5–6+7+6+5–6

Eggs:
- Demersal, slightly oval, flattened near adhesive disk
- Diameter: 0.72–0.80 mm (major axis); 0.64–0.68 mm (minor axis)
- Chorion: smooth
- Yolk: granular, pinkish
- Oil globules: many, various diameters
- Perivitelline space: moderate

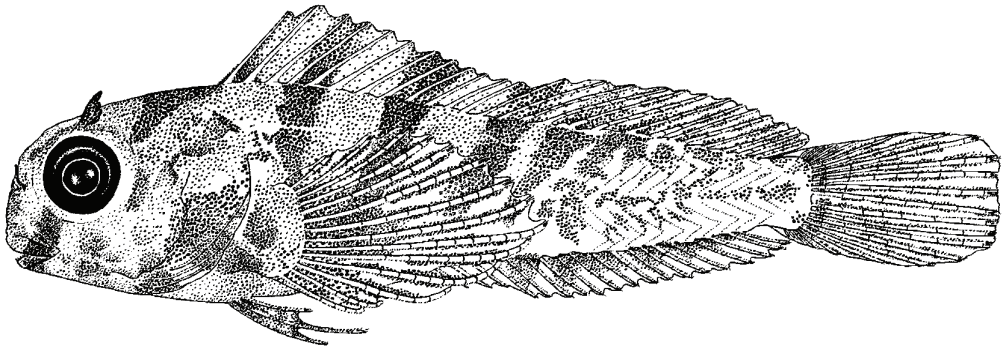
Larvae:
- Hatching occurs at lengths of 2.6–2.8 mmTL
- Body moderate with short gut, rounded head, large eyes, small mouth
- Preanus length about 40% SL
- Flexion occurs at about 4.0–5.0 mmTL
- Sequence of fin ray formation: P_1 – C – D, A – P_2; pelvic fin forms late
- Number of dorsal fin spines approximates number of dorsal fin rays
- Head spines present; see checklist below
- Tentacle forms over eye in late larvae, retained in juveniles and adults
- Pigmentation includes melanophores on pectoral fins, usually early forming; a row of spots along venter of tail; gut pigment heavy; clusters of spots on top of head

Head Spine Checklist:

Preopercle: 3 enlarged spines along edge in small larvae; spine at angle greatly enlarged in later larvae

Early Juvenile:

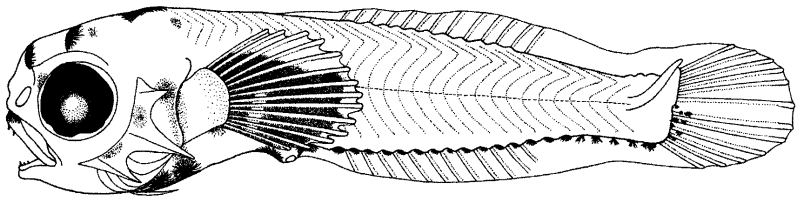
D. 14.8 mmTL



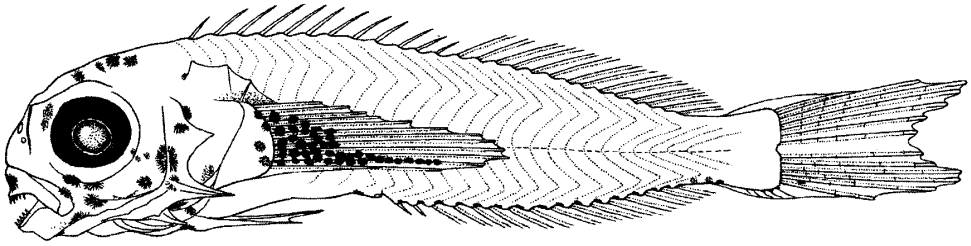
Figures: Adult, egg and **A–B**: Ditty *et al*., 2006; **C**: Hildebrand and Cable, 1938 (redrawn); **D**: Nancy Arthur (Able and Fahay, 1998)

References: Hildebrand and Cable, 1938; Olney, 1983; Peters, 1985; Cavalluzi and Olney, 1998; Able and Fahay, 1998; Ditty *et al*., 2006

Hypsoblennius hentz

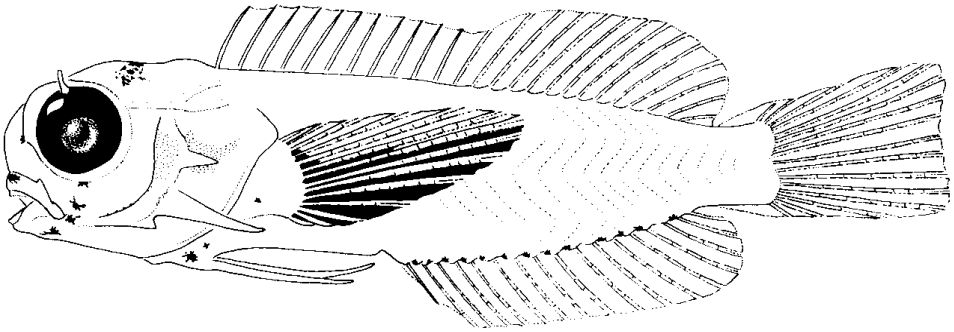


A. 5.0 mmSL



B. 8.7 mmSL

Larvae 3.0 to 9.8 mmTL described as *Hypsoblennius hentz* by Hildebrand and Cable (1938) refer to *Chasmodes bosquianus*. See Ditty *et al.* (2006).



C. 12.0 mmTL

Parablennius marmoreus (Poey, 1876)
Blenniidae
Seaweed blenny

Range: Western North Atlantic Ocean from New York and Bermuda to Gulf of Mexico and Caribbean Sea

Habitat: Demersal on continental shelf; over shell beds or other hard substrates; often sit motionless on reefs or use cover in algal growth

Spawning: Spring and summer; eggs may be deposited in barnacles or other shells

Eggs: – Demersal; otherwise undescribed

Meristic Characters

Myomeres:	36
Vertebrae:	36
Dorsal fin rays:	XI–XII, 17–18
Anal fin rays:	II, 19–20
Pectoral fin rays:	14
Pelvic fin rays:	I, 3
Caudal fin rays:	6+7+6+6

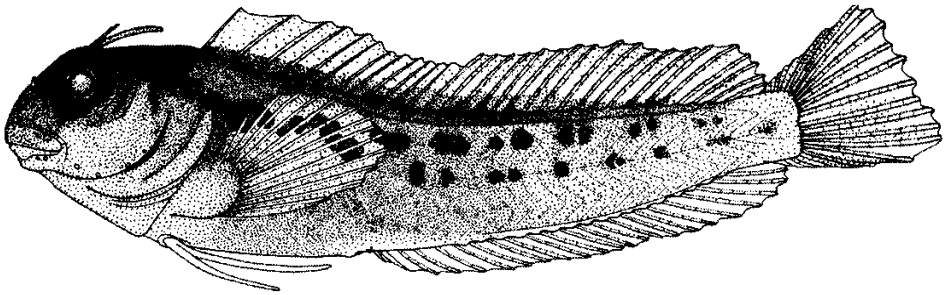
Larvae:
- Hatching occurs at sizes <3.5 mm
- Body moderately elongate and slab-sided; caudal peduncle deep, dorsal and ventral margins nearly parallel
- Preanus length <40% SL to 35% SL in larvae, then increases to 45% SL in juveniles
- Flexion occurs at about 5.0–6.5 mm
- Sequence of fin ray formation: P_1 – C – D_2, A – P_2 – D_1, A (spines)
- Number of dorsal fin spines fewer than dorsal fin rays
- Head spines few; see checklist below
- A single cirrus (tentacle) forms over eye after flexion; this becomes multiple cirri in juveniles and adults
- Pigmentation light in larvae; inner surface of P_1 base dark at least during and after flexion; prominent peritoneal 'shield' over gut; series of melanophores along venter of body composed of a single spot on base of each anal fin ray; a single spot may form at dorsal fin insertion at about 14 mm; individual spots on midbrain, nape, preopercle; later larvae and juveniles develop spots on snout, increased pigment on head, pigment along dorsal midline of body posterior to nape

Head Spine Checklist:

Preopercle: up to 7 prominent spines on edge, fewer on lateral ridge; spines are thin in small larvae, become less obvious in later larvae

Early Juvenile: Settlement occurs at sizes >17.5 mm

G. 23.0 mmSL

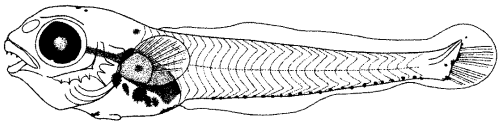


Pectoral fin remains unpigmented until just before settlement; prominent, spotted pigment pattern develops along upper body

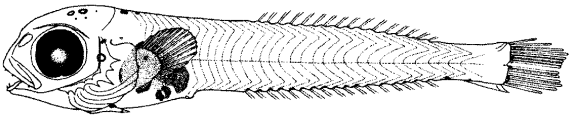
Figures: Adult: NOAA, NOS, Grays Reef website; **A–G**: Jim Ditty (Ditty *et al*., 2006)

References: Cavalluzi and Olney, 1998; Williams, 2002; Ditty *et al.*, 2006

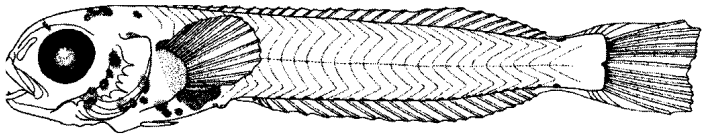
Parablennius marmoreus



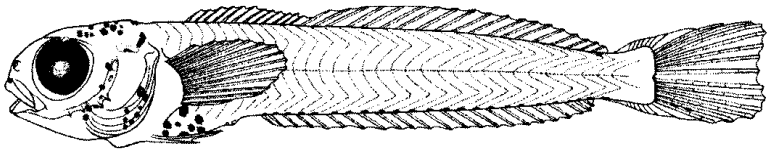
A. 5.8 mmSL



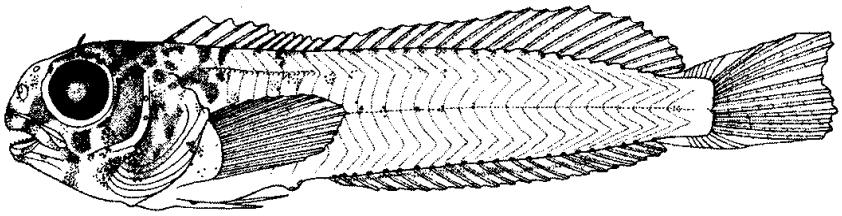
B. 7.5 mmSL



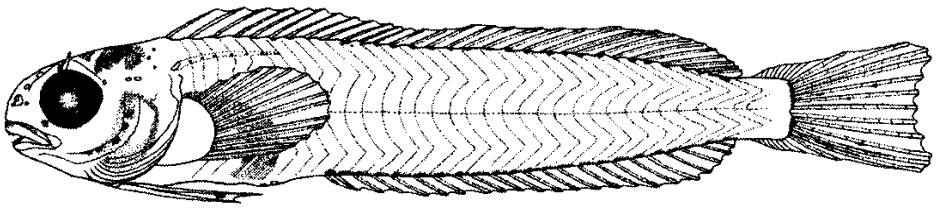
C. 9.6 mmSL



D. 13.7 mmSL



E. 17.3 mmSL



F. 20.9 mmSL