

Suborder Gobioidae

Selected meristic characters in species belonging to the suborder Gobioidae whose adults or larvae have been collected in the study area. Classification sequence follows Murdy, 2002. Sources: Fritzsche, 1978; Miller and Jorgenson, 1973; Birdsong *et al.*, 1988; Wyanski and Targett, 2000

Suborder					
Family					
Species	Vertebrae	Dorsal Fin Rays	Anal Fin Rays	Pectoral Fin Rays	Pelvic Fin Rays
Gobioidae					
Gobiidae					
<i>Coryphopterus punctipectophorus</i> ⁴	26	VI, I, 10	I, 9	17	I, 5
<i>Ctenogobius boleosoma</i>	26	VI, I, 10	I, 11	15–17	I, 5
<i>Ctenogobius saepepallens</i> ⁵	26	VI, I, 10–12	I, 11–13	15–17	I, 5
<i>Ctenogobius shufeldti</i>	26	VI, I, 10–12	I, 11–13	16–18	I, 5
<i>Evorthodus lyricus</i>	26	VI, I, 9–11	I, 10–12	15–17	I, 5
<i>Gnatholepis thompsoni</i>	26	VI, I, 10–11	I, 10–11	16–18	I, 5
<i>Gobionellus oceanicus</i>	26	VI, I, 12–14	I, 13–14	17–20	I, 5
<i>Gobiosoma bosc</i>	27	VII, I, 11–12	I, 9–11	16–19	I, 5
<i>Gobiosoma ginsburgi</i> ¹	27	VII, I, 11–12	I, 9–11	17–20	I, 5
<i>Gobiosoma parri</i> (see species account)	27	VII(VIII), 11–13	9–11	21–22	I, 5
<i>Microgobius thalassinus</i> ¹	27	VI–VIII, I, 14–16	I, 14–16	19–23	I, 5
<i>Ptereleotris calliurus</i> ²	26	VI, I, 21–23	I, 21–22	19–21	I, 4
Eleotridae					
<i>Dormitator maculatus</i>	27	VIII, 8	I, 10	13–15	I, 5
Microdesmidae					
<i>Microdesmus longipinnis</i> ³	63–66	XIX–XXII, 66–74	41–47	11–14	I, 3

¹ *Gobiosoma robustum* Ginsburg, 1933 and *Microgobius gulosus* (Girard, 1858), have been reported from Chesapeake Bay. Both were reportedly collected on a single occasion, in the same tow but the records are seriously questioned and may be based on a labelling error (Murdy *et al.*, 1997). They are otherwise unknown from the present study area (not known from north of Florida) and are not included here.

² Also reported as *Ioglossus calliurus* Bean, 1882. *Ptereleotris calliurus* (Jordan and Gilbert, 1882) follows Murdy (2002). Larvae (as *Ioglossus* sp.) have been collected in Slope Sea waters of study area (Hare *et al.*, 2001). Placed in family Ptereleotridae by some authors (Thacker, 2000).

³ Larvae have been collected from Slope Sea in study area (Hare *et al.*, 2001) and New Jersey coastal waters (unpubl. observ. and Able, 1999).

⁴ Relatively common hard-bottom inhabitant off North Carolina (Ross and Rohde, 2004); included because it is the most probable identity of *Coryphopterus* sp. larvae collected in Slope Sea waters in study area (Hare *et al.*, 2001)

⁵ Larvae collected in Slope Sea waters (Hare *et al.*, 2001)

Two additional reports add critical information on the occurrences of gobioid adults or larvae in the study area. A total of 27 gobioid species have been collected in estuarine and adjacent offshore habitats in North Carolina (Ross and Rohde, 2004). The latter study area is bisected by the southern limit of the present one (35°N). An additional 14 species occur in North Carolina that are not included in the above table, but in almost all of these, the larvae are undescribed. Notes on development of *Ctenogobius shufeldti* are included in the *C. boleosoma* account. Further notes on gobioid larval occurrences in Onslow Bay, North Carolina, are included in Powell and Robbins (1994). These data concern oceanic collections along an inshore-offshore transect just south of the present study area, but this study should be consulted for evidence of offshore occurrences.

Perciformes

Suborder Gobioidae

The Gobioidae is a large and diverse suborder, containing about 2,000 species worldwide, arranged in as many as eight families (or subfamilies). A consensus on higher classification of gobies and goby-like fishes does not exist. Important references that discuss the issue of monophyly of the suborder and composition of constituent groups include: Hoese (1984); Ruple (1984); Birdsong *et al.* (1988); Hoese and Gill (1993); Pezold (1993); Winterbottom (1993); Murdy (2002). The classification followed here is that proposed by Hoese (1984), largely because the larvae of each nominal family appear to share many characters. The phylogenetic value of most of these characters, however, remains to be determined. Gobioids occur in a wide variety of habitats, but in the western Atlantic Ocean they are much more diverse in tropical waters south of the present study area. General characters found in the larvae of the suborder and three families that might occur in the study area follow (after Ruple, 1984):

Gobioidae:

- 12 species have been recorded from the study area, either as adults or larvae
- Eggs demersal, adhesive, some equipped with filamentous strands, usually with numerous oil globules
- Large, prominent air bladder, located just anterior to mid-body; usually disappears at transformation
- Pigment on air bladder located on dorsal surface or dorsal plus posterior surface
- Gut generally straight, uncoiled, extending to mid-body or just beyond (preanus length 50–65% SL)
- Body moderately to very elongate, with parallel dorsal and ventral margins
- Head increases in size (posterior to the eye) in larger larvae
- Head spines totally lacking
- Meristic characters vary greatly and are useful in distinguishing taxa; see each taxon below for sequence of fin ray development
- Pelvic fins can be separated or united to form suction disk
- Pigment usually present on air bladder and along venter of body; otherwise pigmentation is fairly moderate
- Pigment in three families below often located on caudal peduncle, along dorsum of body, tip of lower jaw, on otic capsule, and midlaterally on posterior part of body
- Transformation usually gradual, without striking larval characters or specialized characters; size at transformation varies between taxa

Gobiidae (subfamily Gobiinae):

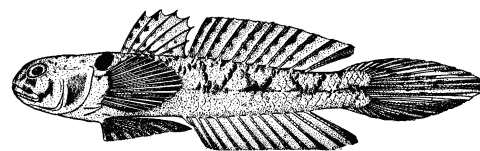
- 10 species have been recorded from the study area, either as adults or larvae
- Eye size generally moderate or large
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂ (pelvic fin rays last)
- Short to moderate dorsal and anal fin bases; fin bases of D₁ and D₂ usually well separated
- Pelvic fins united to form suction disk in some species

Eleotridae:

- 1 species is known from the study area, where it occurs in both the adult and larval stages
- Eye size generally moderately large
- Sequence of fin ray formation: C – D₂, A – P₁, P₂ – D₁ (dorsal fin spines last)
- Short to moderate dorsal and anal fin bases; fin bases of D₁ and D₂ usually well separated
- Pelvic fin bases usually well-separated

Microdesmidae:

- 1 species is known from the study area, where it occurs rarely in the adult and larval stages
- Body very slim, elongate
- Eye size small
- Lower jaw becomes long and hooked at end in larger pelagic larvae
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂ (pelvic fin rays last)
- Long dorsal and anal fin bases; dorsal fin base continuous
- Pelvic fin bases usually well-separated

Ctenogobius boleosoma* (Jordan and Gilbert, 1882)*Gobiidae****Darter goby**

Range: Western North Atlantic Ocean from Massachusetts to Brazil, including Bermuda, Gulf of Mexico and Caribbean Sea

Habitat: Shallow, meso- to polyhaline estuarine waters, often in grass beds

Spawning: Occurs in estuaries, although larvae may be transported into coastal waters; probably summer into fall (as late as Nov)

Eggs:

- Demersal, irregular shape
- Diameter: about 0.3 mm
- Chorion: a tuft of fibrous strands

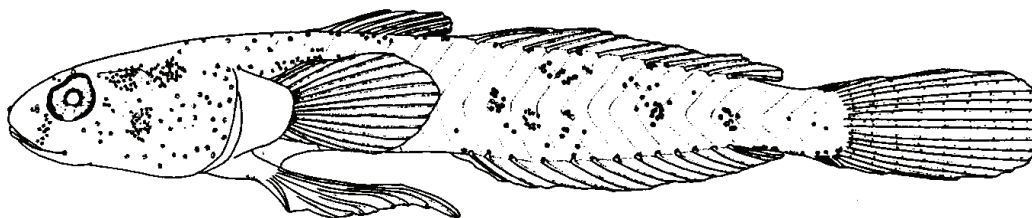
Larvae:

- Hatching occurs at about 1.2 mm
- Body elongate throughout development
- Preanus length about 50% SL
- Head broad, head length about 25–30% SL; eye relatively large. (See table on *Gobionellus oceanicus* page.)
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂
- 2nd dorsal and anal fin bases moderate in length, about equal; D₁ and D₂ separated by narrow gap
- Pectoral and pelvic fins extend beyond anterior air bladder after completion of fin ray formation (compare to *Gobionellus oceanicus*)
- Pelvic fin rays united to form suction disk
- Air bladder pigment occurs on dorsal and posterior surfaces
- Other pigmentation includes light scattering of spots over much of head and body; a series of larger spot along anal fin base and 2 rows along venter of gut, decrease in number; a vertical streak of (partly internal) pigment extends from venter of caudal peduncle; a prominent spot on dorsal surface of gut, near anus; after completion of fin rays, dense pigment scattered on dorsum of head and body, with a small, dense, internal spot anterior to D₁ origin, at about level of pectoral fin bases

Meristic Characters

Myomeres:	26
Vertebrae:	26
Dorsal fin rays:	VI, I, 10
Anal fin rays:	I, 11
Pectoral fin rays:	15–17
Pelvic fin rays:	I, 5
Caudal fin rays:	6–7+9+8+5–7
Supraneurals:	none

- Note:**
1. After all fin rays are formed. *C. boleosoma* have greater head length, eye diameter, body depth and less caudal peduncle depth than comparably sized *G. oceanicus*. See table on *G. oceanicus* page.
 2. A congener, *Ctenogobius shufeldti* (Jordan and Eigenmann, 1886), occurs in oligo- to mesohaline estuarine waters from Croatan Sound, North Carolina to Texas. Therefore, it barely occurs in the present study area. Larvae and juveniles (Figs. E and F) are very similar to those of *C. boleosoma* (Wyanski and Targett, 2000).

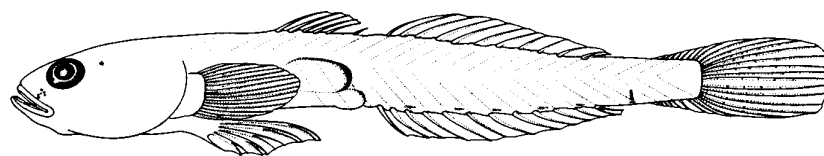


F. 11.2 mmSL (*Ctenogobius shufeldti*)

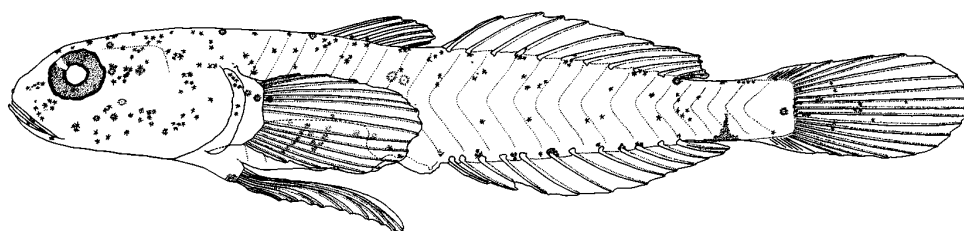
Figures: Adult: Ginsburg, 1932; **A–B, D–F:** Wyanski and Targett, 2000; **C:** Ruple, 1984

References: Hildebrand and Cable, 1938; Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Able and Fahay, 1998; Wyanski and Targett, 2000; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

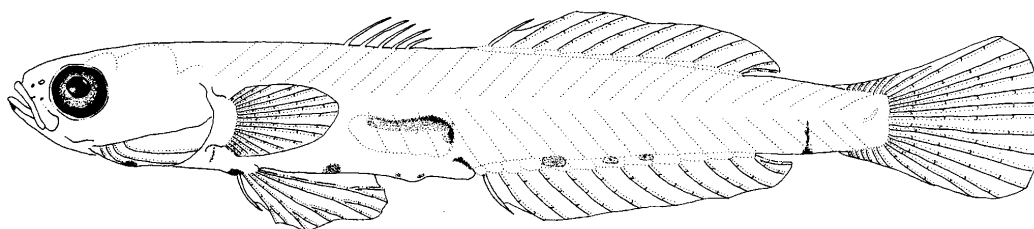
Ctenogobius boleosoma



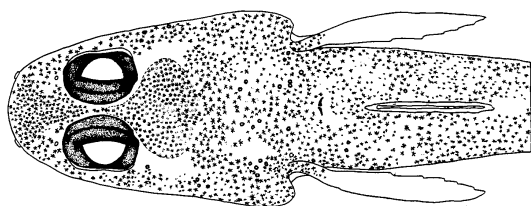
A. 7.1 mmSL



B. 7.8 mmSL

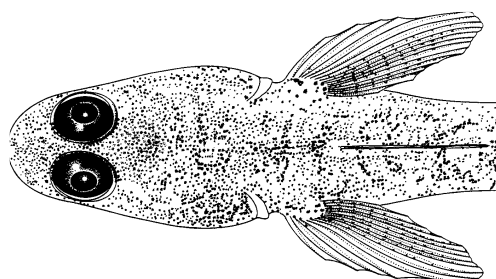


C. 8.6 mmSL



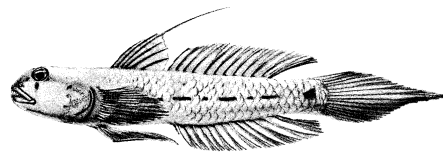
D. 11.6 mmSL (Dorsal View)

C. boleosoma (note small dorsal spot
anterior to 1st dorsal fin)



E. 16.4 mmSL (Dorsal View)

C. shufeldti (note vague dorsal saddles
under 1st dorsal fin)

Ctenogobius saepepallens* (Gilbert and Randall, 1968)*Gobiidae****Dash goby**

Range: Western North Atlantic Ocean from North Carolina (near Cape Hatteras, as far north as 35°40.1'N, 75°13.9'W), Bahamas and Florida to Venezuela, including Caribbean Sea; larvae have been collected in study area in Slope Sea waters

Habitat: Sandy substrates mixed with coral rubble and areas of marl or sand mixed with sea grass or algae; occasional in burrows; in depths to 37 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Body elongate, slightly deeper between D₂ and A fins
- Preanus length 44–57% SL
- Head rounded, snout blunt; HL 21–26% SL
- Eye round, moderately large, eye diameter 20–28% HL
- Flexion occurs at unknown size
- Sequence of fin ray formation: undescribed
- Dorsal and anal fin base lengths about equal, both much longer than length of caudal peduncle
- D₁ and D₂ separated by narrow margin
- Pelvic fin bases united, forming suction disk
- Air bladder pigment heavy on dorsal surface
- Other pigmentation includes a series of 1–5 melanophores along anal fin base; a vertically oriented, internal melanophore on lower gut, on each side of anus; a horizontally oriented melanophore on venter, just posterior to anal fin (usually associated with erythrocyte, see below); a horizontally oriented melanophore on venter just anterior to pelvic fins usually present; small spots rarely present on gular membrane, on opercle, or on base of upper P₁ fin rays
- Erythrocytes (red or orange pigment) occur in a triangular blotch on venter of caudal peduncle, in 2 internal spots in posterodorsal region of head, and in a spot associated with the melanophore near anus; other erythrocytes present ventrally anterior to, and between, pelvic fin bases

Early Juvenile: Scattered melanophores over most of head (except gular region and posterior lower jaw); melanophores also in a bar extending posteroventrally from anterior part of eye and in a triangular patch on mid-opercle; body pigment concentrated into 5 horizontal dashes on lateral midline; all fins with some pigment

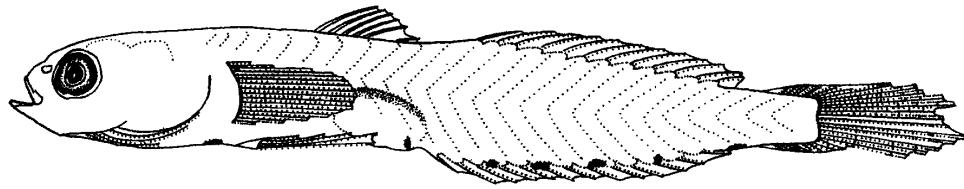
Meristic Characters

Myomeres:	26
Vertebrae:	26
Dorsal fin rays:	VI, I, 10–12
Anal fin rays:	I, 11–13
Pectoral fin rays:	15–17
Pelvic fin rays:	I, 5
Caudal fin rays:	9 + 8 (PrC)
Supraneurals:	none

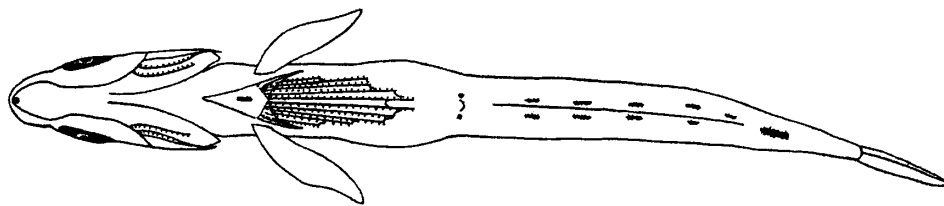
Figures: Adult: Steven Gigliotti (Böhlke and Chaplain, 1993); **A–B:** Baldwin and Smith, 2003

References: Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Humann, 1999; Murdy, 2002; Baldwin and Smith, 2003; Leis and Carson-Ewart, 2004; Ross and Rhode, 2004

Ctenogobius saepepallens



A. 9.5 mmSL

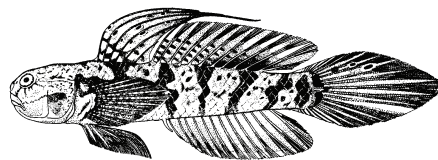


**B. 9.5 mmSL
(Ventral View)**

Evorthodus lyricus (Girard, 1858)

Gobiidae

Lyre goby



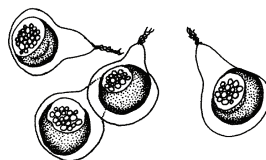
Range: Western North Atlantic Ocean from Chesapeake Bay to Brazil, including Gulf of Mexico and Caribbean Sea

Habitat: Shallow (<1.5 m), muddy substrates in oligo- to mesohaline estuaries and marshes; may inhabit burrows

Spawning: Undescribed

Eggs:

- Demersal, attached by threads
- Diameter: 0.20×0.45 mm (pear-shaped)
- Oil globules: about 20

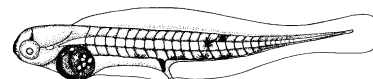


Larvae:

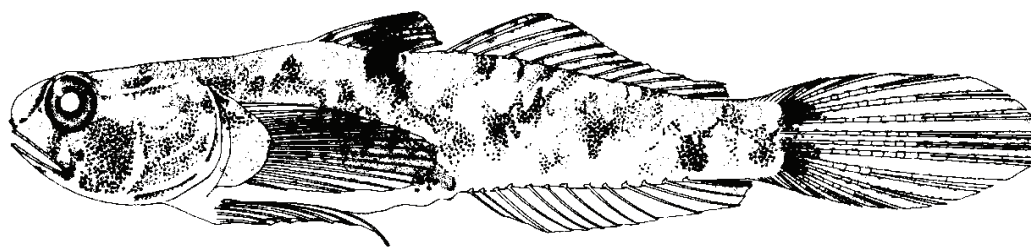
- Hatching occurs at about 1.9 mm
- Body elongate throughout development
- Preanus length about 55% SL
- Head length about 25% SL; eye size moderate
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂ (probably)
- 2nd dorsal and anal fin bases moderate in length, about equal; D₁ and D₂ separated by narrow gap
- Pectoral fin rays extend to middle of air-bladder; pelvic fin rays shorter
- Pelvic fin rays united to form suction disk
- Air bladder pigment on dorsal surface only
- Other pigmentation includes row of spots along anal fin base, a spot on dorsal surface of gut near the anus, scattered pigment on dorsum of body; internal pigment occurs along the notochord; scattered pigment on head, including vague bar through eye and across opercle

Meristic Characters

Myomeres:	26
Vertebrae:	26
Dorsal fin rays:	VI, I, 9–11
Anal fin rays:	I, 10–12
Pectoral fin rays:	15–17
Pelvic fin rays:	I, 5
Caudal fin rays:	9+8 (PrC)
Supraneurals:	none



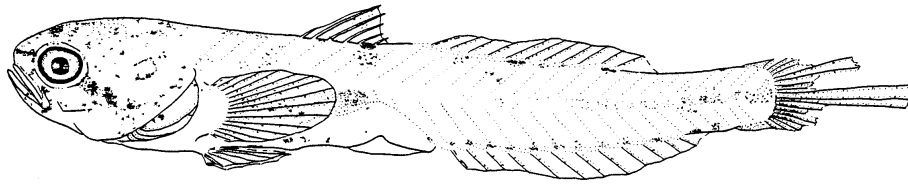
Yolk-sac larva, 1.9 mmNL

Early Juvenile:**D. 20.1 mmSL**

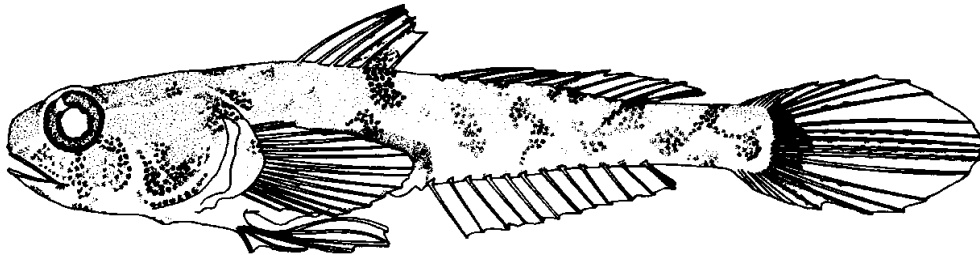
Figures: Adult (male): Louella E. Cable (Ginsburg, 1931); Eggs and yolk-sac larva: Foster and Fuiman, 1987; **A:** David Ruple, unpubl. **B–D:** Wyanski and Targett, 1985

References: Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

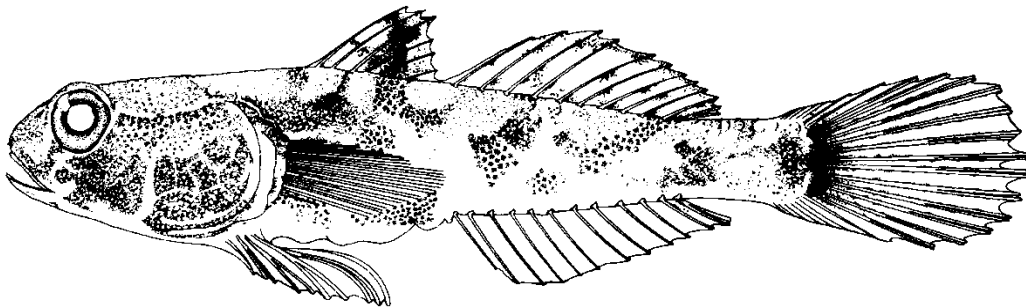
Evorthodus lyricus



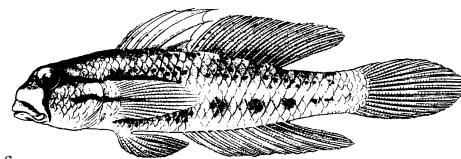
A. 8.2 mmSL



B. 9.9 mmSL



C. 12.3 mmSL

Gnatholepis thompsoni* Jordan, 1904*Gobiidae****Goldspot goby**

Range: Both sides of the Atlantic Ocean; in the western North Atlantic from Bermuda and North Carolina (northern Onslow Bay) to Brazil, including Florida and Lesser Antilles; very common off Belize and Honduras; larvae have been collected in the study area in Slope Sea waters

Habitat: Hard substrates or sand near bases of rocky outcrops on continental shelf in depths to 30 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Body elongate, dorsal and ventral margins nearly parallel
- Preanus length 47–52% SL
- Head length 24–29% SL; may differ in stages before or after those described
- Eye relatively large, round; eye diameter 27–32% HL
- Flexion occurs at unknown size (<9.4 mmSL)
- Sequence of fin ray formation: undescribed
- Dorsal and anal fin bases moderately long, equal in length; D_1 and D_2 separated by moderate gap
- Pelvic fin bases partially united, forming suction disk
- Air bladder pigment forms dense cap on dorsum
- Other melanophores few and/or small; tips of 1st dorsal fin spines and anterior few dorsal fin rays with few spots; venter unpigmented; 1 to few horizontally elongate spots usually present on 1 or more central pectoral fin rays, about 1/4 of distance from base of fin ray; internal melanophores occur on dorsum of notochord; some specimens with bar extending dorsally and ventrally from eye; tiny spots may occur on frontal or opercle bones
- Erythrocytes (red or orange pigment) occur in a prominent, vertical bar extending upwards from venter of tail posterior to anal fin, reaching about 3/4 of the distance to dorsum of body; a series of about 7 spots, 1 each at base of last 7 anal fin rays; a short, vertical spot at origin of anal fin; distal tip of 2nd anal fin ray orange; a spot on lower "cheek" and 2 spots on venter anterior to pelvic fin bases; a patch of orange pigment on bases of several pectoral fin rays. These pigment cells rarely survive preservation

Meristic Characters

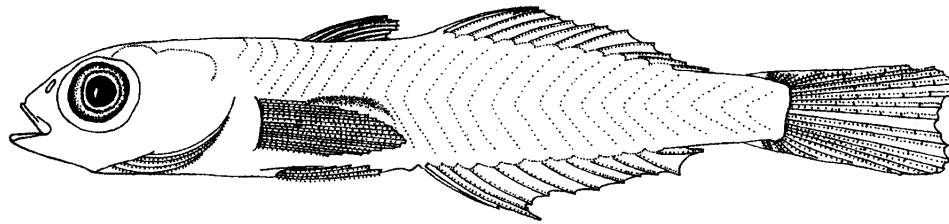
Myomeres:	26
Vertebrae:	26
Dorsal fin rays:	VI, I, 10–11
Anal fin rays:	I, 10–11
Pectoral fin rays:	16–18
Pelvic fin rays:	I, 5
Caudal fin rays:	9 + 8 (PrC)
Supraneurals:	none

Juveniles: Prominent, suborbital bar of melanophores extends posteroventrally from eye nearly to venter of head

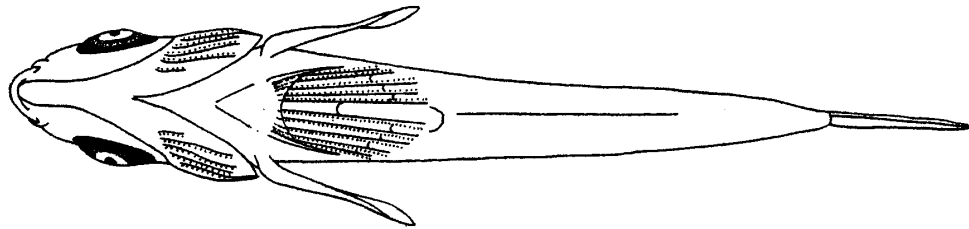
Figures: Adult: Jordan, 1904 (modified); **A–B:** Baldwin and Smith, 2003

References: Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Murdy, 2002; Baldwin and Smith, 2003; Ross and Rhode, 2004; Leis and Carson-Ewart, 2004

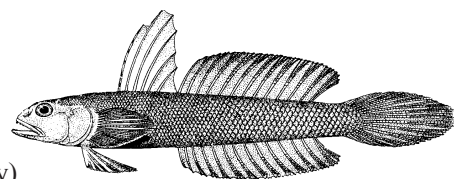
Gnatholepis thompsoni



A. 9.4 mmSL



B. 9.4 mmSL

Gobionellus oceanicus* (Pallas, 1770)*Gobiidae****Highfin goby**

Range: Western North Atlantic Ocean from North Carolina (rarely New Jersey) to Brazil, including Gulf of Mexico; larvae occur commonly in oceanic waters in study area

Habitat: Estuaries, in wide range of salinities, most often on muddy to sandy substrates

Spawning: Depending on location, may spawn throughout the year; spawning may occur in both estuarine and oceanic waters, judging from the abundance of larvae that are transported into the study area (e.g. unpubl. MAR-MAP data)

Eggs: – Undescribed

Larvae:

- Body elongate and slender throughout development; body depth increases from 11–13.7% SL
- Preanus length about 55% SL
- Head length increases from 23–29% SL
- Eye diameter relatively small (compare to other gobiid larvae)
- Flexion occurs at unknown size (< 9.0 mm)
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂; all fin rays formed by 10 mm
- Dorsal and anal fin bases long and equal in length
- D₁ and D₂ initially well separated (anterior D₁ spines form first), become very close together in adults
- Pelvic fin rays united to form suction disk
- Air bladder pigment on dorsal and posterior surfaces
- Other pigmentation very light or absent; in transforming larvae there are a few spots on snout, one on the nape, 1–3 internal streaks may be present on isthmus and pelvic fin bases; some fins may have light, scattered pigment

Meristic Characters

Myomeres:	26
Vertebrae:	26
Dorsal fin rays:	VI, I, 12–14
Anal fin rays:	I, 13–14
Pectoral fin rays:	17–20
Pelvic fin rays:	I, 5
Caudal fin rays:	5–8+9+8+6–8
Supraneurals:	none

Note: 1. See table comparing body proportions in the larvae of 3 species (below)

Comparison of body proportions in 3 species of gobies. Values pertain to increase or decrease from transforming larvae (completion of fin ray formation) to juvenile stages, in Atlantic coast specimens. (After Wyanski and Targett, 2000)

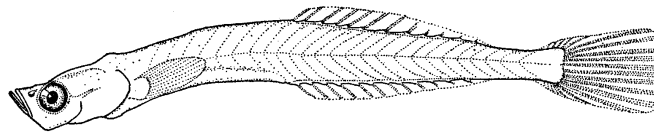
Species	Body Depth (% SL)	Least Caudal Peduncle Depth (% SL)	Head Length (% SL)	Eye Diameter (% HL)
<i>Gobionellus oceanicus</i>	11.0–13.7	6.2–8.1	23.4–28.7	21.7–23.7
<i>Ctenogobius boleosoma</i>	13.2–16.2	7.5–9.4	28.4–27.2	27.1–28.2
<i>Ctenogobius shufeldti</i>	13.0–15.2	7.9–8.4	29.5–28.8	26.1–27.6

Figures: Adult: Jordan and Evermann, 1896–1900; **A, E–F:** Hildebrand and Cable, 1938; **B:** Baldwin and Smith, 2003; **C:** Wyanski and Targett, 2000; **D:** David Ruple, unpubl.

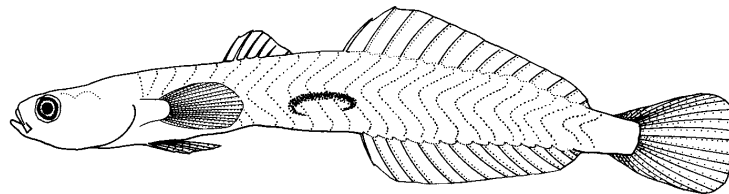
References: Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Wyanski and Targett, 2000; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

Gobionellus oceanicus

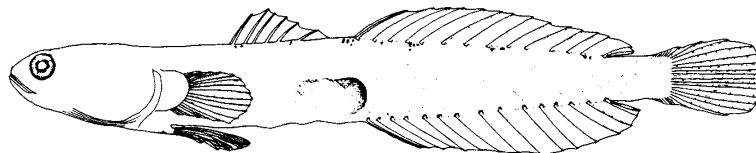
A. 9.0 mm



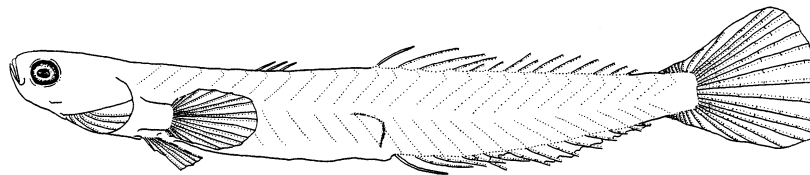
B. 11.5 mmSL



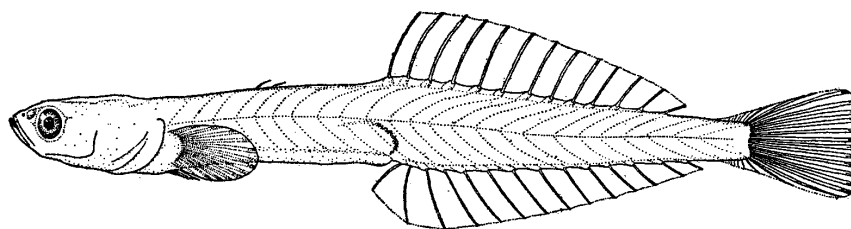
C. 12.0 mmSL



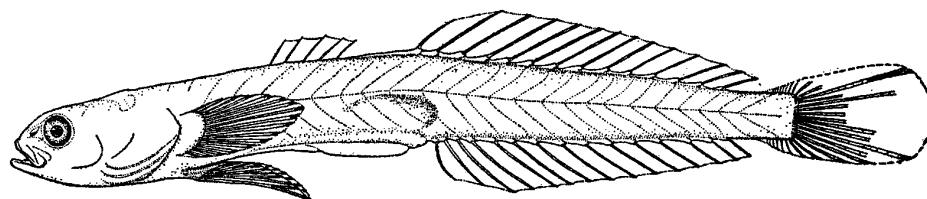
D. 12.5 mmSL

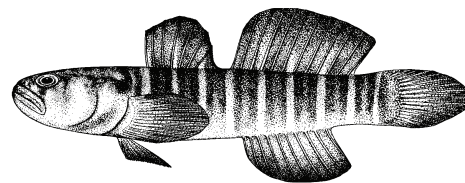


E. 14.0 mm



F. 18.0 mm



Gobiosoma bosc* (Lacepède, 1800)*Gobiidae****Naked goby**

Range: Western North Atlantic Ocean from Connecticut to Campeche, Mexico, excluding southern Florida, but including northern Gulf of Mexico; abundant in New Jersey and Chesapeake Bay

Habitat: Shallow, soft, structured substrates in estuaries; often occupies shells, burrows, debris, or grass beds

Spawning: Apr–Sep in estuaries; eggs deposited and guarded in nest (typically oyster shell)

Eggs:

- Demersal, elliptical
- Diameter: 1.2–1.4 mm (long axis)
- Chorion: fibrous strands

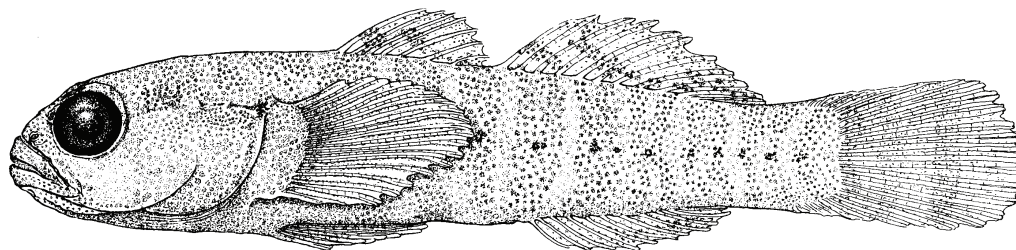
Larvae:

- Hatching occurs at 2.0–2.6 mm
- Body elongate throughout development; body depth <15% SL
- Preanus length 55% SL in preflexion to about 60% SL in transforming larvae
- Head length about 25% SL, increasing to about 32% SL in juveniles; eye diameter 25% HL or less
- Flexion occurs at 4.2–4.9 mmSL
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂; all fin spines and rays complete by 7.9 mm
- Dorsal and anal fin bases short to moderate in length; D₂ slightly longer than A; D₁ and D₂ separated by very narrow gap
- Pelvic fin rays united to form suction disk
- Pelvic fin rays fall well short of anal fin origin
- Air bladder pigment on dorsal surface only
- Other pigmentation includes a prominent spot on venter at insertion of anal fin, joined by 1 or 2 smaller spots over anal fin base; few spots on venter of gut, including 1 behind cleithral symphysis, 1 at mid-gut and 1 near anus; a single spot on dorsum of gut over anus; in postflexion larvae, a series of spots forms along dorsum of body, and scattered spots cover the head; late larvae (>9.2 mm) and early juveniles have dense covering of pigment with vague barred pattern, overlain by series of bolder spots along midline

Note: 1. Settlement of larvae to demersal habitats occurs at about 8–13 mmTL; groups of transforming larvae aggregate in low-energy areas before descending to bottom

Meristic Characters

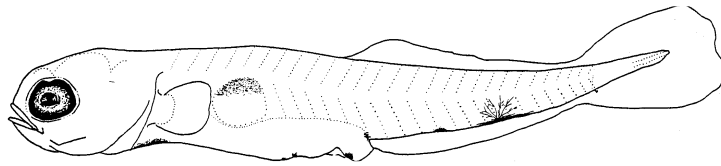
Myomeres:	27
Vertebrae:	27
Dorsal fin rays:	VII, I, 11–12
Anal fin rays:	I, 9–11
Pectoral fin rays:	16–19
Pelvic fin rays:	I, 5
Caudal fin rays:	9+8 (PrC)
Supraneurals:	none

Early Juvenile:**F. 15.0 mmSL**

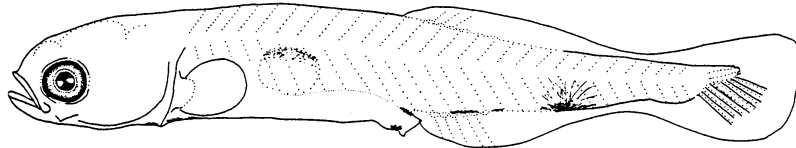
Figures: Adult: Fowler, 1906; A–E: David Ruple, unpubl.; F: Susan Kaiser (Able and Fahay, 1998)

References: Fritzsche, 1978; Ruple, 1984; Breitburg, 1991; Ruple, unpubl.; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

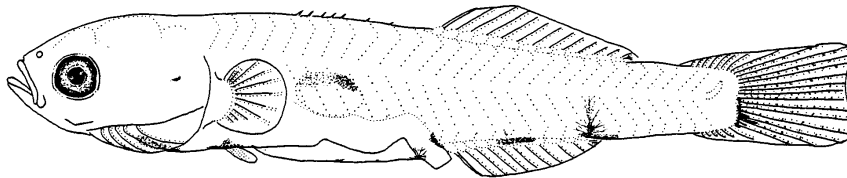
Gobiosoma bosc



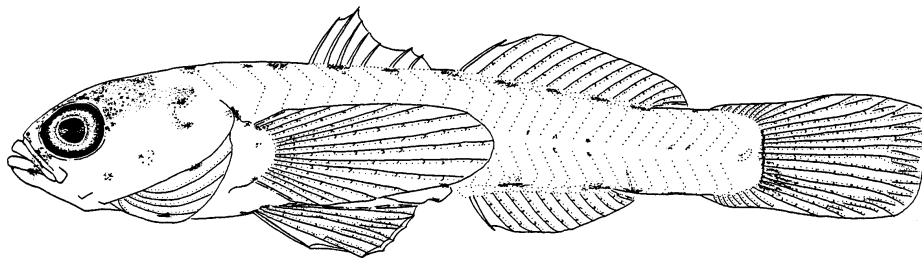
A. 3.4 mmSL



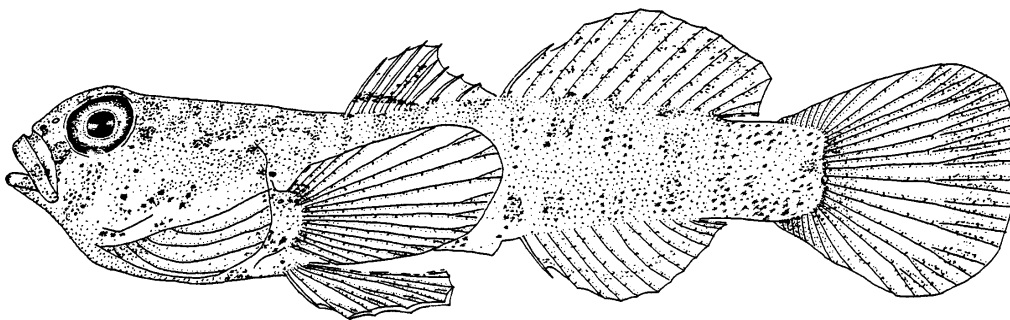
B. 4.8 mmSL



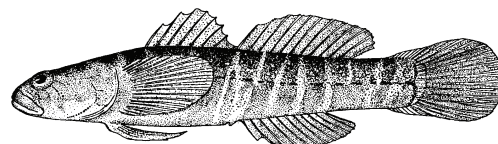
C. 6.9 mmSL



D. 8.3 mmSL



E. 14.5 mmSL

Gobiosoma ginsburgi* Hildebrand and Schroeder, 1928*Gobiidae****Seaboard goby**

Range: Western North Atlantic Ocean from Massachusetts to central Florida

Habitat: Rocky or shelly substrates, usually in depths >2 m in polyhaline estuaries; also in coastal ocean waters to a maximum depth of 28 m

Spawning: Early to late summer in study area, progressively later in northern parts of range; adults spawn at age 1, and probably do not survive their second summer

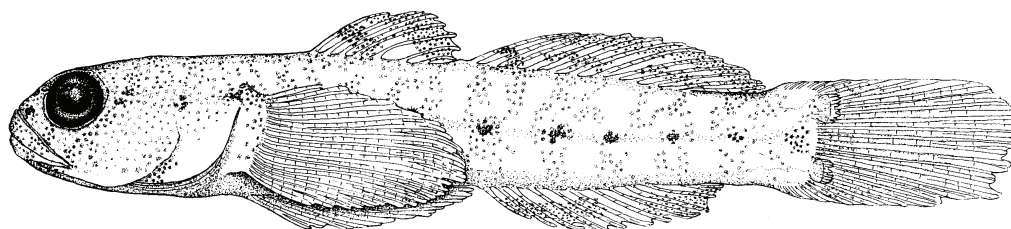
Eggs: – Undescribed; usually deposited in bivalve shells

Larvae:

- Body elongate throughout development; body depth increases from 13% NL in flexion larvae to 17% SL in transforming larvae
- Preanus length about 53–59% SL throughout development
- Head length increases from about 23% SL to about 29% SL; eye moderate in diameter
- Flexion complete by about 4.7 mm
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂; all fin rays complete by 9.8 mmSL
- Dorsal and anal fin bases short to moderate in length; D₂ slightly longer than A; D₁ and D₂ separated by very narrow gap
- Pelvic fin rays united to form suction disk
- Pelvic fin rays barely reach anal fin origin
- Air bladder pigment on dorsal surface only
- Pigmentation very light in larval stages; a series of 3 melanophores along anal fin base, with the posterior most the largest; small spots on dorsal and ventral surfaces of terminus of the gut; a small ventral spot posterior to cleithral symphysis; early juveniles have dense scattering of pigment forming vague bars, with series of darker spots along midline

Note: 1. Two ctenoid scales form at base of caudal fin in postflexion larvae; continue to be present in adults

2. Larvae settle to bottom habitats in estuaries and inner continental shelf at about 9–12 mm

Early Juvenile:

G. 14.8 mmSL

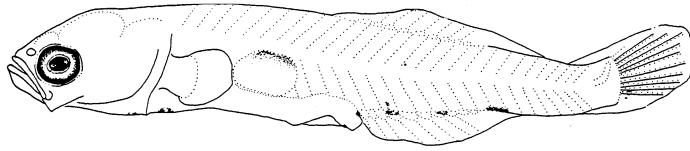
Meristic Characters

Myomeres:	27
Vertebrae:	27
Dorsal fin rays:	VII, I, 11–12
Anal fin rays:	I, 9–11
Pectoral fin rays:	17–20
Pelvic fin rays:	I, 5
Caudal fin rays:	9+8 (PrC)
Supraneurals:	none

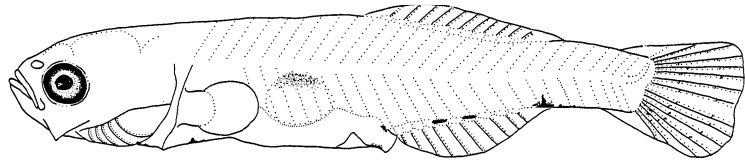
Figures: Adult: Hildebrand and Schroeder, 1928; **A–F:** David Ruple, unpubl.; **G:** Susan Kaiser (Able and Fahay, 1998)

References: Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Able and Fahay, 1998; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

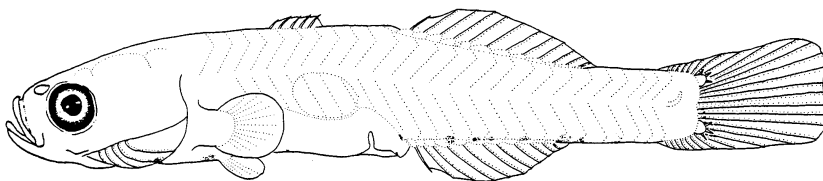
Gobiosoma ginsburgi



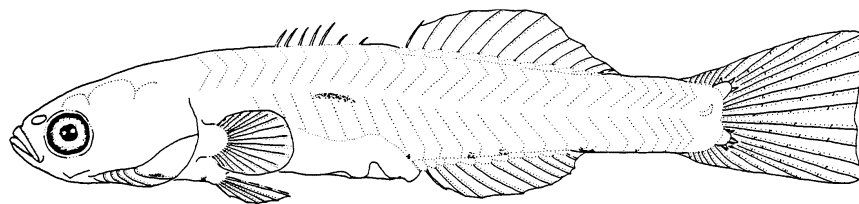
A. 4.5 mmSL



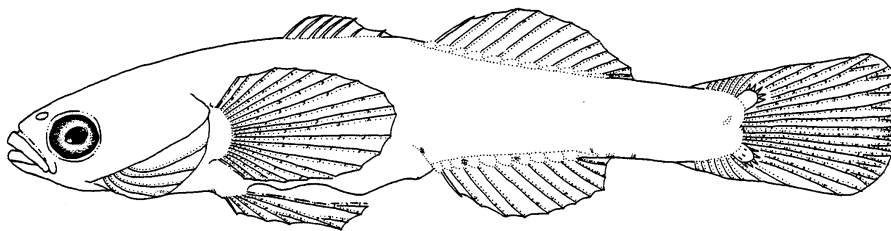
B. 5.2 mmSL



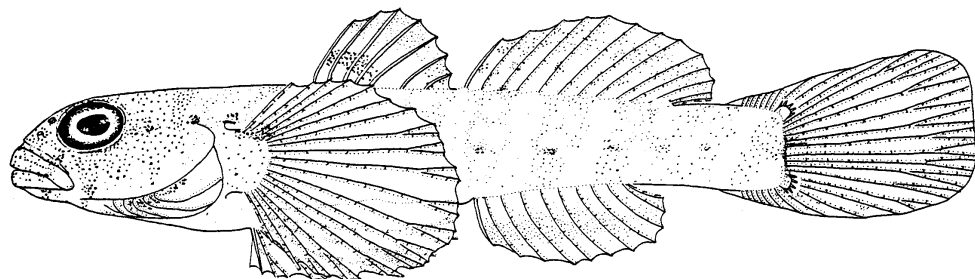
C. 9.1 mmSL



D. 10.0 mmSL



E. 11.7 mmSL



F. 13.9 mmSL

Gobiosoma parri* Ginsburg, 1933*Gobiidae**

No common name

No Illustration Available

Range: Western Atlantic Ocean from Massachusetts (putative) to northern Argentina; some sources list the range as southern Brazil to northern Argentina; probably does not occur in study area in any life history stage (see Note 1, below)

Habitat: Coastal estuaries

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Body elongate, slightly deeper at level of pectoral fin
- Preamble length about 55–60% SL
- Head moderate, snout moderately blunt; HL 20–30% SL
- Eye round, moderate in size; eye diameter about 20% HL
- Flexion occurs at about 4–5 mmSL
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂
- Dorsal and anal fin bases short to moderate in length; D₂ slightly longer than A; D₁ and D₂ separated by very narrow gap
- Pelvic fin bases united, forming suction disk
- Two spiny scales form at base of caudal fin rays at about 14 mmSL
- Air bladder pigment limited to dense pigment on dorsal aspect
- Other pigmentation includes a prominent pair of ventral melanophores located at anus and at insertion of anal fin; a spot between 4th and 5th anal fin ray frequently present;

Meristic Characters

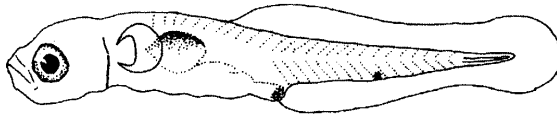
Myomeres:	27
Vertebrae:	27
Dorsal fin rays:	VII(VIII), 11–13
Anal fin rays:	9–11
Pectoral fin rays:	21–22
Pelvic fin rays:	I, 5
Caudal fin rays:	9 + 8 (PrC)
Supraneurals:	none

Note: 1. This species is included here because it is considered valid by California Academy of Sciences (Catalog of Fishes Database), Acha (1994) and Yeung and Ruple (2006) who report the range as Massachusetts to northern Argentina. However, the species is not listed as occurring in the United States or Canada (Robins *et al.*, 1991), the western Central Atlantic Ocean (Murdy, 2002) or from North Carolina (Ross and Rhode, 2004), nor is "*parri*" listed in the synonymy of any included gobiid species in those publications. (Other sources list the distribution as coastal estuaries from Southern Brazil, Uruguay, and northern Argentina.) Larvae have been described from Argentina (Acha, 1994) and these appear to be distinguishable from larvae of *G. ginsburgi* and *G. longipala* based on pigment characters. Assuming the validity of all 3 species, they are the only members of the genus that develop small, spiny, basiocaudal scales at the base of the caudal fin rays. However, of the three species, only *G. ginsburgi* has been documented as occurring in the study area.

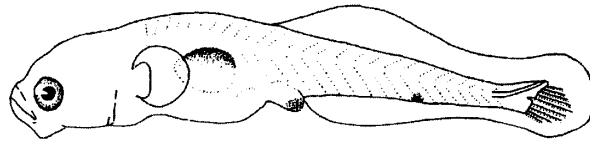
Figures: Adult: No illustration available; A–F: Acha, 1994

References: Fritzsche, 1978; Ruple, 1984; Acha, 1994; Ruple, unpubl.; Murdy, 2002; Leis and Carson-Ewart, 2004

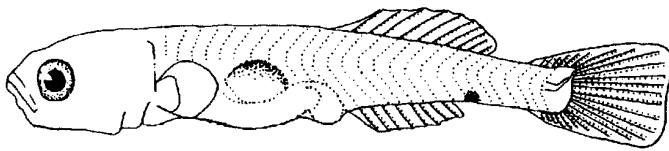
Gobiosoma parri



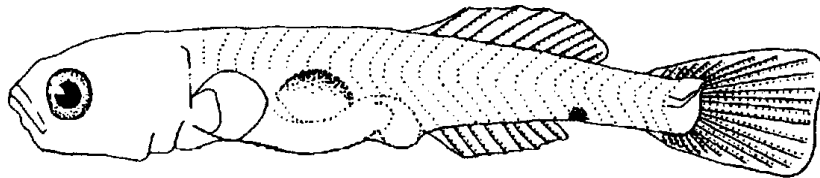
A. 4.1 mmNL



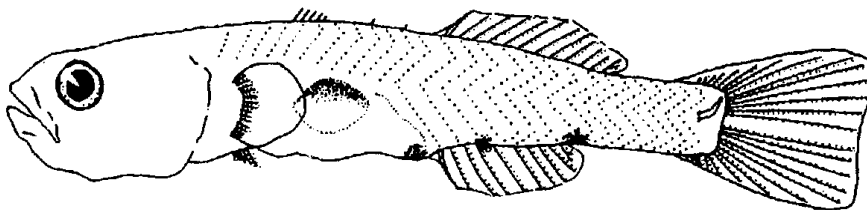
B. 4.6 mmNL



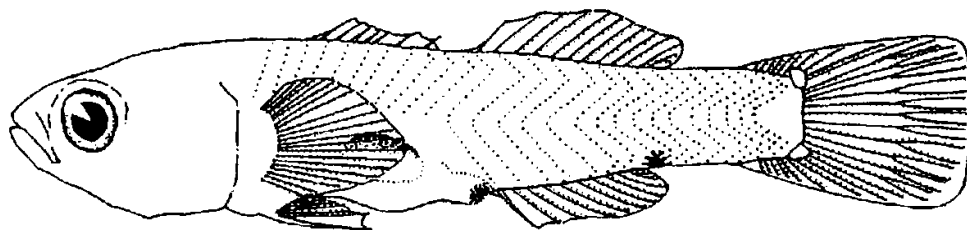
C. 6.8 mmSL



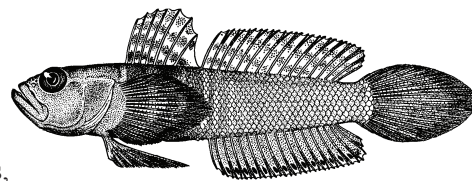
D. 9.1 mmSL



E. 10.6 mmSL



F. 14.4 mmSL

Microgobius thalassinus* (Jordan and Gilbert, 1883)*Gobiidae****Green goby**

Range: Western North Atlantic Ocean from Chesapeake Bay to Texas, including Gulf of Mexico

Habitat: Creeks and shallow estuaries on muddy substrates; larvae may be transported into coastal ocean waters

Spawning: Jun–Oct (Chesapeake Bay)

Eggs: – Undescribed

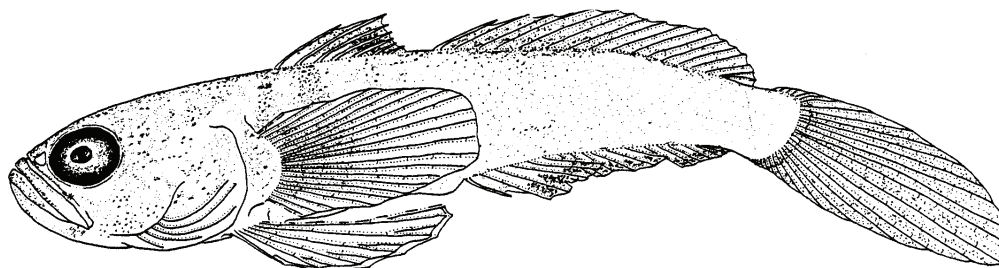
Larvae:

- Body moderately elongate; body depth at anus increases from about 10% SL to about 18% SL
- Preanus length about 50–56% SL
- Head length increases from about 20% SL to about 30% SL
- Eye moderately large in early larvae; diameter decreases from 34% SL to <30% SL in juveniles
- Flexion occurs at about 3.5–5.0 mmSL
- Sequence of fin ray formation: C – D₂, A – D₁, P₂ – P₁; all fin rays complete at about 9.0 mm
- Dorsal and anal fin bases moderately long, equal in length; D₁ and D₂ separated by narrow gap
- Pelvic fin rays united to form suction disk
- Air bladder pigment restricted to dorsal surface
- Other pigmentation includes a spot on angle of lower jaw; few spots along venter of gut (anterior and posterior to cleithral symphysis) and a series of spots along anal fin base with a prominent melanophore over the middle part of developing anal fin

Meristic Characters

Myomeres:	27
Vertebrae:	27
Dorsal fin rays:	VI–VIII, I, 14–16
Anal fin rays:	I, 14–16
Pectoral fin rays:	19–23
Pelvic fin rays:	I, 5
Caudal fin rays:	9+8 (PrC)
Supraneurals:	none

Note: 1. Relatively high pectoral fin ray count

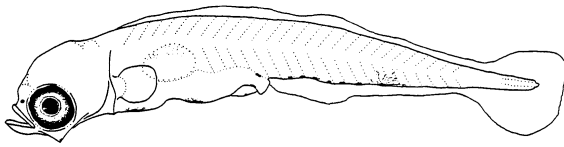
Early Juvenile:

F. 15.1 mmSL

Figures: Adult: Smith, 1907; A–F: David Ruple, unpubl.

References: Hildebrand and Cable, 1938; Richardson and Joseph, 1975; Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

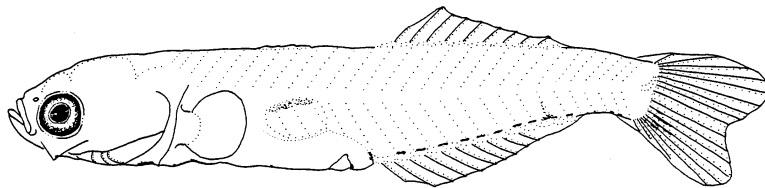
Microgobius thalassinus



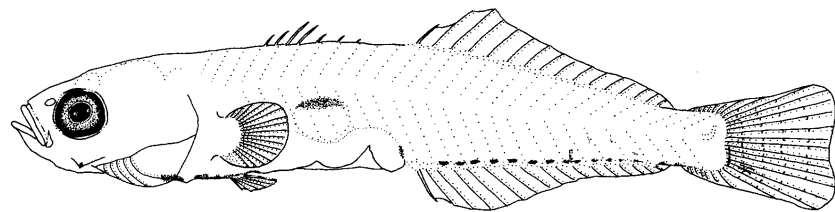
A. 2.7 mmSL



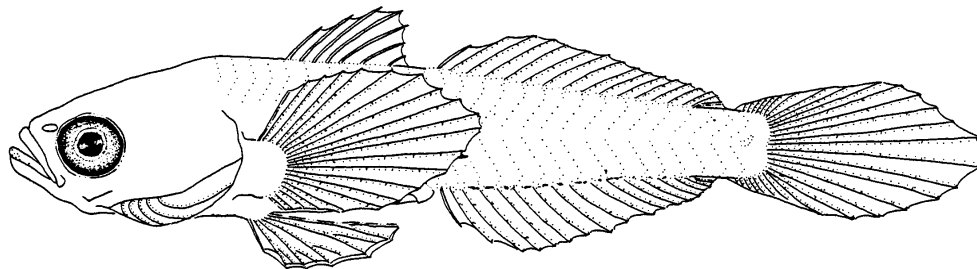
B. 4.0 mmSL



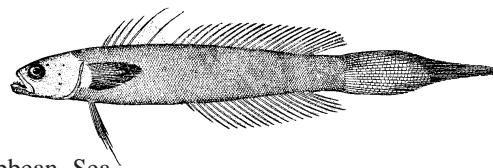
C. 5.2 mmSL



D. 8.4 mmSL



E. 11.0 mmSL

Ptereleotris calliurus* (Jordan and Gilbert, 1882)*Gobiidae****Blue goby**

Range: Western North Atlantic Ocean from North Carolina to Caribbean Sea, including Gulf of Mexico; young stages (as *Ioglossus* sp.) have been collected in study area in Slope Sea waters

Habitat: Burrow in sandy substrates, usually near reefs or other hard bottoms in depths of 18–61 m; often hover over their burrows

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Not well described; proportions below pertain to average of few specimens
- Body moderately elongate; body depth about 16% SL
- Preanus length about 58% SL
- Head length about 27% SL
- Eye moderate in size; diameter about 27% HL
- Flexion size probably about 3.0–4.0 mm
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂ (probable)
- Dorsal and anal fin bases long, equal in length; D₁ and D₂ separated by moderate gap
- Pelvic fin bases are separate, not united to form suction disk; only 4 fin rays
- Air bladder pigment restricted to dorsal surface
- Other pigmentation includes scattered, spaced spots along dorsum of body (unusual for gobiid larvae in study area) forms after flexion; a prominent spot over posterior brain; pigment on dorsal surface of gut terminus, over anus; widely spaced melanophores along anal fin base; few spots on venter of gut, posterior to cleithral symphysis; spots on otic capsule, at least in larger larvae (>8.5 mm)

Meristic Characters

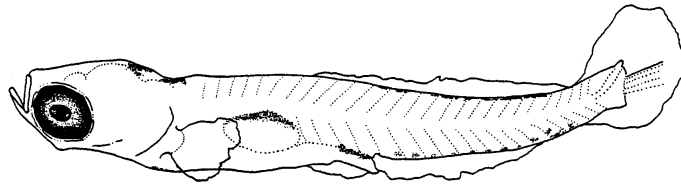
Myomeres:	26
Vertebrae:	26
Dorsal fin rays:	VI, I, 21–23
Anal fin rays:	I, 21–22
Pectoral fin rays:	19–21
Pelvic fin rays:	I, 4
Caudal fin rays:	9+8 (PrC)
Supraneurals:	none

Note: 1. Placed in family Ptereleotridae by some authors (Thacker, 2000)

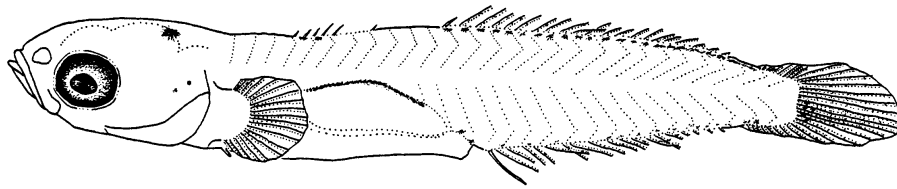
Figures: Adult: Jordan and Evermann, 1896–1900; **A–B:** David Ruple, unpubl. (as *Ioglossus* sp.)

References: Fritzsche, 1978; Ruple, 1984; Ruple, unpubl.; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

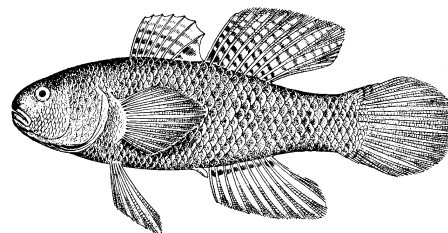
Ptereleotris calliurus



A. 3.4 mmSL



B. 9.1 mmSL

Dormitator maculatus* (Bloch, 1785)*Eleotridae****Fat sleeper**

Range: Western North Atlantic Ocean from North Carolina (rarely New Jersey or New York) to Brazil, including Gulf of Mexico and West Indies

Habitat: Shallow freshwater and estuarine waters, often in vegetated areas; larvae may occur in coastal ocean waters

Spawning: Seasonality undescribed; deposit numerous small, adhesive eggs in rows on rocks

Eggs: – Undescribed

Larvae:

- Body moderately elongate, becoming deeper (14–16% SL in postflexion larvae)
- Preanus length about 56% SL
- Head length about 20% SL
- Eye diameter about 24% HL
- Flexion occurs at unknown size
- Sequence of fin ray formation: C – D₂, A – P₁, P₂ – D₁ (Note D₁ spines last to form)
- Dorsal and anal fin bases very short, equal in length; D₁ and D₂ separated by moderate gap
- Pelvic fin bases well separated, do not form suction disk
- Air bladder pigmented on dorsal surface only
- Other pigmentation includes a series of melanophores along anal fin base plus 3 on venter of caudal peduncle; a line of spots on venter of gut, posterior to pelvic fins; a few spots in region of cleithral symphysis; a spot on lower angle of preopercle

Meristic Characters

Myomeres:	27
Vertebrae:	27
Dorsal fin rays:	VIII, 8
Anal fin rays:	I, 10
Pectoral fin rays:	13–15
Pelvic fin rays:	I, 5
Caudal fin rays:	9+8 (PrC)
Supraneurals:	none

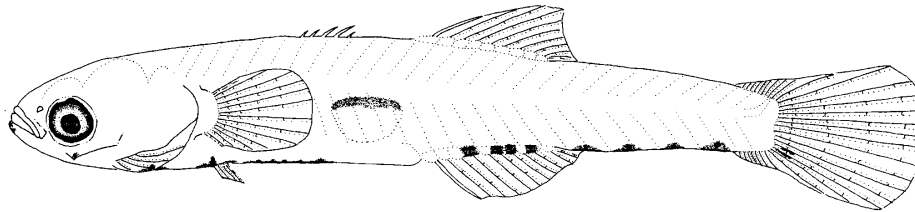
Note: 1. Low number of pectoral, dorsal and anal fin rays

Early Juvenile: Pigment becomes scattered over head and body

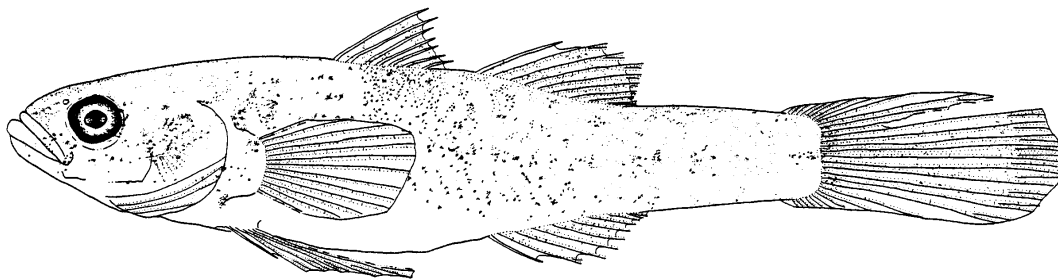
Figures: Adult: Jordan and Evermann, 1896–1900; **A:** Ruple, 1984; **B:** David Ruple, unpubl.

References: Ruple, 1984; Ruple, unpubl.; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

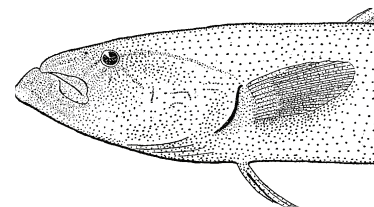
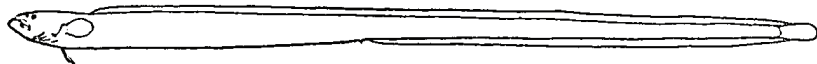
Dormitator maculatus



A. 8.1 mmSL



B. 22.1 mmSL

Microdesmus longipinnis* (Weymouth, 1910)*Microdesmidae****Pink wormfish**

Range: Widespread in western North Atlantic Ocean from North Carolina and Bermuda to Caribbean Sea, including northern Gulf of Mexico; young stages have been collected in study area (Slope Sea and coastal New Jersey)

Habitat: Burrow in soft mud or sand substrates; occur in shallow waters

Spawning: Undescribed

Eggs: – Spherical, otherwise undescribed

Larvae:

- Body very elongate, from preflexion through adult stages
- Preanus length <60% SL
- Head length about 16% SL
- Eye diameter about 18% HL
- Flexion occurs at unknown size
- Sequence of fin ray formation: C – D₂, A – D₁, P₁ – P₂
- Dorsal and anal fin bases very long; D₁ and D₂ continuous
- Pelvic fin bases well separated; not forming suction disk
- Later larvae develop a hook at tip of lower jaw
- Air bladder pigment restricted to dorsal surface
- Other pigmentation in early larvae includes a series of ventral spots from cleithral symphysis to anus, spread wider apart under mid-gut; dorsum of gut well pigmented; a spot on dorsum of body just anterior to notochord tip, plus a few others farther anteriorly; later larvae sparsely pigmented except for 3 prominent lines on body near caudal fin base, retention of spot on dorsum anterior to these, and a series of spots along anal fin base

Note: 1. Not previously reported from study area; a postflexion larva (19.6 mmSL), collected off Little Egg Inlet, New Jersey, Aug 14, 1991, Tucker Trawl, night tow (2047); *Cruise Caleta* 91-09, Station TT3 (bottom), has been deposited at ANSP. Larvae have also been collected in Slope Sea waters in study area (Hare *et al.*, 2001).

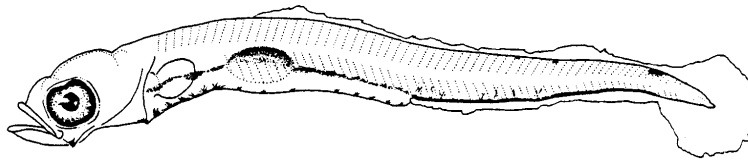
Meristic Characters

Myomeres:	63–66
Vertebrae:	63–66
Dorsal fin rays:	XIX–XXII, 66–74
Anal fin rays:	41–47
Pectoral fin rays:	11–14
Pelvic fin rays:	I, 3
Caudal fin rays:	9+8 (PrC)
Supraneurals:	none

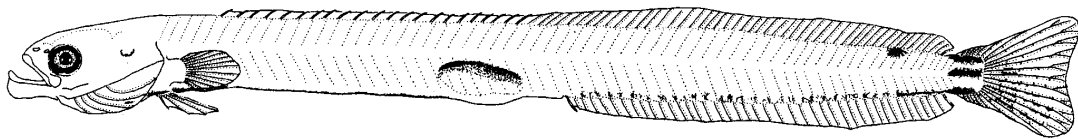
Figures: Adult and adult head: Reid, 1936; **A:** David Ruple, unpubl.; **B:** Ruple, 1984

References: Ruple, 1984; Ruple, unpubl.; Murdy, 2002; Leis and Carson-Ewart, 2004; Ross and Rohde, 2004

Microdesmus longipinnis



A. 3.5 mmSL



B. 19.2 mmSL