Perciformes
Suborder Zoarcoidei, Notothenioidei

Selected meristic characters in species belonging to the suborder Zoarcoidei whose adults or larvae have been collected in the study area. Suborder composition after Eschmeyer (1990); Mecklenburg (2003); Mecklenburg and Sheiko (2004); classification sequence alphabetical by family. Sources: Andriyashev, 1954; Makushok, 1958; Faber, 1976; Scott and Scott, 1988; Matarese *et al*., 1989; Collette, 2002f

Family *Species*	Vertebrae	Caudal Fin Rays	Dorsal Fin (all spines)	Anal Fin	Pectoral Fin	Pelvic Fin
Anarhichadidae						
Anarhichas denticulatus	78–82	18–22	77–79	45–47	–	None
Anarhichas lupus	72–78	22–26	69–77	42–48	18–22	None
Anarhichas minor	76–79	20–23	74–80	44–48	20–23	None

Family *Species*	Vertebrae	Postanal Myomeres[1]	Dorsal Fin (all spines)	Anal Fin	Pectoral Fin	Pelvic Fin
Cryptacanthodidae						
Cryptacanthodes maculatus	85–86	>50	73–77	47–50	11–12?	None
Pholidae						
Pholis fasciata	91–98	–	84–91	II, 43–46	—	I, 1 (or absent)
Pholis gunnellus	86–89	49–51	80–83	II, 42–44	10–12	I, 1
Stichaeidae						
Anisarchus medius	67–70	–	59–62	I, 39–42	13–14	I, 3
Chirolophis ascanii	55–57		50–54	I, 35–40	13–15	I, 3
Eumesogrammus praecisus	52	–	47–49	I–II, 33–35	16–19	I, 3
Leptoclinus maculatus	66–72	38–44	57–64	I, 34–40	14–16	I, 3
Lumpenella longirostris	71–75	–	61–71	II–V, 36–42	13–14	I, 2–3
Lumpenus fabricii	70–73	–	61–67	I, 40–44	15–16	I, 3
Lumpenus lampretaeformis	80–85	58–63	68–85	I, 46–62	15–16	I, 3
Stichaeus punctatus	51–56	33–37	46–50	I–II, 32–38	15–16	I, 4
Ulvaria subbifurcata	45–49	28–33	43–44	II, 30–31	15	I, 3

[1] 46–54 postanal myomeres in 3 species of Anarhichadidae

Perciformes
Suborder Zoarcoidei, Notothenioidei

Selected meristic characters in species belonging to the suborder Zoarcoidei, family Zoarcidae and the notothenioid family Nototheniidae whose adults or larvae have been collected in the study area. Sources: Goode and Bean 1896; Markle and Sedberry, 1978; Anderson, 1984; 1994; Scott and Scott, 1988; Okamura, et al., 1995; Klein-MacPhee and Collette, 2002b

Family Species	Vertebrae	Dorsal Fin	Anal Fin	Pectoral Fin	Pelvic Fin
Zoarcidae					
Gymnelus retrodorsalis	89–99	–	–	–	None
Gymnelus viridis	92–105	81–100	70–79	10–14	None
Lycenchelys alba	–	–	–	–	3
Lycenchelys paxillus	133–138	119–124	112–115	15–16	3
Lycenchelys sarsi	125–126	120–123[1]	117–118[1]	15–17	Reduced
Lycenchelys verrilli	107–111	86–92	86–88	–	Reduced
Lycodes esmarki	115–118	113–118[1]	97–102[1]	21–24	Reduced
Lycodes eudipleurostictus	105–108	97–101	84–86	19–22	3
Lycodes frigidus	104	99	85	20	Reduced
Lycodes lavalaei	100–102	97–104[1]	77–82[1]	18–20	Reduced
Lycodes luetkeni	93	88	70	24	Reduced
Lycodes pallidus	96–104	92–101[1]	79–851	17–21	Reduced
Lycodes polaris	90–92	89–941	69–761	15–19	Reduced
Lycodes reticulatus	93–96	81–951	71–781	19–21	Reduced
Lycodes seminudus	96	91–971	73–781	19–21	Reduced
Lycodes terraenovae	–	111–113[1]	94–981	21–24	Reduced
Lycodes vahlii	98–108	104–113[1]	96–102[1]	17–20	Reduced
Lycodonus mirabilis	119	80+	70+	18	3
Melanostigma atlanticum	83–93	92–99	77–84	6–8	None
Pachycara bulbiceps	113–116	107–109	84–89	16–19	None
Zoarces americanus	129–146	92–103+32–55[2]	105–124	18–21	3
Nototheniidae					
Dissostichus eleginoides	54–55	IX–XI + 26–30	26–30	24–26	I, 5

[1] includes half of caudal fin ray count
[2] 92–103 soft fin rays followed by 16–24 short spines followed by 16–31 soft fin rays

Perciformes
Suborders Zoarcoidei and Notothenioidei

Summary of useful characters for distinguishing larvae of "northern blennioids" in the study area. Little is known about early stages of zoarcids, whose young usually hatch from large eggs while buried in substrates. The larvae of species listed in table below share the following characters:

- Body elongate with straight gut
- Snout short, slightly pointed; mouth large
- Preanus length <50% SL (except *Pholis gunnellus*, slightly >50% SL)
- Dorsal and anal fins long; pectoral fins wide, fan-shaped, situated just below body midline
- Pelvic fin tiny or absent
- Most have row of melanophores, anus to caudal fin (see species accounts)

Character	*Pholis gunnellus*	*Stichaeus punctatus*	*Ulvaria subbifurcata*	*Leptoclinus maculatus*	*Lumpenus lampretaeformis*	*Cryptacanthodes maculatus*	Anarhichadidae (3 species)
Meristic:							
Myomeres	86–89	51–56	45–49	66–72	80–85	85–86	72–82
Postanal myomeres	49–51	33–37	28–33	38–44	58–63	> 50	46–54
Dorsal fin	80–83	46–50	43–44	57–64	68–85	73–77	69–80
Anal fin	II, 42–44	I–II, 32–38	II, 30–31	I, 34–40	I, 46–62	47–50	42–48
Pelvic fin	I, 1	I, 4	I, 3	I, 3	I, 3	None	None
Pectoral fin	10–12	15–16	15	14–16	15–16	12–13?	18–23
Pigment: Intestine	Lateral, external[1]	Dorsal, internal	Dorsal, internal	Lateral, external	Lateral, external	Dorsal, internal	Dorsal, internal
Preanus (venter)	Stitching cleithrum to anus	Middle of gut	Middle of gut and spot at anus	None	None	None	None?
Head	None	Present	Present	None	None	Present	Present
Dorsum of body	None	Posterior half of body	Posterior third of body	None	None	Heavy, almost full length	Heavy overall
Preanus (venter)	Stitching cleithrum to anus	Middle of gut	Middle of gut and spot at anus	None	None	None	None?
Head	None	Present	Present	None	None	Present	Present
Dorsum of	None	Posterior half of body	Posterior third of body	None	None	Heavy, almost full length	Heavy overall
Notochord	None	At small sizes	At small sizes	None	None	Unknown	Unknown
Miscellany	–	Streaks on postanal myomeres	No streaks	~38–44 postanal ventral spots	~58–63 postanal ventral spots	Unpigmented void side of body, over gut	Large round head, big eyes
Range (southern limit)	Delaware Bay	Massachusetts Bay	Woods Hole, Mass	Cape Cod	Cape Cod	New Jersey	See footnote[2]

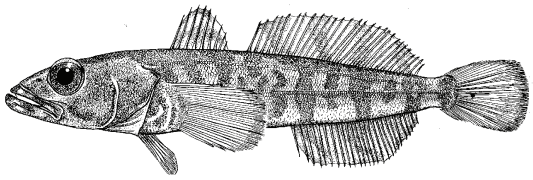
[1] Pigment may be faint or absent

[2] *Anarhichus denticulatus*: S.W. Greenland to Newfoundland and Grand Bank, rarely to Nova Scotia; *A. minor*: Greenland to Gulf of Maine; *A. lupus*: Davis Strait to Cape Cod, rarely straying south to New Jersey

Perciformes
Notothenioidei

The notothenioids are fishes endemic to the Southern Ocean, especially Antarctic and sub-Antarctic waters. However, there is a single record of a notothenioid occurring in the study area, and this occurrence also represents the first for the northern hemisphere (Møller *et al*., 2003). This record involves *Dissostichus elegenoides* (family Notothenidae), a species that occurs in a temperature range of 2–11°C. Temperatures <10°C are typical at depths of 500–1,500 m in tropical areas of the Atlantic Ocean, thus facilitating a potential transequatorial migration from Patagonia to western Greenland. It is highly unlikely that a population of this species occurs in Greenland waters (Møller *et al*., 2003), nor is it likely that early stages will be found in the northwest Atlantic study area. The description below is provided simply because a single adult has been collected in the study area and the species therefore meets a criterion for inclusion.

Dissostichus eleginoides Smitt, 1898
Nototheniidae
Patagonian toothfish



Meristic Characters

Myomeres:	54–55
Vertebrae:	18–20 + 35–36 = 54–55
Dorsal fin rays:	IX–XI + 26–30
Anal fin rays:	26–30
Pectoral fin rays:	24–26
Pelvic fin rays:	I, 5
Caudal fin rays:	9+8 (PrC)

Range: Sub-Antarctic islands, Antarctic Peninsula, southern Chile (north to 30°S) and Argentina (north to 32°S); one record in Davis Strait

Habitat: Usually nearly demersal or in midwater, in depths of 70–1,500 m, on shelves of sub-Antarctic islands and southern South America; pelagic during certain periods of life cycle. Known to make extensive migrations up to 1,800 km (Williams *et al*., 2002).

Spawning: Austral summer (Dec–Jan)

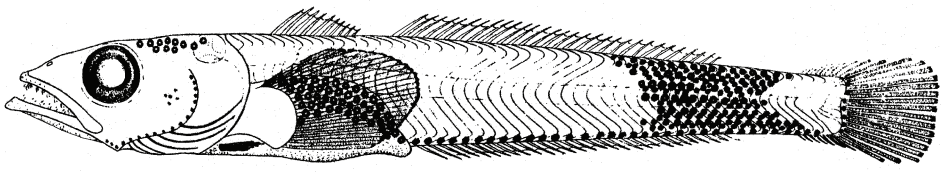
Eggs:
- Pelagic; (diameter ranges from 1.2–4.0 mm in other nototheniids)

Larvae:
- Hatching size unknown; other nototheniids hatch at 6–14 mm
- Body elongate, with large pectoral fins, moderate to wide finfolds
- Preanus lengths typically about 50% SL (45–48% SL in juvenile of present species)
- 35–36 postanal myomeres
- Flexion occurs at 9.0–25.0 mm in larvae of other nototheniids
- Sequence of fin ray formation: P_1, C – P_2 – D, A (unknown whether D_1 or D_2 forms first)
- Pigment patterns highly specific; in the present species, note row of spots along base of anal fin, scattered spots on top of head, base of caudal fin and dorsum of gut, and the broad band of pigment encircling posterior part of body between insertions of D and A fins and anterior caudal peduncle

Note: Meristic characters very useful in distinguishing notothenioid families, genera and species

Juvenile: Size range of juvenile stage in family: 25–60 mm

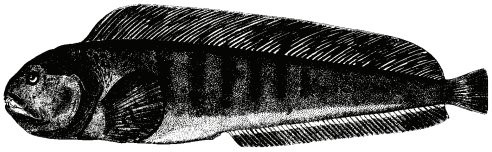
A. 55.5 mmSL



Figures: Adult: Hureau, 1985; **A**: Efremenko, 1983

References: de Ciechomski and Weiss, 1976; Efremenko, 1983; Stevens *et al*., 1984; Hureau, 1985; Kellerman, A. 1989; Møller *et al*., 2003

Anarhichas spp.
Anarhichadidae
Wolffishes



Anarhichas lupus

Range: All 3 species occur both sides North Atlantic Ocean; ranges in the western North Atlantic follow: *Anarhichas lupus* Linnaeus, 1758 – Davis Strait to Cape Cod, rarely to New Jersey; *Anarhichas minor* Olafsen, 1774 – Greenland to Cape Ann, Massachusetts; *Anarhichas denticulatus* Krøyer, 1844 – Northwest Territories and Greenland to Sable Island Bank

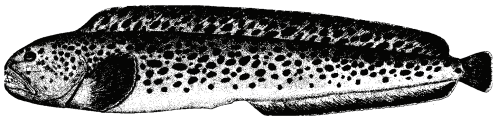
Habitat: Demersal in deep and cold waters; in depths to 600 m and in temperatures <4.0°C; usually on clay or clay-sand substrates, *A. lupus* often over rocks

Spawning: Not well described for any species; *A. lupus*: Jul–Feb; *A. minor*: Apr–Dec; *A. denticulatus*: Apr–Oct

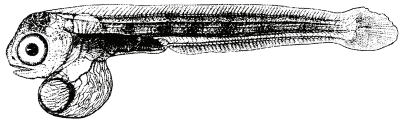
Meristic Characters
(Range in genus)

Myomeres:	72–82
Vertebrae:	72–82
Dorsal fin rays:	69–80
Anal fin rays:	42–48
Pectoral fin rays:	18–23
Pelvic fin rays:	none
Caudal fin rays:	See note below

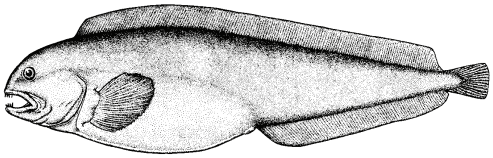
Eggs:
- Deposited in spherical clumps in substrate
- Diameter: 5.0–5.7 mm, chorion, yellowish (*A. lupus*)
- Oil globule: single, 0.4 mm in diameter (*A. lupus*)



Anarhichas minor



Embryo of *A. lupus*, 18.3 mm immediately before hatching

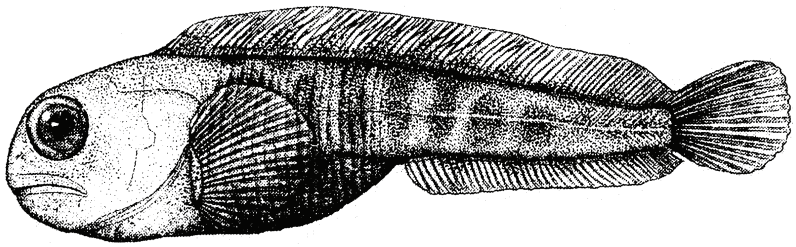


Anarhichas denticulatus

Larvae:
- Hatching occurs at lengths of 18.0 mm+ after 116–163 days
- Body elongate with large, rounded head, large eye
- Preanus length <50% SL
- Dorsal fin extends length of body, from nape to short caudal peduncle
- Fin rays begin formation during embryonic stage
- Larvae feed in midwater for a few days, then settle to bottom habitats
- Pigmentation (soon after hatching) includes a dense dark covering over most of body, with an unpigmented section on the caudal peduncle (in *A. lupus*); early larvae of *A. minor* are prominently barred

Note: 1. Caudal fin ray counts: *A. lupus*: 22–26; *A. minor*: 20–23; *A. denticulatus*: 18–22

Early Juvenile: At 45.0 mm, *A. lupus* has bulky anterior body, well- rounded head, large eye and massive lower jaw; pigment is generally dark over-all with about 7 "parr mark" like blotches on side of body

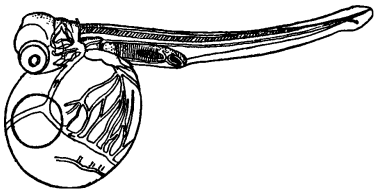


F. 45.0 mm

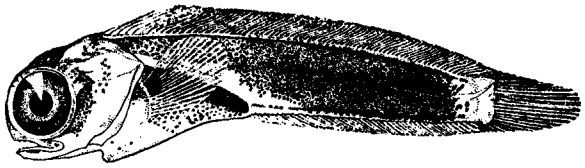
Figures: Adults (3 species): D. R. Harriott (Scott and Scott, 1988); embryo: Pavlov, 1986; **A**: Ehrenbaum, 1905 (reversed); **B**: Bigelow and Schroeder, 1953; **C–E**: Barsukov, 1986; **F**: Pavlov, 1986

References: Ehrenbaum, 1905; Bigelow and Schroeder, 1953; Pavlov, 1986; Barsukov, 1959; 1986; Matarese *et al*., 1989; Pavlov *et al*., 1992

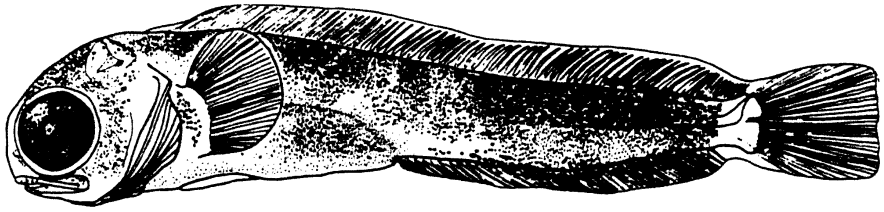
Anarhichas lupus



A. 12.0 mm (Yolk sac larva)

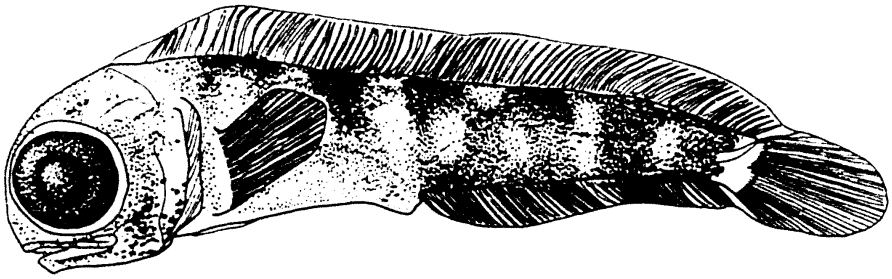


B. 21.5 mm



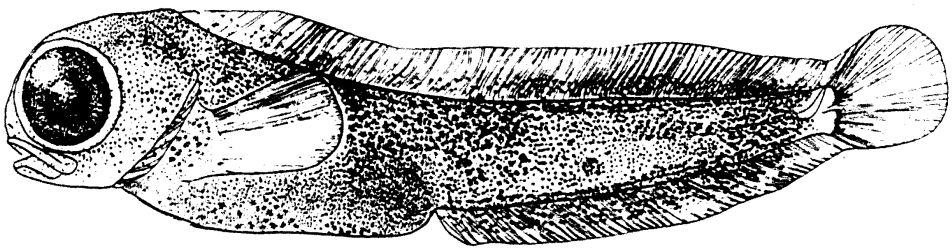
C. Size unknown

Anarhichas minor



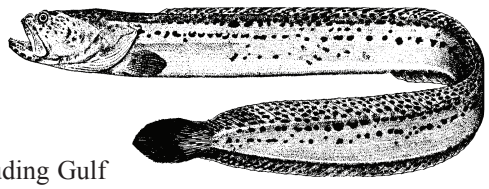
D. Size unknown

Anarhichas denticulatus



E. Size unknown

Cryptacanthodes maculatus Storer, 1839
Cryptacanthodidae
Wrymouth



Range: Western North Atlantic Ocean from Labrador to New Jersey, including Gulf of St. Lawrence and Long Island Sound

Habitat: Demersal from intertidal zone to depths of 183 m (as deep as 595 m off New Jersey); burrows in soft, muddy substrates

Spawning: Winter in Gulf of Maine; larvae found late-winter into summer in variety of habitats ranging from northern estuaries to coastal waters and offshore banks

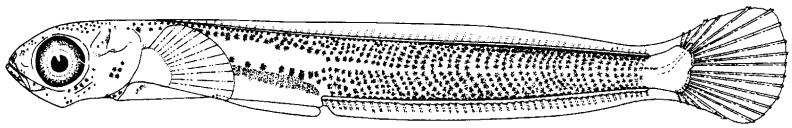
Meristic Characters

Myomeres:	85–86
Vertebrae:	85–86
Dorsal fin rays:	73–77
Anal fin rays:	47–50
Pectoral fin rays:	11–12?
Pelvic fin rays:	none
Caudal fin rays:	–

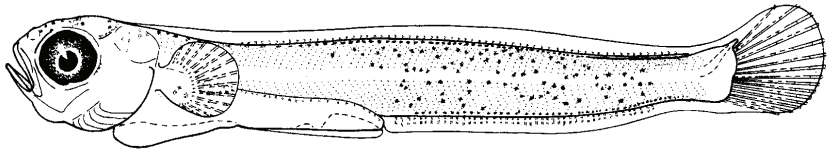
Eggs: – Undescribed

Larvae:
- Undescribed; descriptions below based on larvae of a Pacific Ocean congener, *Cryptacanthodes bergi*
- Body elongate with moderate head; eyes initially very large, become moderate
- Mouth becomes increasingly oblique with development, eyes become displaced upward
- Dorsal fin base long, extends from nape to caudal fin; dorsal, caudal and anal confluent
- Preanus length <50% SL; gut thick, downturned at posterior end
- Postanal myomeres: >50
- Sequence of fin ray formation: C, P_1 – D, A
- Pigment dense, especially dorsally; melanophores also present on top of head, on dorsum of gut, aligned on myosepta on ventral half of body, and a few spots on sides of head; note lack of pigment on sides over pectoral fin and at end of caudal peduncle

Note:
1. Figs. H and I (described as larvae of 2 genera now in synonymy of *Cryptacanthodes*), are from the eastern Pacific Ocean. Note heavy pigment on body, except for unpigmented 'void' over gut, large eye, upturned mouth and early forming pectoral and caudal fin rays. Remnants of yolk material are present under the gut of the larva in Fig. I.



H. 16.0 mmSL (*C. gigantea*)

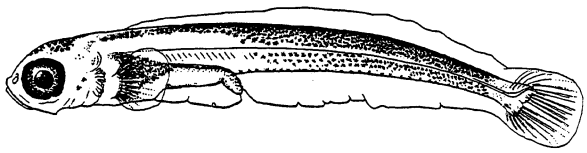


I. 17.5 mmSL (*C. aleutensis*)

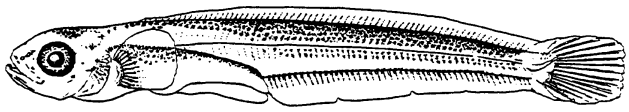
Figures: Adult: H. L. Todd (Collette, 2002h); **A–B**, **E–F**: Sokolovskii and Sokolavskaya, 1996; **C, D**, **G**: Shiogaki, 1982; **H–I**: Bev Vinter (Matarese *et al*., 1989)

References: Okiyama, 1988; Scott and Scott, 1988; Sokolovskii and Sokolavskaya, 1996; Collette, 2002h; Mecklenburg, 2003

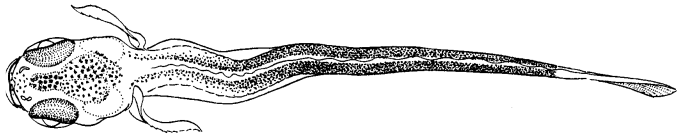
Cryptacanthodes maculatus



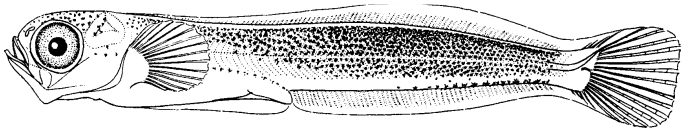
A. 10.3 mmSL



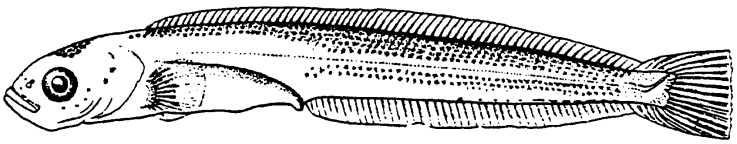
B. 16.0 mmSL



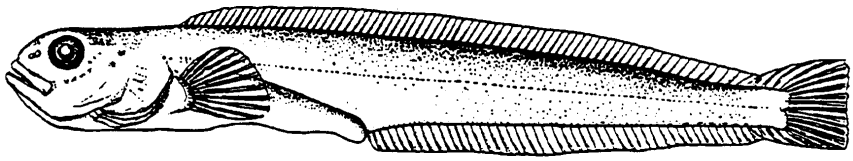
C. 18.0 mmTL (Dorsal View)



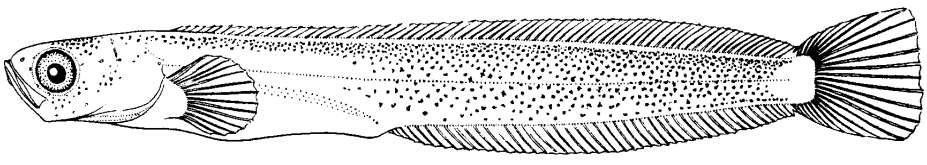
D. 18.0 mmTL



E. 26.0 mmSL

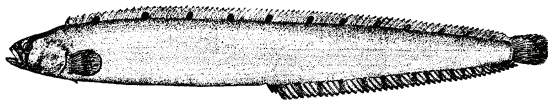


F. 34.0 mmSL



G. 30.0 mmTL

Pholis gunnellus (Linnaeus, 1758)
Pholidae
Rock gunnel



Range: Both sides of North Atlantic Ocean; in the western North Atlantic from Labrador to Southern New England, more rarely to Delaware Bay

Habitat: Tide pools and other intertidal habitats, sheltering under rocks or other structure; also coastal bays in cooler waters; sometimes some distance offshore, e.g. at 183 m on Georges Bank; larvae occur over continental shelf as well as large embayments

Spawning: Winter, after migration away from intertidal habitats; as far south as Long Island Sound; nest sites guarded by both parents; egg masses sometimes deposited in oyster shells, or as deep as 22 m

Meristic Characters	
Myomeres:	86–89
Vertebrae:	86–89
Dorsal fin rays:	80–83
Anal fin rays:	II, 42–44
Pectoral fin rays:	10–12
Pelvic fin rays:	I, 1
Caudal fin rays:	19 (total)

Eggs:
- Adhesive masses deposited on a variety of substrates
- Diameter: 1.4 mm (average) to 2.2 mm
- Oil globule: single
- Incubation occupies 42–70 days (at 6.0°C)

Larvae:
- Hatching occurs at about 9.0 mm
- Body elongate with straight, uncoiled gut and small head
- Snout short, slightly pointed, mouth relatively large
- Preanus length >50% SL
- Postanal myomeres: 49–51
- Sequence of fin ray formation: C – D, A – P_1 – P_2
- Dorsal and anal fins long-based; pectoral fins wide, fan-shaped, base just below midline of body
- Pelvic fins reduced to 1 spine, 1 fin ray
- Pigmentation includes row of melanophores along venter from anus to caudal fin base; a small cluster of spots over the anus and a few spots on branchiostegal region; lateral surface of gut has external pigment, but may be faint or absent; a line of pigment, resembling "stitching", occurs on venter between cleithrum and anus; pigment absent on top of head, on dorsum of body and internally on notochord

Note: 1. Larvae descend to cryptic bottom habitats at 30–40 mmSL

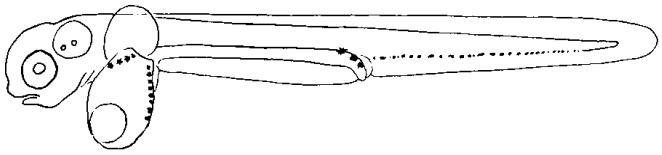
Early Juvenile: Ornate pigment pattern unlike either larvae or adults; note series of blotches along bases of dorsal and anal fins and another series along midline of body

F. 56.0 mmTL

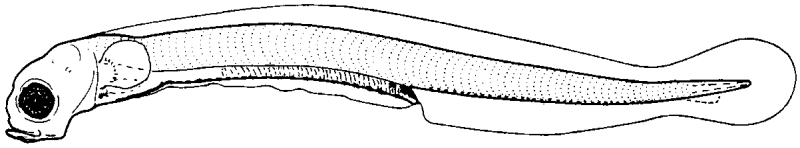
Figures: Adult: H. L. Todd (Collette, 2002g); **A**, **C**: Russell, 1976; **B**, **E**: Bev Vinter (Matarese *et al*., 1989); **D**: Rass, 1949 (redrawn); **F**: Nancy Arthur (Able and Fahay, 1998)

References: Bigelow and Schroeder, 1953; Sawyer, 1967; Russell, 1976; Scott and Scott, 1988; Able and Fahay, 1998; Collette, 2002g

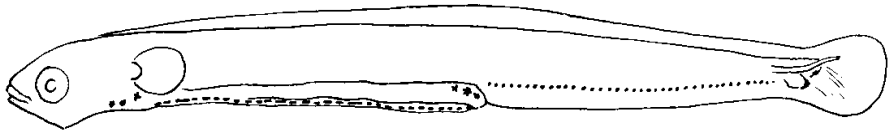
Pholis gunnellus



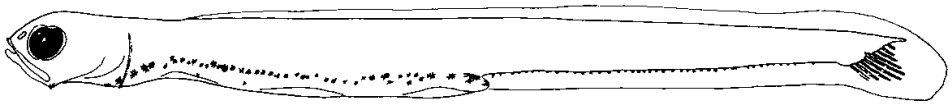
A. 9.0 mmTL (Yolk Sac Larva)



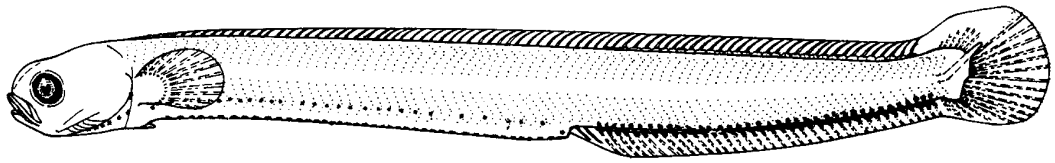
B. 9.2 mmSL (*Pholis* sp.)



C. 15.5 mmTL



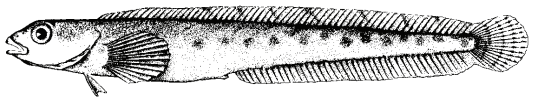
D. 18.5 mmTL



E. 23.0 mmSL (*Pholis* sp.)

Note: larvae in Figs. B and E are from the Northeast Pacific Ocean where up to 7 species may occur

Anisarchus medius (Reinhardt, 1838)
Stichaeidae
Stout eelblenny



Range: Circumpolar; in the study area from Baffin Island, Davis Strait and Labrador to Cape Breton Island, Nova Scotia

Habitat: Demersal, over sand or mud substrates in depths of 16–143 m; in Labrador waters, occurs in temperatures <3.0°C, and usually <1.0°C

Spawning: Undescribed

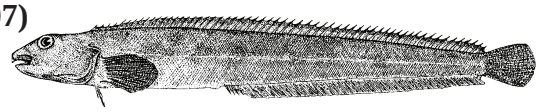
Eggs: – Undescribed

Larvae:
- (Putative; see note on figure page)
- Body elongate with small head, slightly pointed snout
- Mouth oblique, eye large
- Preanus length about 50% SL; rugose folds along length of gut
- Few pigment spots along edges of hypural bones and along base of anal fin

Note: Referred to as *Lumpenus medius* Reinhardt, 1838 by some authors

Meristic Characters	
Myomeres:	67–70
Vertebrae:	23–25 + 44–45
Dorsal fin rays:	59–62
Anal fin rays:	I, 39–42
Pectoral fin rays:	13–14
Pelvic fin rays:	I, 3
Caudal fin rays:	–

Lumpenella longirostris (Evermann and Goldsborough, 1907)
Stichaeidae
Longsnout prickleback



Range: North Pacific Ocean (Japan, Bering Sea, Alaska, British Columbia); also recorded from Greenland

Habitat: Occurs in depths of 25–1,140 m, typically between 300 and 600 m; young stages (4–33 mm) pelagic

Spawning: Undescribed

Eggs: Undescribed

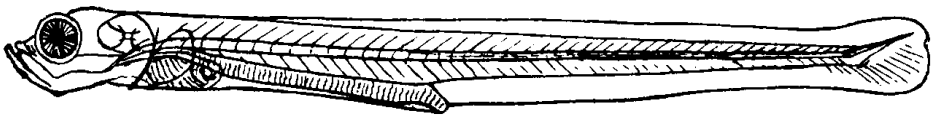
Larvae:
- Body elongate with small, moderately elongate head
- Snout longer than in larvae of other stichaeids
- Mouth reaches anterior edge of eye; eye moderate in size
- Usually >70 myomeres (Pacific)
- Note presence of up to 5 anal fin spines
- Pigment present on hypural edges; a row of spots along gut; a series of spots along anal fin base; pigment absent along dorsum of body

Meristic Characters	
Myomeres:	67–70+
Vertebrae:	71–75
Dorsal fin rays:	61–71
Anal fin rays:	II–V, 36–42
Pectoral fin rays:	13–14
Pelvic fin rays:	I, 2–3
Caudal fin rays:	–

Figures: Adult *A. medius*: D. R. Harriott (Scott and Scott, 1988); **A**: Ehrenbaum, 1905 (reversed); Adult *L. longirostris*: D. R. Harriott (Hart, 1973); **B**: Kathryn Garrison (Matarese *et al*., 1989)

References: Ehrenbaum, 1905; Hart, 1973; Faber, 1976; Scott and Scott, 1988; Matarese *et al*., 1989; Mecklenburg and Sheiko, 2004

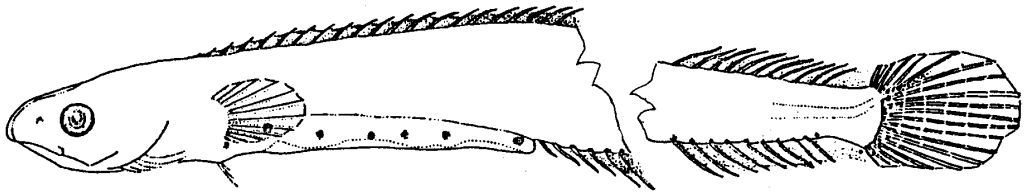
Anisarchus medius



A. 17.0 mmSL

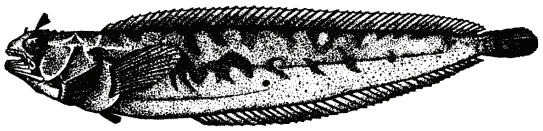
Note: The larva illustrated here has been ascribed to *Leptoclinus maculatus* (Faber, 1976). If this is accurate, larvae of *Anisarchus medius* must be considered to be undescribed.

Lumpenella longirostris



B. 39.0 mmSL

Chirolophis ascanii (Walbaum, 1792)
Stichaeidae
Atlantic warbonnet



Range: North Atlantic and North Pacific oceans in subarctic waters; adults known from northern European locations; young stages (only) known from Canadian Atlantic (e.g. Baffin Island, Labrador, Strait of Belle Isle, Newfoundland, Gulf of St. Lawrence and Grand Bank)

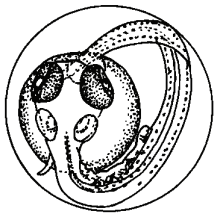
Habitat: Near shore on rocky substrates, often associated with algae; recorded from depths of 100–175 m (maximum 320 m); absent in intertidal zone

Spawning: Oct–Dec (North Sea); larvae planktonic Dec–Apr

Meristic Characters

Myomeres:	55–57
Vertebrae:	55–57
Dorsal fin rays:	50–54
Anal fin rays:	I, 35–40
Pectoral fin rays:	13–15
Pelvic fin rays:	I, 3
Caudal fin rays:	–

Eggs:
- Demersal, in flattened, adhesive masses
- Diameter: 2.3–2.8 mm (slightly off-round)
- Chorion: thin, finely punctate
- Yolk: homogeneous
- Oil globules: numerous, coalescing to single, 0.7–0.8 mm in diameter
- Pervitelline space: moderately wide
- Embryos incubate for 5–6 weeks (at 10–12°C)



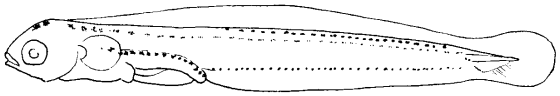
Larvae:
- Hatching occurs at about 10.0 mm
- Body elongate with small head and moderately pointed snout
- Mouth relatively large, extends to middle of eye
- Preanus length about 33% SL
- Flexion occurs at about 11–20 mmSL
- Caudal fin rays form first
- Pigment: a series of melanophores along venter of tail from anus to caudal fin base; a dorsal series of spot salong the dorsum from level of anus to caudal peduncle (originating farther anteriorly in larger larvae); an internal row of melanophores along the notochord from head to base of caudal fin (not visible in older larvae); few bold spots on top of head; row of bold melanophores on dorsum of gut; older larvae have 1–2 spots under pectoral fin base

Note:
1. The larva designated as "*Chirolophis*?" by Dannevig (1919) has been ascribed to *Stichaeus punctatus* (Faber, 1976). The larvae of both species have dorsal series of melanophores on body. Counts of vertebrae and dorsal fin rays are higher in *Chirolophis ascanii* than in *Stichaeus punctatus*.
2. The larva illustrated in Fig. F (designated *Chirolophis* sp.) is from the northeast Pacific Ocean

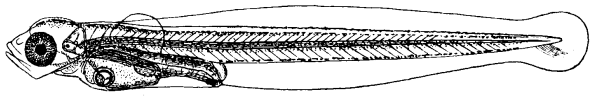
Figures: Adult: Makushok, 1986; Egg: Birgitte Rubæk (Munk and Nielsen, 2005) redrawn from Ehrenbaum, 1904; **A**, **E**: Russell, 1976; **B–D**, **G**: Ehrenbaum, 1905; **F**: Bev Vinter (Matarese *et al*., 1989); **H**: Birgitte Rubæk (Munk and Nielsen, 2005) redrawn from Russell, 1976

References: Ehrenbaum, 1904; Faber, 1976; Russell, 1976; Makushok, 1986; Scott and Scott, 1988; Matarese *et al*., 1989

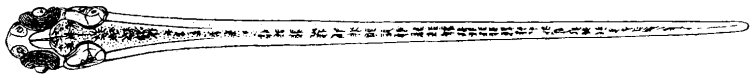
Chirolophis ascanii



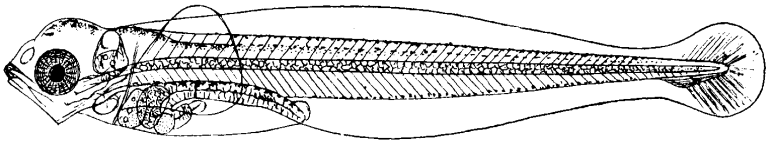
A. 11.6 mmSL



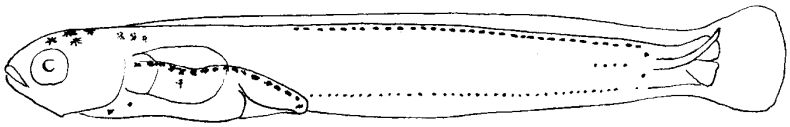
B. 12.0 mmTL



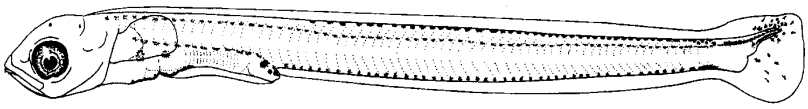
C. 13.8 mmTL (Dorsal View)



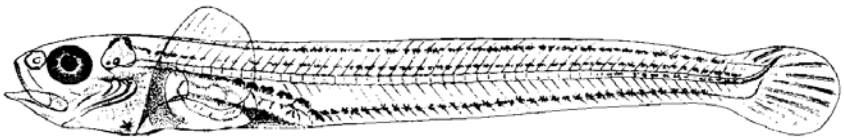
D. 13.8 mmTL



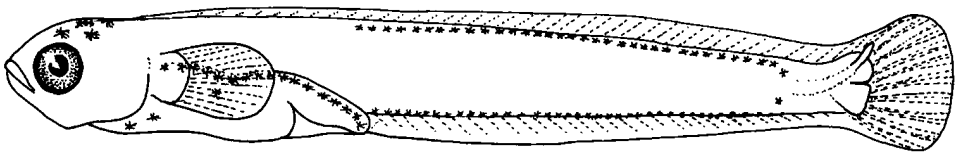
E. 16.5 mmTL



F. 16.5 mmSL *(Chirolophis* sp.)

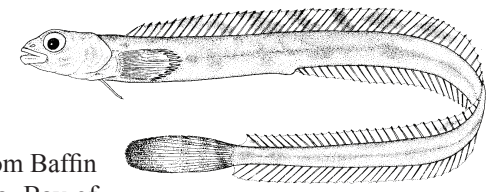


G. 21.0 mmTL



H. 30.0 mmSL

Lumpenus lampretaeformis (Walbaum, 1792)
Stichaeidae
Snakeblenny



Range: Arctic and North Atlantic oceans; in the western North Atlantic from Baffin Island, Davis Strait and Greenland to Newfoundland, Nova Scotia, Bay of Fundy and Cape Cod; larvae occur as far south as New Jersey

Habitat: Demersal on soft or hard substrates; known to burrow in soft sediments; not found intertidally, most common in depths of 2–91 m and never deeper than 183 m

Spawning: Jan–May (Gulf of Maine) in coastal waters, bays and upper estuaries

Eggs: – Demersal, adhesive

Larvae:
- Hatching probably occurs at sizes >10.00 mm
- Body elongate with straight gut, small head
- Preanus length <50% SL
- Postanal myomeres: 58–63
- Dorsal and anal fins long-based
- Pectoral fins wide and fan-shaped, situated just below midline of body
- Pigment includes external spots on lateral surface of gut; about 58–63 spots occur along venter posterior to anus; pigment absent on venter anterior to anus, on head, on dorsal edge of body and internally on notochord

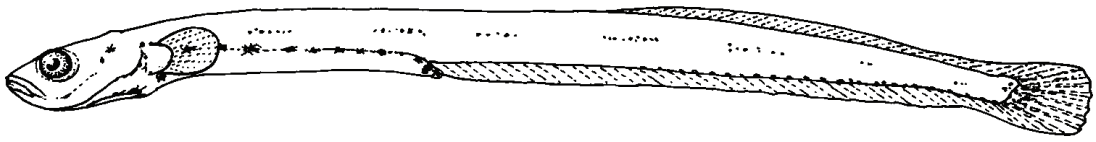
Meristic Characters

Myomeres:	80–85
Vertebrae:	80–85
Dorsal fin rays:	68–85[1]
Anal fin rays:	I, 46–62[1]
Pectoral fin rays:	15–16
Pelvic fin rays:	I, 3
Caudal fin rays:	–

[1] Highest counts in Newfoundland, lowest in St. Lawrence estuary; intermediate counts in Gulf of Maine

Note:
1. Walbaum (1792) spelled the specific name three ways: *lumpretaeformis*, *lampretiformis* and *lampretaeformis*. Subsequent revisers (Andriashev, 1954; Makushok, 1973) selected *lampretaeformis* as the correct spelling. Other spellings are incorrect.
2. Larvae designated as *L. lampretaeformis* in Colton and Marak (1969) refer to larvae of *Ulvaria subbifurcata*

Early Juvenile: Larvae descend to bottom at 30–40 mm



G. 41.0 mmSL

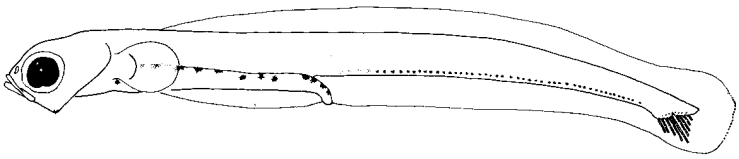
Pigmentation changes gradually to spotted pattern of adult; note short series of melanophores along midline of body; series of spots retained on dorsum of gut and few spots on opercle

Figures: Adult: K. H. Moore (Collette, 2002f); **A–C**: Faber, 1976 (B redrawn); **D**: Ehrenbaum, 1905; **E**: Dunbar, 1947; **F**: Russell, 1976; **G**: Birgitte Rubæk (Munk and Nielsen, 2005)

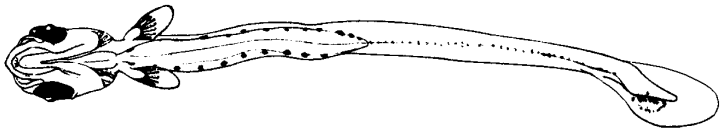
References: Faber, 1976; Makushok, 1986; Scott and Scott, 1988; Able and Fahay, 1998; Collette, 2002f

Lumpenus lampretaeformis

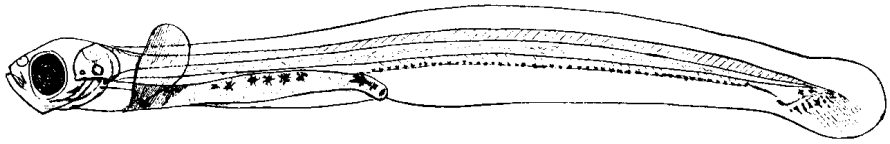
A. 16.0 mmTL (Dorsal View)



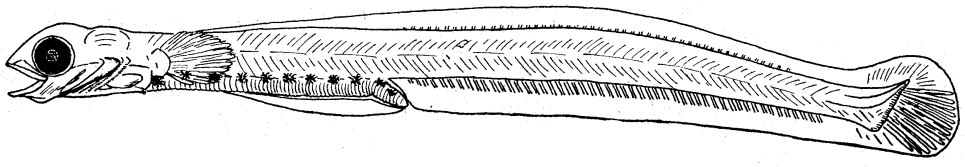
B. 16.0 mmTL



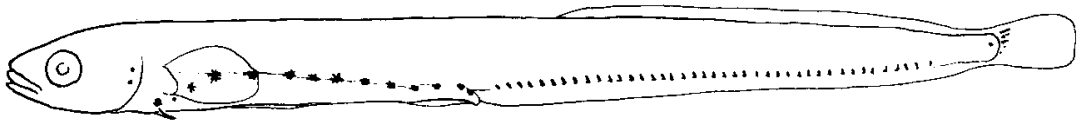
C. 16.0 mmTL (Ventral View)



D. 22.0 mmTL

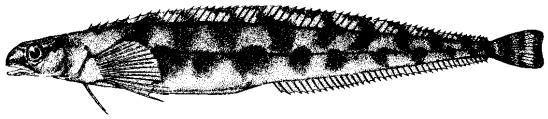


E. 26.0 mmTL



F. 33.0 mmTL

Leptoclinus maculatus (Fries, 1838)
Stichaeidae
Daubed shanny



Range: Circumpolar; in the western North Atlantic from Ellesmere Island, both coasts of Greenland, Baffin Island, Hudson Bay and Labrador to Cape Cod, including Gulf of St. Lawrence, Bay of Fundy and other bays; larvae occur as far south as New Jersey

Habitat: Demersal, usually on shoals in depths of 2–91 m; in Bay of Fundy over sloping, mud substrates; off Labrador found as deep as 110 m on mud, sand or stony substrates; off west Greenland, found as deep as 475 m

Spawning: Winter in shoal areas

Meristic Characters

Myomeres:	66–72
Vertebrae:	66–72
Dorsal fin rays:	57–64
Anal fin rays:	I, 34–40
Pectoral fin rays:	14–16
Pelvic fin rays:	I, 3
Caudal fin rays:	–

Eggs: – Undescribed

Larvae:
- Hatching occurs at unknown size
- Body elongate with small head, moderately pointed snout, fairly large mouth
- Preanus length <50% SL
- Postanal myomeres: 38–44
- Dorsal and anal fins long-based
- Pectoral fins wide and fan-shaped, situated just below midline of body
- Pigment includes lateral, external melanophores on gut and about 38–44 postanal spots along the anal fin base; pigment absent on venter anterior to anus, on head, on dorsum of body and internally on notochord

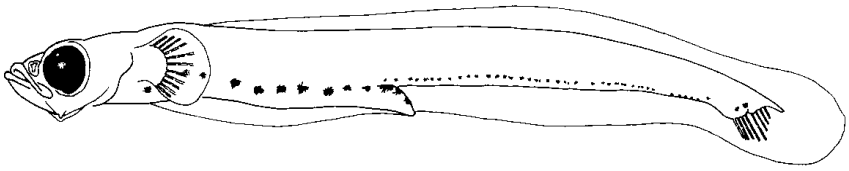
Note:
1. Larva in Fig. D originally described as *Stichaeus punctatus* (Dunbar, 1947)
2. See 17.0 mm larva on *Anisarchus medius* page, originally described by Ehrenbaum (1905). This larva was ascribed to *Leptoclinus maculatus* by Faber (1976) despite the lack of pigment spots on lateral surface of gut.

Figures: Adult: D. R. Harriott (Scott and Scott, 1988); **A–C**: Faber, 1976 (B redrawn); **D**: Dunbar, 1947; **E**: Kathryn Garrison (Matarese *et al.*, 1989)

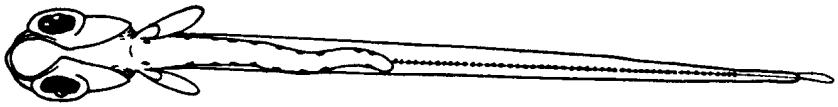
References: Andriashev, 1954; Faber, 1976; Scott and Scott, 1988; Able and Fahay, 1998; Collette, 2002f; Mecklenburg and Sheiko, 2004

Leptoclinus maculatus

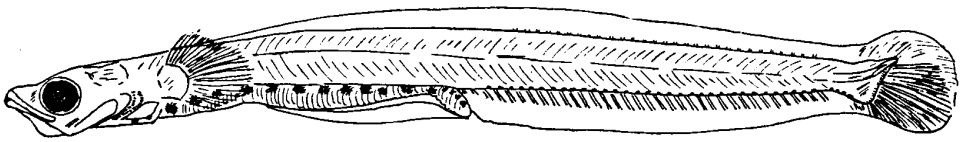
A. 13.5 mmTL (Dorsal View)



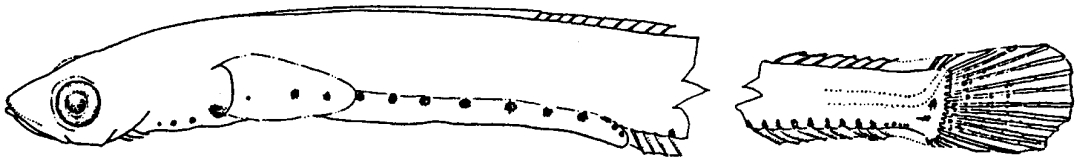
B. 13.5 mmTL



C. 13.5 mmTL (Ventral View)

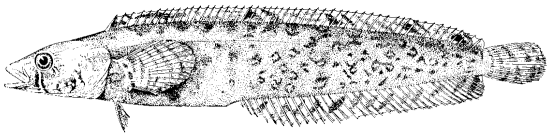


D. 21.0 mmTL



E. 31.3 mmSL

Stichaeus punctatus (Fabricius, 1780)
Stichaeidae
Arctic shanny



Range: Circumpolar in arctic and subarctic waters; in the western North Atlantic from Hudson Bay, Baffin Island, Davis Strait, Labrador, Newfoundland, Gulf of St. Lawrence and Nova Scotia to Massachusetts Bay

Meristic Characters

Myomeres:	51–56
Vertebrae:	51–56
Dorsal fin rays:	46–50
Anal fin rays:	I–II, 32–38
Pectoral fin rays:	15–16
Pelvic fin rays:	I, 4
Caudal fin rays:	–

Habitat: Demersal in cold waters; often near low-tide mark, but also on offshore banks to 73 m; maximum depth 183 m on Georges Bank; usually on pebbly, gravelly, stony or shelly substrates where they take shelter under structure; young stages defend territories; some seasonal offshore movements have been described

Spawning: Winter (Feb–Mar) in Newfoundland

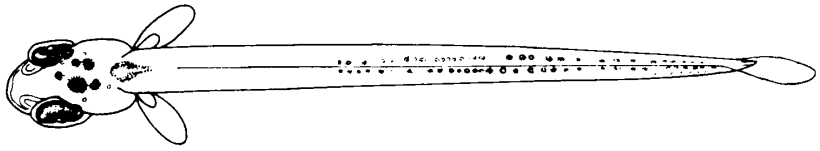
Eggs:
- Demersal and adhesive, deposited in ovoid shaped mass
- Diameter: 1.7 mm

Larvae:
- Hatching occurs at unknown size
- Body elongate with small head, moderately pointed snout and moderate mouth
- Preanus length <50% SL
- Postanal myomeres: 33–37
- Dorsal and anal fins long-based
- Pectoral fins wide and fan-shaped, situated just below midline of body
- Pigment is present internally on the dorsal surface of the gut; the venter of the mid-gut is pigmented with a streak of melanophores; pigment is also present on the head and on the dorsum of the posterior half of body; notochordal pigment is present in small sizes; note streaks of pigment on hypaxial limbs of postanal myosepta; midline pigment develops in larger larvae

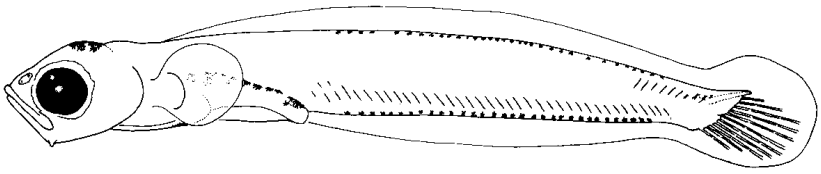
Note:
1. A larva designated as "*Chirolophis*?" (Dannevig, 1919) is a larval *Stichaeus punctatus*
2. Two larvae designated as *Stichaeus punctatus*, 22 mm (Dunbar, 1947) and 30 mm (Dannevig, 1919) have been identified as *Leptoclinus maculatus* (Faber, 1976)

Figures: Adult: D. R. Harriott (Scott and Scott, 1988); **A–C**: Faber, 1976 (B redrawn); **D**: Farwell, *et al*., 1976 (modified, reversed)
References: Faber, 1976; Farwell, *et al*., 1976; Scott and Scott, 1988; Collette, 2002f

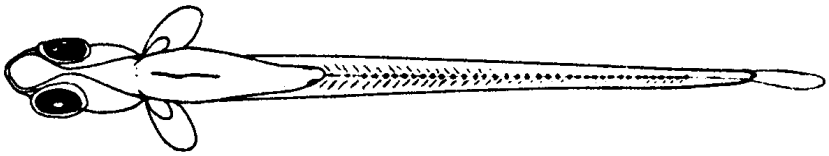
Stichaeus punctatus



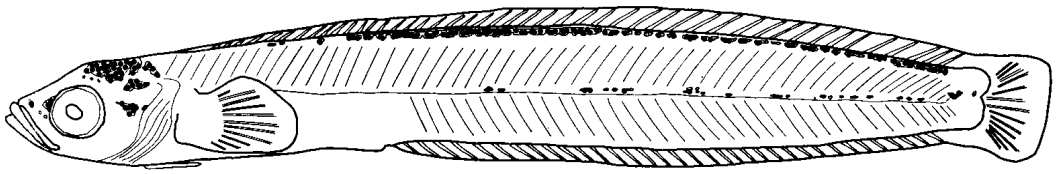
A. 13.5 mmTL (Dorsal View)



B. 13.5 mmTL

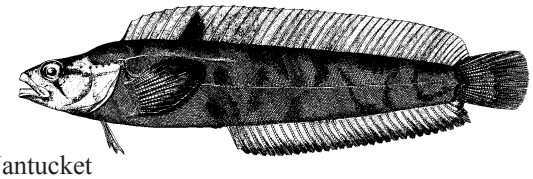


C. 13.5 mmTL (Ventral View)



D. 25.5 mmSL

Ulvaria subbifurcata (Storer, 1839)
Stichaeidae
Radiated shanny



Range: Western North Atlantic Ocean from Strait of Belle Isle to Nantucket Shoals and Vineyard Sound, Massachusetts; widespread in Gulf of Maine; larvae very abundant in some Maine river-estuaries and occur as far south as New Jersey

Habitat: Rocky shores and substrates with algal growth in depths to >55 m; adults inactive during daylight

Spawning: Early spring-summer (Newfoundland); males guard egg masses

Eggs:
- Demersal, adhesive, deposited in masses
- Diameter: 1.55 mm
- Oil globule: single, large
- Incubation: 35–40 days

Larvae:
- Hatching occurs at sizes of about 6.6 mmTL
- Body elongate with small head, moderately pointed snout
- Preanus length <50% SL
- Postanal myomeres: 28–33
- Dorsal and anal fins long-based
- Pectoral fins wide and fan-shaped, situated just below midline of body
- Pigment is present internally on the dorsal surface of the gut; the venter of the mid-gut is pigmented with a streak of melanophores and a single spot occurs at the anus; pigment is also present on the head and on the dorsum of the posterior third of body; notochordal pigment is present in small sizes; the hypaxial limbs of postanal myosepta are unpigmented

Note: 1. Larvae described as *Lumpenus lampretaeformis* (Colton and Marak, 1969) refer to this species

Early Juvenile: Larvae descend to bottom habitats at about 18.0 mm (Aug)

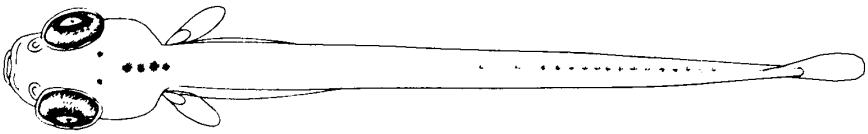
Meristic Characters

Myomeres:	45–49
Vertebrae:	45–49
Dorsal fin rays:	43–44
Anal fin rays:	II, 30–31
Pectoral fin rays:	15
Pelvic fin rays:	I, 3
Caudal fin rays:	–

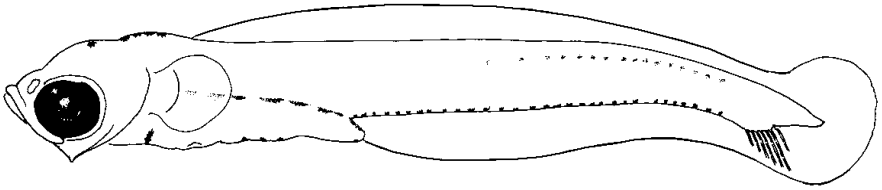
Figures: Adult: H. L. Todd (Collette, 2002f); **A–C**: Faber, 1976 (B redrawn); **D–F**: Colton and Marak, 1969

References: LeDrew and Green, 1975; Faber, 1976; Scott and Scott, 1988; Able and Fahay, 1998; Collette, 2002f

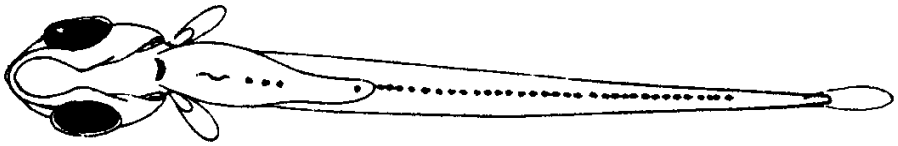
Ulvaria subbifurcata



A. 7.2 mmTL (Dorsal View)



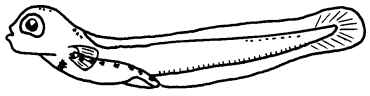
B. 7.2 mmTL



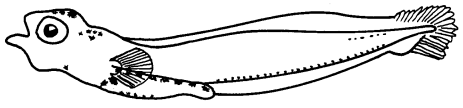
C. 7.2 mmTL (Ventral View)

Larvae described as *Lumpenus lampretaeformis* by Colton and Marak (1969) have been ascribed to *Ulvaria subbifurcata* by Faber (1976)

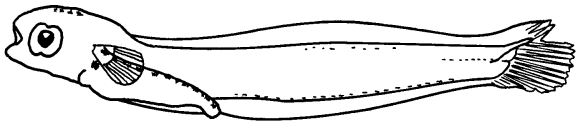
D. 6.9 mmTL



E. 9.0 mmTL



F. 13.5 mmTL



Melanostigma atlanticum Koefoed, 1952
Zoarcidae
Atlantic soft pout

Range: North Atlantic ocean; in the western North Atlantic from Greenland, Gulf of St. Lawrence, southern Newfoundland and Grand Bank to Cape Hatteras; also eastern Atlantic and Mediterranean Sea

Habitat: Meso- to benthopelagic, drifting passively in water column at depths of 200–2,000 m; descend to bottom for spawning

Spawning: Presumably summer over Continental Slope; sexually dimorphic – males have fang-like teeth on jaws and vomer; females produce 26–106 eggs; males, females and eggs have been found in burrows

Meristic Characters

Myomeres:	83–93
Vertebrae:	83–93 (62–76 caudal)
Dorsal fin rays:	92–99
Anal fin rays:	77–84
Pectoral fin rays:	6–8
Pelvic fin rays:	none
Caudal fin rays:	–

Eggs:
- Deposited in burrows
- Diameter: up to 3.9 mm

Larvae:
- Hatching (at undescribed size) and early development presumably occurs in burrow
- Early pelagic stages resemble adults:
- Body elongate, tapering to narrow caudal peduncle
- Preanus length about 30% SL
- Head and anterior body brilliant blue; remainder of body transparent, with loose, delicate skin
- Head small, with rounded snout, large eye
- Mouth small, oblique, terminal
- Elongate teeth on jaws, vomer and palatines
- Larval pigment pattern undescribed; earliest stages collected resemble adults

Note: 1. Young stages as small as 24.0 mm have been collected

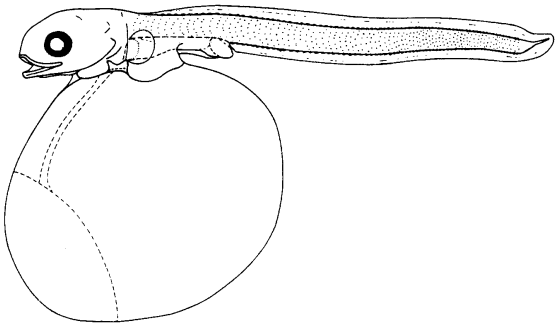
Figures: Adult: Todd and Stackhouse (Scott and Scott, 1988); **A**: Kendall *et al*., 1983; **B**: Rass, 1949; **C**: Okiyama, 1982

References: M^{c}Allister and Rees, 1964; Wenner, 1978; Markle and Wenner, 1979; Kendall *et al*., 1983; Scott and Scott, 1988; Klein-M^{ac}Phee and Collette, 2002b

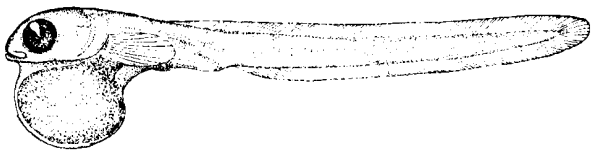
Melanostigma atlanticum

Larval zoarcids are almost never collected in plankton nets and few have been described (Anderson, 1984). Most are morphologically advanced at hatching and strongly resemble adults. With the exception of *Zoarces*, zoarcids are oviparous. A generalized life history schedule for the family Zoarcidae follows:

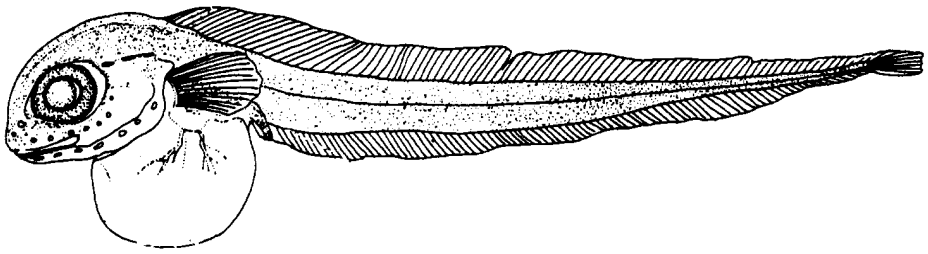
- Eggs are large (to 9.2 mm), demersal, adhesive and have a single oil globule
- Egg clusters are encased in a gelatinous matrix
- Egg clusters are deposited in burrows where adults guard the egg mass
- Hatching occurs within the burrow
- Larval pigment patterns lacking in the few species described
- After hatching, larvae retain a large yolk sac to a large body size
- Early stages are probably demersal or semidemersal immediately after hatching



A. 11.0 mmTL
(Unidentified zoarcid found buried in sediments, Northeast Pacific Ocean)

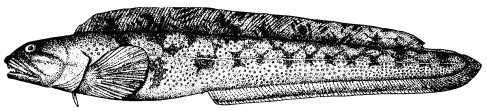


B. 24.6 mmTL
(Yolk sac larva of *Gymnelus viridis*, Barents Sea)



C. 35.5 mmSL
(Yolk sac larva of *Bothrocara hollandi*, western Pacific Ocean)

Zoarces americanus (Bloch and Schneider, 1801)
Zoarcidae
Ocean pout



Range: Western North Atlantic Ocean from Labrador to Chesapeake Bay, most commonly from northern Gulf of St. Lawrence and Nova Scotia to New Jersey

Habitat: Demersal, in depths from intertidal zone to a maximum depth of 363 m; usually associates with algal growth, ledges, or rocky, pebbly or shell debris substrates; probably excluded from soft, muddy bottoms; usually in temperatures of 6–9°C; early stages, from hatchling to juveniles, remain closely associated with bottom habitats

Meristic Characters

Myomeres:	129–146
Vertebrae:	25–28 + 103–118
Dorsal fin rays:	92–103+16–24+16–31
Anal fin rays:	105–124
Pectoral fin rays:	18–21
Pelvic fin rays:	3
Caudal fin rays:	8

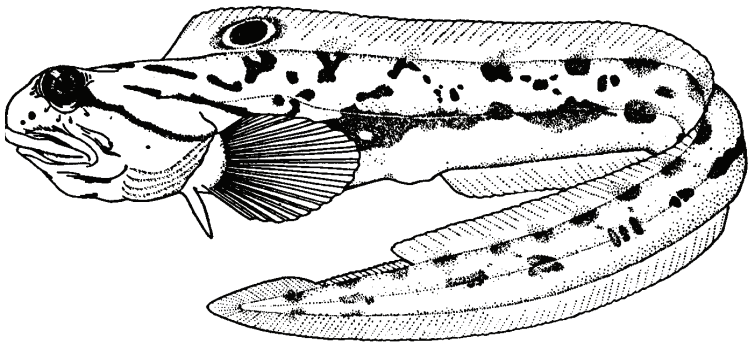
Spawning: Aug–Oct, Newfoundland to New Jersey; internal fertilization followed by deposition of eggs (unlike viviparity in eastern Atlantic *Zoarces viviparus*); copulation and egg deposition occur in nearshore rocky areas; females guard egg masses for 2–3 months; hatching occurs in winter (Jan–Feb)

Eggs:
- Spherical, encased in gelatinous matrix
- Diameter: 6.0–9.2 mm
- Chorion: Thick, yellowish, pale white or light brownish
- Yolk: homogeneous
- Oil globule: single, 3.2 mm in diameter

Larvae:
- Hatch with juvenile characteristics (but with vestige of yolk material), at sizes about 30.0 mm; larger and more developed than *Zoarces viviparus* at "birth"
- Full complement of fin rays formed at hatching
- Dorsal and anal fins long-based; pectoral fin wide and fan-shaped
- Teeth well developed at hatching
- "First-feeding" stage begins within 24 h of hatching
- Body elongate, with small head, well-rounded snout, small mouth; lips become thickened
- Checkered pigment pattern typical of early stages; ocellus forms on anterior dorsal fin rays in juveniles about 50 mm; pattern breaks up in older juveniles, and typical streaks form on head behind eye;

Note:
1. The eastern Atlantic congener, *Zoarces viviparus*, is viviparous, with internal fertilization; eggs hatch within ovary of adult and young are "born" with yolk mass attached

Juvenile:

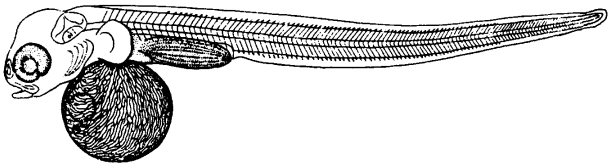


F. 387 mm

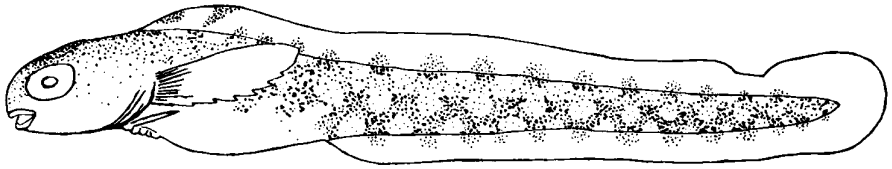
Figures: Adult: Todd and Stackhouse (Scott and Scott, 1988); **A**: Soin, 1968; **B**: White, 1939; **C–D**: S.J. Stephen (Methven and Brown, 1990); **E–F**: Louella E. Cable (Bigelow and Schroeder, 1953) (F reversed)

References: Bigelow and Schroeder, 1953; Scott and Scott, 1998; Methven and Brown, 1990; Klein-M^{ac}Phee and Collette, 2002b

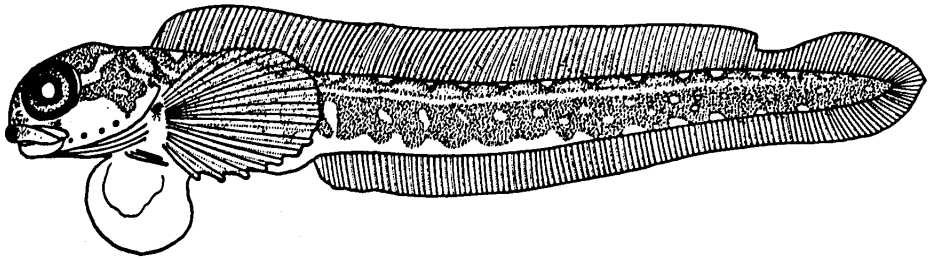
Zoarces americanus



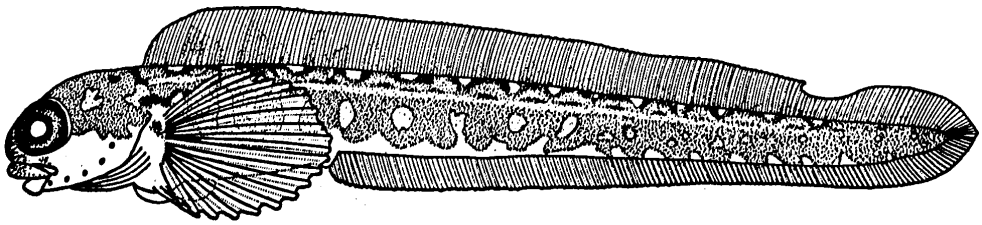
A. 17.1 mmTL (*Zoarces viviparus*)



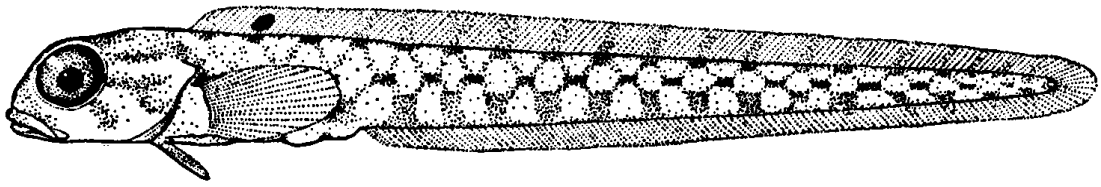
B. 30.0 mmSL



C. 34.5 mmSL



D. 40.4 mmSL



E. 48.0 mmSL