

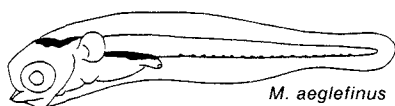
**GADIFORMES**  
**Gadoidei**

**Gadidae, Merlucciidae, Moridae**  
**Bregmacerotidae, Macrouridae**

**General characters**

- Eggs** — Pelagic, buoyant, and usually small.  
— Membrane smooth, except hexagonal sculpting in Macrouridae.  
— Yolk homogeneous, usually with single oil globule, or multiple coalescing to one in few genera, or none in few genera (see table, p. 169).
- Larvae** — Pigment patterns usually well-developed at hatching.  
— In early larvae, vent opens at side of finfold (not at margin); gut short and coiled; preanal length from 33% to 50% SL.  
— Pelvic fins thoracic (rarely jugular) in position, and usually elongate.  
— There may be 1, 2 or 3 dorsal fins, and 1 or 2 anal fins.  
— High numbers of dorsal and anal fin rays.  
— Barbels often form on symphysis of lower jaw (on snout in some species).  
— No head spines present during larval development (except in *Gaidropsarus*).  
— Gradual transformation, followed by pelagic-juvenile stage (except in Moridae and Macrouridae?).

**Discriminating early larvae of three species**



*Melanogrammus aeglefinus*. Single row of ventral spots along tail; no dorsal pigment on tail until later in development.

*Gadus morhua*. Three ventral accumulations of pigment on tail, including one on notochord tip; two dorsal accumulations of pigment on tail; ventral accumulations longer than dorsal and extend farther posteriorly.

*Pollachius virens*. Two ventral and two dorsal accumulations of pigment on tail (none at notochord tip); dorsal accumulations longer and unpigmented space between ventral groups wider than space between dorsal groups.

- The above illustrations are schematic on same body outline with pigment exaggerated. In larger larvae (>15 mm), when pigment patterns fuse, counts of precaudal vertebrae, anal fin rays and caudal rays on superior hypural are diagnostic (see below):

	<i>Melanogrammus aeglefinus</i>	<i>Gadus morhua</i>	<i>Pollachius virens</i>
Precaudal vertebrae	19–22	17–20	23–25
First anal rays (A <sub>1</sub> )	21–25	20–24	24–28
Second anal rays (A <sub>2</sub> )	20–24	17–22	20–21
Formation of anus	Under anterior end of 2nd dorsal	Under anterior end of 2nd dorsal	Under posterior end of 1st dorsal
No. of caudal rays on superior hypural	5	4	5

**Gadidae, Merlucciidae, Moridae  
Bergmacerotidae, Macrouridae**

**GADIFORMES  
Gadoidei**

**Developmental characters in genera of the family Gadidae and four other gadoid families.**

Character	Gadidae			
	<i>Brosme</i>	<i>Enchelyopus</i> , <i>Gaidropsarus</i>	<i>Urophycis</i> , <i>Phycis</i>	<i>Gadus</i> , <i>Pollachius</i> , <i>Melanogrammus</i>
No. of dorsal fins <sup>1</sup>	1	1 (modified)+1	2	3
No. of anal fins <sup>1</sup>	1	1	1	2
First fin to form	Pelvic	Pelvic	Pelvic	Caudal (Pelvic late)
No. of pelvic rays — larvae	3	4	3-4	
No. of pelvic rays — adults	4-5	5-7,8-9	2-3	6-7
Pelvic fin elongate?	Yes	Yes	Yes	No
Formation of pectoral rays	Late	Late	Late	Late
Body shape	Elongate	Stocky	Stocky	Elongate
Range of vertebrae	64-66	51-55	45-50	49-57
Egg diameter (mm)	1.3-1.5	0.66-0.98	0.63-0.97	1.0-1.8
No. of oil globules	1	Multiple to 1	Multiple to 1	None
Other features	Barbel forms on lower jaw in juveniles	Barbels form on lower jaw and snout  Pterotic spines present in <i>Gaidropsarus</i> and eastern Atlantic <i>Phycis</i>	Barbel forms on lower jaw	Barbel forms on lower jaw during/ after juv. stage

Character	Moridae <sup>2</sup>	Bregmacerotidae	Merlucciidae	Macrouridae <sup>2</sup>
No. of dorsal fins <sup>1</sup>	2	1 single ray on head plus 1 fin (divided by low midsection)	2 (2nd divided by low midsection)	2
No. of anal fins <sup>1</sup>	1-2	1 (divided)	1 (divided)	1
First fin to form	Pelvic	Pelvic (with 1st dorsal ray)	Caudal (pelvic in midsequence)	Pelvic (with anal and dorsal)
No. of pelvic rays	6-9	3	7	5-17
Pelvic fin elongate?	Yes (most)	Yes	Moderately	Moderate (stalked)
Formation of pectoral rays	?	Late	Late	Late (paddle- shaped)
Body shape	Tapers to nar- row peduncle	Elongate	Elongate	Attenuated
Range of vertebrae	?	47-59	53-56	80-116+
Egg diameter (mm)	?	?	0.8-1.2	1.0-4.0
No. of oil globules	?	?	1	1
Other features	Barbel forms on lower jaw in some			Barbel on lower jaw in some; no caudal fin

<sup>1</sup> Number of dorsal and anal fins reflects external appearance, not structure or spacing of pterygiophores.

<sup>2</sup> See illustrations in Miscellaneous Section (p. 396).

**GADIDAE*****Brosme brosme* (Müller)**

**Spawning:** April–July in the Gulf of Maine.

**Meristic features**

- |             |   |  |
|-------------|---|--|
| <b>Eggs</b> | <ul style="list-style-type: none"> <li>— Pelagic, buoyant and spherical, usually with coppery tint.</li> <li>— Diameter: 1.3–1.5 mm.</li> <li>— Shell: smooth (finely pitted).</li> <li>— Yolk: homogeneous.</li> <li>— Oil globules: 1 (pinkish).</li> <li>— O.G. diameter: 0.25–0.30 mm.</li> <li>— Perivitelline space: narrow.</li> </ul> | <ul style="list-style-type: none"> <li>Myomeres : 64–66</li> <li>Vert : 64–66</li> <li>D : 85–105</li> <li>A : 71–76</li> <li>Plv : 4–5</li> </ul> |
|-------------|---|--|

- Larvae**
- Hatching occurs at about 4 mm; oil globule posterior in yolk; little eye pigment; characteristic larval pigment pattern present.
  - Yolk absorbed at about 5 mm.
  - Body; elongate and tapered, with short rounded snout.
  - Barbel forms on lower jaw at about 37 mm.
  - Sequence of fin formation: Plv, C, D and A, P.
  - Three pelvic rays form at 6 mm, not connected by membrane, the middle ray being shortest (fourth or fifth tiny rays sometimes visible medially); dorsal and anal rays begin forming at about 12.5 mm and are complete at 28 mm; caudal rays also begin forming at 12.5 mm.
  - Transformation occurs at about 40 mm.
  - Pigmentation: spots on crown, peritoneum and body margin over gut; two bands on tail, each paired or constricted at midline; prominent pigment at end of notochord, on finfold or caudal rays; pelvic fins heavily pigmented on distal portion.

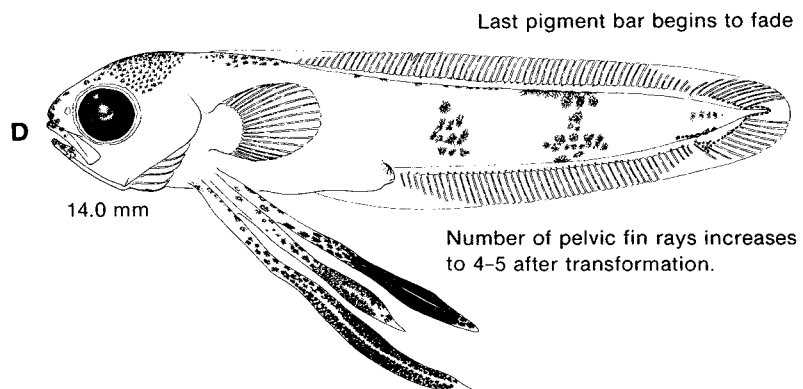
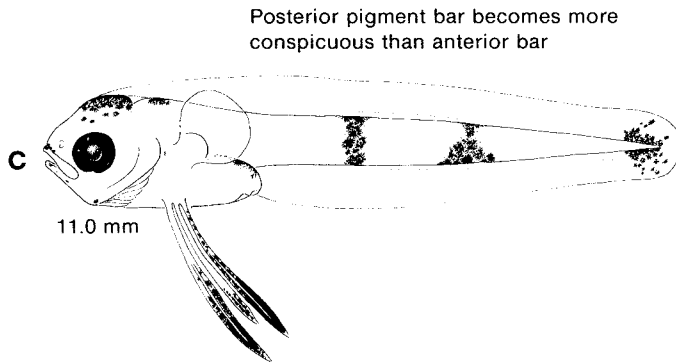
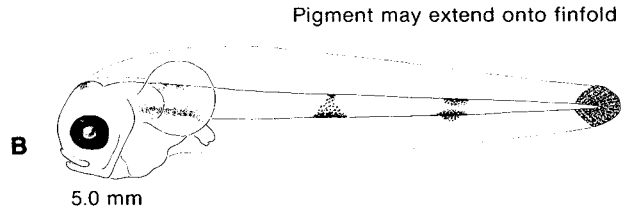
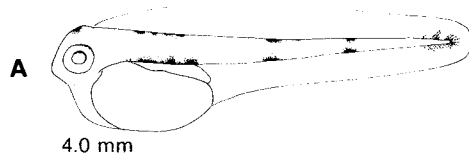
**Note:** Early eggs similar to those of *Scomber scombrus* (p. 318), separable by fine pitting in *Brosme brosme*; early larvae superficially similar to *Lophius americanus* (see note, p. 190).

**Fig.** — A–D, Schmidt 1905b (redrawn).

**Ref.** — Leim and Scott 1966; Colton and Marak MS 1969.

***Brosme brosme***

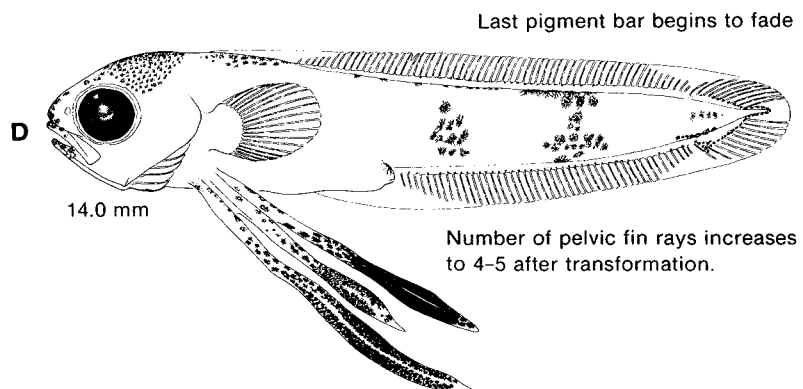
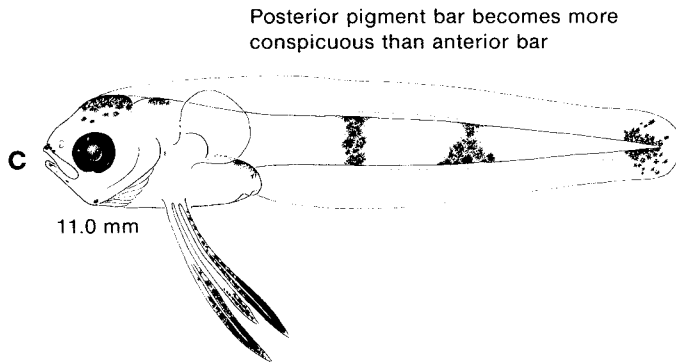
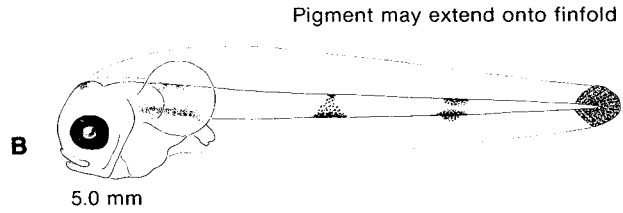
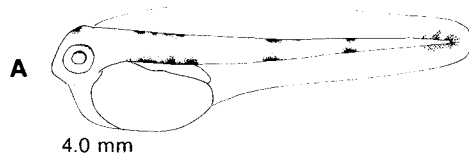
**GADIDAE**



A-D (eastern Atlantic material)

***Brosme brosme***

**GADIDAE**



A-D (eastern Atlantic material)

**GADIDAE*****Enchelyopus cimbrius* (Linnaeus)****Spawning:** May to October.**Meristic features**

<b>Eggs</b>	— Pelagic, buoyant, spherical and transparent.	Myomeres : 51-55
	— Diameter: 0.66-0.98 mm.	Vert : 51-55
	— Shell: smooth.	D : 1, ~50, 45-55
	— Yolk: homogeneous.	A : 39-49
	— Oil globules: multiple, coalesce to 1 (greenish-yellow); pigmented.	P <sub>lv</sub> : 5-7
	— O.G. diameter: 0.13-0.20 mm (when single).	P : 15-19
	— Perivitelline space: narrow.	

- Larvae**
- Hatching occurs at 1.6-2.4 mm (late embryo has characteristic larval pigment pattern and lightly pigmented eyes).
  - Body short and stocky with rounded head and snout.
  - Vent opens laterally on finfold (not at margin) in early larvae.
  - Yolk absorbed at about 3.6 mm.
  - Barbel develops on lower jaw at about 10 mm NL (3 barbels form on snout during juvenile stage).
  - Pigmented pelvic rays develop early at about 3 mm; second dorsal and anal fins begin to form at about 6 mm and are complete before 10 mm; first dorsal fin begins to form at about 10 mm and is complete at 15-20 mm (unique first dorsal fin, with one long ray followed by about 50 very short separate rays, Fig. G); pectoral rays develop last.
  - Transformation occurs at about 20 mm (after development of first dorsal fin).
  - Pigmentation: spots on snout and crown; nape and peritoneal pigment sometimes merged into oblique swath as in *Gaidropsarus*; band on midtail, most dense at dorsal and ventral margins; spot at notochord tip on finfold (disappears with caudal ray formation); entire pelvic fin black with pigment, which persists until transformation when it may be restricted to distal part of fin only.

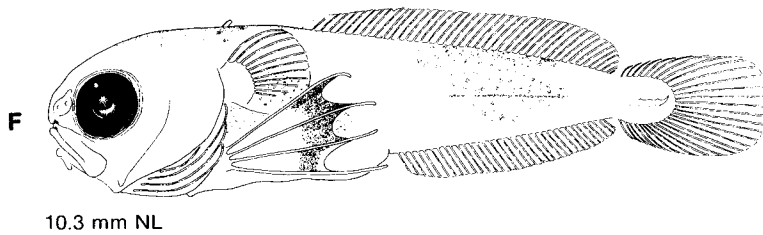
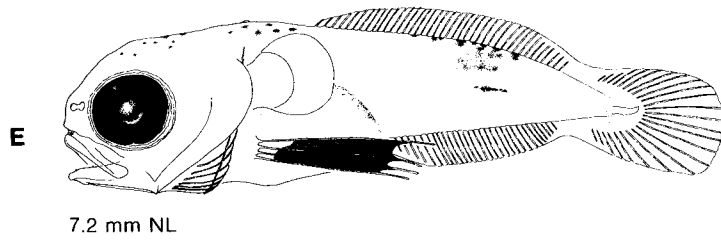
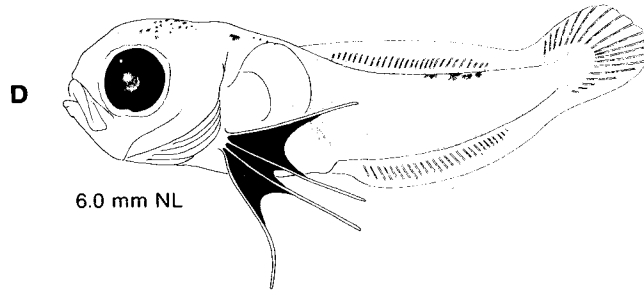
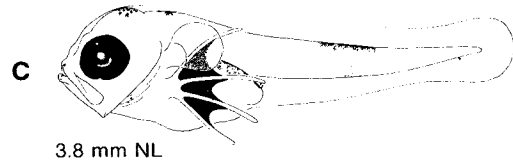
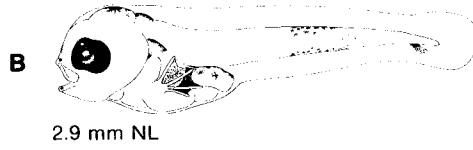
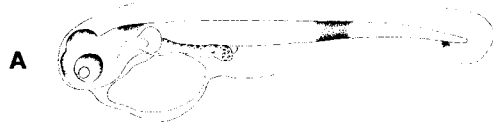
- Note:**
- (1) Meristic characters above pertain to material north of Cape Hatteras (Cohen and Russo, 1979).
  - (2) Early larvae of *Urophycis* (and *Phycis*?) lack pigment at tip of notochord, and pigment on pelvic fin (if present) is restricted to the tips of the rays. Later larvae are distinguished by the structure of the first dorsal fin, barbels on the snout and number of pelvic fin rays (2-3 in *Urophycis*, 3-4 in *Phycis*, and 5-7 in *Enchelyopus*).
  - (3) See Markle (1982) for description of larval *Gaidropsarus ensis* and Demir (1982) for larval descriptions of two Mediterranean species of *Gaidropsarus*. Prominent posttemporal (or pterotic) spines are present in the larvae of all three species; otherwise larvae are very similar to *Enchelyopus*.

**Fig.** — **A-F**, M. P. Fahay (see p. 11); **G**, Cohen and Russo 1979.

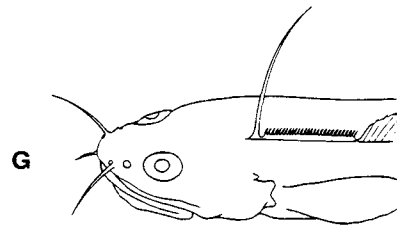
**Ref.** — Colton and Marak MS 1969; Markle 1982.

*Enchelyopus cimbricus*

GADIDAE



Number of pelvic fin rays  
increases to 5-7 after transformation



Adult

**GADIDAE*****Urophycis chuss* (Walbaum)****Spawning:** Summer into autumn.**Meristic features**

- Eggs**
- Pelagic, buoyant, spherical and transparent.
  - Diameter: 0.63–0.97 mm (most 0.7–0.8 mm).
  - Shell: smooth.
  - Yolk: homogeneous.
  - Oil globules: multiple, coalesce into 1 (pigmented).
  - O.G. diameter: 0.17–0.20 mm.
  - Perivitelline space: narrow.

Myomeres: 45–50  
 Vert : 14–16+32–36  
 D : 9–11, 53–64  
 A : 45–56  
 Piv : 2  
 P : 16

(See note 1 below)

- Larvae**
- Hatching occurs at 1.8–2.0 mm; eyes unpigmented, and body pigment scattered.
  - Body long and tapering, with bulbous head.
  - Vent opens laterally on finfold (not at margin) in early larvae.
  - Gut becomes short and coiled; preanal length <50% SL.
  - Head length about 25% SL; body depth at pelvic fin origin 25% SL.
  - Barbel appears on lower jaw at about 15 mm.
  - Three pelvic rays develop early (at 2.75 mm NL) and extend to anus by about 6 mm NL; long anal and second dorsal fins formed by 6.6 mm NL; short first dorsal and pectoral rays form last.
  - Transformation occurs at about 25 mm (pelagic-juvenile stage); descent to bottom occurs at 35–40 mm.
  - Pigmentation: in early larvae, spots between eyes and on forehead, scattered spots on dorsal and ventral body margins, and oil globule pigmented; rapid change in later larvae, with spots on nape, crown and peritoneum, black pigment on tips of pelvic fin membrane; pair of spots on midtail (one dorsal and one ventral); midline stripe develops and ventral spot at midtail disappears.

**Note:** (1) Vertebral count distribution in 414 *U. chuss* pelagic-juveniles from the Middle Atlantic Bight:

Pre-caudal	Caudal				
	32	33	34	35	36
16	—	—	—	1	—
15	1	40	254	53	1
14	—	2	27	31	1

(2) The larval development of *Urophycis tenuis* and *Phycis chesteri* is undescribed. Postlarvae and juveniles of these species resemble *U. chuss* and the larvae are presumably very similar.

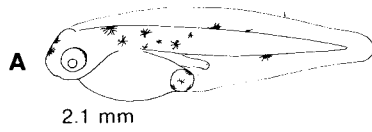
**Fig.** — **A-B**, Miller and Marak 1959; **C-F**, Hildebrand and Cable 1938 (all redrawn).

**Ref.** — Miller MS 1958; Musick 1973.

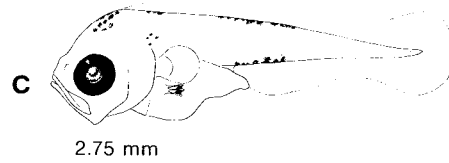
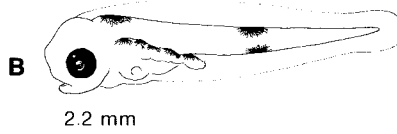


***Urophycis chuss***

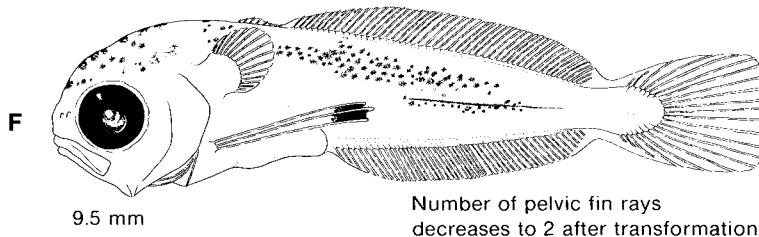
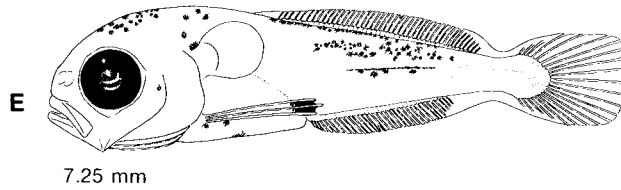
**GADIDAE**



Dorsal and ventral tail spots  
occupy same myomeres



Pigment on tail heavier than  
in *Enchelyopus* (p. 172)



**GADIDAE*****Urophycis regia* (Walbaum)**

**Spawning:** Late summer into winter.

- Eggs**
- Pelagic, buoyant, spherical and transparent.
  - Diameter: 0.67–0.81 mm.
  - Shell: smooth.
  - Yolk: homogeneous.
  - Oil globules: multiple, coalesce into 1.
  - O.G. diameter: 0.14–0.22 mm.
  - Perivitelline space: narrow.

**Meristic features**

- Myomeres: 42–49  
 Vert : 13–15+31–35  
 D : 8–9, 43–51  
 A : 41–50  
 Plv : 2  
 (See note below)

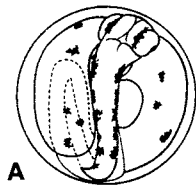
- Larvae**
- Hatching occurs at 1.4–1.6 mm NL: eyes unpigmented, mouth unformed, yolk pigmented, and oil globule pigmented posteriorly.
  - Body long and tapering, with bulbous head (deeper-bodied than *Urophycis chuss*, p. 174).
  - Vent opens laterally on finfold (not at margin) in early larvae.
  - Barbel appears on lower jaw at about 15 mm NL.
  - Pelvic rays develop early at about 4 mm NL; anal and second dorsal rays develop before 7 mm NL (rays in dorsal and anal fins longer than in *U. chuss*); first dorsal formed at about 10 mm NL; pectoral rays are the last to form.
  - Transformation occurs at about 20 mm NL (pelagic-juvenile stage); descent to bottom occurs at 40–50 mm NL.
  - Pigmentation: two spots above and between eyes and one (rarely 2) at snout tip in late embryo and early larva (compare to *U. chuss*); usually two dorsal spots on midtail (usually one in *U. chuss*); no spots at nape or on tips of pelvic fins; streak of spots laterally, and variable pigment over anal fin base; in postlarvae, body pigment consists of large spots overlying a field of smaller spots.

**Note:** Vertebral count distribution in 318 *U. regia* pelagic-juveniles from the Middle Atlantic Bight:

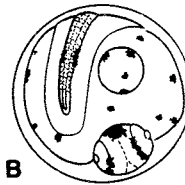
Pre-caudal	Caudal				
	31	32	33	34	35
15	—	1	2	8	—
14	2	98	141	10	4
13	—	6	35	11	—

***Urophycis regia***

**GADIDAE**



**A**  
Late stage egg



**B**  
Late stage egg

7-10 spots along dorsolateral trunk and tail



**C**  
1.98 mm  
Ventral spot at myomeres 27-30

1 or 2 (usually 2) dorsal spots at myomeres 22-26



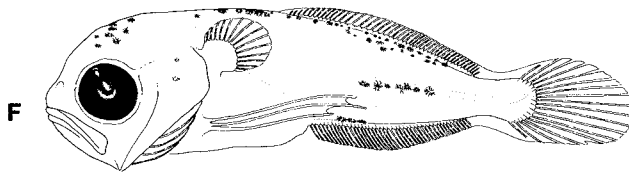
**D**  
2.03 mm

Dorsolateral spots on trunk disappear; migrate to form peritoneal pigment

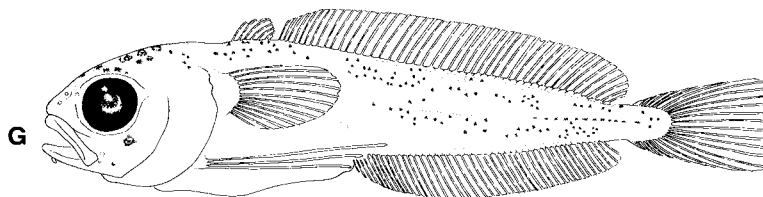


**E**  
2.05 mm  
Dorsal and ventral tail spots separated by a few myomeres

Intermediate sizes similar to *U. chuss* — no pigment on pelvic fin tips, slightly deeper-bodied



**F**  
7.0 mm



**G**  
15.0 mm

Number of pelvic fin rays decreases to 2 after transformation

**GADIDAE*****Gadus morhua* Linnaeus**

**Spawning:** December–April (peak in February), in Georges Bank, Gulf of Maine and Middle Atlantic Bight areas; April–June in Newfoundland and Grand Bank areas.

**Eggs** — Pelagic, buoyant, spherical and transparent.  
 — Diameter: 1.2–1.6 mm.  
 — Shell: smooth.  
 — Yolk: homogeneous.  
 — Oil globules: none.  
 — Perivitelline space: narrow.

**Larvae** — Hatching occurs at 3.3–5.7 mm; mouth unformed but eyes pigmented; characteristic larval pigment present in late stage embryo.  
 — Body and tail long and tapering.  
 — Vent opens laterally on finfold (not at margin) in early larvae; it is located under anterior part of second dorsal fin in later larvae.  
 — Preanal length <50% TL (39% at hatching).  
 — Caudal rays begin formation at about 9 mm; second and third dorsal fin rays and first and second anal fin rays complete at 20 mm; first dorsal fin rays complete at 26–30 mm; pelvic fin buds form at about 13 mm and rays complete at about 23 mm; pectoral rays are the last to form.  
 — Transformation occurs at sizes greater than 20 mm; descent to bottom occurs at 25–50 mm.  
 — Pigmentation: spots on crown, lower jaw and peritoneum; two dorsal and two ventral groups of spots on tail (ventral groups wider and extend farther posterior than dorsal); ventral spots on tip of notochord; distinct preanal streak of ventral pigment present (compare to *Pollachius*, p. 180); lateral continuous streak of pigment forms on tail at about 6.5 mm TL; all tail pigment fuses at 8–10 mm; all unpaired fins unpigmented until transformation.

**Meristic features**

Myomeres: 49–53  
 Vert : 17–20+32–35  
 D : 13–16,16–25,18–21  
 A : 20–24,17–22  
 Piv : 6–7

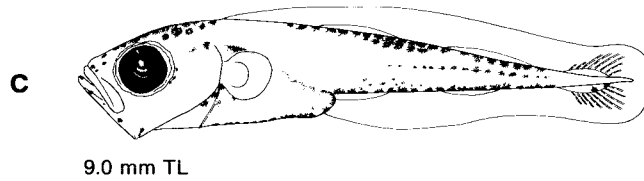
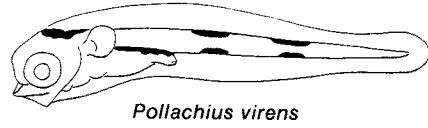
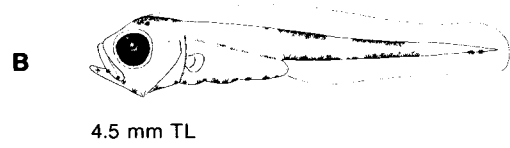
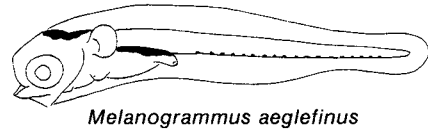
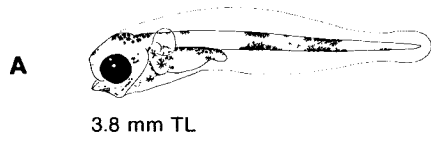
**Note:** (1) Early egg similar to *Melanogrammus* egg (p. 182).  
 (2) See table of comparative features (p. 168).

**Fig.** — **A**, Dannevig 1919; **B–E**, Schmidt 1905a (all redrawn).

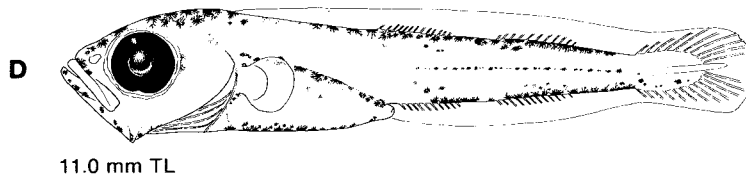
**Ref.** — Schmidt 1906a; Ehrenbaum 1909; Bonnett 1939; Leim and Scott 1966; Colton and Marak MS 1969; Markle 1982.

*Gadus morhua*

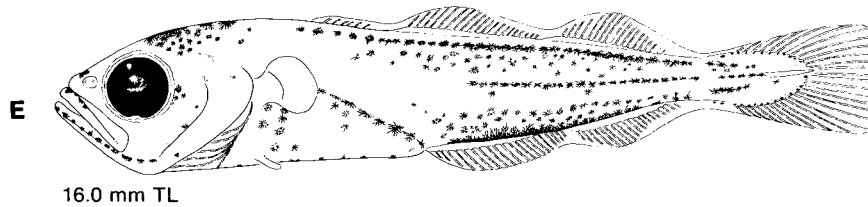
GADIDAE



Ventral pigment farther posterior than dorsal



4 primary caudal rays on superior hypural



Lateral streak originates under middle of second dorsal fin

A-E (eastern Atlantic material)

**GADIDAE*****Pollachius virens* (Linnaeus)**

**Spawning:** September to March (peak November to February); rarely spawns west of Cape Cod.

- Eggs** — Pelagic, buoyant, spherical and transparent.  
 — Diameter: 1.0–1.2 mm.  
 — Shell: smooth.  
 — Yolk: homogeneous.  
 — Oil globules: none.  
 — Perivitelline space: narrow.

- Larvae** — Hatching occurs at 3.0–4.0 mm; eyes unpigmented; anterior pigment scattered and light.  
 — Long tapering body and tail.  
 — Vent forms under posterior part of 1st dorsal fin, and opens laterally on finfold (not at margin) in early larvae.  
 — Transformation occurs at >25 mm (juveniles descend to bottom at <50 mm).  
 — Sequence of fin formation: caudal, 2nd and 3rd dorsals and 1st and 2nd anals, 1st dorsal, pectoral, and pelvic.  
 — Caudal fin rays begin forming at about 9 mm; 2nd and 3rd dorsal and 1st and 2nd anal rays begin to form at about 11 mm.  
 — Pelvic fin buds present at 12.5 mm.  
 — Pigmentation: spots on crown, lower jaw and peritoneum; 2 dorsal and 2 ventral groups of spots on tail, dorsal groups wider than ventral groups, more space between ventral groups, dorsal groups fuse at about 9 mm; no pigment at notochord tip; preanal ventral streak weak, shorter than streak in *Gadus*; lateral interrupted streak distinct at 6.7 mm, most intense posteriorly.

**Meristic features**

Myomeres: 53–57  
 Vert: 23–25+29–32  
 D : 13–14,21–22,24–28  
 A : 24–28,20–21  
 Plv : 6–7  
 P : 19–22

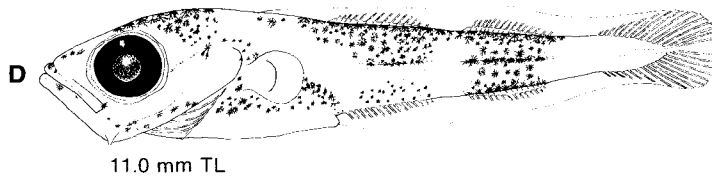
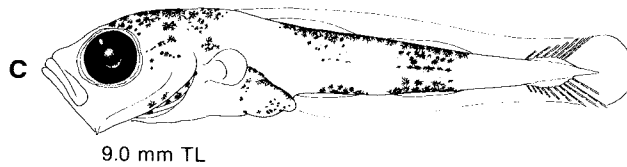
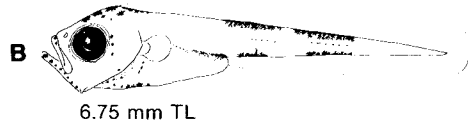
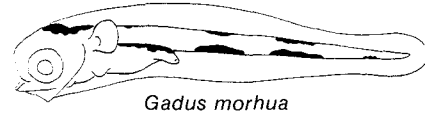
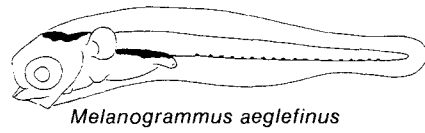
**Note:** See table of comparative features of various gadids (p. 168).

**Fig.** — **A**, Rass 1949; **B–E**, Schmidt 1905a (all redrawn).

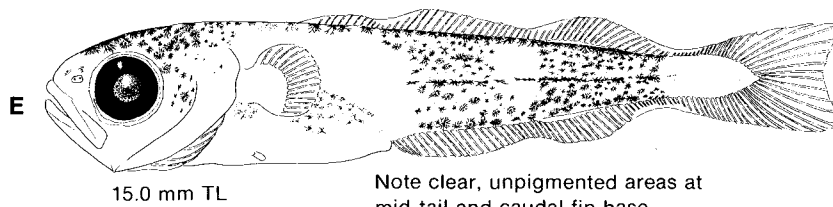
**Ref.** — Schmidt 1906a; Leim and Scott 1966; Colton and Marak MS 1969; Markle 1982.

***Pollachius virens***

**GADIDAE**



5 primary caudal rays  
on superior hypural



## GADIDAE *Melanogrammus aeglefinus* (Linnaeus)

**Spawning:** January to July (peak in spring).

### Meristic features

<b>Eggs</b>	— Pelagic, buoyant, spherical, and transparent.	Myomeres: 50-57
	— Diameter: 1.20-1.60 mm.	Vert : 19-22+32-35
	— Shell: smooth.	D : 14-17,20-24,19-22
	— Yolk: homogeneous.	A : 21-25,20-24
	— Oil globules: none.	Plv : 6-7
	— Perivitelline space: narrow.	P : 19-21

**Larvae**

- Hatching occurs at 2-4 mm NL; eyes unpigmented; mouth unformed.
- Body slightly deeper than in *Gadus* and *Pollachius*; head blunt and large.
- Vent forms under anterior half of 2nd dorsal fin, and opens laterally on finfold (not at margin) in early larvae.
- Preanal length <50% TL, increasing slightly with growth.
- Transformation occurs at about 20 mm NL.
- Sequence of fin formation: caudal, 2nd and 3rd dorsals and 1st and 2nd anals, 1st dorsal, pectoral and pelvic.
- Caudal fin rays begin to form at about 7 mm; dorsal and anal rays at 9-10 mm.
- First dorsal last unpaired fin to develop rays; all rays complete at 16-20 mm.
- Finfold between adjacent unpaired fins disappears by 25 mm.
- Pigmentation: spots on crown, dorsum over gut, and peritoneum; row of ventral spots from vent to notochord tip (persists until about 10 mm); no preanal ventral pigment, or very few weak spots >9 mm; pigment on sides spreads posteriorly, but lateral streak does not form; pectoral and pelvic fins develop pigment at 10-15 mm; larger juveniles paler and first dorsal fin higher than in *Gadus* and *Pollachius*.

- Note:**
- (1) Pelagic juvenile *M. aeglefinus* (28-100 mm) often associate with medusae.
  - (2) Early larvae of *M. aeglefinus* are similar to *Myoxocephalus aeneus* (p. 226) and *M. octodecemspinosus* (p. 228), but the latter species lack head pigment in early stages and have fewer myomeres.
  - (3) See table of comparative features of various gadids (p. 168)
  - (4) Second dorsal develops before 1st dorsal (Fig. C), but, as illustrated by Rass (1949), it appears that 1st dorsal rays form before 2nd dorsal rays.
  - (5) Early eggs similar to *Gadus morhua* (p. 178) and *Glyptocephalus cynoglossus* (p. 372)

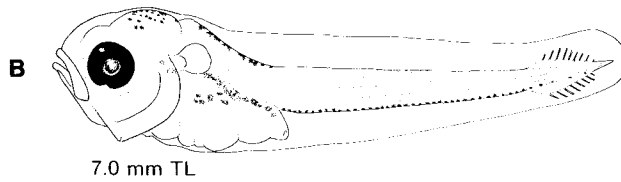
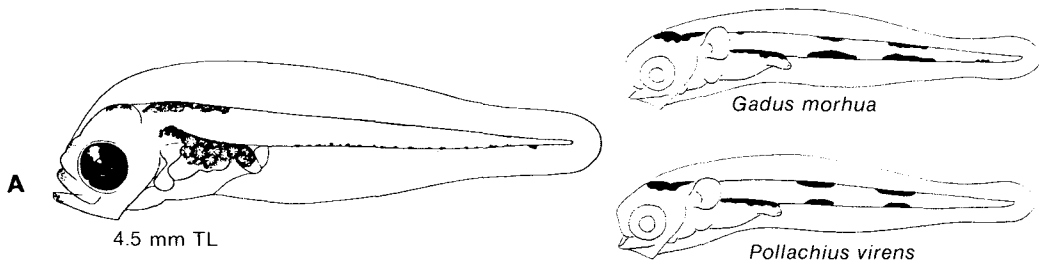
**Fig. A.** — Schmidt 1905a; **B,** Dannevig 1919; **C-D,** Rass 1949 (**B-D** redrawn).

**Ref.** — Schmidt 1906a; Leim and Scott 1966.

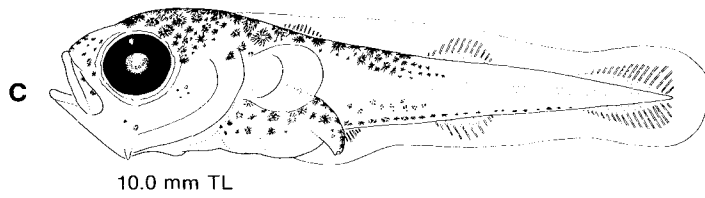


**Melanogrammus aeglefinus**

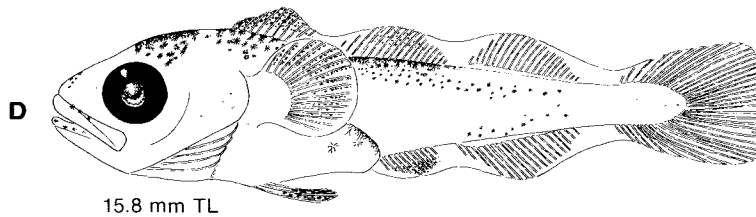
**GADIDAE**



No lateral streak of pigment



First and second dorsal fins pigmented



First anal fin pigmented; second anal fin remains unpigmented until juvenile stage (>30 mm)

A-D (eastern Atlantic material)

**MERLUCCIIDAE**      *Merluccius albidus* (Mitchill)

**Spawning:** April to July (?).

- Eggs** — Pelagic, buoyant, spherical and transparent.  
 — Diameter: 1.05–1.15 mm.  
 — Shell: smooth.  
 — Yolk: homogeneous.  
 — Oil globules: 1.  
 — O.G. diameter: 0.29–0.36 mm.  
 — Perivitelline space: narrow.

**Meristic features**

Myomeres: 53–55  
 Vert : 25+28–30  
 D : 10–13, 35–41  
 A : 35–42  
 Plv : 7  
 P : 13–16

- Larvae** — Hatching occurs at 3.0–3.8 mm; eyes unpigmented; mouth unformed; pigment on head, yolk and oil globule heavier than in *M. bilinearis* (p. 186).  
 — Head and cleithral region deeper than in *M. bilinearis*.  
 — Vent opens laterally on finfold (not at margin) in early larvae.  
 — Transformation occurs at about 20 mm.  
 — Pelvic buds formed at about 5 mm, and fins become moderately long.  
 — Sequence of fin formation: caudal, 1st dorsal, pelvic, 2nd dorsal and anal, and pectoral.  
 — Pigmentation: more pigment on snout and head in early larvae than in *M. bilinearis*, but snout unpigmented in later larvae; anterior of 2 tail bands less intense than posterior one; no spot at notochord tip until about 10 mm NL; lateral series of expanded melanophores forms on flank behind pectoral fin; pectoral and pelvic fins always pigmented, usually heavily.

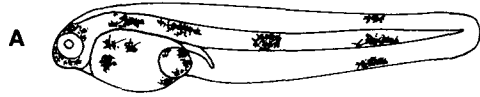
**Note:** In juveniles and adults, 9–11 total gill rakers on first arch.

**Fig.** — **A**, Marak 1967; **B–E**, M. P. Fahay (see p. 11).

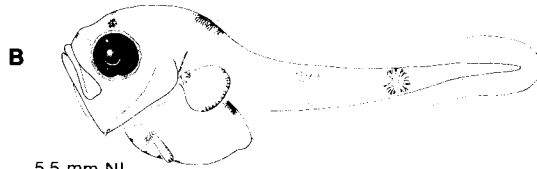
**Ref.** — Ginsburg 1954; Colton and Marak MS 1969.

*Merluccius albidus*

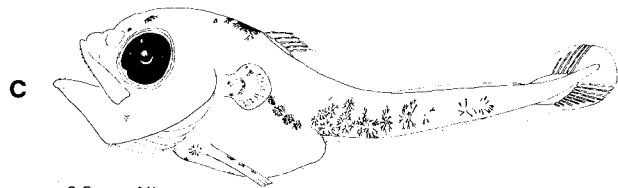
MERLUCCIIDAE



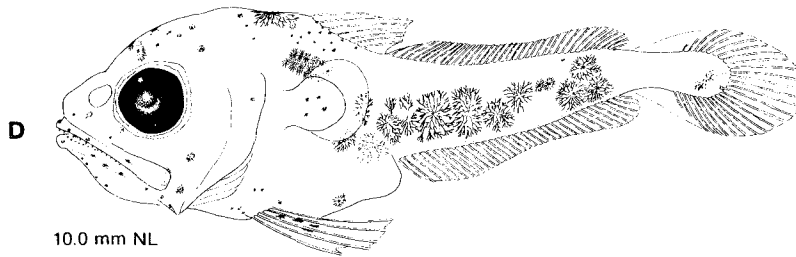
3.9 mm TL



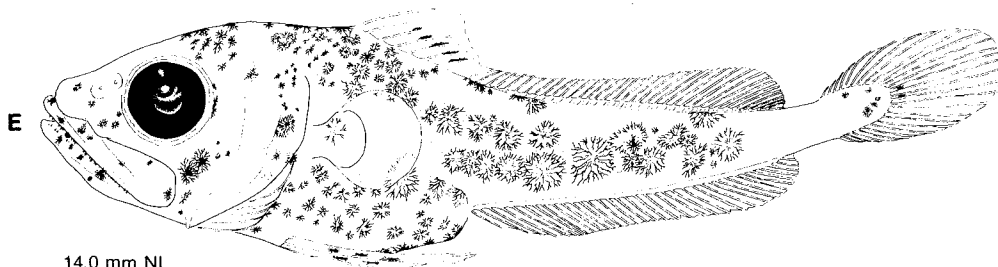
5.5 mm NL



8.5 mm NL



10.0 mm NL



14.0 mm NL

**MERLUCCIIDAE**      ***Merluccius bilinearis* (Mitchill)****Spawning:** May to November (peak in June).**Meristic features**

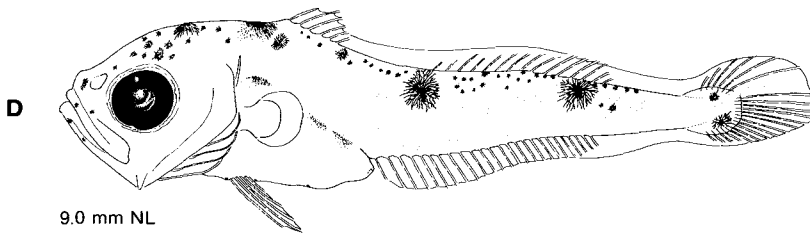
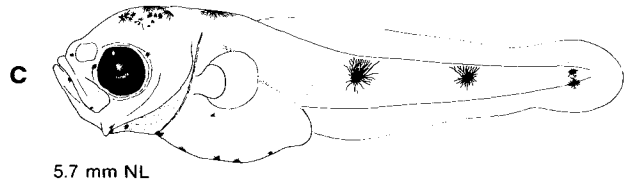
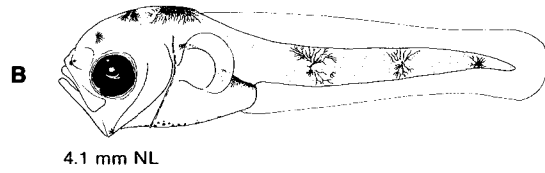
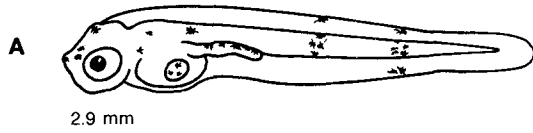
<b>Eggs</b>	— Pelagic, buoyant, spherical, and transparent.	Myomeres: 54-56
	— Diameter: 0.88-0.95 mm.	Vert : 27-28+26-27
	— Shell: smooth.	D : 11-14, 36-42
	— Yolk: homogeneous.	A : 37-42
	— Oil globules: 1.	Plv : 7
	— O.G. diameter: 0.24-0.29 mm.	P : 13-17
	— Perivitelline space: narrow.	

- Larvae**
- Hatching occurs at 2.6-3.5 mm; eyes unpigmented; mouth unformed; pigment on oil globule and on yolk near head and gut; scattered head and gut pigment, and 2 bands on tail.
  - Body slender and tapering, preanal length about 45% NL; head large, length about 25% NL.
  - Body depth at cleithrum about 25% NL, decreasing slightly at transformation.
  - Vent opens laterally on finfold (not at margin) in early larvae.
  - Transformation occurs at about 20 mm NL; descent to bottom occurs at 17-20 mm NL (or larger).
  - Sequence of fin formation: caudal, 1st dorsal, pelvic, 2nd dorsal and anal, and pectoral.
  - Pelvic fins moderately long: buds formed at about 7 mm NL and fins reach anus at about 10 mm NL.
  - Finfold between 1st and 2nd dorsal fins disappears by about 12 mm NL.
  - Pigmentation: 2 tail bands, about equal in intensity vary from distinct spots or bars to dendritic accumulations; spots on snout, crown, nape and peritoneum, and on notochord tip after yolk absorption; dorsal and anal fins unpigmented; pectoral and pelvic fins unpigmented (or rarely lightly pigmented).

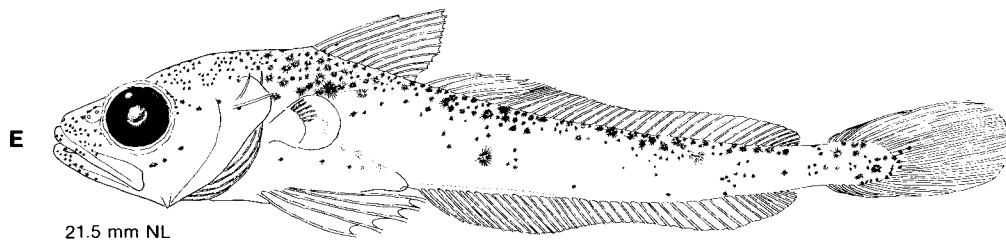
**Note:** In juveniles and adults, 15-22 total gill rakers on first arch.**Fig.** — **A**, Colton and Marak MS 1969; **B-E**, M. P. Fahay (see p. 11).**Ref.** — Ginsburg 1954; Sauskan and Serebryakov 1968; Fahay 1974.

*Merluccius bilinearis*

MERLUCCIIDAE



Uniform pigment spreads over body, obliterates original two spots



Becomes elongate, shallow-bodied

**BREGMACEROTIDAE*****Bregmaceros* sp.****Eggs** — Undescribed.**Larvae** — Body long and tapered, with large head.  
— Body proportions decrease with increase in larval size from about 5 mm SL to 15 mm SL as follows:

Body depth	35 to 15% SL
Preanal length	55 to 35% SL
Head length	30 to 15–20% SL

- Pectoral fin, with paddle-shaped fleshy base, situated high on body.
- Dorsal and anal fins long and notched in middle.
- Dorsal tentacle (or occipital ray) and pelvic fin rays form early.
- Pelvic fin rays long and trailing.
- Transformation occurs at about 18–20 mm SL.
- Pigmentation increases with growth; internal pigment spots often occur within muscle tissue.

**Meristic features\***

Vert: 44–59

D : 44–65

A : 44–68

Piv : 3

\* Pertain to family, excluding Indo-Pacific species

- Note:**
- (1) Three or four species in the western North Atlantic; small tropical and sub-tropical fishes of the open ocean, occurring often in schools; larval development not well described, and illustrations (opposite) may include a mixture of more than two species.
  - (2) For a description of larvae of two other unnamed types of bregmacerotids, see Houde (1981).

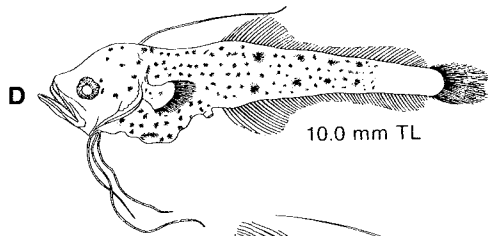
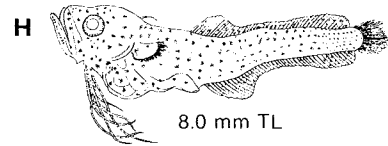
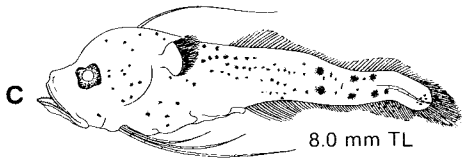
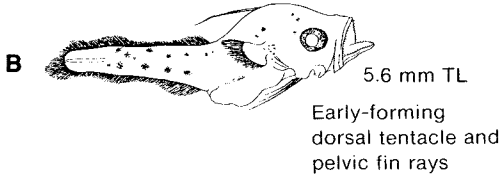
**Fig.** — **A–J**, d'Ancona and Cavinato 1965; **K–M**, Munro 1950.**Ref.** — Clancey 1956; Aboussouan 1968; A. W. Kendall 1980 (pers. comm.).

**Bregmaceros sp.**

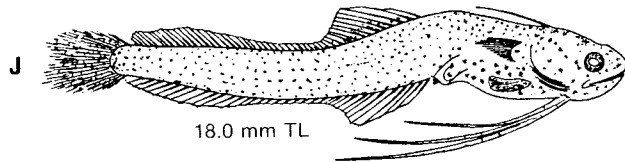
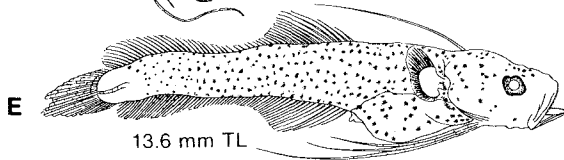
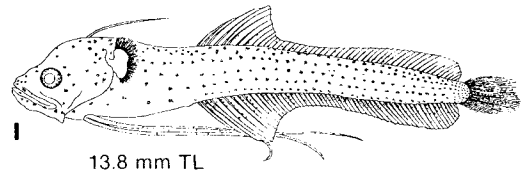
**BREGMACEROTIDAE**

**A-E.** Described as  
*Bregmaceros maclellandii*  
(North Atlantic)

**F-J.** Described as  
*Bregmaceros atlanticus*  
(North Atlantic)



Pigment increases with growth



**K-M.** Described as  
*Bregmaceros maclellandii*  
(Australasia)

