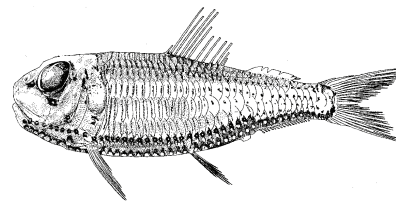


Ichthyococcus ovatus* (Cocco, 1838)*Phosichthyidae**

No common name



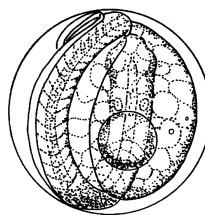
Range: Subtropical waters of the Atlantic Ocean and Mediterranean Sea; in the western North Atlantic from Flemish Cap to Gulf of Mexico and Caribbean Sea

Habitat: Mesopelagic in depths of 200–500 m

Spawning: Year-round with peak late spring into summer

Eggs:

- Pelagic, spherical
- Chorion: smooth, orange
- Diameter: 0.80 mm
- Yolk: segmented
- Oil globule: single, 0.24 mm in diameter
- Perivitelline space: narrow

**Meristic Characters**

Myomeres:	38–42
Vertebrae:	38–42
Dorsal fin rays:	11–12
Anal fin rays:	15–17
Pectoral fin rays:	8
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

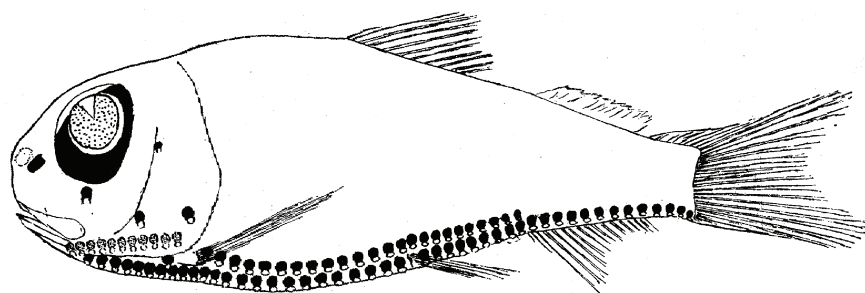
Larvae:

- Body slender, elongate and round in cross section; snout pointed and depressed; eye oval
- Trailing gut; preanal length about 70% SL; preanal myomeres 32, decrease to 26 in later larvae
- Sequence of fin ray formation: C – D, A – P₁ – P₂
- Elongate lower pectoral fin rays in early stages
- Adipose fin present
- Anal fin origin well posterior to dorsal fin origin; pelvic fin forms under dorsal fin

– **Photophores**

Sequence of development: IV VAV Ac ORB OP BR OA SO (Total IV–VAV–AC)
Definitive # (adult) in group: 24–25 10 12–14 2 3 11 24–25 None 46–49

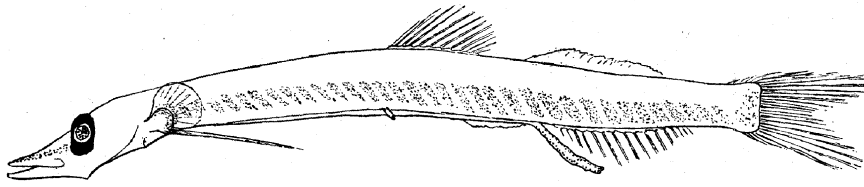
- Photophores complete at 15–17 mmSL
- Pigment distributed on myomeres below midline; also few spots on snout, opercle, on trailing portion of gut and on caudal peduncle
- Transformation begins at about 28 mm with marked shrinkage and deepening stage; smallest juveniles 11–14 mm

Early Juvenile:**D. 20.0 mmSL**

Figures: Adult: Janet Wright (Grey, 1964); Egg: Sanzo, 1930a; A, C–D: Jespersen and Tåning, 1926; B: Jack Javech (Ahlstrom *et al.*, 1984c)

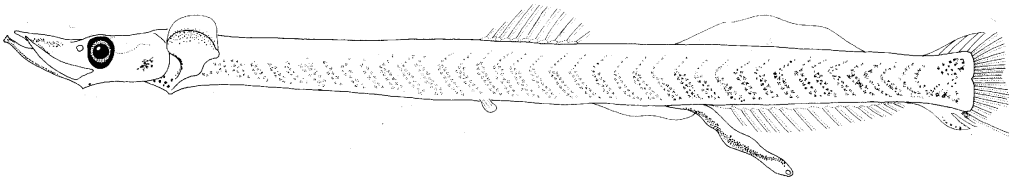
References: Jespersen and Tåning, 1926; Ahlstrom *et al.*, 1984c

Ichthyococcus ovatus



A. 15.0 mm

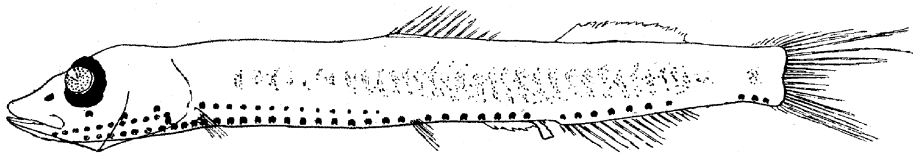
Pectoral fin in 2 parts; lower part
can extend beyond pelvic fin



B. 18.1 mmSL

Note broad lateral stripe of diffuse pigment

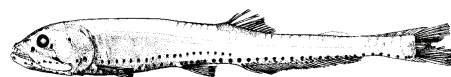
Pigment on snout and pectoral fin



C. 13.0 mmSL

Pollichthys mauli* (Poll, 1953)*Phosichthyidae**

No common name



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

Habitat: Mesopelagic in depths of 200–500 m during day, 100–200 m during the night; to a maximum of 1,000 m

Spawning: Year-round

Eggs: – Undescribed

Larvae:

- Elongate, slim body, with very long gut; preanus length 80% SL
- Eyes oval with ventral choroid tissue; snout short, upturned, sharply pointed
- Mouth large on pointy snout; gape extends posterior to eye
- Teeth appear on maxilla at 3.5 mm, on dentary at 4.0 mm, and on premaxilla at 14.0 mm
- Eye diameter decreases from about 45% HL to 20% HL in juveniles
- Flexion occurs at 3.6–7.0 mm
- Sequence of fin ray development: $C_1 - D - C_2 - A - P_2 - P_1$
- Anal fin origin well posterior initially, finally originating under middle of dorsal fin
- Adipose fin present

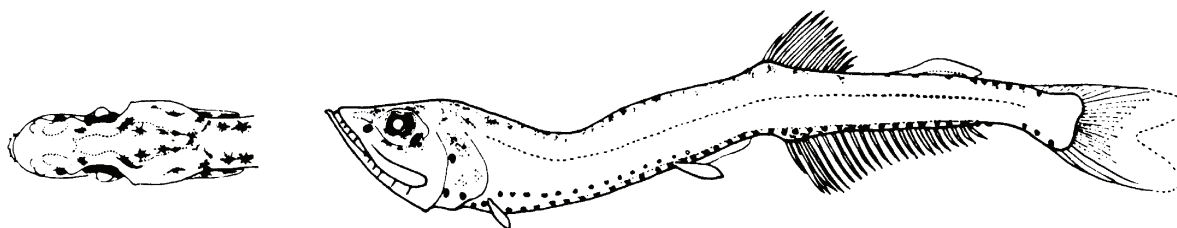
– **Photophores**

Sequence of development: IV VAV AC ORB OP BR OA SO (Total IV–VAV–AC)

Definitive # (adult) in group: 21–23 7–9 18–21 2 3 8 19–21 1 47–50

- Most photophores (unpigmented) form between 16 and 25 mm, become pigmented simultaneously
- No pigment, except in eyes, until after transformation when spots appear on top of head and along dorsum
- Transformation occurs at 16–18 mm

Note: 1. Similar to *Vinciguerria* larvae, but *Pollichthys mauli* has longer tail, longer anal fin base, anteriorly directed eyes in early stages, shows more anterior migration of anus at transformation, and lacks pigment at end of caudal peduncle

Early Juvenile:

H. 18.1 mmSL
(Dorsal Head and Lateral View)

Preanal finfold retained behind pelvic fin; anus separate from anal fin

Figures: Adult: Badcock, 1984b; A–C, E–F: Ozawa, 1976; D: Jack Javech (Ahlstrom *et al.*, 1984c); G–H: Grey, 1964

References: Ozawa, 1976; Ahlstrom *et al.*, 1984c; Richards, 2001

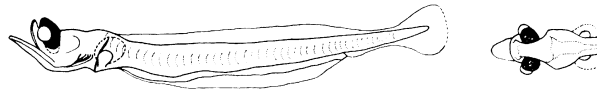
Meristic Characters

Myomeres:	40–44
Vertebrae:	40–44
Dorsal fin rays:	10–12
Anal fin rays:	25–26
Pectoral fin rays:	8
Pelvic fin rays:	6–7
Caudal fin rays:	10+9 (PrC)

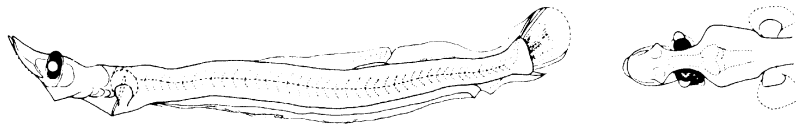
Pollichthys maui

(Dorsal views of heads included)

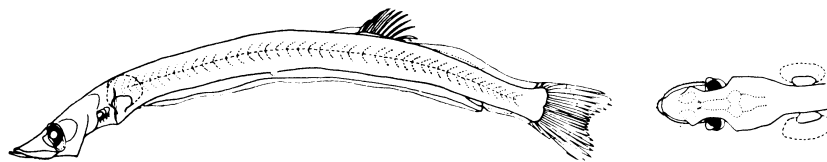
A. 3.4 mmSL



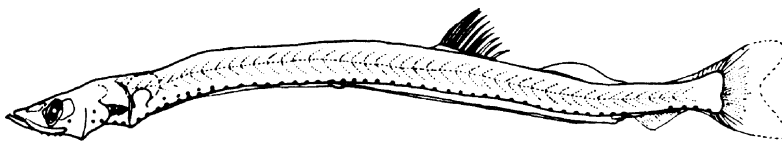
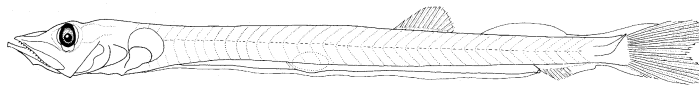
B. 8.4 mmSL



C. 12.7 mmSL

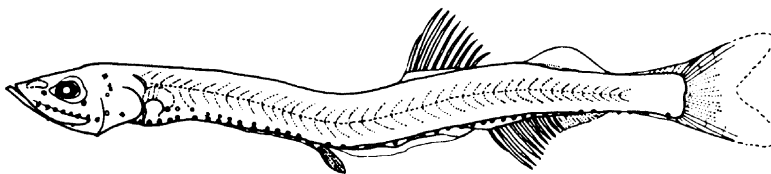


D. 14.5 mmSL



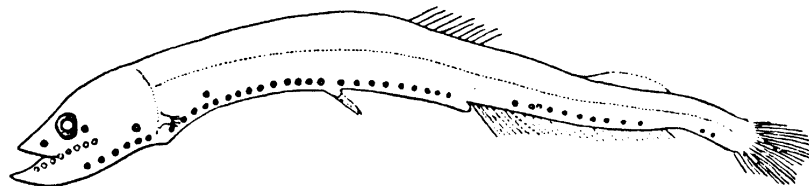
E. 21.3 mmSL

Sudden change in body form at transformation; anal fin migrates forward



F. 18.1 mmSL

OA series incomplete; forms after transformation



G. 17.0 mmSL

Note gap in developing AC photophores

Vinciguerria attenuata* (Cocco, 1838)*Phosichthyidae**

No common name



Range: Worldwide in temperate to tropical waters; in the western North Atlantic from Laurentian Channel and Bermuda to Gulf of Mexico and Caribbean Sea

Habitat: Mesopelagic in depths of 250–600 m during the day, migrating to 100–500 m at night

Spawning: Year-round

Eggs: – Undescribed

Larvae:

- Elongate, slender body, with long, straight gut; preanus length >70% SL
- Relative preanus length decreases during development
- Concave occiput and snout; head length about 20% SL, increases at transformation
- Eyes oval and semi-stalked
- Mouth large on pointy snout; gape extends posterior to eye after transformation
- Sequence of fin ray development: $C_1 - D - C_2 - A - P_2 - P_1$
- Anal fin origin under middle of dorsal fin
- Adipose fin small and late forming
- Small, round organ sometimes visible in body above anal papilla

Meristic Characters

Myomeres:	40–41
Vertebrae:	40–41
Dorsal fin rays:	13–15
Anal fin rays:	14–16
Pectoral fin rays:	9–10
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

– **Photophores**

Sequence of development: ORB OP BR IV VAV AC OA SO (Total IV–VAV–AC)

Definitive # (adult) in group: 2 3 8 23 7–9 12–14 21–23 None 42–46

- Adult complement of photophores reached by 20 mmSL
- Pigment includes a caudal spot at midline, sometimes lost at transformation; air bladder pigmented; otherwise unpigmented
- Transformation marked: body deepens, head and eyes increase in relative size, photophores develop almost simultaneously (some AC and OA slightly later)

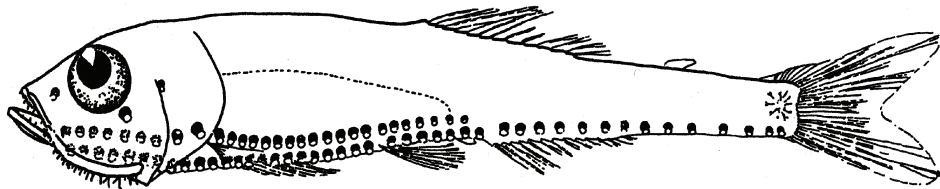
Note: 1. Distinguish from larvae of congeners by position of caudal spot, relative tail length, and air bladder pigment

Early Juvenile:

D. 20.8 mmSL

Note tubular eye

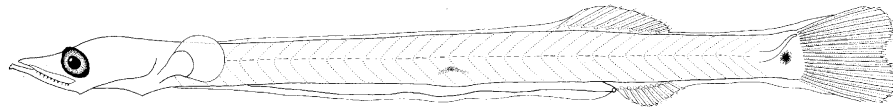
(See *Pollichthys maui* comparative note)



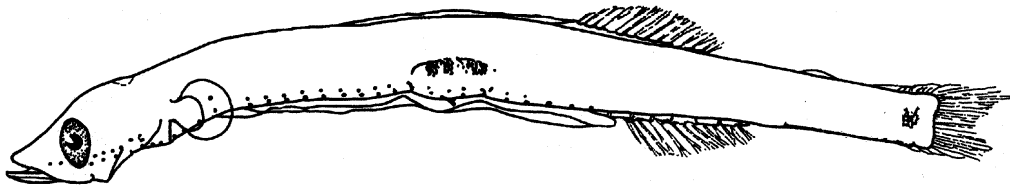
Figures: Adult: Badcock, 1984b; A: Jack Javech (Ahlstrom *et al.*, 1984c); B–D: Jespersen and Tåning, 1926

References: Jespersen and Tåning, 1926; Ahlstrom and Counts, 1958; Grey, 1964; Ahlstrom *et al.*, 1984c

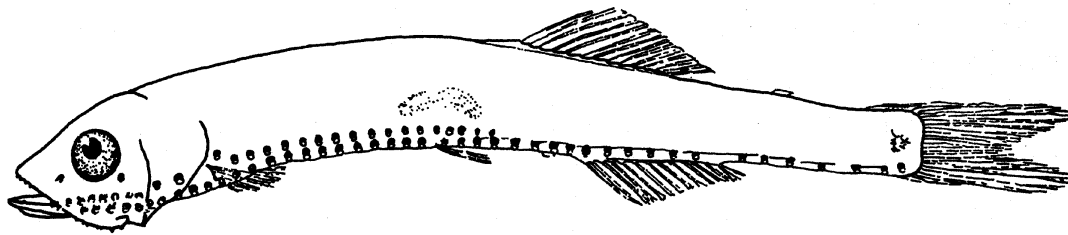
Vinciguerria attenuata



A. 9.7 mmSL



B. 18.3 mmSL



C. 18.5 mmSL

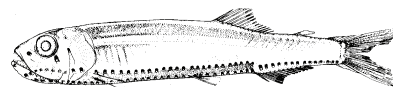
At all stages, relative tail length is greater in *V. attenuata* than in congeners

Ratio of snout-anus length to tail length (anus to caudal fin base) in 3 species of *Vinciguerria*

	<i>V. poweriae</i>	<i>V. nimbaria</i>	<i>V. attenuata</i>
Early larva	3	3	2.75
Late larva	3	2.75	2+
Transforming	2.5+	2.5+	1.75
Juvenile	2.5	2	1.5+

Vinciguerria nimbaria* (Jordan and Williams, 1895)*Phosichthyidae**

No common name



Range: Worldwide in temperate to tropical waters; in the western North Atlantic from Sable Island Bank, Nova Scotia to equator

Habitat: Mesopelagic in depths of 200–400 m during day, surface to 100 m at night

Spawning: Year-round

Eggs: – Undescribed

Larvae:

- Elongate, slender body, with long, straight gut; preanus length >70% SL
- Relative preanus length decreases during development
- Concave occiput and snout; head length about 20% SL, increases at transformation
- Eyes oval and semi-stalked
- Mouth large on pointy snout; gape extends posterior to eye after transformation
- Sequence of fin ray development: C₁ – D – C₂ – A – P₂ – P₁
- Anal fin origin under middle of dorsal fin
- Adipose fin small and late forming
- Small, round organ sometimes visible in body above anal papilla

Meristic Characters

Myomeres:	40–42
Vertebrae:	40–42
Dorsal fin rays:	13–14
Anal fin rays:	13–15
Pectoral fin rays:	9–10
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

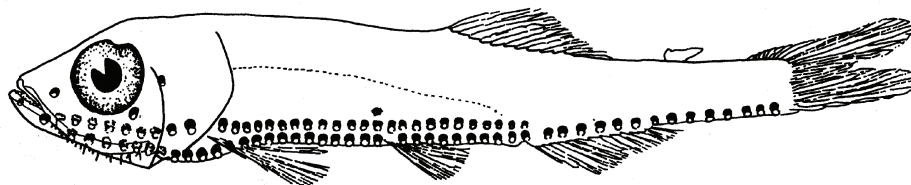
– **Photophores**

Sequence of development: ORB OP BR IV VAV AC OA SO (Total IV–VAV–AC)

Definitive # (adult) in group: 2 3 8 23 9–11 12–14 23–25 1 44–49

- Adult complement of photophores reached by 20 mmSL
- Pigment includes a caudal spot on ventral caudal peduncle, lost at transformation; air bladder unpigmented; 2–3 spots over anal fin; 2–3 vertical lines cross caudal fin base; a narrow line at isthmus-body junction
- Transformation marked: body deepens, head and eyes increase in relative size, photophores develop almost simultaneously (some AC and OA slightly later)

Note: 1. Distinguish from larvae of congeners by position of caudal spot, relative tail length, and lack of air bladder pigment

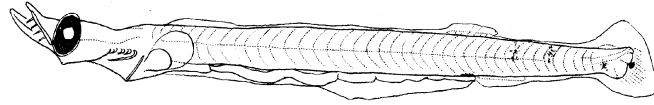
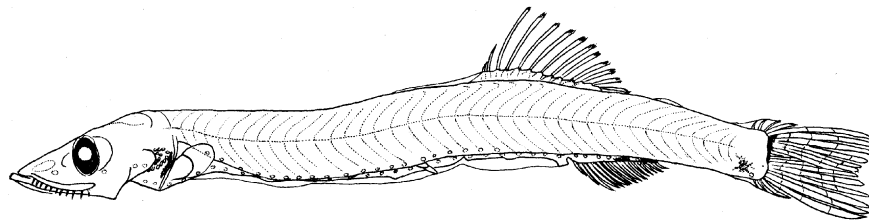
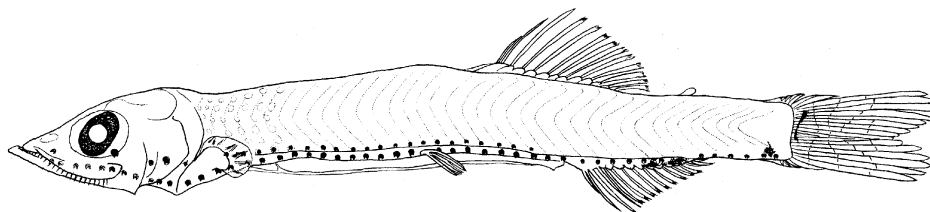
Early Juvenile:

E. 20.3 mmSL SO photophore forms at transformation

(See *Pollichthys mauli* comparative note)

Figures: Adult: Badcock, 1984b; **A, C–D:** Okiyama, 1988 (C and D reversed); **B, E:** Jespersen and Tåning, 1926

References: Jespersen and Tåning, 1926; Ahlstrom and Counts, 1958; Grey, 1964; Ahlstrom *et al.*, 1984c

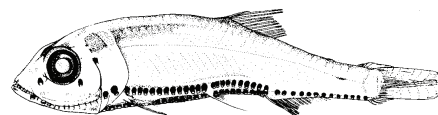
Vinciguerria nimbaria**A. 5.6 mmSL****B. 7.3 mmSL****C. 13.5 mmSL****D. 13.9 mmSL**

Ratio of snout-anus length to tail length (anus to caudal fin base)
in 3 species of *Vinciguerria*

	<i>V. poweriae</i>	<i>V. nimbaria</i>	<i>V. attenuata</i>
Early larva	3	3	2.75
Late larva	3	2.75	2+
Transforming	2.5+	2.5+	1.75
Juvenile	2.5	2	1.5+

Vinciguerria poweriae* (Cocco, 1838)*Phosichthyidae**

No common name



Range: Worldwide in temperate to tropical waters; in the western North Atlantic from Browns Bank (Scotian Shelf) to Bermuda and Gulf of Mexico

Habitat: Mesopelagic in depths of 300–600 m during the day, 50–350 m at night

Spawning: Year-round, possible peak during spring and summer

Eggs: – Undescribed

Larvae:

- Elongate, slender body, with long, straight gut
- Preanus length >70% SL
- Relative preanus length decreases during development
- Concave occiput and snout; head length about 20% SL, increases at transformation
- Eyes oval and semi-stalked
- Mouth large on pointy snout; gape extends posterior to eye after transformation
- Sequence of fin ray development: C₁ – D – C₂ – A – P₂ – P₁
- Anal fin origin under posterior rays of dorsal fin
- Adipose fin small and late forming
- Small, round organ sometimes visible in body above anal papilla

Meristic Characters

Myomeres:	38–39
Vertebrae:	38–39
Dorsal fin rays:	13–15
Anal fin rays:	12–14
Pectoral fin rays:	9–10
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

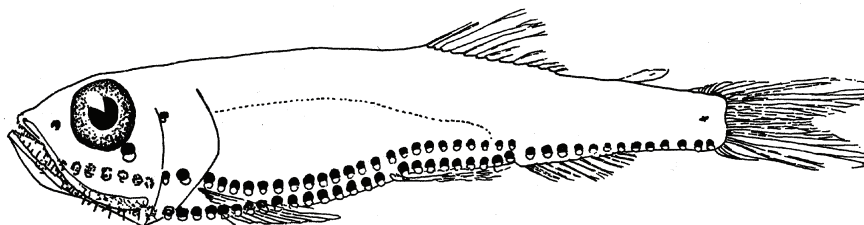
– **Photophores**

Sequence of development: ORB OP BR IV VAV AC OA SO (Total IV–VAV–AC)

Definitive # (adult) in group: 2 3 8 23 8–10 13–14 22–24 None 45–46

- Adult complement of photophores reached by 20 mmSL
- Pigment includes a caudal spot at midline, visible through transformation; air bladder unpigmented
- Transformation marked: body deepens, head and eyes increase in relative size, photophores develop almost simultaneously (some AC and OA slightly later)

Note: 1. Distinguish from larvae of congeners by position of caudal spot, relative tail length, and lack of air bladder pigment

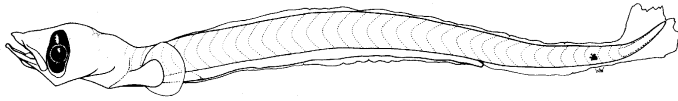
Early Juvenile:**F. 21.3 mmSL**

Note normal eye shape, remnant caudal spot, Lack of SO photophore
(See *Pollichthys maui* comparative note)

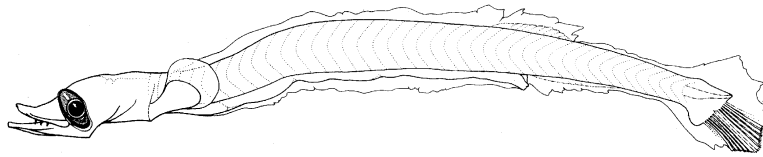
Figures: Adult: Badcock, 1984b; A–C: William Watson (Watson, 1996d); D, F: Jespersen and Tåning, 1926; E: Ahlstrom and Counts, 1958

References: Jespersen and Tåning, 1926; Ahlstrom and Counts, 1958; Grey, 1964; Ahlstrom *et al.*, 1984c

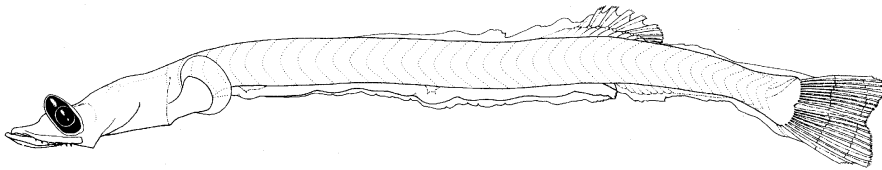
Vinciguerria poweriae



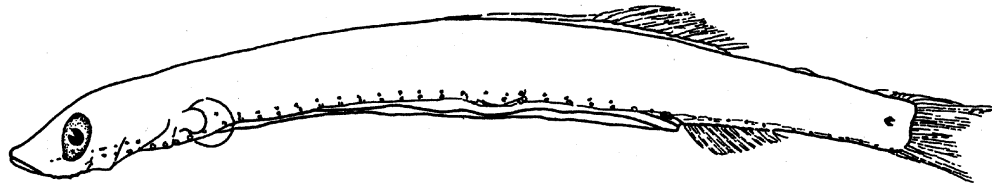
A. 5.0 mmSL



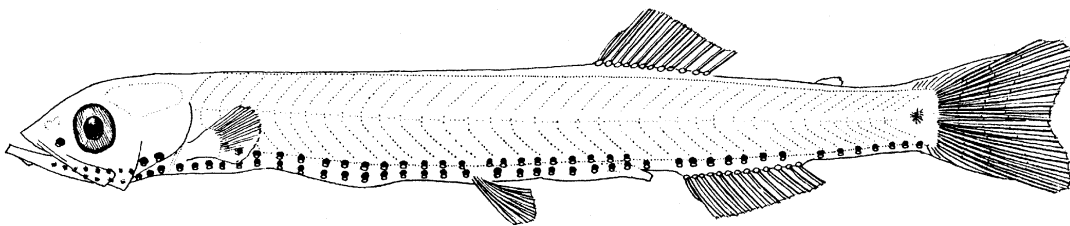
B. 6.6 mmSL



C. 10.1 mmSL



D. 20.0 mmSL



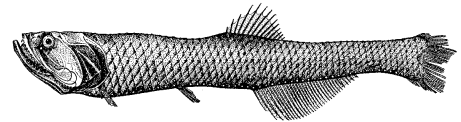
E. 22.9 mmSL

Ratio of snout-anus length to tail length (anus to caudal fin base)
in 3 species of *Vinciguerria*

	<i>V. poweriae</i>	<i>V. nimbaria</i>	<i>V. attenuata</i>
Early larva	3	3	2.75
Late larva	3	2.75	2+
Transforming	2.5+	2.5+	1.75
Juvenile	2.5	2	1.5+

Yarella blackfordi* Goode and Bean, 1896*Phosichthyidae**

No common name



Range: Atlantic Ocean in tropical and subtropical waters; in the western North Atlantic from Block, Hudson and Norfolk canyons to northern South America

Habitat: Benthopelagic in depths of 500–700 m

Spawning: Undescribed; larvae rarely collected in study area

Eggs: – Undescribed

Larvae:

- Elongate, slender body, with long, straight gut
- Preanus length >60% SL
- Gut thick in posterior section
- Snout long, pointed, slightly concave head profile
- Mouth large, reaches anterior edge of eye
- Eyes round
- Sequence of fin ray development: pectoral and pelvic fins form last
- Anal fin origin under posterior half of dorsal fin
- Adipose fin absent (remnant finfold present in larvae)

– **Photophores**

Sequence of development: ORB OP BR IV VAV AC OA SO (Total IV–VAV–AC)

Definitive # (adult) in group: 1 3 12–13 24–25 12 24–28 52–53 1 61–63

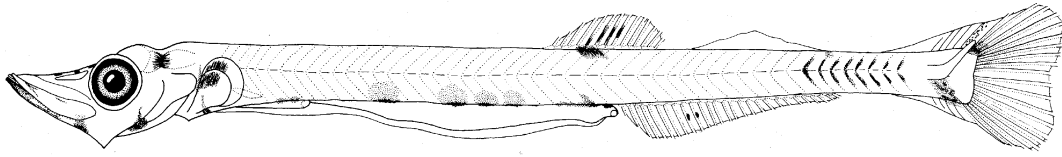
- Adult complement of photophores reached shortly after transformation
- Pigment includes melanophores on myosepta of caudal peduncle, forming chevron pattern; conspicuous spot on dorsum under dorsal fin; internal pigment in body over intestine; few spots on anal fin rays and lower caudal fin base; large spots in head-cleithral region
- Transformation marked: photophores develop almost simultaneously

Meristic Characters	
Myomeres:	53–54
Vertebrae:	53–54
Dorsal fin rays:	14–17
Anal fin rays:	28–31
Pectoral fin rays:	8–10
Pelvic fin rays:	6–7
Caudal fin rays:	10+9 (PrC)

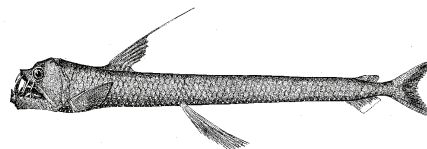
Figures: Adult: Grey, 1964; A: Jack Javech (Ahlstrom *et al.*, 1984c)

References: Grey, 1964; Ahlstrom *et al.*, 1984c

Yarella blackfordi



A. 23.5 mmSL

Chauliodus sloani* Schneider, 1801*Chauliodontidae****Sloan's viperfish**

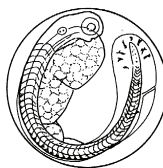
Range: Worldwide and widespread in temperate to tropical waters; in the western North Atlantic from Greenland to Caribbean Sea

Habitat: Meso- to bathypelagic, in depths of 1,000 to 1,800 m during the day, surface to 800 m at night; more commonly collected than *C. danae*

Spawning: Year-round, peak in late winter and early spring

Eggs:

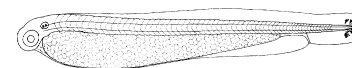
- Pelagic, spherical
- Diameter: 2.24–2.52 mm
- Chorion: smooth, double membrane
- Yolk: segmented
- Oil globule: none
- Perivitelline space: narrow

**Meristic Characters**

Myomeres:	54–62
Vertebrae:	54–62
Dorsal fin rays:	5–7
Anal fin rays:	10–13
Pectoral fin rays:	11–14
Pelvic fin rays:	6–8
Caudal fin rays:	10+9 (PrC)

Larvae

- Hatching occurs at about 7.2 mm; elongate yolk-sac
- Body elongate and slender; body depth about 8% SL
- Eye oval, snout pointed, head flexed ventrally
- Mouth terminal and large, extends posterior to eye
- Preanus length about 90% SL (gut not trailing, but terminus extends slightly beyond anal fin origin)
- Fin formation sequence: C – P₂ (bud) – D – A – P₁ – P₂ (rays)
- Dorsal fin starts as cutaneous thickening at about 23 mm
- Dorsal adipose fin present; preanal finfold remnant still present after transformation



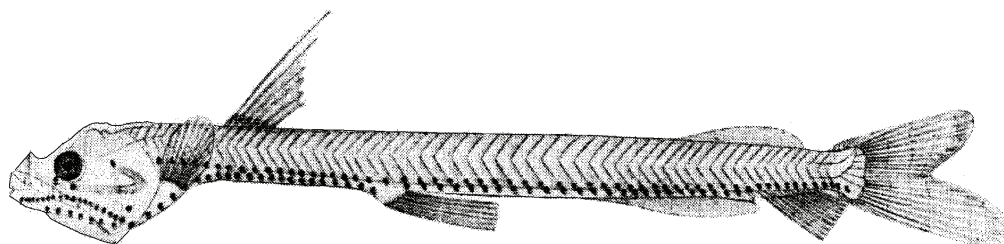
Yolk-sac larva

– **Photophores**

Photophore group: IP PV VAV AC OV VAL
Definitive # (adult) in group: 9–11 18–21 23–28 8–13 17–21 22–28 (range in genus)

- Very little pigment (or none)
- Transformation involves shrinkage from about 44 mm (maximum larval size) to about 27 mm; then growth resumes; photophores form simultaneously at about 40 mm, acquire pigment later

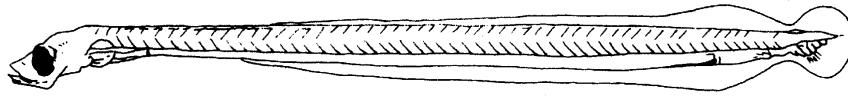
Note: 1. Larval *Chauliodus danae* are presumably similar; they have 51–58 vertebrae and the dorsal fin origin is more posteriorly placed than in *C. sloani*; *C. danae* larvae have pigment over anal fin base. Range: Atlantic Ocean in temperate to tropical waters.

Early Juvenile:**D. 27.1 mm**

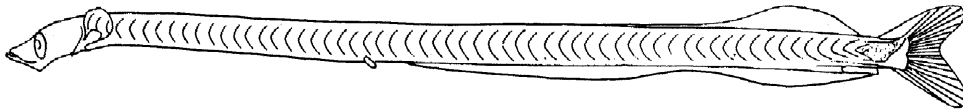
Figures: Adult: Gibbs, 1984b; Egg and **A, D**: Sanzo, 1931a; Yolk-sac larva: Mito, 1961a; **B–C**: Sanzo, 1914

References: Grey, 1964; Kawaguchi and Moser, 1984

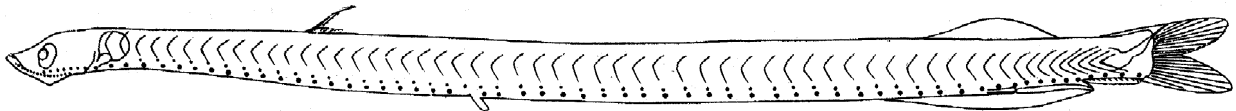
Chauliodus sloani



A. 14.0 mm



B. 33.6 mmSL



C. 41.6 mmSL

Stomias boa ferox* Reinhardt, 1843*Stomiidae****Boa dragonfish**

Range: North Atlantic Ocean as far north as 65°N; in the western North Atlantic from Greenland to South Carolina

Habitat: Mesopelagic, in depths to >1,000 m; shallower at night

Spawning: Spring; details undescribed

Eggs: – Undescribed

Larvae:

- Hatching occurs at 3–4 mm; larvae have elongate yolk mass
- Elongate with long head and prominent jaws
- Preanus length very long (87–90% SL), but slightly shorter than in *Chauliodus*
- Slightly trailing gut until transformation
- Relative head length decreases through development from about 10% SL to about 6% SL
- Eyes oval
- Dorsal finfold long
- Sequence of fin ray formation: C, D, A – P₁ – P₂
- Caudal, dorsal and anal fin rays begin formation at about 17 mm, complete at about 44 mm; pelvic fin buds and pectoral fin rays form after transformation, complete in adult stage
- Dorsal and anal fins far posterior on body

Meristic Characters

Myomeres:	81–84
Vertebrae:	77–83
Dorsal fin rays:	17–21
Anal fin rays:	19–23
Pectoral fin rays:	6
Pelvic fin rays:	5
Caudal fin rays:	10+9 (PrC)

– **Photophores**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	10–13	46–51	10–13	15–19	45–50	12–14

- Pigment is very light; widely spaced spots (as in *Eustomias*) are absent; see notes on figures
- Transformation involves shrinkage from about 44 mm to to about 23 mm; growth then resumes and photophores formed simultaneously; photophores appear at about 30 mm

Note: 1. *Stomias affinis* occurs from the Hudson Canyon area to northern South America. It has 66–71 vertebrae and fin ray counts similar to those of *S. boa ferox*. Photophore counts follow:

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	10–12	42–46	6–7	15–17	41–46	6–7

Illustrations of *Stomias affinis* are based on larval material collected in the Pacific Ocean. Note lack of body pigment, scattered pigment on dorsal finfold.

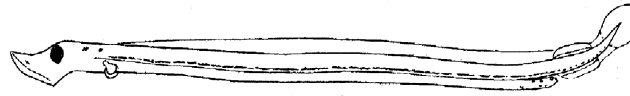
2. *Stomias boa ferox* is a subspecies of *Stomias boa* occurring in the western Atlantic Ocean. *Stomias boa boa* occurs in the eastern Atlantic Ocean and Mediterranean Sea; vertebrae are 75–78

3. Two other species of the genus *Stomias* have occurred in the study area. A small (18.5 mm TL) *Stomias brevibarbatus* (NMC 84-0279) was collected south of Emerald Bank at 42°08'N, 62°59'W (Scott and Scott, 1988) and more specimens from the study area are in the collections of MCZ (Moore *et al.*, 2003). This is a mesopelagic species, occurring as deep as 1,000 m in temperate to tropical waters of the North Atlantic. *Stomias longibarbatus* occurs in the western North Atlantic from 40°N to 25°N, including the Gulf of Mexico, and a 124-mm specimen collected off Browns Bank (MCZ 130644) is a northern record (Moore *et al.*, 2003). This is a meso- to bathypelagic species, occurring in subtropical to temperate waters worldwide. Larvae of these species are undescribed, but are presumably similar to those of *S. boa ferox*.

Figures: Adult: Scott and Scott, 1988; **A–D:** Ege, 1918; **E–F:** Okiyama, 1988 (**F** reversed)

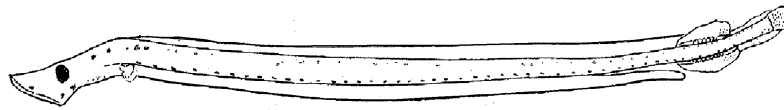
References: Sanzo, 1914; Grey, 1964; Kawaguchi and Moser, 1984

Stomias boa ferox



A. 10.0 mmSL

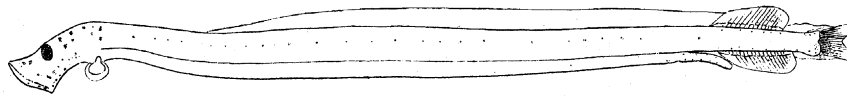
Few spots on head



B. 17.0 mmSL

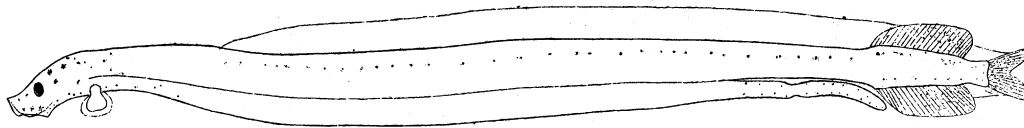
Ventral row of fine spots, pectoral to anal fin origin, forms line over gut

Dorsolateral row of spots forms



C. 30.0 mmSL

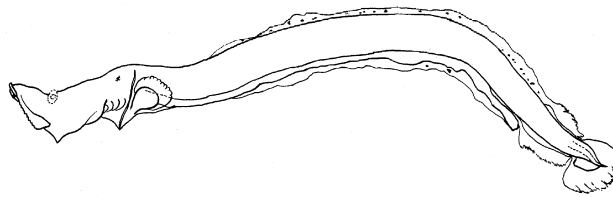
Fine spots at bases of fins and end of gut



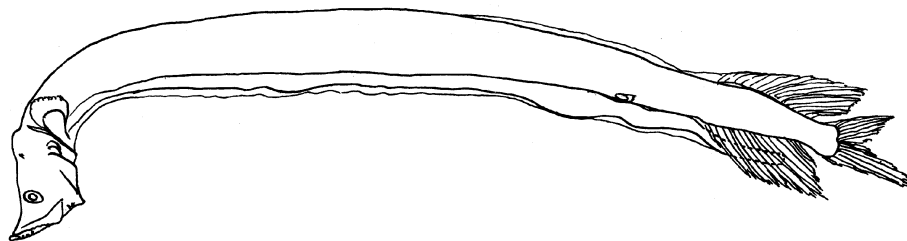
D. 44.0 mmSL

Ventral row disappears, head pigment increases

Stomias affinis

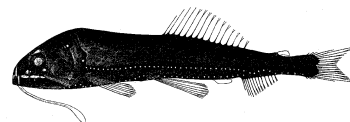


E. 8.0 mmSL



F. 19.1 mmSL

***Astronesthes* sp.**
Astronesthidae
 No common name



Range: Seven species of *Astronesthes* occur in the western North Atlantic Ocean in the study area; larvae are rarely collected

Habitat: Meso- to benthopelagic, some species occurring as deep as 2,400 m, some venturing to near-surface at night

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Two types of larvae in family: the 1st has a laterally compressed body with very long, slightly trailing gut (Figs. A, B); the 2nd has a rounded body with trailing gut, deflected from body either posterior (Figs. C, D) or anterior (Fig. E) to midbody
- Some have dorsal and anal fins on cartilaginous pedestals; some have large, voluminous median finfolds
- Trailing gut can be ornamented with fleshy appendages
- Dorsal fin origin well anterior to anal fin (unusual for stomiatoids)
- Eyes not stalked or telescopic, but may be oval in shape
- Dorsal (and rarely anal) adipose fins form after transformation and are present in adults
- **Photophores (genus *Astronesthes*)**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	IV	VAL
<i>Definitive # (adult) in group:</i>	5–12	6–20	7–27	7–13	5–19	7–26

- Adult complement of photophores is presumably reached after transformation
- Pigment patterns range from very light (few or no melanophores) to heavy spotting on finfolds and/or myosepta, or prominent series along body
- Transformation size is presumably large, based on limited larval data

Meristic Characters (Genus)

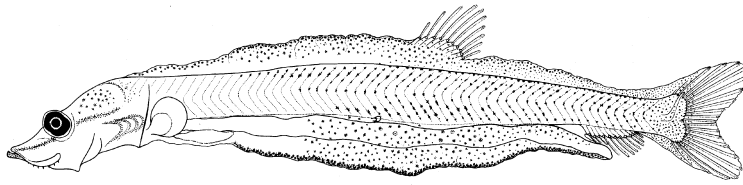
Myomeres:	45–55
Vertebrae:	45–55
Dorsal fin rays:	11–21
Anal fin rays:	11–19
Pectoral fin rays:	6–9
Pelvic fin rays:	6–8
Caudal fin rays:	10+9 (PrC)

- Note:**
1. See Okiyama (1988) for description of *Astronesthes cyaneus* and 6 un-named larval types
 2. See following pages for limited data on *Borostomias*, *Heterophotus*, and *Neonesthes* larvae

Figures: Adult (*A. niger*) G. G. Pasley (Gibbs, 1964a); A–E: Kawaguchi and Moser, 1984

References: Gibbs, 1964a; Kawaguchi and Moser, 1984; Parin and Borodulina 1997; 1998

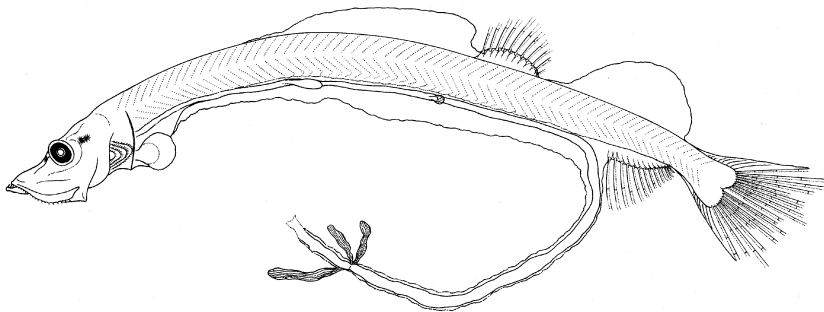
Astronesthidae



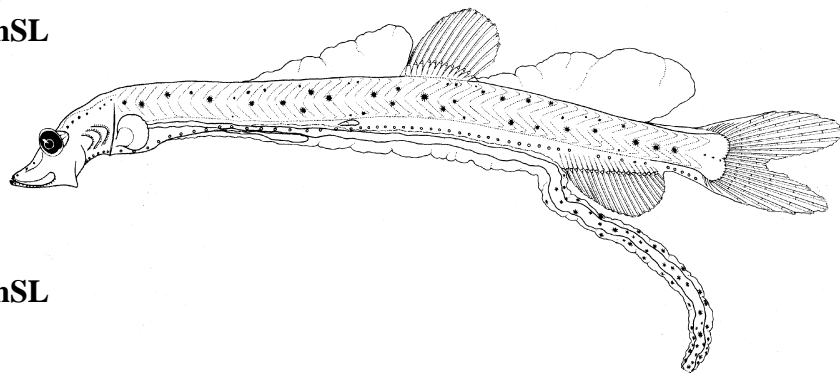
A. 23.7 mmSL



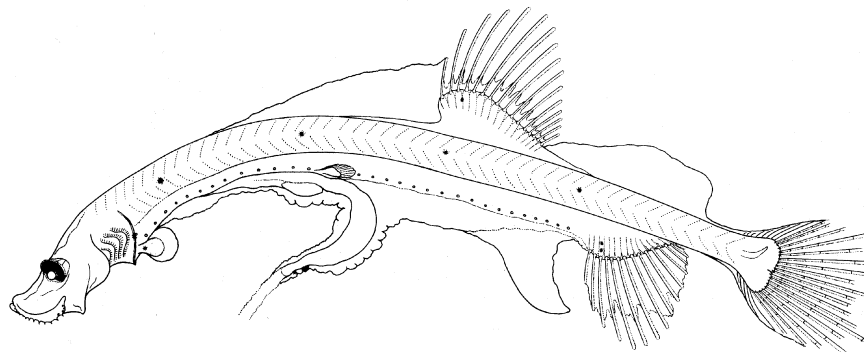
B. (< 26 mm)



C. 33.0 m mSL



D. 22.0 m mSL

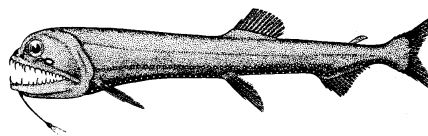


E. 28 mmSL

Examples of 5 larval types in the family Astronesthidae. None has been identified to species; some based on material collected outside the Atlantic.

Borostomias antarcticus* (Lönnerberg, 1905)*Astronesthidae**

No common name



Range: North Atlantic Ocean and southern hemisphere in boreal to temperate waters; in the western North Atlantic from Greenland to Hudson and Norfolk canyons (as far south as 37°09' N, 74°06' W)

Habitat: Meso- to bathypelagic in depths of 350 to 2,500 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae: – Undescribed; description based on tentative *B. panamense* larva from eastern Pacific ocean
 – Body elongate and slender
 – Head and snout pointed, depressed
 – Trailing gut departs from body at about mid-length
 – Eye elliptical and small
 – Dorsal fin origin at about 60% SL, well anterior to anal fin
 – Note voluminous finfolds
 – Pectoral fins slightly pedunculate, low on body

– **Photophores (genus *Borostomias*)**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	IV	VAL
<i>Definitive # (adult) in group:</i>	9–13	20–31	15–25	9–15	21–29	16–25

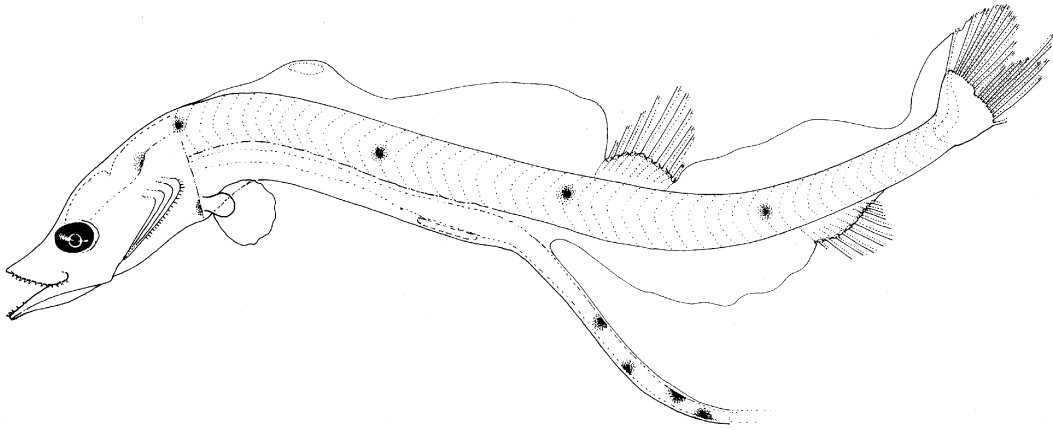
– Adult complement of photophores is presumably reached after transformation
 – Pigment includes internal melanophores on brain; a series of spots along body from nape to near anal fin origin (the latter alternating on each side of body); spots present on trailing portion of gut
 – Transformation size unknown

Meristic Characters	
Myomeres:	56–60
Vertebrae:	56–60
Dorsal fin rays:	10–13
Anal fin rays:	14–16
Pectoral fin rays:	7–9
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

Figures: Adult: Gibbs, 1984a; A: Nancy Arthur (Moser, 1996d)

References: Gibbs, 1964a; Kawaguchi and Moser, 1984

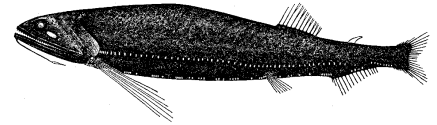
Borostomias panamense



A. 13.7 mmSL

Heterophotus ophistoma* Regan and Trewavas, 1929*Astronesthidae**

No common name



Range: Tropical and subtropical waters of western and middle Atlantic Ocean including Gulf of Mexico and Caribbean Sea; also known from the Pacific Ocean

Habitat: Meso- to bathypelagic in depths of 200–850 m

Spawning: Undescribed; 1 larva collected near Cape Hatteras in Dec (MCZ 83540; 46 mmSL; 34°32' N, 75°26' W)

Eggs: – Undescribed

Larvae:

- Body elongate and slender
- Head and snout pointed, depressed
- Trailing gut departs from body well posterior to mid-length, immediately anterior to anal fin origin
- Eye small
- Dorsal fin origin posterior to mid-point of body, well anterior to anal fin origin
- Voluminous finfold, especially behind dorsal fin
- Pectoral fin pedunculate, low on body

– **Photophores (genus *Heterophotus*)**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	IV	VAL
<i>Definitive # (adult) in group:</i>	10–11	32–35	13–16	12–15	33–36	16–20

- Adult complement of photophores is presumably reached after transformation
- Pigment light or absent
- Transformation size unknown

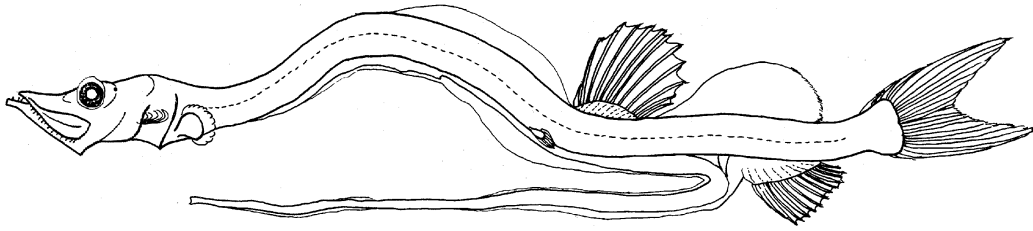
Meristic Characters

Myomeres:	66–68
Vertebrae:	66–68
Dorsal fin rays:	11–13
Anal fin rays:	12–17
Pectoral fin rays:	7
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

Figures: Adult: G. G. Pasley (Gibbs, 1964a); A: Okiyama, 1988

References: Gibbs, 1964a; Kawaguchi and Moser, 1984

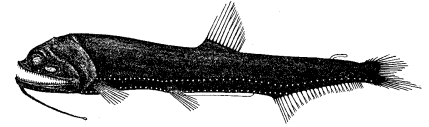
Heterophotus ophistoma



A. 30.9 mmSL

Neonesthes capensis* (Gilchrist and von Bonde, 1924)*Astronesthidae**

No common name



Range: Worldwide in temperate to subtropical waters; in the western North Atlantic from LaHave Bank south to 20°N

Habitat: Meso- to bathypelagic in depths of 70–1,650 m

Spawning: Undescribed; 1 larva collected in Slope Sea in Apr; (MCZ 65784; 29 mmSL; 38°54.6 N, 71°36.8'W)

Eggs: – Undescribed

Larvae:

- Body elongate and slender
- Head and snout pointed, depressed
- Terminal section of gut trails slightly
- Eye slightly telescopic
- Dorsal fin origin at about mid-point of body, well anterior to anal fin origin
- Dorsal fin rays slightly produced
- Voluminous finfold, especially anterior to anal fin
- Pectoral fin pedunculate, low on body

– **Photophores (genus *Neonesthes*)**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	IV	VAL
<i>Definitive # (adult) in group:</i>	9–12	14–17	16–21	13–18	13–15	13–20

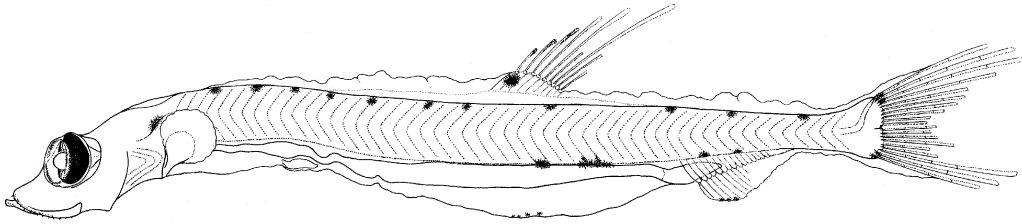
- Adult complement of photophores is presumably reached after transformation
- Pigmentation includes series of bold spots along dorsum of body; prominent melanophore on anterior dorsal fin base; other prominent melanophores over pectoral fin, between gut and body near middle of gut, a few spots over anal fin base and at base of caudal fin; light pigment on tips of dorsal and anal rays
- Transformation size unknown

Meristic Characters	
Myomeres:	51–57
Vertebrae:	51–57
Dorsal fin rays:	9–12
Anal fin rays:	22–28
Pectoral fin rays:	7–8
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

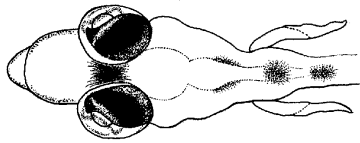
Figures: Adult: G. G. Pasley (Gibbs, 1964a); **A–B:** Barbara Sumida M^{ac}Call (Moser, 1996d)

References: Gibbs, 1964a; Kawaguchi and Moser, 1984; Evseenko and Suntsov, 1995

Neonesthes capensis



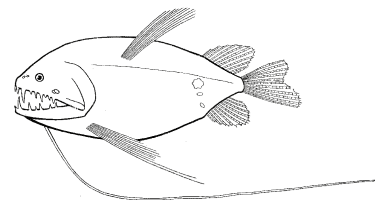
A. 15.2 mmSL



**B. 15.2 mmSL
(Dorsal View of Head)**

Bathophilus brevis* Regan and Trewavas, 1930*Melanostomiidae**

No common name



Range: North Atlantic and Pacific oceans; in the western North Atlantic from near Hudson Canyon (39°08' N, 72°18' W) and Bermuda to northern Florida

Habitat: Meso- to bathypelagic in depths of 75–1,650 m

Spawning: Undescribed

Eggs: – Undescribed

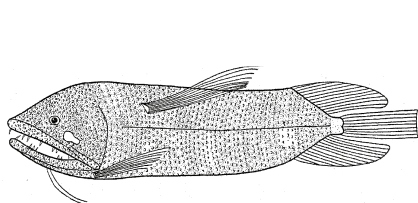
Larvae:

- Body relatively stubby, head large, snout profile concave
- Head length decreases from 29% SL in early larvae, to 20% SL
- Body, including finfolds, very deep; becomes slimmer
- Gut thick and voluminous with well-developed, twisted terminus
- Eye moderate, circular
- Barbel (without appendages) forms on lower jaw in larger larvae
- Mouth large, upper jaw broad
- Flexion occurs at 8–11 mm
- Dorsal and anal fins form opposite each other, well posterior
- Pectoral fins pedunculate, low on body; pelvic fins form high on body, between myomere #11 and gut
- Pelvic fin buds form at 6.3 mm, rays complete at 15.9 mm; caudal, dorsal and anal fin rays complete at 8.9 mm
- Lower lobe of caudal fin longer than upper
- No adipose fin
- Pigmentation includes row of melanophores (1 or more per myomere) along dorsum of body; with a row of indistinct spots along ventral edge; scattering of pigment on deep finfolds; pigment on snout, top of head, and a row of spots along isthmus
- Transformation occurs at < 20 mm (largest reported larva: 17.2 mm; smallest juvenile 14.9 mm)

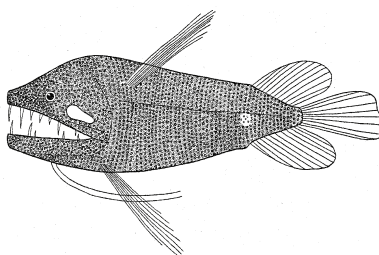
Meristic Characters

Myomeres:	32–37
Vertebrae:	33–35
Dorsal fin rays:	10–11
Anal fin rays:	9–10
Pectoral fin rays:	11–13
Pelvic fin rays:	11–14
Caudal fin rays:	10+9 (PrC)

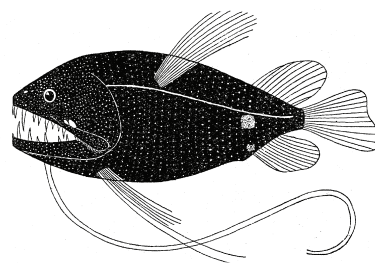
Early Juvenile: Body becomes jet-black and oval shaped; head remains large; both jaws with large canine teeth; pectoral and pelvic fin rays become long and filamentous, the pelvics higher than eye level; large luminous organs form on middle of upper jaw and midlaterally below dorsal fin origin



E. 13.3 mm late larva



F. 13.3 mm adolescent

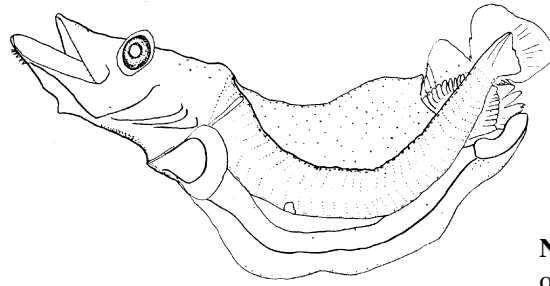


G. 26.0 mm transitional

Figures: Adult: Shirley G. Hartman (Morrow and Gibbs, 1964); **A–B, D:** Ozawa and Aono, 1986; **C:** Kawaguchi and Moser, 1984; **E–G:** Beebe and Crane, 1939

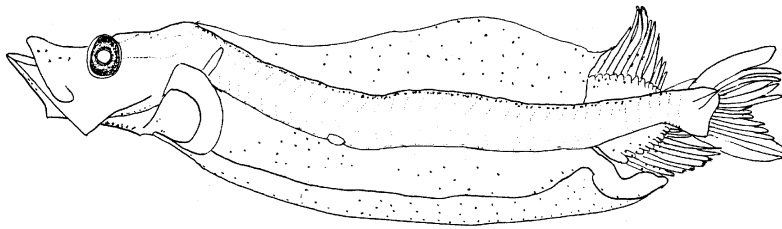
References: Beebe and Crane, 1939; Morrow and Gibbs, 1964; Kawaguchi and Moser, 1984; Ozawa and Aono, 1986

Bathophilus brevis

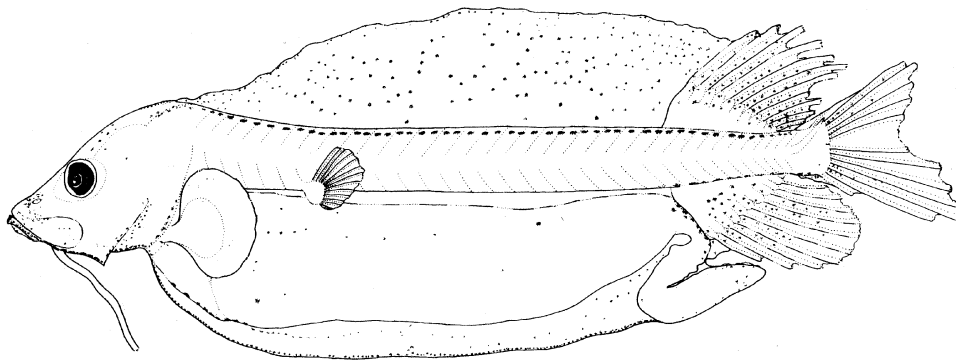


A. 6.3 mmSL

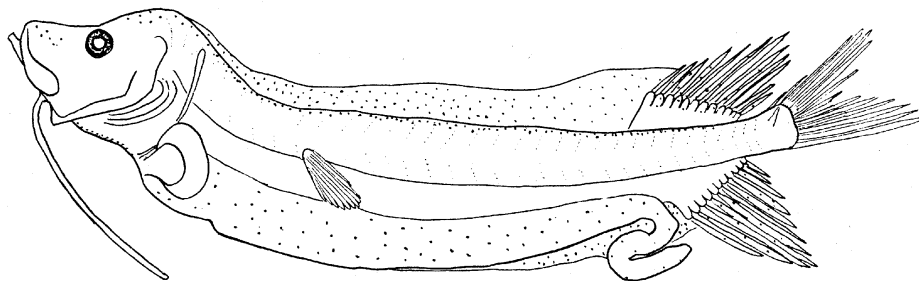
Note: 6 other species of *Bathophilus* may occur in study area; larvae undescribed



B. 8.9 mm



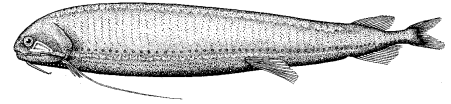
C. 15.7 mm



D. 15.9 mm

Echiostoma barbatum* Lowe, 1843*Melanostomiidae**

No common name



Range: Worldwide in tropical to subtropical waters; in the western North Atlantic from latitude 42° N to Caribbean Sea

Habitat: Mesopelagic in depths from near surface to 1,900 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Elongate body with thick, voluminous gut
- Head large and depressed
- Gut with well-developed terminus, slightly trailing
- Eyes slightly oval, become round and smaller with development
- Flexion occurs at about 8.0 mm
- 15–17 myomeres between pelvic and anal fins
- Pelvic fins form at myomere #31
- Dorsal and anal fins opposite each other, well posterior; dorsal finfold well-developed
- All fin rays complete by 30 mm
- Photophores form at about 28 mm (except IP which forms late)

– **Photophores**

<i>Name of photophore group:</i>	PV	VAV	AC	OV	VAL	IP
<i>Definitive # (adult) in group:</i>	28	15	15	26	16	8

– Pigment includes melanophores along dorsum of body (1 per myomere) and on lower limbs of each myoseptum (1–5 per myoseptum); spots on dorsal surface of gut terminus; melanophores on top of head, on isthmus, at edge of dorsal finfold (early larvae) and scattered on lower lobe of caudal fin

– Transformation occurs at >16 mm

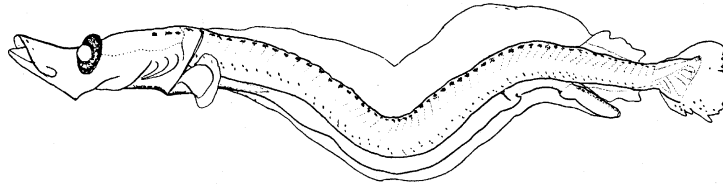
Meristic Characters

Myomeres:	about 57–59
Vertebrae:	57–59
Dorsal fin rays:	11–14
Anal fin rays:	13–19
Pectoral fin rays:	1+3
Pelvic fin rays:	8
Caudal fin rays:	10+9 (PrC)

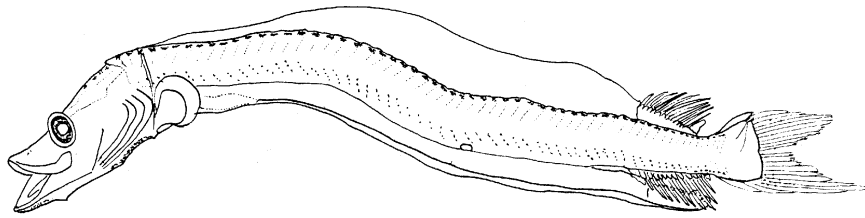
Figures: Adult: Shirley G. Hartman (Morrow and Gibbs, 1964); **A–D:** Ozawa and Aono, 1986

References: Gibbs, 1984d; Kawaguchi and Moser, 1984; Ozawa and Aono, 1986

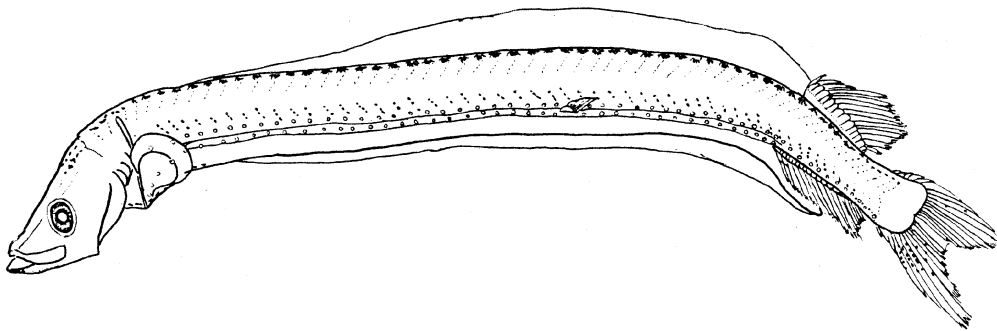
Echiostoma barbatum



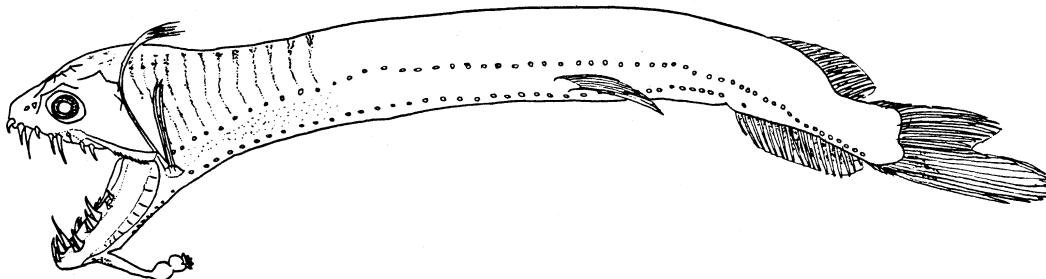
A. 8.5 mmSL



B. 16.4 mmSL



C. 28.3 mmSL



D. 30.8 mmSL

***Eustomias* sp.**
Melanostomiidae
 No common name



Range: Twelve species of *Eustomias* occur in the western North Atlantic Ocean north of 35°N

Habitat: Primarily mesopelagic, some bathypelagic, in depths from near surface to 1,800 m

Spawning: Undescribed; larvae rarely collected in study area

Eggs: – Undescribed

Larvae:

- Elongate, slim body with long preanus length
- Prominent trailing gut
- Head elongate, depressed, with spatulate snout, terminal mouth
- Eyes moderate, slightly oval to round
- Anal fin considerably longer than dorsal fin; anal fin origin farther anterior
- Pectoral fin lacking in some species
- Finfolds low anteriorly, higher posteriorly
- Pelvic fin forms at about myomere #32–37

– **Photophores (genus *Eustomias*)**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	7–8	24–36	11–20	15–25	24–37	12–21

- Pigment includes characteristic series of bold melanophores along dorsum of body but does not include pigment on myosepta; pigment at tip of lower jaw usually present
- Transformation in some species occurs at >45 mm

Note: 1. Several other examples of *Eustomias* larvae collected outside of the present study area are described in Ozawa and Aono (1986) and Moser (1996d). Although different kinds are recognized, few have been identified to the species-level.

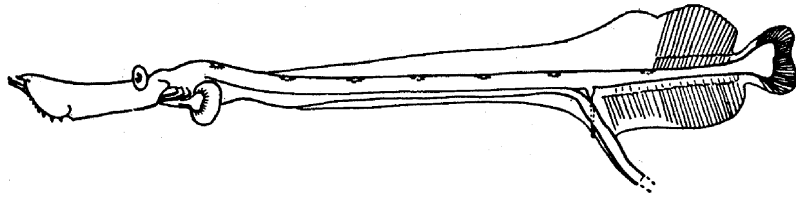
Meristic Characters (Genus)

Myomeres:	about 56–71
Vertebrae:	56–71
Dorsal fin rays:	20–29
Anal fin rays:	32–46
Pectoral fin rays:	0–13
Pelvic fin rays:	7–8
Caudal fin rays:	10+9 (PrC)

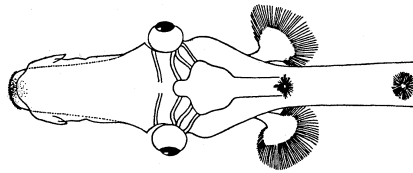
Figures: Adult (*Eustomias obscurus*): Shirley G. Hartman (Morrow and Gibbs, 1964); **A–B:** Beebe and Crane, 1939; **C:** Kawaguchi and Moser, 1984 (redrawn from Regan, 1916)

References: Beebe and Crane, 1939; Morrow and Gibbs, 1964; Kawaguchi and Moser, 1984; Moser, 1996d

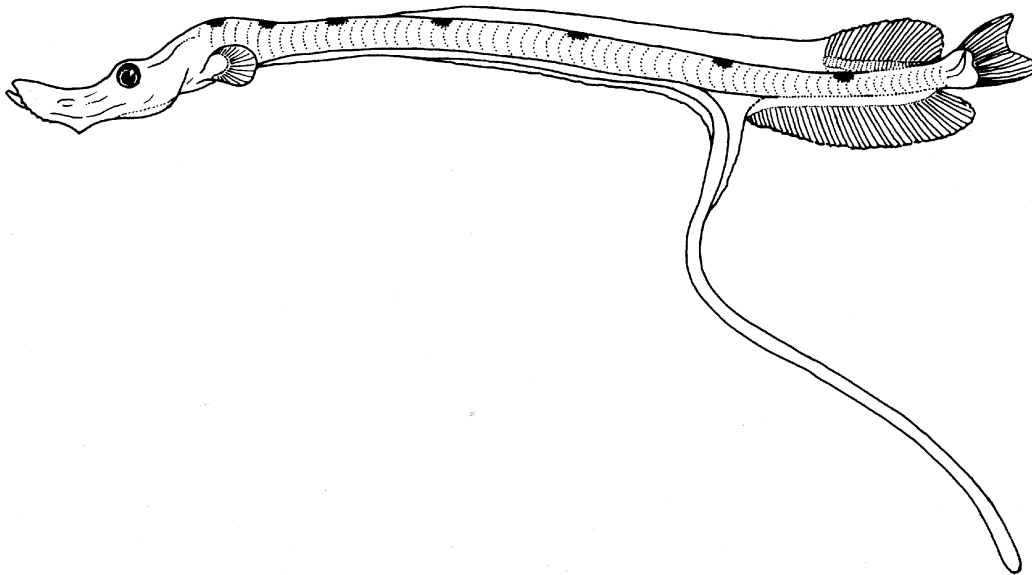
Eustomias sp.



A. 13.0 mmSL



**B. 13.0 mm SL
(Dorsal View of Head)**



C. 33.0 mm

Flagellostomias boureei* (Zugmayer, 1913)*Melanostomiidae**

No common name



Range: Worldwide in warm temperate to tropical waters; in the western North Atlantic from LaHave Bank to 33°N, including Bermuda and the Bahamas; also east of Greenland as far north as 58°N

Habitat: Meso- and bathypelagic in depths of 75–1,825 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Body long and deep, with wide finfolds
- Gut thick, trails a short distance beyond body
- Head large and deep, with steeply sloping profile and large jaws
- Anal fin base longer than dorsal fin base; origins about even in early larvae, then anal fin origin slightly anterior to dorsal fin origin

– **Photophores**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	9–10	32–34	14–15	16–18	31–32	14–15

- Pigment includes 1 expanded melanophore per myomere along dorsum of body; few spots on each lower limb of myosepta; few spots at bases and rays of dorsal and anal fins; few spots on head
- Transformation occurs at 30–40 mm; lower pectoral fin ray becomes isolated from rest of fin

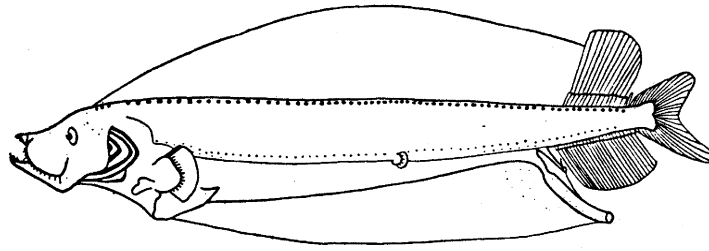
Meristic Characters

Myomeres:	65
Vertebrae:	65
Dorsal fin rays:	14–17
Anal fin rays:	21–26
Pectoral fin rays:	1+8–11
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

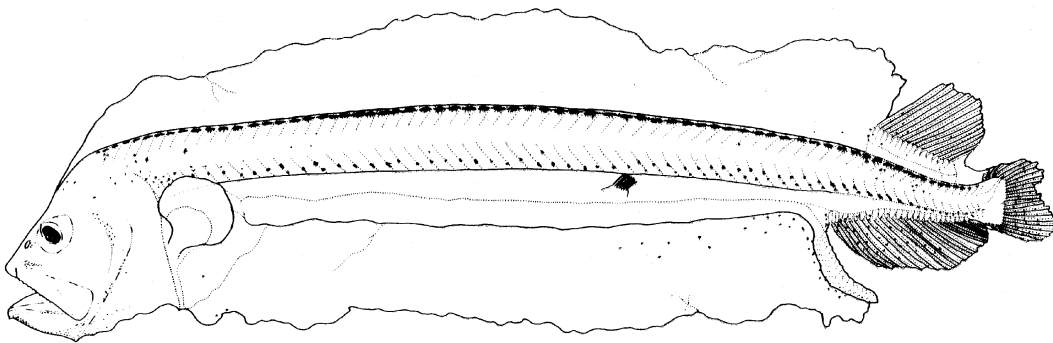
Figures: Adult: Shirley G. Hartman (Morrow and Gibbs, 1964; **A, C**: Beebe and Crane, 1939; **B**: Kawaguchi and Moser, 1984

References: Morrow and Gibbs, 1964; Kawaguchi and Moser, 1984

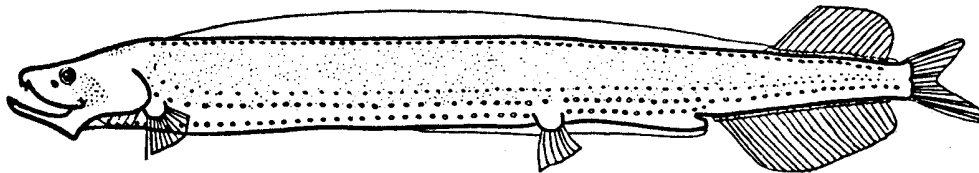
Flagellostomias boureei



A. 21.0 mmSL



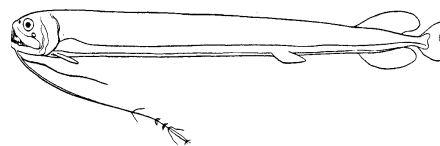
B. 36.4 mmSL



C. 34.0 mm, (Transforming)

Leptostomias gladiator* (Zugmayer, 1911)*Melanostomiidae**

No common name



Range: Worldwide in temperate to subtropical waters; in the western North Atlantic found between 40° and 25° N, including Gulf of Mexico and Caribbean Sea

Habitat: Mesopelagic

Spawning: Undescribed

Eggs: – Undescribed

Larvae: – Body moderately deep, head fairly large and deep
 – Gut only slightly thickened, slightly trailing
 – Eyes small; snout concave
 – Dorsal and anal fin origins about even
 – Pelvic fin origin posterior (at about myomere 45–48)

– **Photophores**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	10–11	39–44	20–23	11–14	39–42	20–24

– Pigment includes a series along dorsum of body consisting of 1 large melanophore, plus 1 to a few per myomere; 1–7 small spots on upper limb of each myoseptum; 2–9 small spots on lower limb of each myoseptum; in later larvae, these groups fuse to encompass entire myoseptum; dorsal and ventral surfaces of head pigmented; other pigment over liver and on finfold margins, short line of spots on each side of nape
 – Transformation occurs at about 40 mm

Note: 1. High myomere counts compared to most melanostomiids

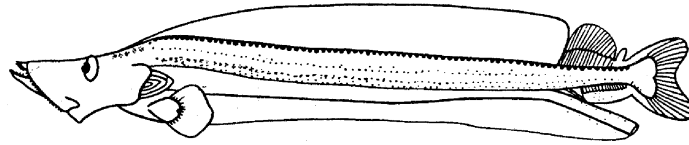
Meristic Characters

Myomeres:	about 75–78
Vertebrae:	75–78
Dorsal fin rays:	19–22
Anal fin rays:	26–29
Pectoral fin rays:	5–11
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

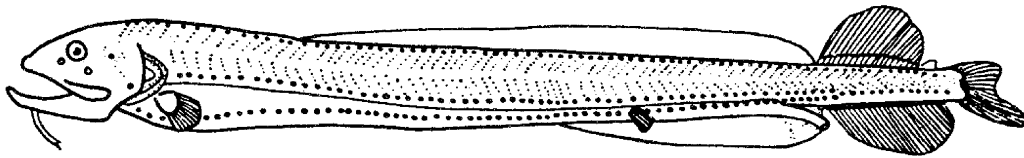
Figures: Adult: Gibbs, 1984d; **A–B:** Beebe and Crane, 1939; **C:** Barbara Sumida MacCall (Kawaguchi and Moser, 1984); **D:** Ozawa and Aono, 1986

References: Beebe and Crane, 1939; Morrow and Gibbs, 1964; Kawaguchi and Moser, 1984

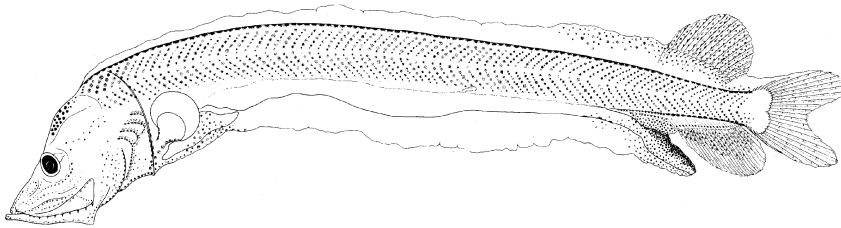
Leptostomias gladiator



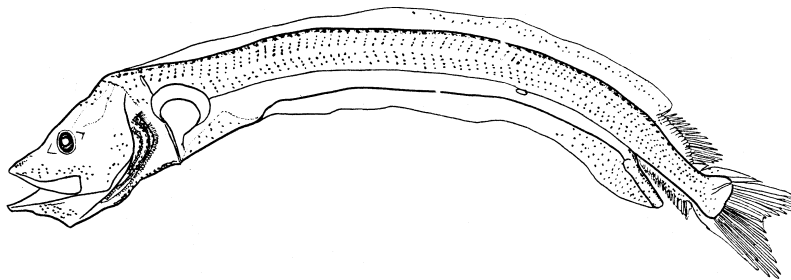
A. 12.0 mmSL



B. 42.0 mmSL (Transforming)



C. 24.5 mmSL (*Leptostomias* sp.)



D. 17.7 mmSL (*Leptostomias* sp.)

Melanostomias* sp.*Melanostomiidae**

No common name



Range: Six species of *Melanostomias* occur in the western North Atlantic Ocean north of 35°N

Habitat: Meso- to bathypelagic in depths of 45 to 1,350 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

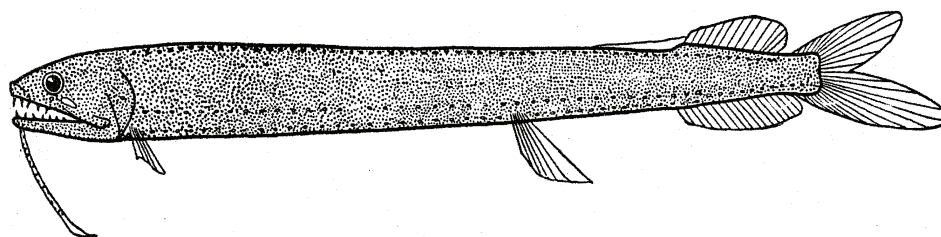
- Body elongate, with long, thick gut
- Short terminal section of gut trailing
- Head and snout relatively short, eye moderate, oval
- Wide dorsal finfold, anal finfold very narrow
- Dorsal and anal fin origins about equal
- Pelvic fin bud forms below myomere #31 in *Melanostomias tentaculatus*
- 9–12 myomeres between pelvic and anal fins

– **Photophores (genus)**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	8+2–3	23–30	12–15	9–11	22–28	11–15

- Pigment includes a series of melanophores (1 per myoseptum) along dorsum (Fig. D); in some species, this dorsum pigment is absent between about the 10th myoseptum and the dorsal fin origin (see Figs. A–C); 2–3 spots on lower limb of each myoseptum; other pigment present on head, below liver, on finfold margins, along isthmus and on terminus of gut
- Transformation occurs at sizes as small as 16 mm

Note: 1. Larva shown in Fig. C may be *Melanostomias tentaculatus*

Early Juvenile:

F. 25.0 mm (*Melanostomias bartonbeani*)

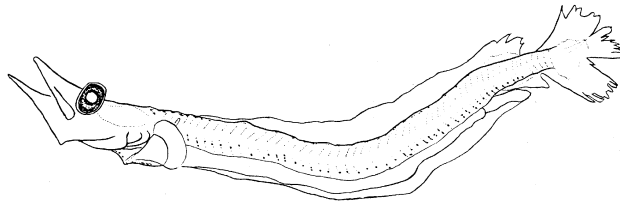
Meristic Characters (Genus)

Myomeres:	about 50–55
Vertebrae:	50–55
Dorsal fin rays:	13–17
Anal fin rays:	16–20
Pectoral fin rays:	5–6
Pelvic fin rays:	7–8
Caudal fin rays:	10+9 (PrC)

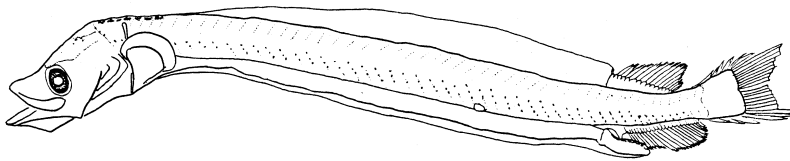
Figures: Adult (*M. biseriatus*): Shirley G. Hartman (Morrow and Gibbs, 1964); **A–B, D:** Ozawa and Aono, 1986; **C:** Henry Orr (Kawaguchi and Moser, 1984); **E–F:** Beebe and Crane, 1939 (described as *M. spilorhynchus*)

References: Morrow and Gibbs, 1964; Kawaguchi and Moser, 1984

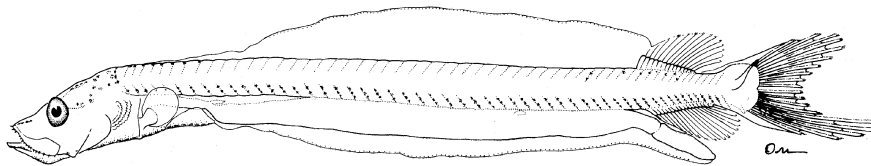
Melanostomias sp.



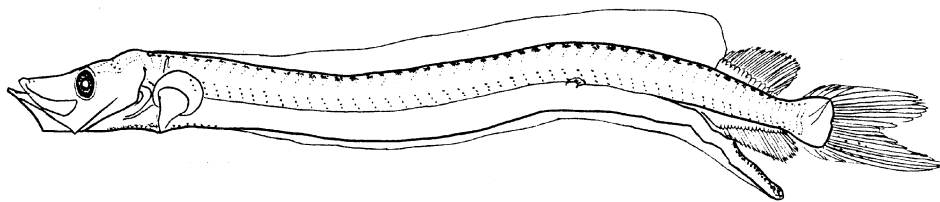
A. 6.9 mm (*Melanostomias tentaculatus*)



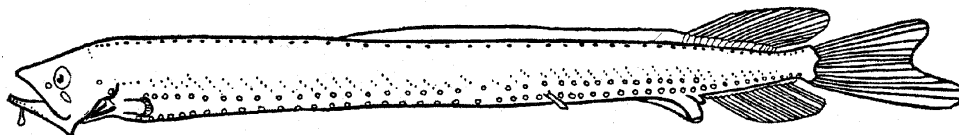
B. 16.3 mm (*Melanostomias tentaculatus*)



C. 16.0 mm (*Melanostomias* sp.)



D. 18.8 mm (*Melanostomias* sp.)



E. 24.0 mm (*Melanostomias bartonbeani*)

Photonectes margarita* (Goode and Bean, 1896)*Melanostomiidae**

No common name



Range: Worldwide in temperate to tropical waters; in the western North Atlantic Ocean from Grand Bank (as far north as 48°N) to Gulf of Mexico and Caribbean Sea

Habitat: Meso- and bathypelagic in depths from near surface to 2,000 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Body long, with very long, fairly thick, gut
- Short terminal section of gut trailing
- Head and snout moderate in length; snout profile strongly concave
- Eye small and very elliptical
- Finfolds moderately wide, especially posterior part of dorsal finfold
- Dorsal and anal fin origins about even
- Pelvic fin bud forms at about myomere 38–39
- 11–12 myomeres between pelvic and anal fins
- Photophores formed by 20 mm

– **Photophores**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	8–11	33–35	11–13	11–12	28–34	11–14

- Pigment includes several melanophores on dorsum of each myomere; up to 7 spots on lower limb of each myoseptum; finfolds and anal fin sprinkled with fine spots; a row of fine spots along edge of opercle; dense patch of spots on top of head; trailing portion of gut with pigment
- Transformation occurs at about 20–25 mm

Note: 1. There are 6 species of *Photonectes* in the study area. Larvae of the subgenus *Photonectes* have 1 dorsal melanophore per myomere, whereas larvae of the subgenus *Trachinostomias* have 3–7 dorsal melanophores per myomere (as in *Photonectes margarita* and *P. parvimanus*); there are 2–7 melanophores on the lower limb of each myoseptum, and a scattering of pigment on both finfolds (somewhat more dense on outer parts) in all larvae of the genus

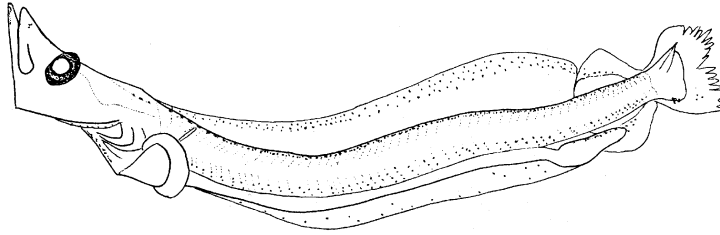
Meristic Characters

Myomeres:	63–64
Vertebrae:	62–63
Dorsal fin rays:	15–20
Anal fin rays:	19–24
Pectoral fin rays:	0–1
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

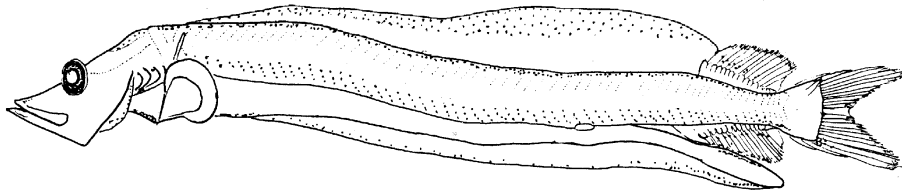
Figures: Adult: Shirley G. Hartman (Morrow and Gibbs, 1964); A–C: Ozawa and Aono, 1986

References: Morrow and Gibbs, 1964; Kawaguchi and Moser, 1984; Ozawa and Aono, 1986

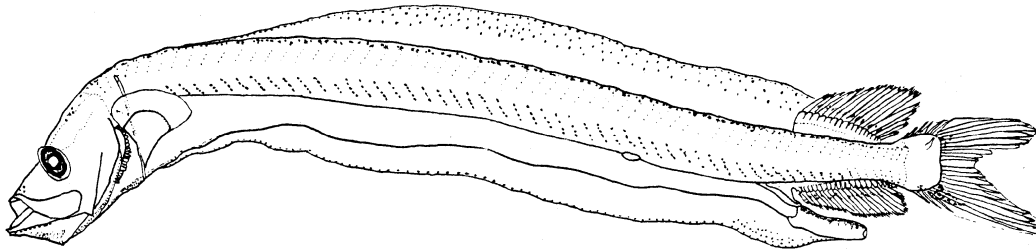
Photonectes margarita



A. 8.1 mm



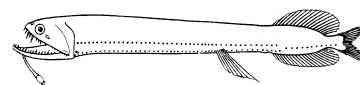
B. 12.5 mm



C. 19.9 mm

Photonectes parvimanus* Regan and Trewavas, 1930*Melanostomiidae**

No common name



Range: Atlantic and Pacific oceans in temperate to subtropical waters; in the western North Atlantic from slope water south of Browns Bank and near Hudson Canyon south to 23°N

Habitat: Meso- and bathypelagic in depths from near surface to 1,466 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Body long, with very long, fairly thick, gut
- Short terminal section of gut trailing
- Head and snout moderate in length; snout profile strongly concave
- Ventral border of maxilla strongly curved
- Eye small and very elliptical
- Finfolds moderately wide, especially posterior part of dorsal finfold
- Dorsal and anal fin origins about even
- Pelvic fin bud forms at about myomere 29–41
- 12–13 myomeres between pelvic and anal fins
- Photophores formed by 26 mm

– **Photophores**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	10–11	34–38	12–14	11–13	34–36	12–14

- Pigment includes 3–6 melanophores on dorsum of each myomere; 3–4 spots on lower limb of each myoseptum; finfolds and anal fin sprinkled with fine spots; dense patch of spots on top of head
- Transformation occurs at about 25–26 mm; chin barbel forms at about 25 mm

Note: 1. There are 6 species of *Photonectes* in the study area. Larvae of the subgenus *Photonectes* have 1 dorsal melanophore per myomere whereas larvae of the subgenus *Trachinostomias* have 3–7 dorsal melanophores per myomere (as in *P. margarita* and *P. parvimanus*); there are 2–7 melanophores on the lower limb of each myoseptum, and a scattering of pigment on both finfolds (somewhat more dense on outer parts) in all larvae of the genus

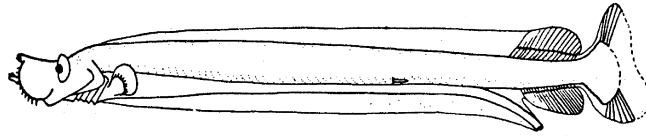
Meristic Characters

Myomeres:	about 60–65
Vertebrae:	60–65
Dorsal fin rays:	17–19
Anal fin rays:	21–24
Pectoral fin rays:	2
Pelvic fin rays:	7
Caudal fin rays:	10+9 (PrC)

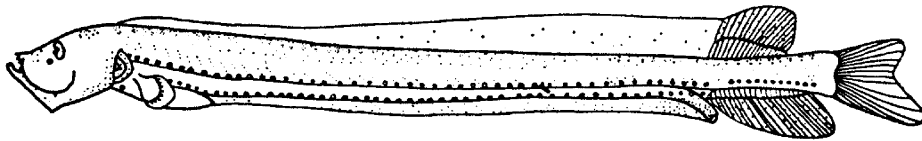
Figures: Adult: Gibbs, 1984d; **A–C:** Beebe and Crane, 1939; **D:** Kawaguchi and Moser, 1984

References: Morrow and Gibbs, 1964; Kawaguchi and Moser, 1984; Ozawa and Aono, 1986

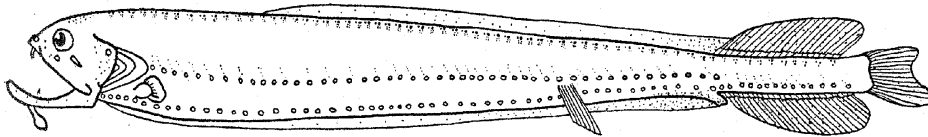
Photonectes parvimanus



A. 14.0 mm

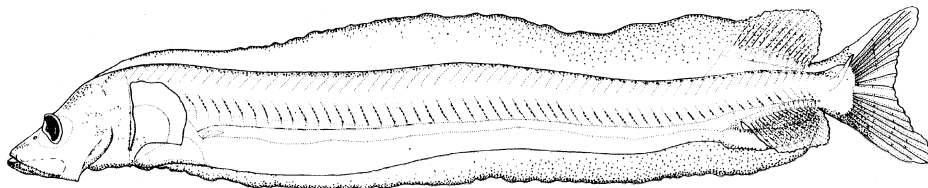


B. 26.0 mm



C. 25.0 mm

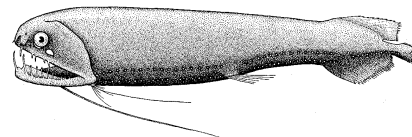
Photonectes sp.



D. 22.2 mm

Collected in eastern Pacific ocean

***Aristostomias* sp.**
Malacosteidae
 No common name



Range: Six species of *Aristostomias* occur in the western North Atlantic Ocean. Larvae of all have been collected in study area

Habitat: Meso- to bathypelagic in depths from near surface to 2,000 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Elongate, very slender body
- Head long and depressed, with very long jaws, terminal mouth
- No chin barbel
- Gut long and trailing well beyond body
- Eyes small and oval
- Dorsal and anal fin origins about even
- Adipose fin absent

Meristic Characters (Genus)

Myomeres:	about 44–52
Vertebrae:	44–52
Dorsal fin rays:	18–26
Anal fin rays:	24–32
Pectoral fin rays:	6–17
Pelvic fin rays:	6
Caudal fin rays:	10+9 (PrC)

– **Photophores (genus)**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	5+3	14–18	13–18	9–12	14–19	15–18

- Pigment includes opposing dorsal (8–14) and ventral melanophores along body, the latter often embedded and difficult to see; many in the dorsal series occur below dorsal fin base; upper and lower limbs of myosepta without pigment; trailing gut with pairs of melanophores; head pigment absent or a row of spots along isthmus
- Transformation occurs at unknown size

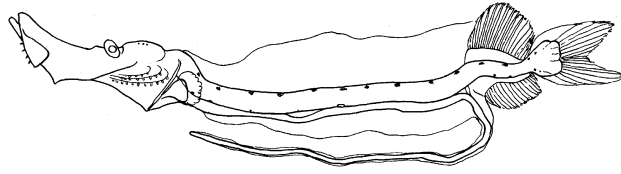
Note:

1. Larvae are similar to those of *Eustomias*, but the latter have round eyes, a flatter head, fewer (5–10) spots in the dorsal series, and a trailing gut without pigment. The 12-mm larva identified as ?*Eustomias* by Beebe and Crane (1939) pertains to *Aristostomias*
2. See Richards (2001) for illustration of 22.8-mm *Aristostomias* specimen from the Gulf of Mexico
3. The larva in Fig. C is from the Pacific Ocean; it is included to demonstrate typical larval development in the genus *Aristostomias*.

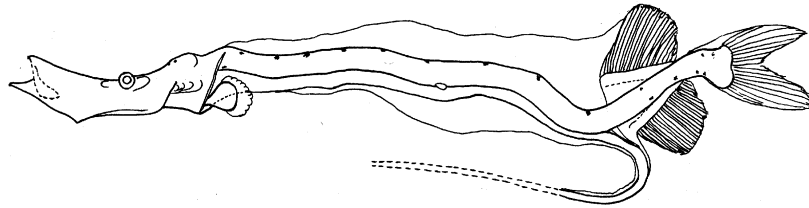
Figures: Adult: (*Aristostomias* sp.) Shirley G. Hartman (Morrow, 1964c); **A–B:** Okiyama, 1988 (A reversed); **C:** Kawaguchi and Moser, 1984

References: Morrow, 1964c; Kawaguchi and Moser, 1984; Moser, 1996d

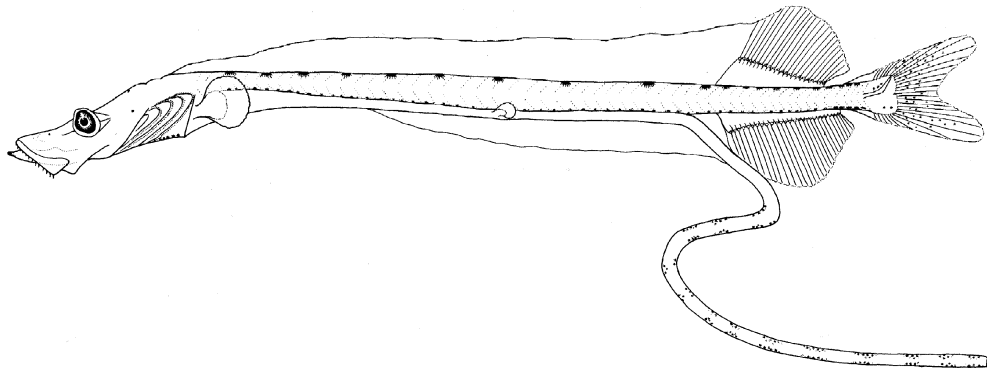
Aristostomias sp.



A. 12.6 mmSL



B. 18.5 mmSL



C. 34.7 mm
(*Aristostomias scintillans*)

Photostomias guernei* Collett, 1889*Malacosteidae**

No common name



Range: Subarctic to tropical waters of the North Atlantic, Indo-Pacific and SE Pacific oceans; in the western North Atlantic from Grand Bank to the Gulf of Mexico; worldwide latitudinal range 40° N to 56°S

Habitat: Meso- to bathypelagic in depths from near surface to 3,100 m

Spawning: Undescribed

Eggs: – Undescribed

Larvae:

- Elongate, slender body with long, depressed head
- Pointed snout, terminal mouth
- Eyes small and oval
- Gut with a trailing terminal section
- Dorsal and anal fin origins about even
- Finfolds fairly wide
- Adipose fin absent
- Pelvic fin rays become slightly elongate

– **Photophores**

<i>Name of photophore group:</i>	IP	PV	VAV	AC	OV	VAL
<i>Definitive # (adult) in group:</i>	5+2	13–16	21–25	12–15	12–17	20–23

- Pigment includes series of prominent spots along dorsal and ventral margins of body; trailing section of gut with distinct spots; spot at tip of lower jaw; a prominent melanophore on pectoral fin base
- Transformation occurs at about 30 mm

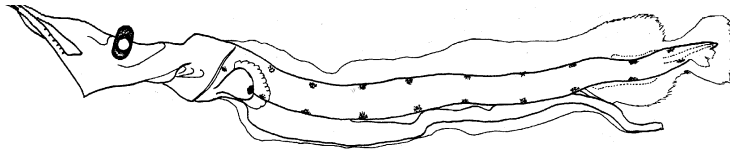
Note: 1. Larvae of *Photostomias* (Figs. A–C) based on Pacific Ocean specimens

Meristic Characters	
Myomeres:	about 52–58
Vertebrae:	52–58
Dorsal fin rays:	22–28
Anal fin rays:	25–32
Pectoral fin rays:	none
Pelvic fin rays:	6
Caudal fin rays:	10+9 (PrC)

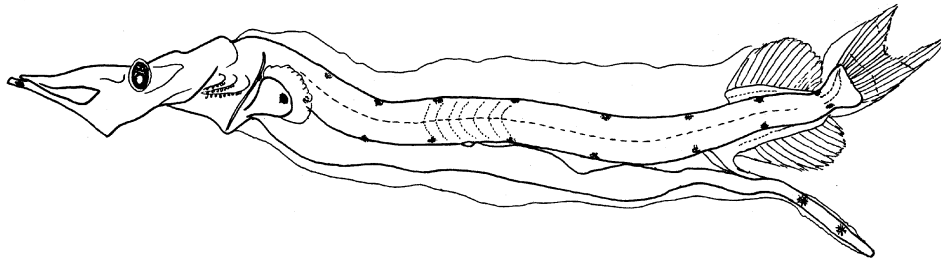
Figures: Adult: Shirley G. Hartman (Morrow, 1964c); **A–B:** Okiyama, 1988; **C:** Barbara Sumida McCall (Kawaguchi and Moser, 1984)

References: Morrow, 1964c; Kawaguchi and Moser, 1984; Moser, 1996d

Photostomias guernei

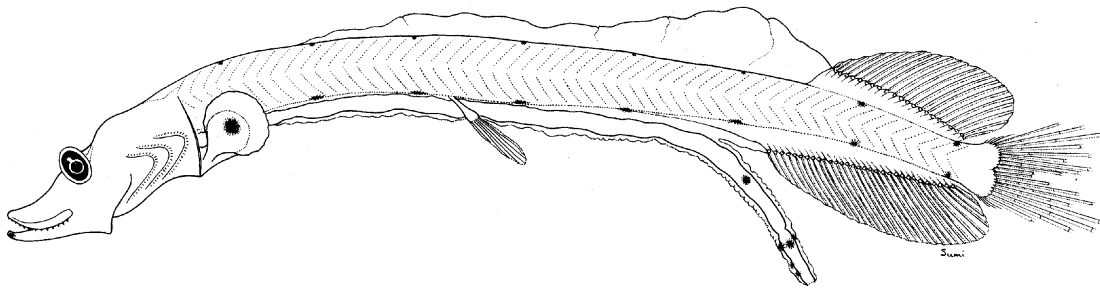


A. 8.6 mmSL



B. 14.3 mmSL

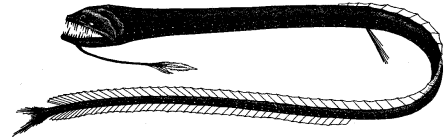
Photostomias sp.



C. 26.7 mm

Idiacanthus fasciola* Peters, 1877*Idiacanthidae**

No common name



Range: Worldwide in temperate to subtropical waters; in the western North Atlantic from Grand Bank to Gulf of Mexico and Caribbean Sea

Habitat: Meso- to bathypelagic; females 500–2,000 m during day, surface to 250 m at night; males 1,000–2,000 m day and night

Spawning: Undescribed; larvae frequently collected in study area, throughout the year

Eggs: – Undescribed

Larvae:

- Eyes on long stalks
- Elongate and slender body, with long head, long, flat snout, small mouth
- Gut long, straight and trailing
- No opercle; gill arches exposed
- Flexion occurs at 16–25 mm
- Larval pectoral fin large, fan-shaped
- Dorsal finfold high; anal finfold low
- Dorsal fin rays begin ossifying from posterior end at about 16 mm; followed by pectoral, caudal, anal and pelvic
- Dorsal fin origin well in advance of anal fin origin; dorsal fin twice as long as anal fin
- No adipose fin

– **Photophores**

Name of photophore group: IP+ PV VAV AC OV VAL

Definitive # (adult) in group: 31–36 15–18 13–18 21–25 30–36

- Pigment includes row of midlateral spots; about 6 spots along isthmus; spots on trailing portion of gut
- Transformation occurs at 28–40 mm (males); 43–161 mm (females); body shrinks and deepens; fins and photophores form; eyestalks gradually shorten, then disappear; opercle forms; pectoral fins disappear; terminus of gut included within body
- After transformation, male has no barbel or pelvic fin, forms large postorbital photophore; female develops lower jaw barbel and small postorbital photophore; small pelvic fin forms rays

Meristic Characters

Myomeres: about 78

Vertebrae: about 78

Dorsal fin rays: 54–65 (74)

Anal fin rays: 38–49

Pectoral fin rays: none

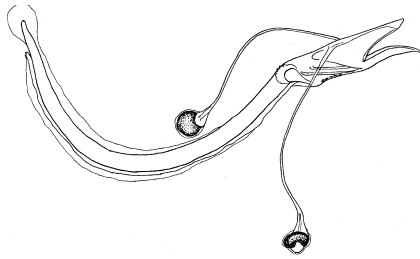
Pelvic fin rays: 6 (female only)

Caudal fin rays: 10+9 (PrC)

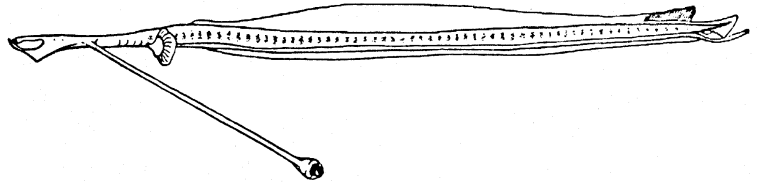
Figures: Adult: G. G. Pasley (Gibbs, 1964b); **A:** Okiyama, 1988; **B–H:** Beebe, 1934

References: Gibbs, 1964b; Kawaguchi and Moser, 1984; Moser, 1996d

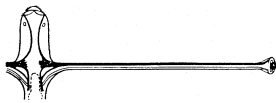
Idiacanthus fasciola



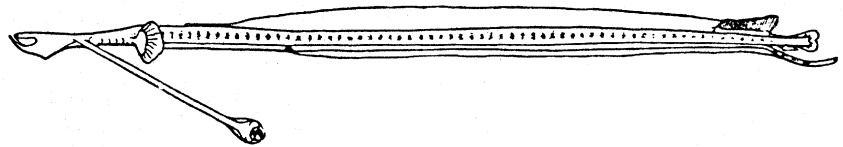
A. 5.6 mmSL



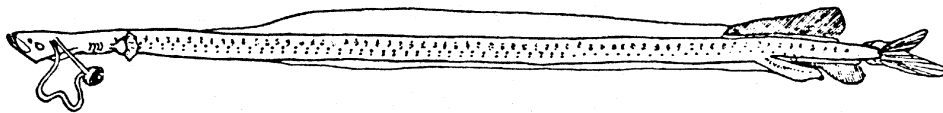
B. 16.0 mm



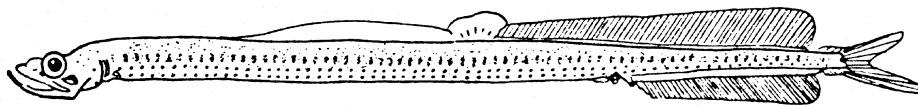
C. 16.0 mm
(Top of Head)



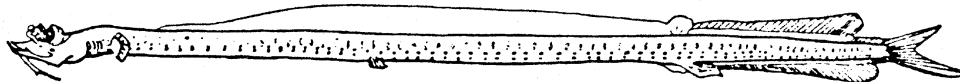
D. 25.0 mm



E. 40.0 mm (Male)



F. 35.0 mm (Male Transforming)



G. 45.0 mm (Female)



H. 48.0 mm (Female Transforming)