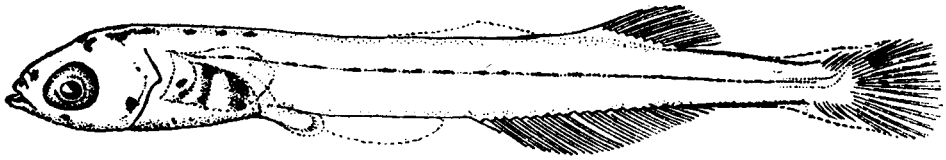
NOAA Technical Memorandum NMFS-SEFSC-482

PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE HISTORY STAGES OF ATHERINOPSID FISHES OF THE WESTERN CENTRAL NORTH ATLANTIC

BY

LOURDES VÁSQUEZ-YEOMANS



U.S. DEPARTMENT OF COMMERCE
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National Marine Fisheries Service
Southeast Fisheries Science Center
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This report will be posted on the Bethune Cookman College NOAA Cooperative web site later in 2002 at URL: http://www4.cookman.edu/NOAA/ and will also appear on the SEFSC web site at URL: http://www.sefsc.noaa.gov/ It will be a chapter entitled Atherinopsidae in the "Guide to the early life history stages of fishes of the western central North Atlantic".

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ATHERINOPSIDAE: New World Silversides by L. Vásquez-Yeomans

The Atherinopsidae, comprised by the New World silversides subfamilies Menidiinae and Atherinopsinae, were proposed as a separate family by Saeed *et al*. (1994). This was confirmated by Dyer & Chernoff (1996) based on twenty diagnostic characters. In our area, Western Central Atlantic (WCA), there are 18 species of Atherinopsidae, all pertaining to the subfamily Menidiinae (Chernoff, 2001). Menidiinae, a group confined to the Americas, occurs primarily in the tropics, has many freshwater species in Mexico and Central America. and is represented by seven genera: *Chirostoma, Labidesthes, Menidia, Poblana, Atherinella, Membras* and, *Melanorhinus* (Dyer & Chernoff, 1996). In the WCA region we have *Atherinella* with 8 species, *Melanorhinos* with 1 species, *Membras* with 3 species, and *Menidia* with 6 species occur.

The atherinopsids are small fishes <150 mm SL, slender, elongate, and moderately compressed posteriorly, with large eyes. The lateral line is weak or absent, broad silvery lateral band is present, and pelvic fins are usually abdominal. The characters that define at this family are: premaxilla protactile, usually highly protractile; distal end of the premaxilla expanded though reduced slightly in a few species; premaxilla lacks a postmaxillary process; mandibular sensory canal connected to the preopercular canal, and two well-separated dorsal fins, the first with II to IX spines (Chernoff, 2001). Atherinopsids are often extremely abundant in inshore regions of freshwater lakes, estuaries, and various shallow marine environments.

Martin & Drewry (1978) compiled the meager information on early life history stages of three species (*Membras martinica, Menidia beryllina* and *Menidia menidia*), the only atherinopsids present in WCA area that have been described. Also, there is information on four other atherinopsids species, but they occur in the California Current region (Watson, 1996t). Eggs for the known species (*Membras martinica, Menidia beryllina* and *M. menidia*) are not found in plankton tows but can be captured in hand seines pulled along shore areas where heavy filamentous algae and vegetative debris are present. Eggs of these species are demersal, and possess one or more filaments that attach to vegetation and debris. Newly hatched atherinopsids larvae (ca. 3 mm) are slender, with an extremely short gut. A line of melanophores is present along the dorsal and lateral midline from the head to the caudal region. Atherinopsid larvae can be confused with other fish families such as Atherinidae, Clupeidae, Engraulidae, Hemiramphidae and Mugilidae, but are generally recognizable to family by their extreme slenderness coupled with the forward position of the anus. Among atherinopsids species differentiation is difficult due to their morphometric and pigmentation similarities. ELH stages are known only for only three species: *Menidia beryllina*, *M. menidia*, & *Membras martinica* and species accounts & illustrations are provided. Tables Atherinopsidae 1 & 2 provide meristic, distribution, and habitat data for all species.

Table Atherinopsidae 1. Meristic characters for the described atherinopsid species that occur in the western central Atlantic. Counts were obtained from various authors listed in Literature Cited.

Species	Fin Rays				Gill Rakers	Vertebrae
	First Dorsal	Second Dorsal	Anal	Pectoral		
Atherinella						
alvarezi	III-V	I,7-10	I,19-21	13-14	23-28	37
beani	II-IV	I,7-9	I,19-23	12-14	5-6+18-22	36-40
blackburni	II-IV	I,7-9	I,22-24	12-14	4-6+16-19	40-41
brasiliensis	II-V	I,7-9	I,18-20	14-15	3-4+15-17	38
chagresi	II-VI	I,7-9	I,18-24	12-14	20-29	36-44
milleri	II-IV		I,23-27		20-29	
robbersi	II-IV		I,17-18	13		
schultzi	IV-VI	I,9-10	I,20-24	12-14		
Membras						
analis	IV-VI	I,8-9	I,15-17	13-14	3+16-17	38-42
argentea	V	I,8-9	I,14-16			38-42
martinica	II-VII	I,6-9	I,15-23	11-15		43
Melanorhinus						
microps	VI-IX	I,15-19	I,21-24		3+17	
Menidia						
beryllina	IV-VI	I,7-10	I,13-20	12-13		37-41
clarkhubbsi	IV-VI	I,7-9	I,16-18	12-14		
colei	IV-VI	I,7-9	I,9-12			
conchrum	IV-V	I,7-8	I,11-14			
menidia	III-VII	I,7-11	I,19-29	12-16		38-47
peninsulae	V-VI	I,8-9	I,15-16	12		36-41

Table Atherinopsidae 2. Geographical distribution & habitat of the species of the Family Atherinopsidae.
Data were obtained from various authors listed in Literature Cited.

Species	Distribution & Habitat
Atherinella	
alvarezi	Villahermosa, Tabasco, Mexico in freshwater.
beani	Province of Colon, Panama in coastal waters; pelagic.
blackburni	Southern Caribbean, Central & South America in coastal shores & estuaries; benthopelagic.
brasiliensis	From the Gulf of Venezuela to Brazil in estuaries, mangroves, & protected open sea; benthopelagic.
chagresi	Costa Rica & Panama in freshwater.
milleri	Central America: Belize, Honduras, & Costa Rica in coastal estuaries, lagoons, & mangroves; brackish.
robbersi	Only at Totumo cienaga & lagoon Bolivar, Colombia in coastal marsh, estuaries, freshwater; benthopelagic.
schultzi	Veracruz & Campeche, Mexico in brackish coastal estuaries; primarily freshwater.
Membras	
analis	Colombia & Venezuela over muddy bottoms in lagoons or bays with brackish or hypersaline water.
argentea	Sabanilla, Colombia in freshwater.
martinica	New York south to Campeche & Quintano Roo, Mexico in shore, bays, & inlets; pelagic.
Melanorhinus	
microps	Cuba, Tobago, & Panama entering tide pools & flooded coastal caves; pelagic.
Menidia	
beryllina	Massachusetts to southern Florida; Gulf of Mexico, Quintano Roo, Mexico, usually brackish; pelagic.
clarkhubbsi	Northern Gulf of Mexico, Texas in freshwater or brackish; pelagic.
colei	Yucatan & Quintano Roo, Mexico restricted to brackish cienegas; pelagic.
conchrum	Lower Florida Keys in brackish or marine ponds; pelagic.
menidia	Gulf of St. Lawrence, Canada to northeastern Florida & Quintano Roo, Mexico in freshwater, brackish, & marine; pelagic. Common in open beaches, tidal creeks, & near river mouths.
peninsulae	Northern Gulf of Mexico from Veracruz & Tamaulipas, Mexico around to southern Florida in tidal creeks, marshes, & estuaries or inlets in brackish or marine, never in inland waters.

MERISTICS

Vertebrae:	
Precaudal	16-20
Caudal	22-27
Total	38-47
Number of Fin Spines and Rays:	
First Dorsal	III-VII
Second Dorsal	I,7-11
Anal	I,19-29
Pectoral	12-16
Pelvic	
Caudal	
Principal	17(9+8)

LIFE HISTORY

Range: Gulf of St. Lawrence to northeastern Florida; found in Puerto Morelos, Quintano Roo, Mexico.

Habitat: Occurs in freshwater, brackish & marine; pelagic; common on open beaches, tidalcreeks, & river mouths.

ELH Pattern: Oviparous, demersal eggs & planktonic larvae.

Spawning: Intertidal zone or shallow estuaries.
Season: March to September.

LITERATURE

Chernoff 2001; Eschmeyer 1998; Froese & Pauly 2001; Hildebrand 1922; Kolba 1972; Kuntz 1916; Kuntz & Radcliffe 1917; Linnaeus 1766; Martin & Drewry 1978; Murdy et al. 1997; Robins & Ray 1986; Smith 1985; Schmitter-Soto et al. 2000; Wang 1974

EARLY LIFE HISTORY DESCRIPTION

EGGS:

Diameter: 1.0-1.2 mm.

No. of Oil Globules: 5-12 large with numerous small ones.

Yolk:

Shell: 40 or more equal length filaments

Incubation:

Pigmentation:.

LARVAE:

Length at Hatching: 3.8-5.0 mm TL

Length at Flexion: 9.2 mm SL

Length at Transformation: 16.1-23.8 mm SL.

Sequence of Fin Development: C_1, A & D_2, C_2, P_1

Pigmentation: At hatching highly transparent, large dendritic melanophores & yellow chromatoophores aggregated at head. Melanophores on ventral surface of yolk sac, a series along base of ventral finfold, & a few small pigment groups at base of dorsal finfold toward posterior end of body. *Flexion*- at 5.5 mm TL yellow pigment almost reduced; melanophores more abundant on head & anterior tunk region; body further marked by series ofmelanophores at base of ventral finfold & another at ventral level of notochord. *Postflexion* – at 9.2-12 mm TL dorsal surface melanophores arranged in two irregular parallel rows & melanophores in single lateral rows along anal fin.

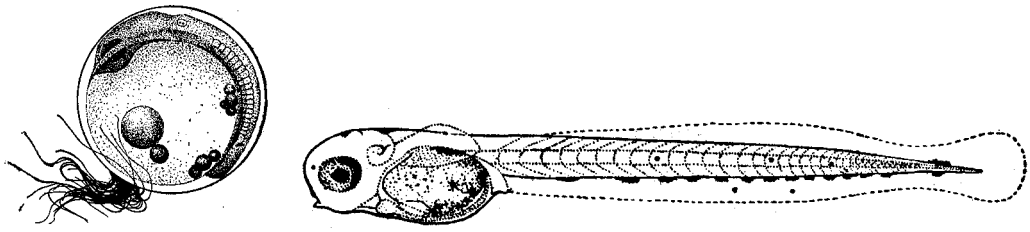
JUVENILES:

Pigmentation: At 13 mm TL large melanophores on head; melanophores on dorsum randomly distributed.

Diagnostic Characters: Elongate body, slender to robust, head triangular, rounded & short gut, pigment pattern.

ILLUSTRATIONS

A) Egg from Kuntz & Radcliffe 1917; B) newly hatched larva from Hidebrand 1922; C) newly hatched, 5 mm TL from Kuntz & Radcliffe1917; D) larva 8 mm TL from Kuntz & Radcliffe 1917; E) 9.2 mm SL dorsal view of larva from Martin & Drewry 1978; F) 12.1 mm larva from Martin & Drewry 1978; G) 23.8 juvenile dorsal view of head from Martin & Drewry 1978.



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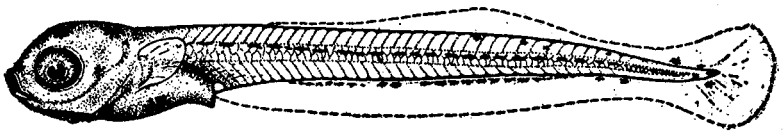

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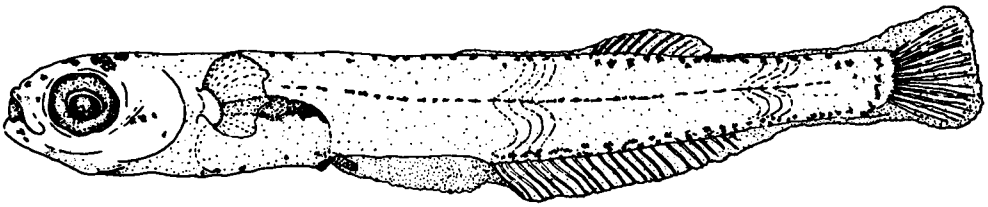

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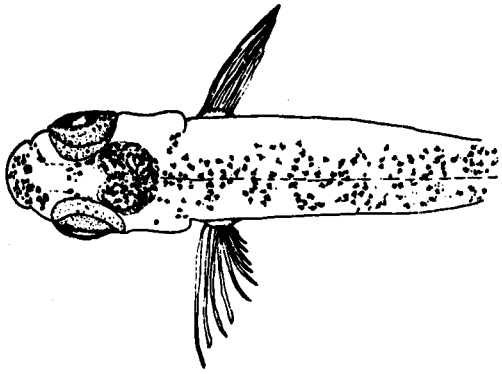

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MERISTICS

Vertebrae:	
Precaudal	17-19
Caudal	19-21
Total	37-41
Number of Fin Spines and Rays:	
First Dorsal	IV-VI
Second Dorsal	I,7-11
Anal	I,13-20
Pectoral	12-14
Pelvic	
Caudal	
Principal	17(9+8)

LIFE HISTORY

Range: Massachusetts to southern Florida, around Gulf of Mexico to northeastern Mexico; larvae in Puerto Morelos, Quintano Roo, Mexican Caribbean waters.

Habitat: Occurs in freshwater, brackish & marine; pelagic; common in brackish waters.

ELH Pattern: Oviparous, demersal eggs & planktonic larvae.

Spawning: In shallow waters with abundant dead leaves, tree roots & vegetation; primarily in tidal freshwater or brackish water.

Season: March to October.

LITERATURE

Chernoff 2001; Cope 1867; Dyer 2001; Eschmeyer 1998; Froese & Pauly 2001; Hildebrand 1922; Kolba 1972; Kuntz 1916; Martin & Drewry 1978; Schmitter-Soto et al. 2000; Wang 1974

EARLY LIFE HISTORY DESCRIPTION

EGGS:

Diameter: 0.9-1.0 mm.

No. of Oil Globules: 1-3 large.

Shell: 4-9 filaments, one much longer than others.

LARVAE:

Length at Hatching: 3.5-4.0 mm TL

Length at Flexion: 7.8-8.9 mm SL

Length at Transformation: 16.1-23.8 mm SL.

Sequence of Fin Development: C_1, D_2 & A & P_1, C_2, P_2, D_1

Pigmentation: Newly hatched larvae, 3-11 small melanophores on head, a cluster of melanophores above gut &dorsal surface of yolk, a line of pigment along ventral base of finfold from anus to tip of urostyle. At 4.7 mm TL some dark chromatophores along sides over notochord. *Postflexion* – by 11-12 mm TL mid-dorsal pigmentation still slight of lacking, a dark mid-lateral line present; one large melanophore on opercle.

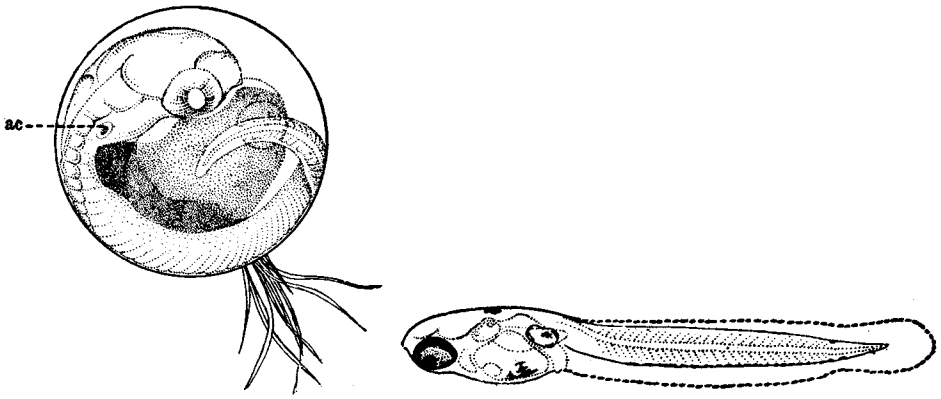
JUVENILES:

Pigmentation: Two line sof spots mid-ventrally along caudal peduncle & a lateral row of melanophores on each side of anal fin.

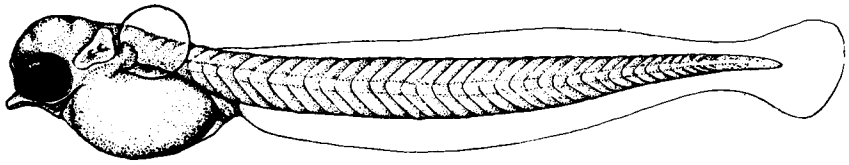
Diagnostic Characters: Elongate body, broad, round head & short, rounded gut & pigment pattern.

ILLUSTRATIONS

A) Egg from Hildebrand 1922, ac=auditory canal; B) yolk-sac larva, 3.5 mm TL, from Hidebrand 1922; C) yolk-sac larva, 3.7 mm TL, from Martin & Drewry 1978; D) larva, 4.7 mm TL from Martin & Drewry 1978; E) dorsal view of the 4.7 mm TL larva from Martin & Drewry 1978; F) 6.7 mm TL larva from Martin & Drewry 1978; G) 6.7 mm TL larva, dorsal view of head, from Martin & Drewry 1978; H) 8.9 mm TL larva from Martin & Drewry 1978..



A **B**



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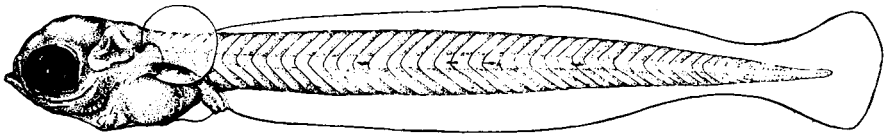

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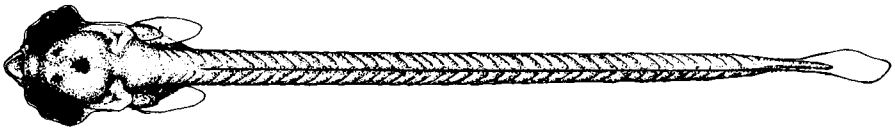

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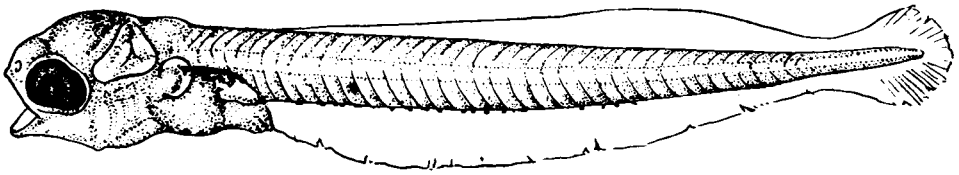

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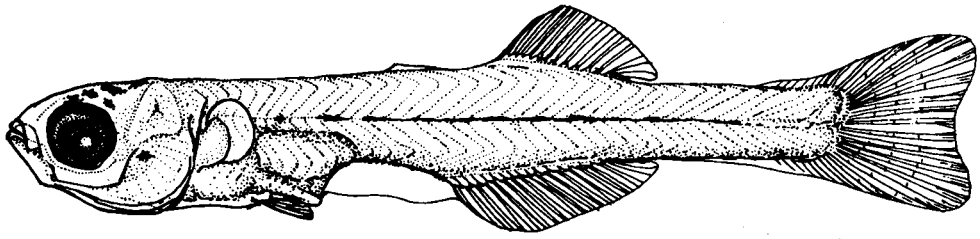


H

MERISTICS

Vertebrae:	
Precaudal	19
Caudal	24
Total	43
Number of Fin Spines and Rays:	
First Dorsal	II-VII
Second Dorsal	I,6-9
Anal	I,15-23
Pectoral	11-15
Pelvic	
Caudal	
Principal	17(9+8)

LIFE HISTORY

Range: New York to Laguna de Terminos, Campeche, Mexico; larvae in Puerto Morelos and lagoonal systems of Sian Ka'an Biosphere Reserve, Quintano Roo, Mexican Caribbean waters.

Habitat: Occurs along shores, bays & inlets; pelagic.

ELH Pattern: Oviparous, demersal eggs & planktonic larvae.

Spawning: In estuarine & marine waters.

Season: Between March & August or September.

LITERATURE

Boschung 1992; Castro-Aguirre et al. 1999; Chernoff 1986b, 2001; Eschmeyer 1998; Froese & Pauly 2001; Hildebrand 1922; Jordan 1905; Kolba 1972; Kuntz 1916; Martin & Drewry 1978; McEachran & Fechhelm 1998; Murdy et al. 1997; Sanvicente-Añorve et al. 1999; Schmitter-Soto et al. 2000; Wang 1974

EARLY LIFE HISTORY DESCRIPTION

EGGS:

Diameter: 0.7-0.8 mm.

No. of Oil Globules: 8-15 in early stages, fewer in later stages.

Shell: 1-3 enlarged filaments.

LARVAE:

Length at Hatching: 3.0 mm

Length at Flexion: 7.9 mm SL

Length at Transformation: Ca. > 20 mm TL.

Sequence of Fin Development: C_1, D_2 & A, C_2, P_1, P_2, D_1

Pigmentation: Newly hatched larvae (ca. 3.0-5.0 mm TL), 1 large & a few small melanophores on head, a line of pigment spots along the base of the ventral finfold, a dark patch on the ventral surface of the yolk sac. *Flexion* – at 9.0 mm TL a few spots on dorsum of head & a dark line along side of body. *Postflexion* - larger larvae >11.0 mm TL with sides distinctly silvery. Melanophores on dorsal surface arranged in 1 row down the mid-dorsal line, pigment spots at the base of the anal rays but very rarely found lateral to anal fin..

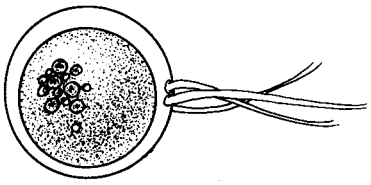
JUVENILES:

Pigmentation: Basically similar to adults, mid-dorsal row of melanophores very prominent in juveniles <30 mm.

Diagnostic Characters: Elongate body, broad, round head & short, rounded gut & pigment pattern.

ILLUSTRATIONS

All illustrations from Martin & Drewry 1978. A) Egg; B) yolk-sac larva, 3.3 mm TL; C) yolk-sac larva, 3.8 mm TL; D) dorsal view of; E) 5 mm TL larva; F) 7.3 mm SL larva,; G) dorsal view of same; H) 11 mm TL larva. On following page dorsal views I) 11.6 mm SL ; & J) 23.1 mm SL.



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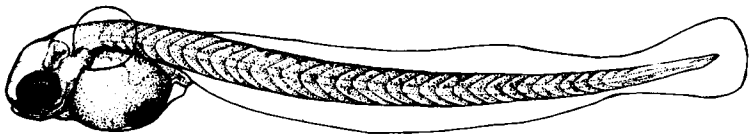

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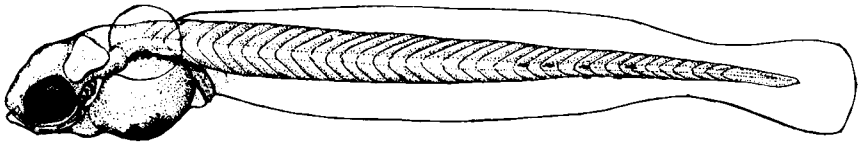

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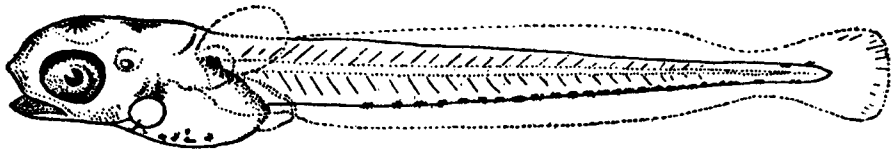

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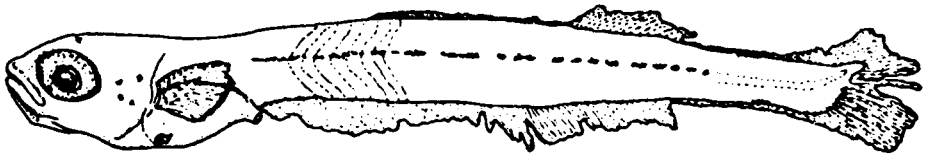

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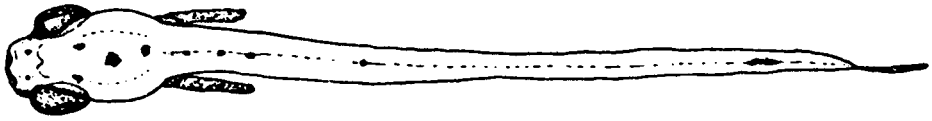

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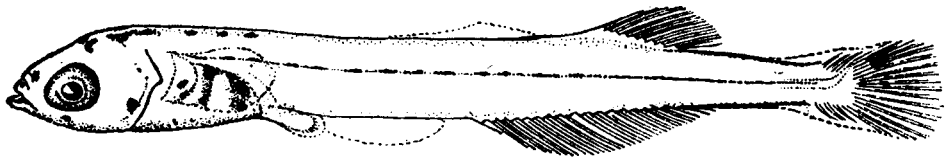

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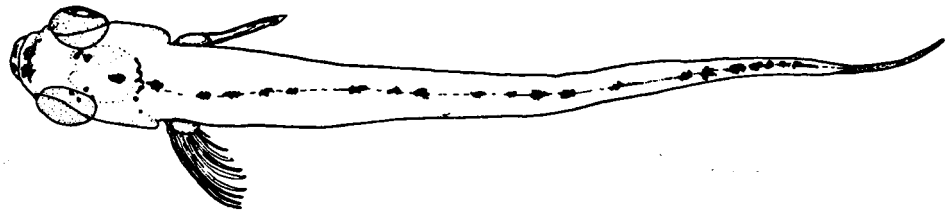

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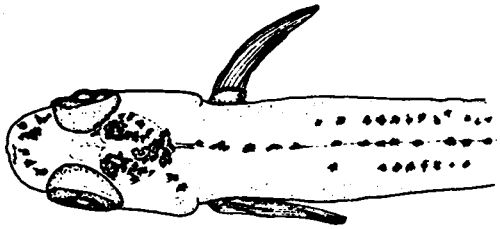

J

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