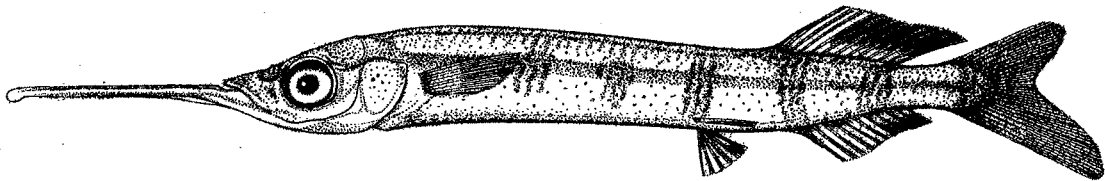




PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE
HISTORY STAGES OF HEMIRAMPID FISHES OF THE WESTERN CENTRAL
NORTH ATLANTIC

BY

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December 2003



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National Marine Fisheries Service
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December 2003

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This report should be cited as follows:

Collette, B. B. 2003. Preliminary guide to the identification of the early life history stages of hemiramphid fishes of the western central North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-513, 23 p.

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It will be a chapter entitled Hemiramphidae in the "Guide to the early life history stages of fishes of the western central North Atlantic".

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Halfbeaks are elongate fishes, usually with a prolonged lower jaw (except in *Chriodorus* and *Oxyporhamphus*) and a short triangular upper (except in *Oxyporhamphus*) jaw. Nostrils are in a pit anterior to the eyes. No spines in fins; dorsal and anal fins posterior in position; pelvic fins abdominal in position, with 6 soft rays; pectoral fins usually short. Lateral line running down from pectoral fin origin and then posteriorly along ventral margin of body. Scales moderately large, cycloid, easily detached. The Hemiramphidae contains 14 genera and subgenera and 115 species and subspecies (Collette, in press) of which five genera and nine species (one with two subspecies) occur in the western central North Atlantic (Collette 2003).

Halfbeaks live near the surface and are protectively colored for this mode of life by being green or blue on the back and silvery white on the sides and ventrally. Tip of the lower jaw bright red or orange in most species, due to carotenoid pigments, especially zeaxanthin, astaxanthin, and beta-doradexanthin.

Most species are marine, but 4 genera and about 40 species inhabit freshwaters. They are omnivorous, feeding on floating seagrass, crustaceans and small fishes. They are prone to leap and skitter at the surface and species of the offshore genus *Euleptorhamphus* leap out of the water and glide like a flying fish.

Although at present halfbeaks are not of great commercial importance, many species are regularly found in local markets. The flesh is excellent and halfbeaks are utilized as food in many parts of the world. They are also important bait fishes when fishing for billfishes. Halfbeaks are mainly caught with seines and pelagic trawls, and dipnetted under lights at night. They are utilized fresh, dried salted and smoked.

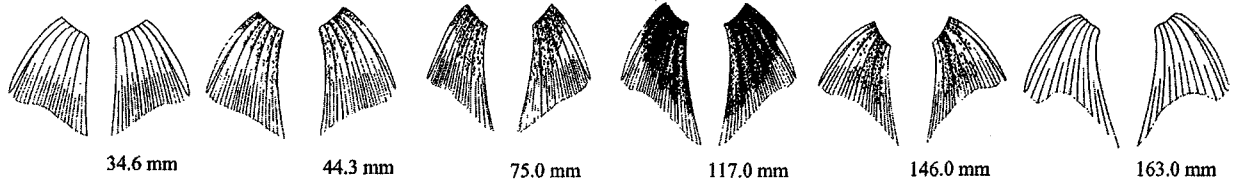
Development has long been of interest in

beloniform fishes (Schlesinger 1909; Nichols & Breder 1928; Collette et al. 1984). Most beloniform fishes produce large spherical eggs with attaching filaments, characters they share with other atherinomorph fishes (Rosen & Parenti 1981). Three Asian freshwater genera are viviparous (Meisner & Collette 1999). Halfbeak eggs are typically 1.5-2.5 mm in diameter and have attaching filaments although these are greatly reduced in length in the pelagic eggs of *Oxyporhamphus*. Halfbeaks hatch at 4.8-11 mm, smaller than needlefishes but larger than flyingfishes and sauries (Collette et al. 1984). During post-embryonic development, halfbeaks, like other beloniform fishes, undergo a number of complex changes in beak length, melanistic dorsal fin lobe, body bars, and pelvic fin pigmentation. Adults of four genera lack the elongate lower jaw that characterizes most halfbeaks. Juveniles of all four genera, including *Chriodorus* and *Oxyporhamphus* in the western Atlantic, have a distinct beak. Juveniles of *Hemiramphus* and *Oxyporhamphus* develop a darkened posterior lobe on the dorsal fin similar to that present in two genera of needlefishes, *Ablennes* and *Tylosurus*. The ten species of *Hemiramphus* have a series of broad vertical bars on the body during some stages of their development. Body bars are retained for different periods of time during development in different species. Species of *Hemiramphus* also have pigmented pelvic and caudal fins as juveniles. Patterns of pelvic fin pigmentation divide the genus into two species groups, one with pigment concentrated proximally on the fin (*balao* group, including the eastern Pacific *He. saltator*; see Figure Hemiramphidae 1), and the other with pigment absent basally and concentrated distally (*brasiliensis* group; including *He. bermudensis*).

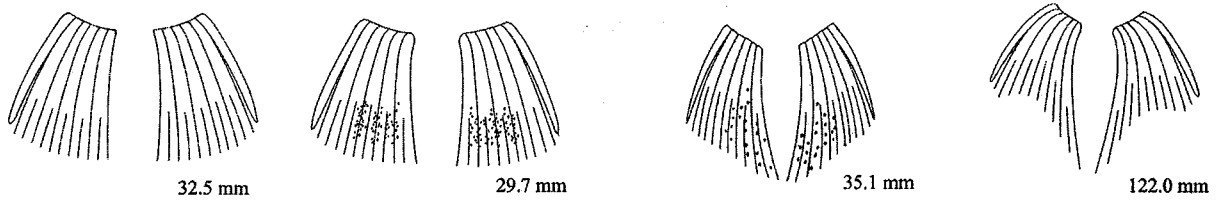
Legends

Figure Hemiramphidae 1. Pelvic fins of *Hemiramphus* juveniles, in ventral view. Top row, *He. balao* from Collette et al. 1984: fig. 183: 34.6, 44.3, 75.0, 146, and 163 mm SL; middle row, *He. bermudensis*: 32.5, 29.7, and 122 mm SL; bottom row, *He. brasiliensis*: 37.2, 55.7, 60.2, 62.9, 81.4, and 118 mm SL.

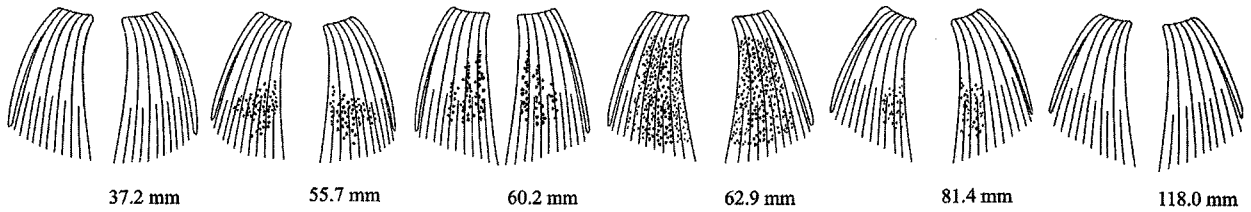
Hemiramphus balao



Hemiramphus bermudensis



Hemiramphus brasiliensis



HEMIRAMPHIDAE

Chriodorus atherinoides Goode and Bean 1882

MERISTICS

Vertebrae:	
Precaudal	31-33, mean 31.6
Caudal	18-19, mean 18.2
Total	49-50, mean 49.8
Number of Fin Rays:	
Dorsal	15-18, mean 16.7
Anal	15-18, mean 16.5
Pectoral	12-14, mean 13.0
Pelvic	6
Predorsal scales	33-39, mean 36.0
Gillrakers:	
First arch	(4-6) + (15-18) = 19-24, mean 21.3
Second arch	(2-4) + (13-14) = 16-18
Branchiostegals	

LIFE HISTORY

Range: western Atlantic, southern Florida, Florida Keys, Bahamas, Cuba, Campeche & Yucatan, Mexico, & Belize.

Habitat: abundant in clear waters around Key West & in brackish lakes in the Bahamas.

ELH Pattern: oviparous.

Spawning: nearly ripe specimens were reported from lake Forsyth, Bahamas In January. Juveniles 20-46 mm SL were Collected at Key West in April.

LITERATURE

Breder 1934, Collette 2003c

EARLY LIFE HISTORY DESCRIPTION

EGGS: unknown

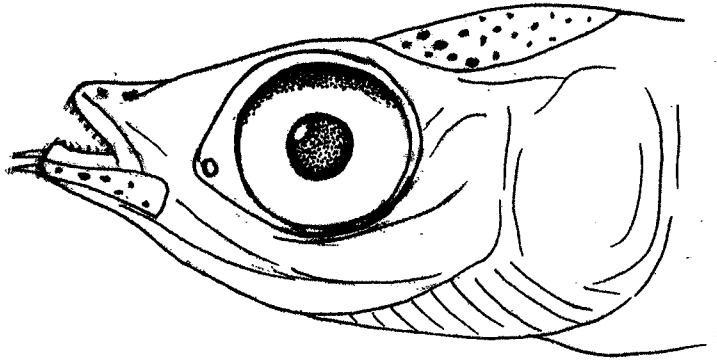
LARVAE: unknown

JUVENILES:

Diagnostic characters: no beak but juveniles mm SL have a pair of processes at the tip of the lower jaw that presumably represent a beak.

ILLUSTRATIONS

Original, head of a 31.5 mm SL juvenile; USNM 038720, Gulf of Mexico, Key West.



HEMIRAMPHIDAE*Euleptorhamphus velox* Poey 1868**MERISTICS**

Vertebrae:	
Precaudal	45-46
Caudal	26-27
Total	71-73
Number of Fin Rays:	
Dorsal	21-24, mean 22.3
Anal	20-24, mean 21.8
Pectoral	7 + 1 tiny splint
Pelvic	6
Predorsal scales	52-58, mean 54.5
Gillrakers:	
First arch	(6-9) + (20-27) = 27-35, mean 29.9
Second arch	(2-6) + (15-20) = 17-25, mean 21.7
Branchiostegals	

LIFE HISTORY

Range: Atlantic Ocean, in the Western Atlantic from South Dartmouth, MA and Newport, RI south through the Gulf of Mexico & Caribbean Sea to Recife, Brazil. Replaced in the Indo-Pacific by the closely related *E. viridis* (van Hasselt).

Habitat: Marine, epipelagic, usually offshore or around islands.

ELH Pattern: Oviparous

Spawning: Well-developed eggs present in a female collected in May in Puerto Rico

LITERATURE

Chen 1988, Collette 1965, 2003, Erdman 1976, Hardy 1978, Watson 1996aa.

EARLY LIFE HISTORY DESCRIPTION

EGGS: unknown.

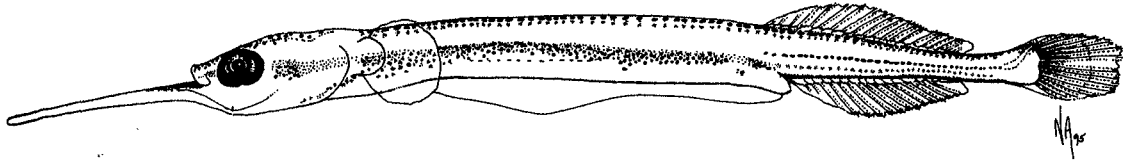
LARVAE: unknown.

JUVENILES:

Diagnostic characters: much more elongate & Slender with more D & A rays (20-24) than any other halfbeaks in the region (not more than 18).

ILLUSTRATIONS

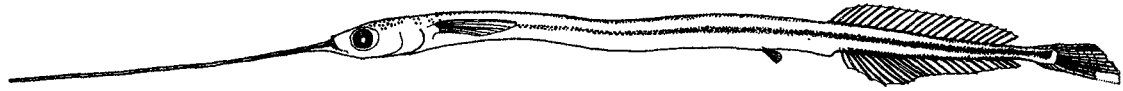
A) Larval *E. viridis*, 8.6 mm, from Watson 1996aa: 635;
 B) larval *E. viridis*, 13.4 mm SL, from Chen 1988: 272;
 C) juvenile *E. viridis*, 35.8 mm SL, from Chen 1988: 272; D) subadult *E. velox*, 135 mm SL from Collette 1965.



A *E. viridis* 8.6 mm



B *E. viridis* 13.4 mm SL



C *E. viridis* 35.8 mm SL



D *E. velox* 135 mm SL

HEMIRAMPHIDAE***Hemiramphus balao* (LeSueur 1823)****MERISTICS**

Vertebrae:	
Precaudal	37-39
Caudal	16-17
Total	54-56
Number of Fin Rays:	
Dorsal	11-15, mean 13.5
Anal	10-13, mean 11.6
Pectoral	10-12, mean 10.7
Pelvic	6
Predorsal scales	37-41
Gillrakers:	
First arch	(7-10) + (22-29) = 31-37, mean 34.5
Second arch	(4-7) + (19-24) = 25-30, mean 27.2
Branchiostegals	

LIFE HISTORY

Range: Atlantic Ocean, in the western Atlantic m off New York south throughout the Gulf of Mexico & Caribbean Sea to Santos, Brazil.

Habitat: Marine, epipelagic, usually offshore.

ELH Pattern: Oviparous

Spawning: off Florida, reproduction peaks spring or early summer & all mature females were spawning daily during June. Batch fecundity about 3,700 hydrated eggs.

LITERATURE

Collette 1962, 1965, 2003; Collette et al. 1984; McBride & Thurman 2003; Rass 1972

EARLY LIFE HISTORY DESCRIPTION**EGGS:**

Diameter: egg diameters in the most advanced mode in near-ripe individuals were 0.90-1.45 mm; hydrated eggs about 1.6 mm

No. of oil globules:

Yolk:

Shell: chorion of all near-ripe ova bear threadlike filaments that allow attachment to seagrass or algae

Incubation:

Pigmentation:

LARVAE:

Length at hatching:

Length at flexion:

Length at transformation:

Sequence of fin development:

Pigmentation:

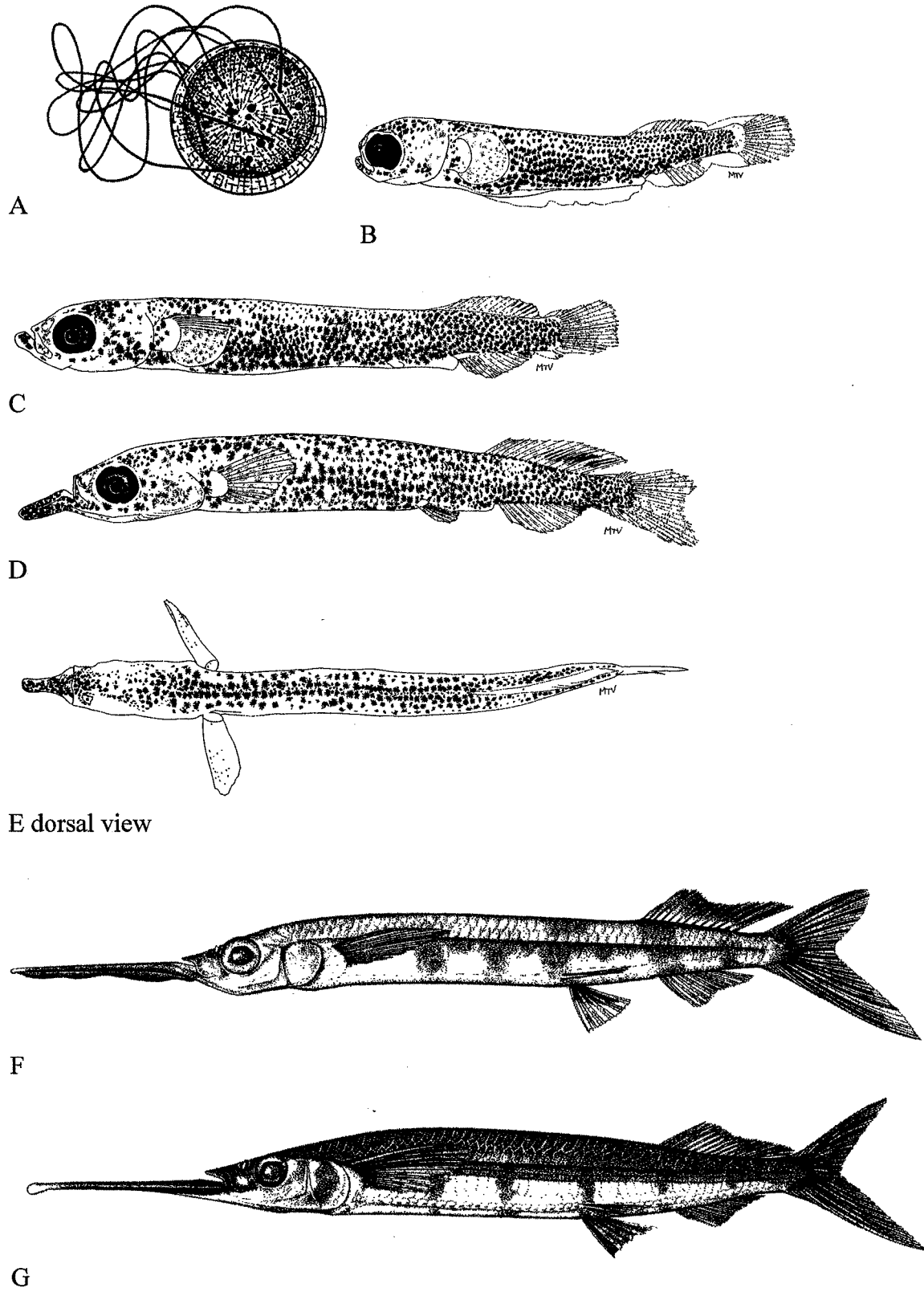
JUVENILES:

Pigmentation: Broad vertical bars on the body of juveniles retained past 175 mm SL. Pigment on the pelvic fins concentrated proximally on the fin (Fig. 1), present from 44.3 to 105 mm SL & lost after 163 mm SL.

Diagnostic characters: Pigment on pelvic fins concentrated proximally in *He. balao*, concentrated distally in *He. bermudensis* & *He. brasiliensis*.

ILLUSTRATIONS

A) egg 1.5 mm in diameter from Rass 1972: fig. 1.5; B) larval *He. saotator* 5.2 mm from Watson 1996aa: 637; C) larval *He. saltator* 8.2 mm from Watson 1996aa: 637; D) larval *He. saltator* 14.1 mm from Watson 1996aa: 637; E) larval dorsal view of *He. saltator* 14.1 mm from Watson 1996aa: 637; F) juvenile, 53.7 mm SL from Collette et al. 1984: fig. 80A; G) juvenile, 117 mm SL from Collette 1962: fig. 1, top.



HEMIRAMPHIDAE***Hemiramphus bermudensis* Collette 1962****MERISTICS**

Vertebrae:	
Precaudal	36-37, mean 36.6
Caudal	17-19, mean 17.6
Total	53-56, mean 54.2
Number of Fin Rays:	
Dorsal	13-15, usually 14
Anal	12-14, usually 13
Pectoral	10-12, usually 11
Pelvic	6
Predorsal scales	35-40, mean 36.7
Gillrakers:	
First arch	(9-13) + (26-33) = 37-44, mean 40.2
Second arch	(5-10) + (21-28) = 28-35
Branchiostegals	

LIFE HISTORY

Range: Restricted to the waters around Bermuda where it replaces the wide-ranging *He. brasiliensis*.

Habitat: Marine, epipelagic, off shore and inshore at Bermuda.

ELH Pattern: oviparous

Spawning:

LITERATURE

Collette 1962, 2003

EARLY LIFE HISTORY DESCRIPTION

EGGS: unknown

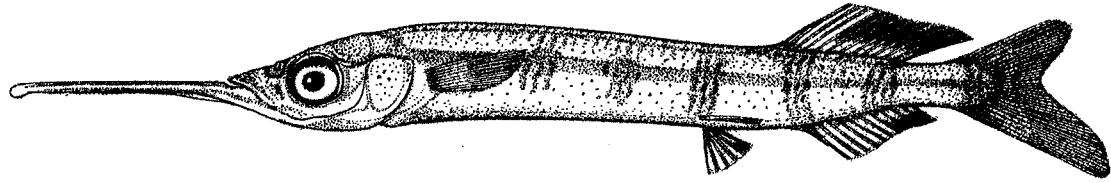
LARVAE: unknown.

JUVENILES:

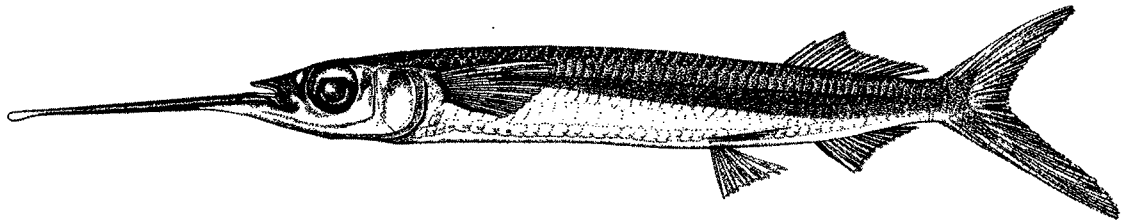
Pigmentation: Broad vertical bars on the body of Juveniles lost by about 120 mm SL. Pigment on the pelvic fins concentrated distally on the fin, present from 30-35 mm.

ILLUSTRATIONS

A) juvenile, 35.5 mm SL, USNM 337727, original. B) juvenile, 120 mm SL, from Collette 1962: fig. 1, middle.



A



B

HEMIRAMPHIDAE***Hemiramphus brasiliensis* (Linnaeus 1758)****MERISTICS**

Vertebrae:	
Precaudal	34-37
Caudal	16-18
Total	52-55
Number of Fin Rays:	
Dorsal	12-15, usually 14, mean 13.7
Anal	11-15, usually 13, mean 12.7
Pectoral	10-12, usually 11, mean 10.7
Pelvic	6
Predorsal scales	
Gillrakers:	
First arch	(7-10) + (20-26) = 28-33, mean 31.0
Second arch	(3-7) + (18-23) = 20-29, mean 24.4
Branchiostegals	

LIFE HISTORY

Range: Atlantic Ocean, in the western Atlantic from Buzzards Bay & Woods Hole, MA south through the Gulf of Mexico & Caribbean Sea to Rio de Janeiro & Porto Belo, Brazil.

Habitat: marine, epipelagic,

ELH Pattern: oviparous

Spawning: off Florida, spawning begins in March or April & is essentially complete by the end of July. Batch fecundity is about 1,200 hydrated eggs.

LITERATURE

Berkely & Houde 1978, Collette 1962, 1965, 2003, Collette et al. 1984, Hardy 1978, Hardy & Johnson 1974, McBride & Thurman 2003, McBride et al. 2003.

EARLY LIFE HISTORY DESCRIPTION**EGGS:**

Diameter: egg diameters in the most advanced mode in near-ripe individuals were 1.70-2.32 mm; hydrated oocytes were 2.4 mm.

No. of oil globules:

Shell: chorion of all near-ripe ova bear threadlike filaments that allow attachment to seagrass or algae. Filaments originate over the entire chorion but their tips congregate, forming a tuft near one & of the egg. Incubation: hatching time in the laboratory varied between 1 & 9 days after collection

LARVAE:

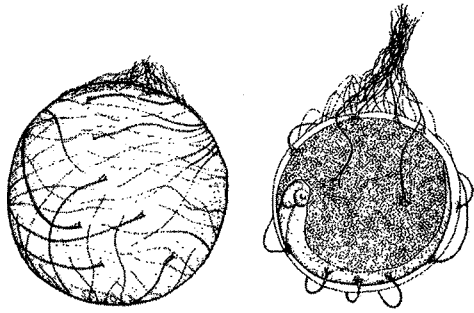
Length at hatching: 5-7 mm SL

JUVENILES:

Pigmentation: Broad vertical bars on the body of juveniles lost at about 120 mm SL. Pigment on the pelvic fins concentrated distally on the fin, present from 55.7 to 81.4 mm SL & lost before 118 mm SL.

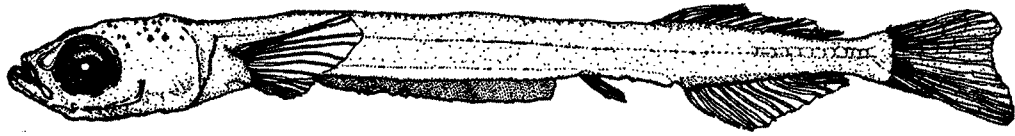
ILLUSTRATIONS

A) near-ripe ovum, 2.20 mm in diameter, from Berkely & Houde 1978: fig. 11A; B) embryo in egg, 2.48 mm in diameter, from Berkely & Houde 1978: fig. 11B; C) larva, 13.5 mm SL from Hardy 1978: fig. 67B; D) juvenile, 46.0 mm SL from Hardy 1978: fig. 67C; E) juvenile, 50.0 mm SL from Collette et al. 1984: fig. 180E; F) juvenile, 119 mm SL from Collette 1962: fig. 1, bottom.

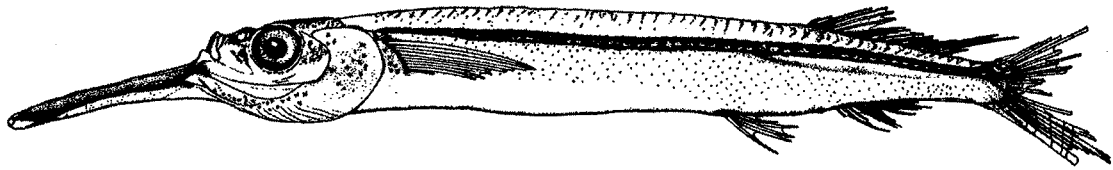


A

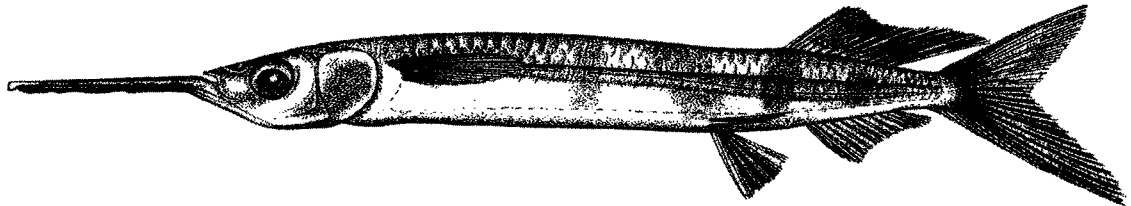
B



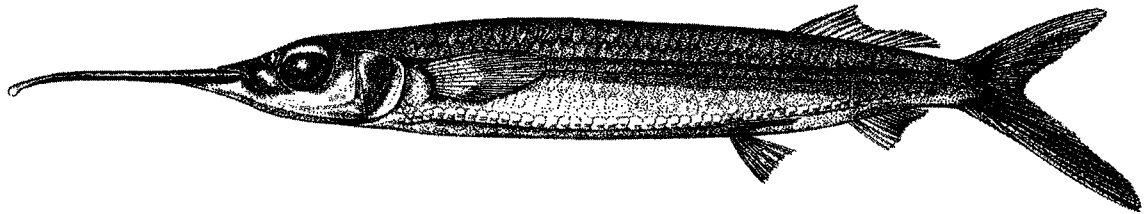
C



D



E



F

HEMIRAMPHIDAE***Hyporhamphus meeki* Banford & Collette 1993****MERISTICS**

Vertebrae:	
Precaudal	32-35, mean 33.8
Caudal	16-19
Total	50-53, mean 51.4
Number of Fin Rays:	
Dorsal	12-16, mean 14.5
Anal	14-18, mean 16.0
Pectoral	10-13, mean 11.3
Pelvic	6
Predorsal scales	34-39, mean 36.9
Gillrakers:	
First arch	(8-12) + (20-29) = 27-40, mean 34.2
Second arch	(2-6) + (20-26) = 20-30, mean 26.2
Branchiostegals	

LIFE HISTORY

Range: Atlantic coast of the United States from Miami, FL north to Cape Cod and rarely to Passamaquoddy Bay, New Brunswick & in the Gulf of Mexico from the Everglades to Galveston, TX & also at Yucatan.

Habitat: Marine, epipelagic, coastal & estuarine waters usually over sandy substrate in the proximity of submerged vegetation.

ELH Pattern: Oviparous

Spawning: Eggs are attached to floating eel grass blades during summer months in Chesapeake Bay.

LITERATURE

Banford & Collette 1993; Hardy 1978; Hardy & Johnson 1974; Olney & Boehlert 1988

EARLY LIFE HISTORY DESCRIPTION**EGGS:**

Diameter: 2.0 mm.

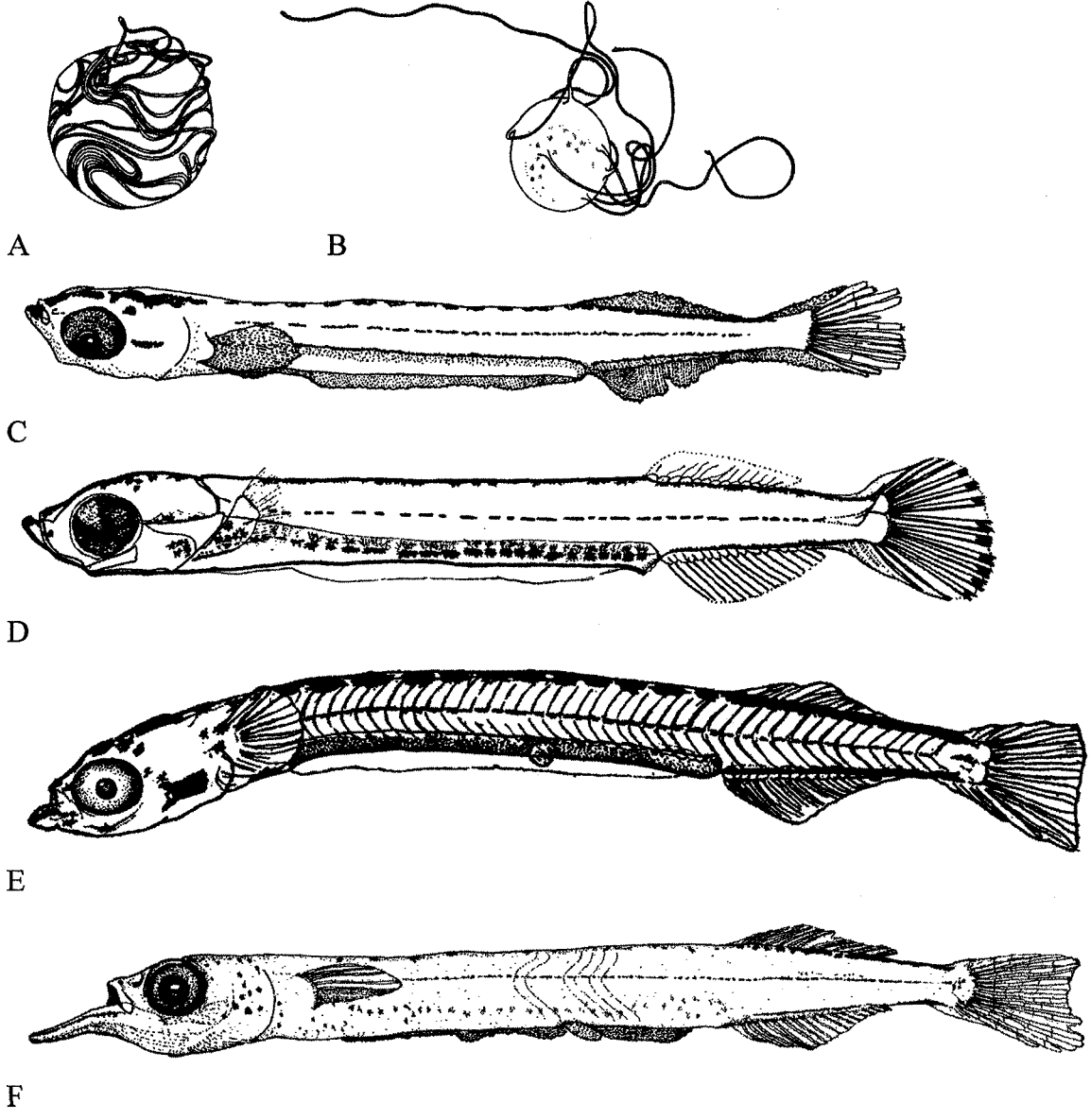
Shell: Chorion with several very long attachment filaments.

LARVAE:

Length at hatching: Unknown but smallest known specimen 3.0 mm.

JUVENILES:**ILLUSTRATIONS**

A) ovulated egg, ca. 1.4 mm in diameter from Hardy 1978: fig. 70B; B) fertilized egg, ca. 1.2 mm in diameter from Hardy 1978: fig. 70C; C) larva, 7.0 mm SL, from Hardy & Johnson 1974: fig. 2; D) larva 9.5 mm SL from Hardy 1978: fig. 72A; E) larva, 11.6 mm SL from Hardy 1978: fig. 72D; F) larva, 15.8 mm SL from Hardy & Johnson 1974: fig. 2.



HEMIRAMPHIDAE*Hyporhamphus roberti* (Valenciennes 1846)**MERISTICS**

Vertebrae:	
Precaudal	31-35
Caudal	16-18
Total	47-53
Number of Fin Rays:	
Dorsal	13-16
Anal	14-17
Pectoral	8-11
Pelvic	6
Predorsal scales	
Gillrakers:	
First arch	(8-14) + (21-34) = 29-46
Second arch	(3-7) + (19-33) = 24-37
Branchiostegals	

LIFE HISTORY

Range: Western Atlantic, two subspecies, the southern *Hy. r. roberti* (Valenciennes) from Lake Maracaibo, Venezuela, Trinidad, the Guianas & Brazil south to Iguape, Estado Sao Paulo, south of Rio de Janeiro, Brazil & the northern *Hy. r. hildebrandi* Jordan & Evermann from Belize southeast along the coast of Central America to the Gulf of Uraba, Colombia.

Habitat: Marine and estuarine, epipelagic.

ELH Pattern: Oviparous

Spawning:

LITERATURE

Collette 2003c

EARLY LIFE HISTORY DESCRIPTION

EGGS: unknown

LARVAE: unknown

JUVENILES:

Pigmentation:

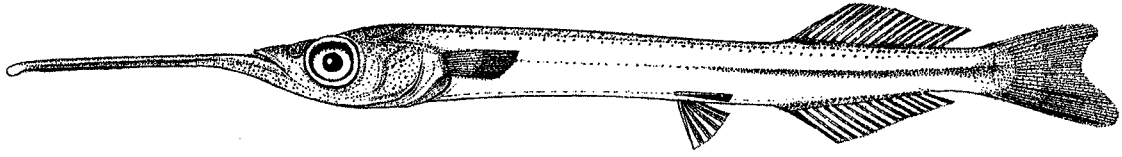
Diagnostic characters:

ILLUSTRATIONS

A) juvenile, 35.5 mm SL, USNM 11426, original, Guatemala, Lake Yzabel.

HEMIRAMPHIDAE

Hyporhamphus roberti (Valenciennes 1847)



A

HEMIRAMPHIDAE*Hyporhamphus unifasciatus* (Ranzani 1842)**MERISTICS**

Vertebrae:	
Precaudal	31-35, mean 33.0
Caudal	17-19, mean 17.9
Total	50-54, mean 50.9
Number of Fin Rays:	
Dorsal	13-16, usually 15, mean 14.8
Anal	14-18, mean 16.3
Pectoral	9-12, usually 11, mean 10.8
Pelvic	6
Predorsal scales	
Gillrakers:	
First arch	(7-11) + (18-25) = 27-35, mean 30.7
Second arch	(2-6) + (17-23) = 19-28, mean 23.5
Branchiostegals	

LIFE HISTORY

Range: Western Atlantic from Bermuda, southern Florida, & the West Indies south along the coasts the coasts of Central & South America to Uruguay.

Habitat: Marine, epipelagic, coastal.

ELH Pattern: Oviparous

Spawning:

LITERATURE

Alvarez Cadena & Flores-Coto 1981; Banford & Collette 1993; Collette 2003c

EARLY LIFE HISTORY DESCRIPTION

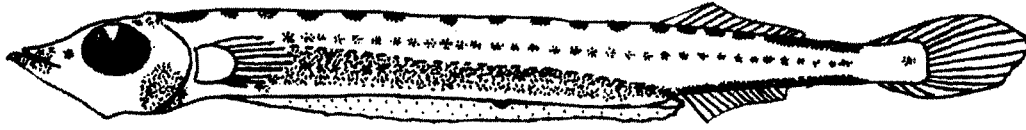
EGGS: unknown.

LARVAE:

Pigmentation: see illustration.

JUVENILES:**ILLUSTRATIONS**

A) larva 9.0 mm "L.P." Alvarez Cadena & Flores-Coto 1981: fig. 5.



A

HEMIRAMPHIDAE***Oxyporhamphus micropterus similis* Bruun 1935****MERISTICS**

Vertebrae:	
Precaudal	30-32, mean 30.6
Caudal	18-20, mean 18.9
Total	49-51, mean 50.0
Number of Fin Rays:	
Dorsal	13-15, mean 14.1
Anal	13-16, mean 15.0
Pectoral	11-13
Pelvic	6
Predorsal scales	28-32, mean 29.8
Gillrakers:	
First arch	(8-9) + (22-25) = 30-35
Second arch	
Branchiostegals	

LIFE HISTORY

Range: Widespread in tropical & subtropical waters of the Atlantic, in the western Atlantic north to 40°N, in the Gulf of Mexico, & Caribbean Sea south to the equator. Replaced in the Indo-Pacific by *O. micropterus micropterus* (Valenciennes).

Habitat: Marine, epipelagic, usually offshore

ELH Pattern: Oviparous

Spawning: Females are ripe at about 120 mm SL

LITERATURE

Breder 1938, Bruun 1935, Collette et al. 1984, Fahay 1983, Khrapkova-Kovalevskaya 1963.

EARLY LIFE HISTORY DESCRIPTION**EGGS:**

Diameter: 1.8-2.1 mm

No. of oil globules: none

Shell: chorion with 74-120 very short (0.08-0.12 mm) filaments

LARVAE:

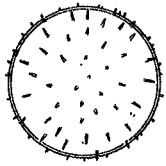
Length at hatching: 7.7 mm

JUVENILES:

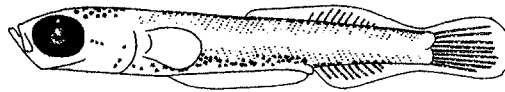
Diagnostic characters: The beak occupies more than 20% of standard length at lengths of 20-40 mm SL, decreases rapidly to less than 5% of SL until a length of about 50 mm SL, & gradually disappears by about 100 mm SL.

ILLUSTRATIONS

A) egg from Bruun 1935: fig. 3; B) larva, 4.2 mm from Fahay 1983:209 after Khrapkova-Kovalevskaya 1963: fig. 1a (Pacific specimen); C) larva, 6.9 mm from Fahay 1983:209 after Khrapkova-Kovalevskaya 1963: fig. 1c (Pacific specimen); D) juvenile, 38.6 mm SL, original, USNM 199244; E) juvenile, 41.2 mm SL from Collette et al. 1984: fig. 180F; F) juvenile, 70.0 mm SL, original, USNM 159032, and G) juvenile, 146.0 mm SL, original, USNM 159032.

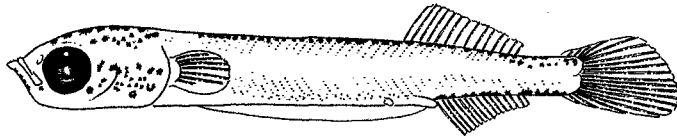


1mm.

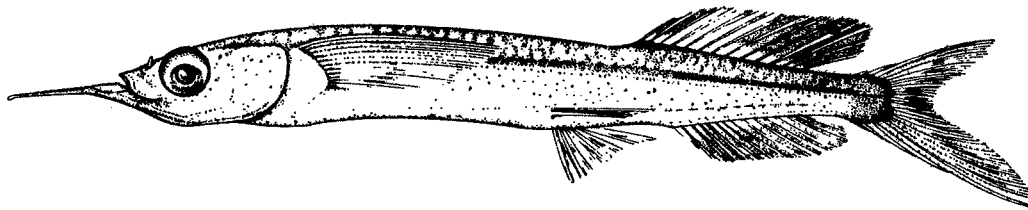


A

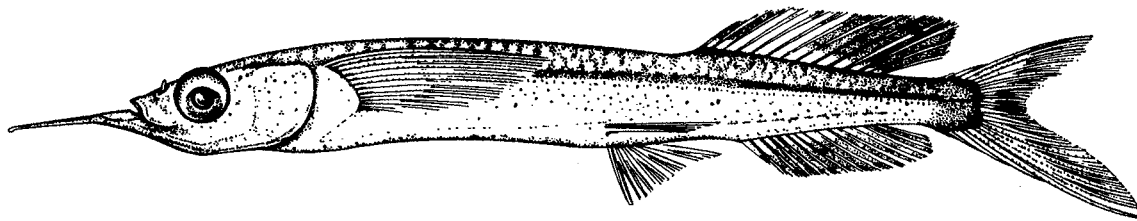
B



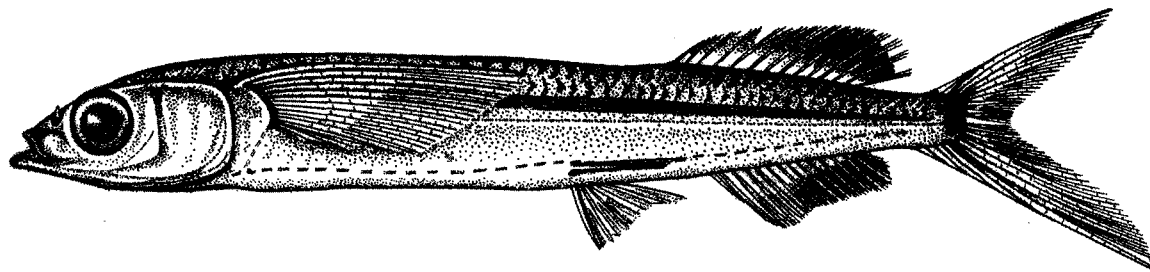
C



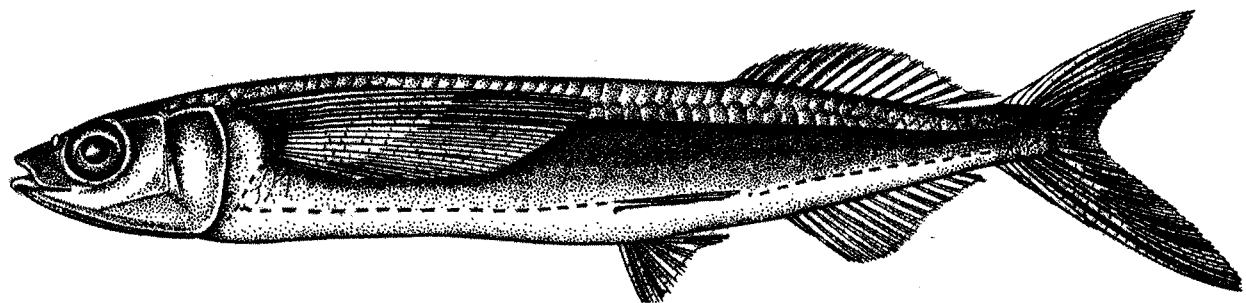
D



E



F



G

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