NOAA Technical Memorandum NMFS-SEFSC-507

PRELIMINARY GUIDE TO THE IDENTIFICATION OF THE EARLY LIFE STAGES OF SCOPHTHALMID FISHES OF THE WESTERN CENTRAL ATLANTIC

BY

Pamela J. Bond & Joanne Lyczkowski-Shultz

U.S. DEPARTMENT OF COMMERCE
Donald L. Evans, Secretary

National Oceanic and Atmospheric Administration
Conrad C. Lautenbacher, Jr., Under Secretary for Oceans and Atmosphere

National Marine Fisheries Service
William T. Hogarth, Assistant Administrator for Fisheries

October 2003

This Technical Memorandum series is used for documentation and timely communication of preliminary results, interim reports, or similar special-purpose information. Although the memoranda are not subject to complete formal review, editorial control, or detailed editing, they are expected to reflect sound professional work.

NOTICE

The National Marine Fisheries Service (NMFS) does not approve, recommend or endorse any proprietary product or material mentioned in this publication. No reference shall be made to NMFS or to this publication furnished by NMFS, in any advertising or sales promotion which would imply that NMFS approves, recommends, or endorses any proprietary product or proprietary material mentioned herein or which has as its purpose any intent to cause directly or indirectly the advertised product to be used or purchased because of this NMFS publication.

This report should be cited as follows:
Bond, P. & J. Lyczkowski-Shultz. 2003. Preliminary guide to the identification of the early life history stages of scophthalmid fishes of the western central North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-507, 4 p.

W. J. Richards, Editor. NOAA Fisheries, 75 Virginia Beach Drive, Miami, FL

This report will be posted on the Bethune Cookman College NOAA Cooperative web site later in 2003 at <www4.cookman.edu/noaa/> and also appear on the SEFSC web site at <www.sefsc.noaa.gov/>
It will be a chapter entitled Scophthalmidae in "The early life history stages of fishes of the western central North Atlantic".

Copies may be obtained by writing:

the authors
Mississippi Laboratories
3209 Frederic Street
Pascagoula, MS 39567
or
National Technical Information Center
5825 Port Royal Road
Springfield, VA 22161
(800) 553-6847 or (703) 605-6000
<http://www.ntis.gov/numbers.htm>

This group of fishes comprise 4 genera and 10 species worldwide (Nelson, 1994) with only 1 species found in the western central North Atlantic (WCNA), which includes FAO fishing area 31. Oval to nearly round in shape scophthalmids are generally medium sized fishes that have long dorsal and anal fin bases located opposite one another; highly compressed bodies, eyes on left side of body (sinistral) after transformation, and large mouths with prominent lower jaws. Most scophthalmids are found in the eastern north Atlantic (ENA) and Mediterranean. One species occurs in the eastern Atlantic, one species occurs solely in the Black Sea, and one ENA species has recently been found in the northwestern Atlantic (Chanet & Desoutter, 2000) Only one species, *Scophthalmus aquosus*, resides in the WCNA, ranging from the Gulf of St. Lawrence to northern Florida, usually on shallow, sandy to mud substrates of inner continental shelf waters. The common name, windowpane flounder, refers to the thin body that is translucent when held up to the light. The windowpane flounder is placed in the Family Scopthalmidae here following Hensley & Ahlstrom's (1984) treatise of the evolution of pleuronectiformes as a monophyletic group based on pelvic fin morphology.

Reproduction occurs by release of spherical pelagic eggs that range in size from 0.9 – 1.4 mm in diameter; usually contain a single oil globule; and exhibit faint irregular lines on the egg surface. Windowpane larvae are compressed with a preanal length < 50% total length (TL). Larvae are deep bodied with the greatest body depth in the gut region. Larvae hatch at about 2 mm in length with eyes symmetrical in position. Eye migration (transformation) begins at about 6.5 mm TL with the eye migrating over the head (Martin and Drewry, 1978). Formation of the dorsal and anal fins begins during preflexion with flexion beginning at about 5.5 mm. These fins are complete and the pelvic fins are formed by 8.5 mm TL (Bigelow and Schoeder, 1953). The pectoral fin rays form after transformation (Fahay, 1983) that is completed between 10 and 13 mm TL. Pigmentation of early larvae is rather heavy from behind the head to mid length, with the posterior 1/3 of body unpigmented (Colton & Marak, 1969). In late larvae pigment bars form on trunk and tail and extend onto the fins with pronounced contrast between pigmented and unpigmented areas.

Windowpane larvae are most likely to be confused with the larvae of other left-eyed flatfish. The distinguishing characteristic of small windowpane flounder is the dark pigment extending from the posterior margin of the head to mid tail. Very small *Peprilus burti* have been confused with windowpane larvae due to similar pigmentation on the trunk and tail, however, the coiled gut of preflexion windowpane larvae (a flatfish characteristic) should distinguish them from *Peprilus* larvae whose guts are uncoiled at this stage. The similar barred pigmentation of windowpane larvae and small hogchoker (*Trinectes maculatus*) can cause confusion between these taxa. However, hogchoker bars are present almost immediately upon hatching while in windowpane bars develop at sizes >5.5 mm. The difference in myomere number, 34-36 in *S. aquosus* and 28-29 in *T. maculatus*, further serves to separate these larvae. Unlike the larvae of many other flatfishes, windowpane larvae do not develop ridges over the eye and on the head. As postlarvae, windowpane can be readily distinguished from bothid larvae in that the pelvic fins are as wide at the bases as at the tips, simulating a detached segment of the anal fin. The ocular side pelvic fin base is longer with the origin on the ventral midline while the blind side fin base origin is above the midline. In addition, windowpane larvae do not develop elongated fin rays as bothids do. *Scophthalmus aquosus* larvae have been described and redescribed (Bigelow & Welsh 1925, Bigelow & Schroeder 1953, Colton & Marak 1969, Martin & Drewry 1978, and Fahay 1983).

MERISTICS

	Range	Mode
Vertebrae:		
Precaudal	11	
Caudal	23-25	
Total	34-36	
Number of Fin Spines and Rays:		
Total Dorsal elements	63-73	
Anal	46-56	
Pectoral	9-12	11
Pelvic	6/6	
Caudal	9 + 8	
Gill rakers on First Arch		
Upper	8	
Lower	22-26	
Total	30-34	

LIFE HISTORY

Range: Atlantic coast of North America from the Gulf of St. Lawrence, Nova Scotia to Florida.
Habitat: inner continental shelf to ~46 m.
ELH Pattern: Oviparous, planktonic larvae.
Spawning: Spring to autumn

LITERATURE

Ahlstrom et al. 1984, Bigelow & Schroeder 1953, Fahay 1983, Gutherz 1967, Martin & Drewry 1978.

ILLUSTRATIONS

A & E from Colton & Marak 1969; B, C, & F from Fahay 1983; D from Martin & Drewry 1978; G from Able & Fahay 1998.

EARLY LIFE HISTORY DESCRIPTION

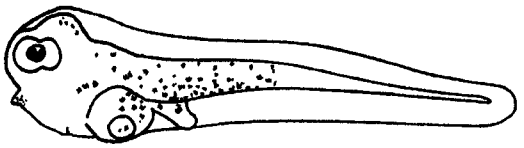
EGGS: Planktonic, spherical
Diameter: 0.90 – 1.38 mm
No. of Oil Globules: 1 or multiple
Yolk: Homogenous
Shell: Clear with faint irregular lines.
Perivitelline Space: Narrow
Hatch Size: ~ 2.0 mm

LARVAE

Length at Flexion: ~ 5.5 mm
Length at Transformation: ~ 6.5 mm
Sequence of Fin Development: D_1&A, C, P_2, P_1
P_2 Fin Position at Flexion: Both P_2 fin bases long, both originate on urohyal, left base on ventral midline, right base above midline
Pigmentation: *Preflexion* - small amount on tip of lower jaw; on snout, forebrain, & midbrain; few spots (increasing with size) on side of head & nape; relatively heavy & evenly distributed from behind the head to mid tail; gut evenly covered with spots; none in posterior ½ of tail or notochord tip region. *Flexion* - increasing on lower jaw & appears on upper jaw; midbrain pigment increasing; as size increases melanophores begin to line up along myosepta; small amount in D_1 finfold and D_1 rays just posterior to P_1 finfold (increasing with size); increasing on dorsal and ventral midlines towards caudal; eye migration begins; P_2 begins forming at ~6.5 mm. *Postflexion* – pigmentation increasing on jaws & head; early body pigment mostly lined up on myosepta to ~ ¾ tail length; pigment extends to base of C & spots less "lined up" by around 13 mm; bar forms from D_1 ray tips to A ray tips just posterior to P_1, on D_1 pterygiophores & small amount on rays just anterior to mid tail, & on A pterygiophores just posterior to mid tail; eye migration continues & is nearly complete at 13 mm.
Diagnostic Characters: mouth large; lower jaw prominent; lack of pigment in small larvae in posterior ½ of tail; no elongate rays; no ridges or prominent spines on head; P_2 base lengths (resembling detached anal fin) & position; size at beginning of eye migration; two pigment bars extending over D_1 & A forming at > 5.5 mm.

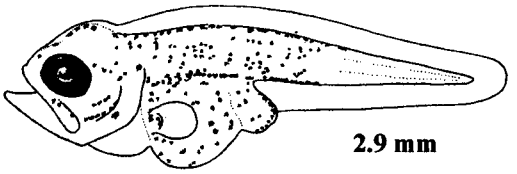
JUVENILES: Pigment bars still present at 36 mm, adult color pattern assumed by 45 mm; eye migration complete; all fins complete with P_2 resembling detached A fin.
Diagnostic Characters: Eyes on left side (sinistral); P_2 origins & base lengths; meristics.

A.



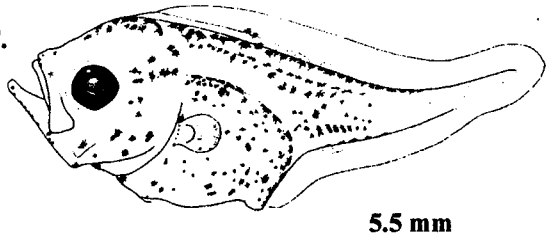
2.3 mm SL

B.



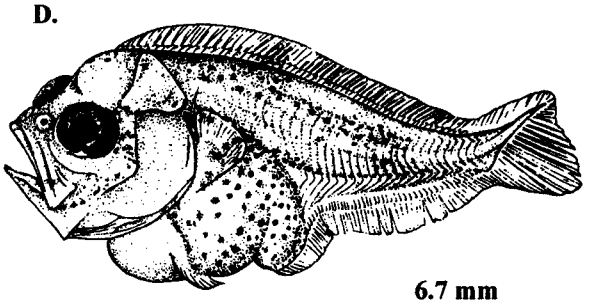
2.9 mm

C.



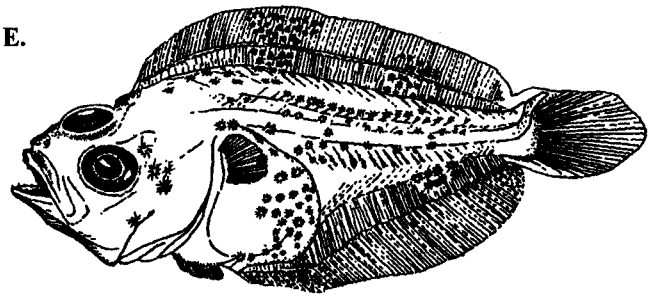
5.5 mm

D.



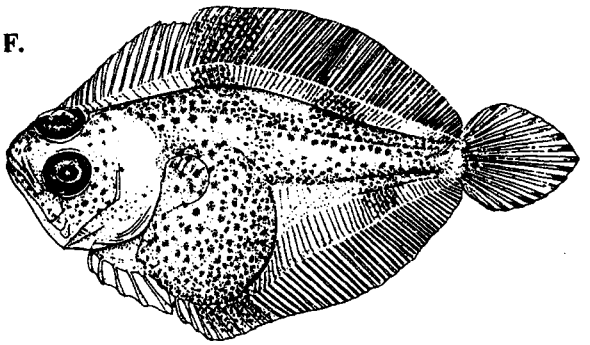
6.7 mm

E.



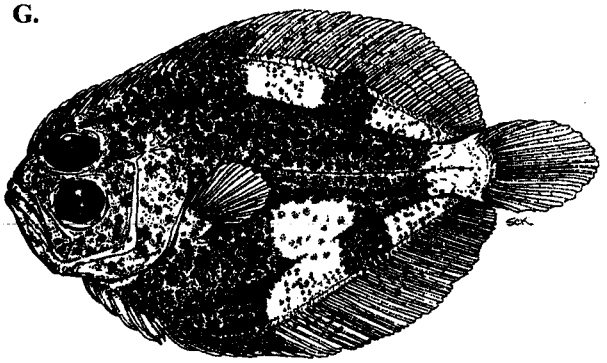
8.0 mm

F.



13.0 mm

G.



12.5 mm

NOAA Rec. Library
3 1234 00006 1366

LITERATURE CITED

Able, K. W. & M. P. Fahay. 1998. The First Year in the Life of Estuarine Fishes in the Middle Atlantic Bight. Rutgers University Press. New Brunswick, New Jersey. 342 p.

Ahlstrom, E. H., K. Amaoka, D. A. Hensley, H. G. Moser, & B. Y. Sumida. 1984. Pleuronectiformes: Development. Pages 640-669 *in*: Ontogeny and Systematics of Fishes. H. G. Moser et al. (eds.). Spec. Publ. Amer. Soc. Ichthyol. Herpetol.(1): 760 p.

Bigelow, H. B., & W. C. Schroeder. 1953. Fishes of the Gulf of Maine. Fish. Bull. U. S. 53: 1-577.

Bigelow, H. B. & W. W. Welsh. 1925. Fishes of the Gulf of Maine. Bull. U.S. Bur. Fish. 40(1): 1-567.

Chanet, B. & M. Desoutter. 2000. First western Atlantic record of *Zeugopterus punctatus* (Pleuronectiformes: Scopthalmidae) from off the Newfoundland coast (Canada). Cybium. 24: 203-204.

Colton, J. B., Jr., & R. R. Marak. 1969. Guide for identifying the common planktonic fish eggs and larvae of continental shelf waters, Cape Sable to Block Island. Woods Hole Biol. Lab. Ref. (69-9). 43 pp.

Fahay, M. P. 1983. Guide to the early stages of marine fishes occurring in the western north Atlantic ocean, Cape Hatteras to the Southern Scotian shelf. J. Northw. Atl. Fish. Sci. 4: 1-423.

Gutherz, E. J. 1967. Field Guide to the Flatfishes of the Family Bothidae in the western North Atlantic. U.S. Fish Wildl. Serv. Circ. 263: 47 p.

Hensley, D. A. & E. H. Ahlstrom. 1984. Pleuronectiformes: Relationships. Pages 670-687 *in* Ontogeny and Systematics of Fishes. H. G. Moser et al. (eds.). Spec. Publ. Amer. Soc. Ichthyol. Herpetol.(1): 760 p.

Martin, F. D. & E. C. Drewry. 1978. Development of fishes of the Mid-Atlantic Bight. An atlas of egg, larval and juvenile stages. Vol.6. U.S. Fish Wildl. Serv., Biol. Serv. Program FWS/OBS-78/12; 416 p.

Morse, W. W. & K. W. Able. 1995. Distribution and life history of windowpane, *Scophthalmus aquosus*, off the northeastern United States. Fish. Bull. U. S. 93: 675-693.