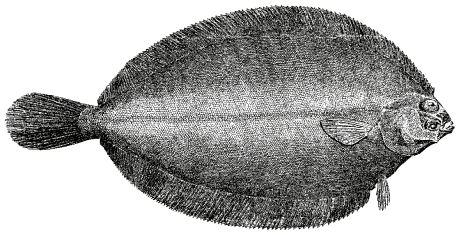
Glyptocephalus cynoglossus (Linnaeus, 1758)
Pleuronectidae
Witch flounder



Range: Both sides of North Atlantic Ocean; in the western North Atlantic from Strait of Belle Isle to Cape Hatteras

Habitat: Moderately deep water (mostly 45–330 m), deepest in southern part of range; found on mud, muddy sand or clay substrates

Spawning: May–Oct in Gulf of Maine; Apr–Oct on Georges Bank; Feb–Jul in Middle Atlantic Bight

Eggs:
- Pelagic, spherical
- Diameter: 1.2–1.6 mm
- Chorion: smooth
- Yolk: homogeneous
- Oil globules: none
- Perivitelline space: narrow

Early eggs similar in size to those of *Gadus morhua* and *Melanogrammus aeglefinus*

Meristic Characters

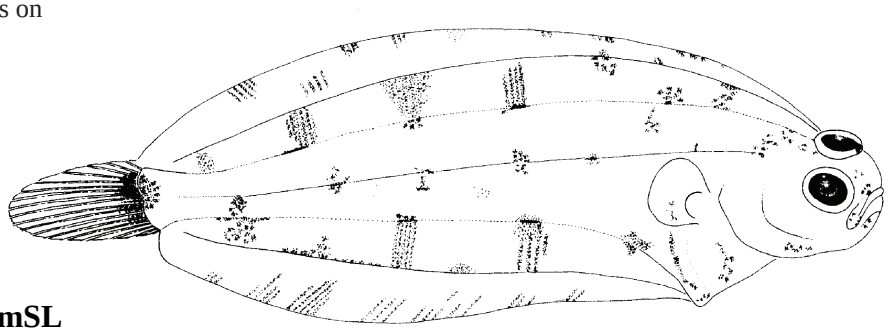
Myomeres:	58–60
Vertebrae:	11–12+45–47=56–59
Dorsal fin rays:	97–117
Anal fin rays:	86–102
Pectoral fin rays:	9–13
Pelvic fin rays:	6/6
Caudal fin rays:	20–24 (total)

Larvae:
- Hatching occurs at 4–6 mm; eyes unpigmented
- Body long, thin and transparent; preanus length (<33% TL) shorter than in *Hippoglossoides* or *Hippoglossus*
- Head length increases from 13% SL at 6 mm to 22% SL at 42 mm
- Body depth increases from 9% SL at 6 mm to 30% SL at 42 mm
- Preopercle spines: 3–4 occur on posterior edge, 5–6 on lateral ridge at about 16 mm, increase to 17–19 spines
- Flexion occurs at 14–20 mm; transformation occurs at 22–35 mm (sometimes delayed to larger sizes)
- Sequence of fin ray formation: C, D, A – P_2 – P_1
- Pigment intensifies with development: 6 bands on body and fins, 3 major, 3 minor (see table below)

	Glyptocephalus cynoglossus	*Hippoglossoides platessoides*
Total myomeres	58–60	44–47
Preanus length	<33%TL	>35%TL
Postanal pigment bars	3 major, 3 minor	3 with light scattering between
Finfold pigment	Bars extend onto finfold	None
Flexion size	14–20 mm	9–19 mm
Ventral pigment	Scattering anterior to anus	Line from anus to isthmus

Early Juvenile:

Occurs in nursery habitats on continental slope

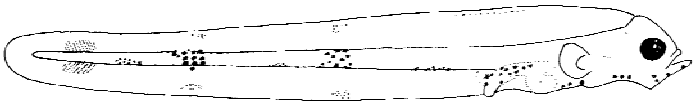


E. 42.0 mmSL

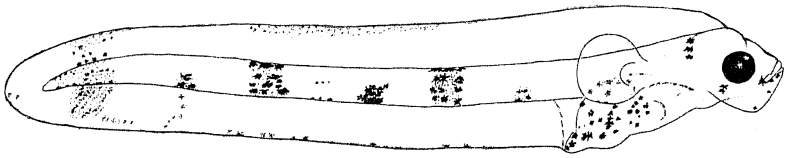
Figures: Adult: H. L. Todd; **A**: Holt, 1895; **B**: Ehrenbaum, 1905; **C, D, F**: Peterson, 1904; **E**: Holt and Byrne, 1903 (all redrawn, Fig. C by Birgitte Rubæk (Munk and Nielsen, 2005)

References: Norman, 1934; Nichols, 1971; Evseenko and Nevinsky, 1975; Markle 1975; Berrien and Sibunka, 1999

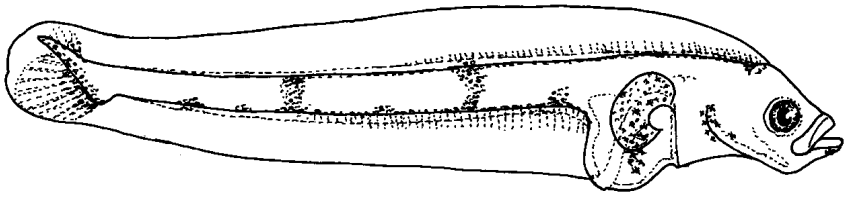
Glyptocephalus cynoglossus



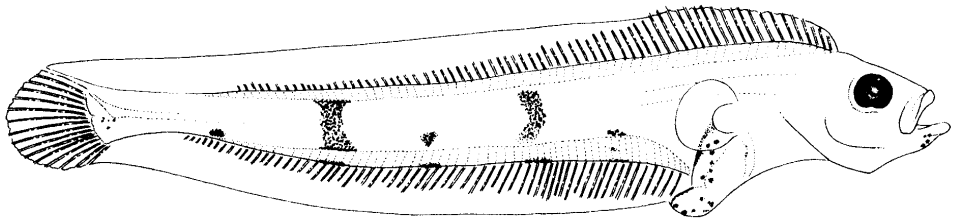
A. 5.6 mmNL Note pigment on finfold edges



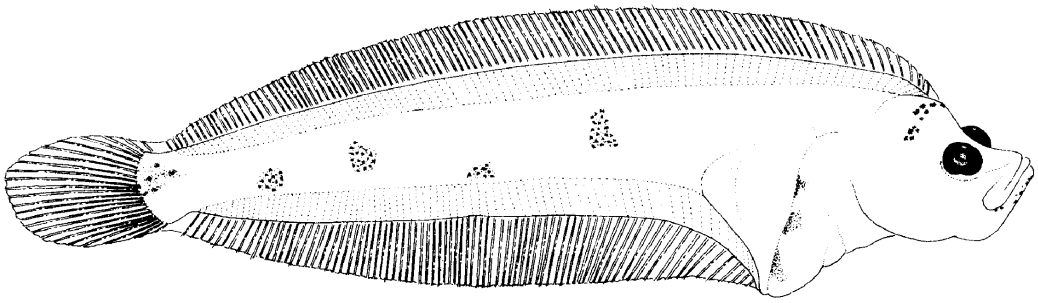
B. 12.0 mmNL Prominent bars alternate with less prominent bars



C. 18.0 mmSL Preopercle spines not evident in figures

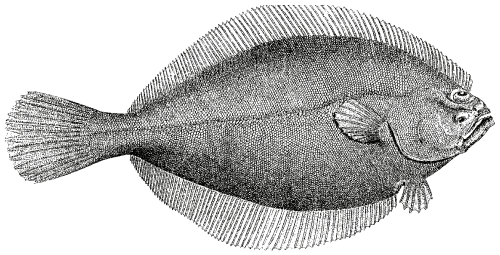


D. 21.0 mmSL Note concave outline anterior to anus



E. 25.5 mmSL

Hippoglossoides platessoides (Fabricius, 1780)
Pleuronectidae
American plaice



Range: Both sides of North Atlantic Ocean; in the western North Atlantic from Baffin Island, Hudson Bay, Labrador and Grand Bank to Gulf of Maine; rarely to Martha's Vineyard and Narragansett Bay

Habitat: Shallow, coastal waters in northern, colder seas; in Gulf of Maine, usually >100 m, but also as shallow as 18 m, on sand or mud substrates

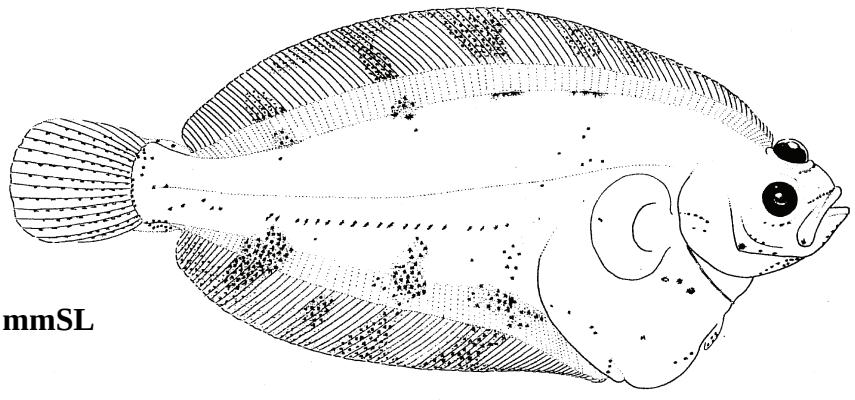
Spawning: Some reproduction occurs year-round, with peak Feb–Aug, especially Mar–Apr on Georges Bank, Apr–Jun around perimeter of Gulf of Maine

Meristic Characters	
Myomeres:	44–47
Vertebrae:	13–14+32–35
Dorsal fin rays:	78–98
Anal fin rays:	60–79
Pectoral fin rays:	9–12
Pelvic fin rays:	6/6
Caudal fin rays:	18 (total)

Eggs:
- Pelagic and spherical
- Diameter: 1.5–2.8 mm
- Chorion: smooth
- Yolk: homogeneous
- Oil globules: none
- Perivitelline space: wide (this is the only pleuronectid known with a wide perivitelline space)

Larvae:
- Hatching occurs at about 4–6 mm, light pigment scattered over body; preanal finfold retained to about 10 mm
- Preanus length decreases from 41–35% SL
- Preanus length >33% TL (longer than in similar *Glyptocephalus* larvae)
- Head length increases from <20% SL to 23% SL
- Body depth increases from 12% SL at 7.2 mm, to 42% SL at 31 mm
- Flexion occurs at 9–19 mm
- Sequence of fin ray formation: C – D, A – P_2 – P_1
- Pigmentation: early larvae develop 5 clusters of pigment that do not extend onto finfolds (1 over gut, 1 at the anus, and 3 postanally on the body); scattered pigment occurs between these clusters; at 12–13 mm, these clusters split into dorsal and ventral pairs; spots appear on fins
- Transformation occurs at 18–34 mm (usually >25 mm)
- See comparative tables on *Glyptocephalus cynoglossus* and *Limanda ferruginea* pages

Early Juvenile:

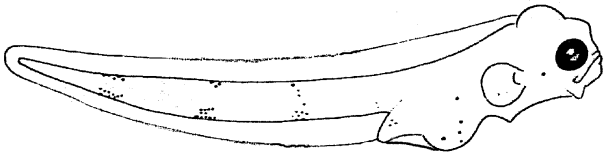


E. 31.5 mmSL

Figures: Adult: H. L. Todd; **A**: Nichols, 1971; **B–E**: Peterson, 1904; (all redrawn, Fig. D by Birgitte Rubæk (Munk and Nielsen, 2005)

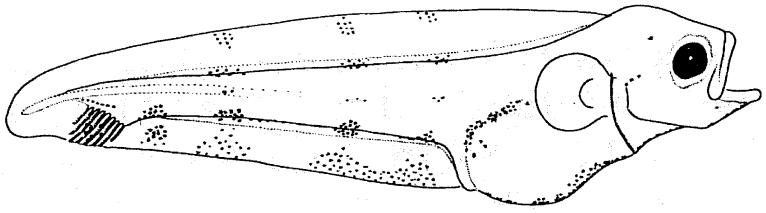
References: Norman, 1934; Colton and Marak, MS 1969; VanGuelpen, 1980; Berrien and Sibunka, 1999

Hippoglossoides platessoides

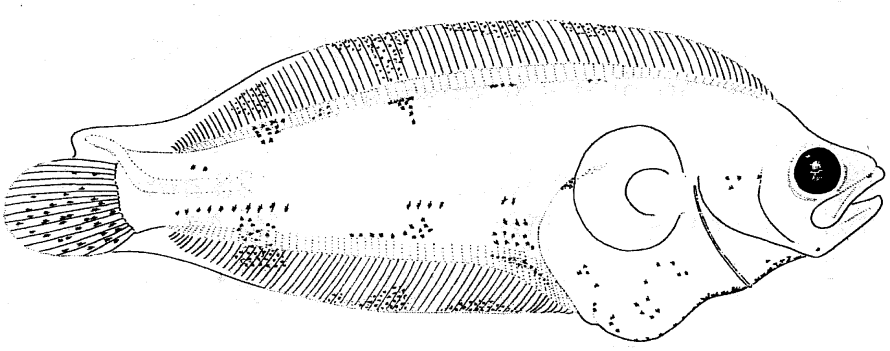


A. 7.3 mmNL

Preanal finfold present between anus and yolk mass (not present in *Glyptocephalus*)

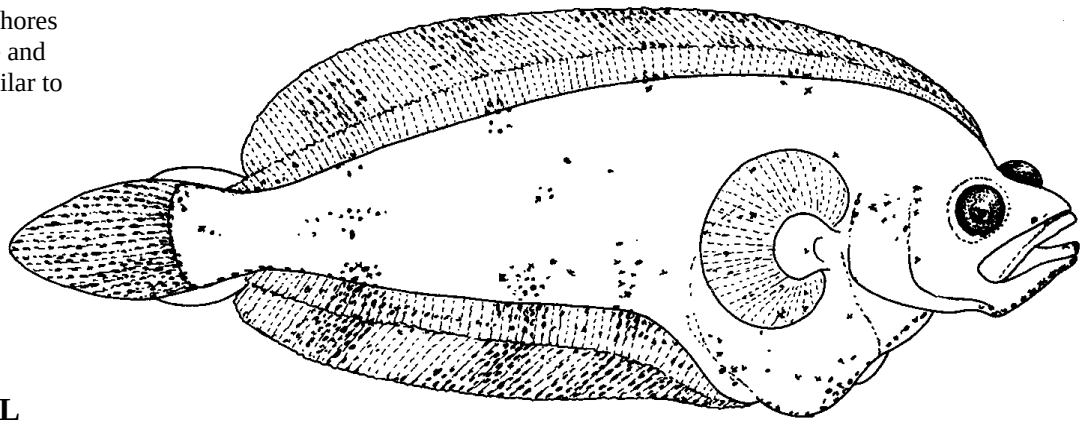


B. 11.5 mmNL



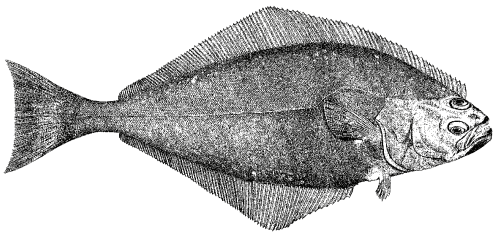
C. 17.5 mmSL

Line of melanophores between midline and ventral edge similar to *Limanda*



D. 24.0 mmSL

Hippoglossus hippoglossus (Linnaeus, 1758)
Pleuronectidae
Atlantic halibut



Range: Both sides of the North Atlantic Ocean; in the western North Atlantic from Labrador to southern New England, rarely to the latitude of Virginia

Habitat: Found on sand, gravel or clay substrates in depths to 900 m, somewhat shallower during summer

Spawning: Late fall-early summer (and into summer months) on continental slope; as late as Sep between Georges Bank and Grand Bank; peak Nov–Dec in Canadian waters; late spring off west Greenland

Meristic Characters

Myomeres:	50–51
Vertebrae:	16+34–35=50–51
Dorsal fin rays:	98–106
Anal fin rays:	69–84
Pectoral fin rays:	15–17
Pelvic fin rays:	6/6
Caudal fin rays:	17–19 (total)

Eggs:
- Pelagic, spherical
- Diameter: 3.0–3.8 mm (to >4.0 mm)
- Chorion: smooth and thick
- Yolk: homogeneous
- Oil globules: none
- Perivitelline space: narrow

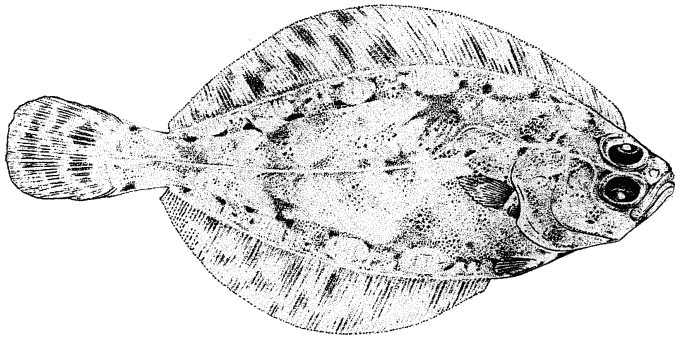
Eggs float suspended at depths of 50–90 m, not at surface

Larvae:
- Hatching occurs at 6–7 mm; eye unpigmented, body pigment lacking
- Large head with upturned snout, and long, straight lower jaw
- Head length increases from 21% SL at 13 mm to 29% SL at 34 mm
- Preanus length decreases from 40% SL at 13 mm to 32% SL at 34 mm
- Body depth increases from 20% SL at 13 mm to 38% SL at 34 mm
- No spines on head or preopercle
- Flexion occurs at 13–24 mm
- Sequence of fin ray formation: C – D, A – P_2 – P_1
- Pigmentation: in early larvae, faint undulating rows of melanophores on body, none along midline, faint spots along dorsal and anal margins, and faint row on preanal ventral margin; later larvae develop 3 dorsal and 3 ventral clusters on body, spread onto fins; undulating rows remain; double ventral rows anterior to anus converge on isthmus; in larger larvae, 2 clusters of pigment form on caudal fin, dorsal and ventral to middle ray.
- Transformation occurs at 20–34 mm

Note:
1. One study concluded that settlement to bottom habitats occurs a year after hatching, before the left eye has completed its migration to the right side of head, and when the larvae are 100 mm long (Nickerson, 1978).

Early Juvenile:

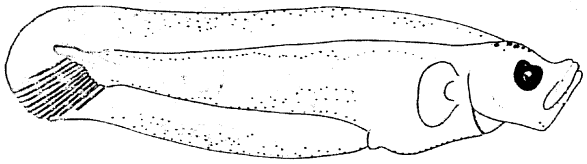
E. 47.4 mmSL



Figures: Adult: H. L. Todd; **A–D**: Schmidt, 1904 (redrawn); **E**: Tåning, 1936

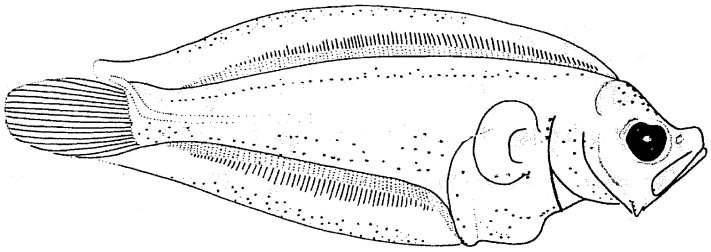
References: Cox, 1924; Bigelow and Schroeder, 1953; Nichols, 1971

Hippoglossus hippoglossus



A. 13.5 mmNL

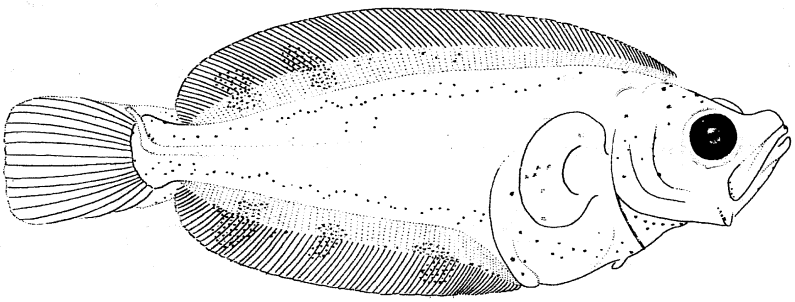
The MARMAP surveys (1977-1987) only collected 2 larvae, northern Gulf of Maine and Georges Bank



B. 18.0 mmSL

Scattered melanophores develop over midbody

Head large and stout

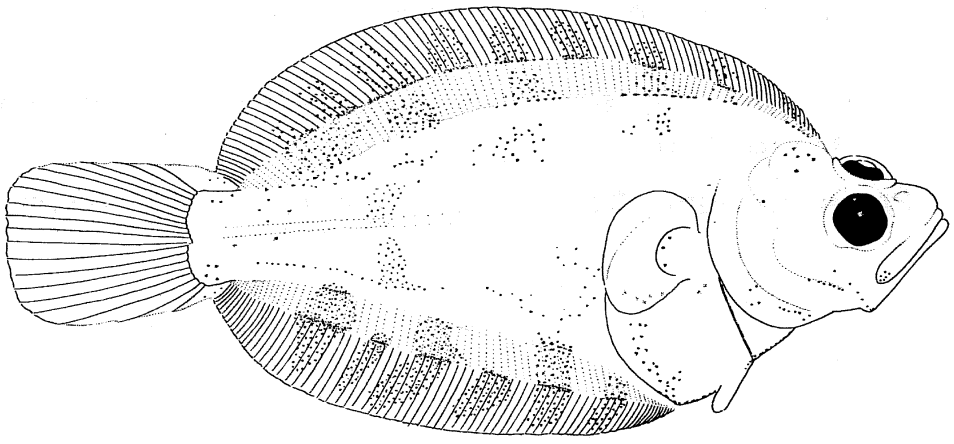


C. 22.0 mmSL

5 prominent pigment clusters on dorsal fin, with smaller clusters between

Note short caudal peduncle (compare to other pleuronectids)

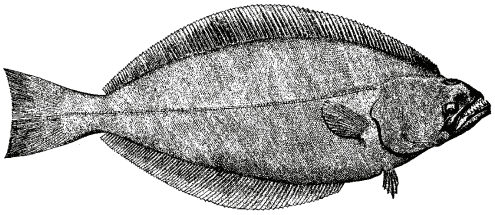
Caudal fin unpigmented, rear edge straight



3 prominent pigment clusters on anal fin, with smaller clusters between

D. 27.0 mmSL

Reinhardtius hippoglossoides (Walbaum, 1792)
Pleuronectidae
Greenland halibut



Range: North Pacific and North Atlantic oceans, Bering Sea and Sea of Okhotsk; in the western North Atlantic from Baffin Island and Greenland to Gulf of Maine (rarely as far south as New Jersey); one record from just north of Cape Hatteras

Habitat: Found at depths of 63–1,216 m, but make frequent vertical incursions into water column; most abundant between 400 and 700 m at temperatures of 2–6°C

Spawning: May–Sep (Greenland to Georges Bank) at depths to 600 m; winter-early spring (Davis Strait) at depths of 650–1,000 m

Meristic Characters

Myomeres:	61–63
Vertebrae:	17–19+43–45
Dorsal fin rays:	92–104
Anal fin rays:	66–80
Pectoral fin rays:	13–15
Pelvic fin rays:	6/6
Caudal fin rays:	19 (total)

Eggs:
- Spherical and buoyant, but float at depths, not near surface
- Diameter: 3.7–4.5 mm
- Chorion: smooth
- Yolk: homogeneous
- Oil globules: none
- Perivitelline space: narrow

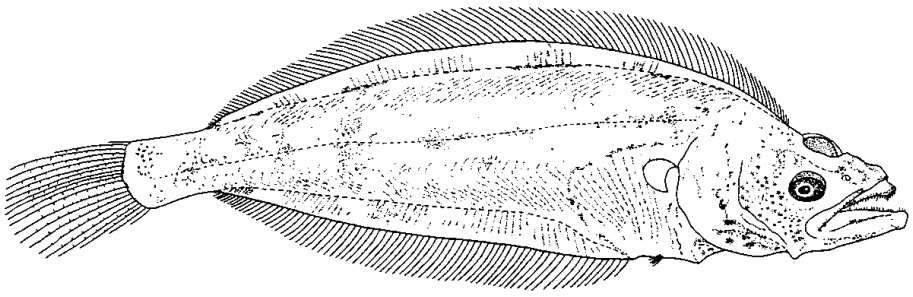
Yolk-sac larva, 16 mm

Larvae:
- Hatching occurs at >7 mm
- Body elongate, with very long lower jaw
- No spines on head or preopercle
- Caudal peduncle much longer than wide (compare to other pleuronectids)
- Head length increases from 16% SL to 28% SL
- Preanus length decreases slightly from about 40% SL to 37% SL
- Body depth increases from 12% SL to 32% SL
- Flexion occurs at 17–36 mm
- Sequence of fin ray formation: C – D, A – P_2 – P_1
- Pigmentation: early larvae have very light pigment with no bands or patches on body or fins; in late stages, myosepta become pigmented and indistinct bars form on fins
- Transformation occurs at >30 mm; left eye does not complete migration to final position on mid-dorsal ridge until 73 mm

Note:
1. Number of vertebrae and body shape will separate this species from larvae of *Hippoglossus hippoglossus*
2. Preanus length >33% SL (compare to *Glyptocephalus cynoglossus*)
3. Pelagic-juveniles do not settle to bottom habitats until about 73 mm

Early Juvenile:

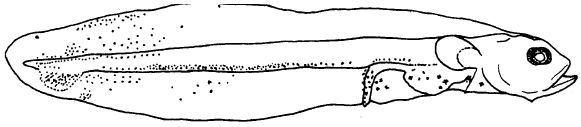
G. 49.9 mmSL



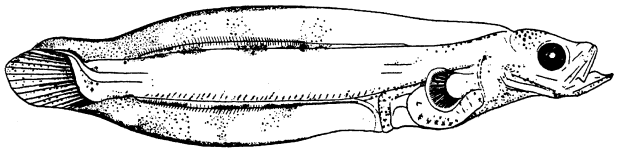
Figures: Adult: H. L. Todd; Yolk-sac larva: Jensen, 1935; **C–E**: Schmidt, 1904; **A–B**, **F**: Jensen, 1935 (C–F redrawn); **G**: Tsukamoto *et al.,* 1995

References: Ehrenbaum, 1905; Andriyashev, 1954; Nichols, 1971; Bowering, 1983; Tsukamoto *et al*., 1995; Bowering and Nedreaas, 2000

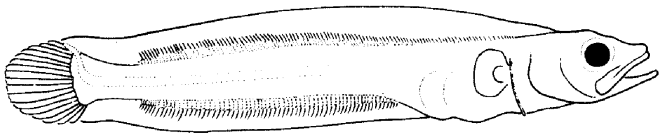
Reinhardtius hippoglossoides



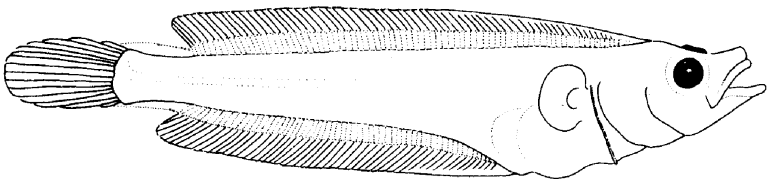
A. 17 mm



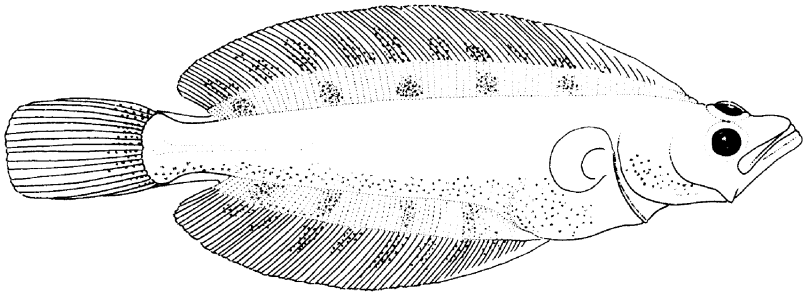
B. 27 mm



C. 34.0 mm

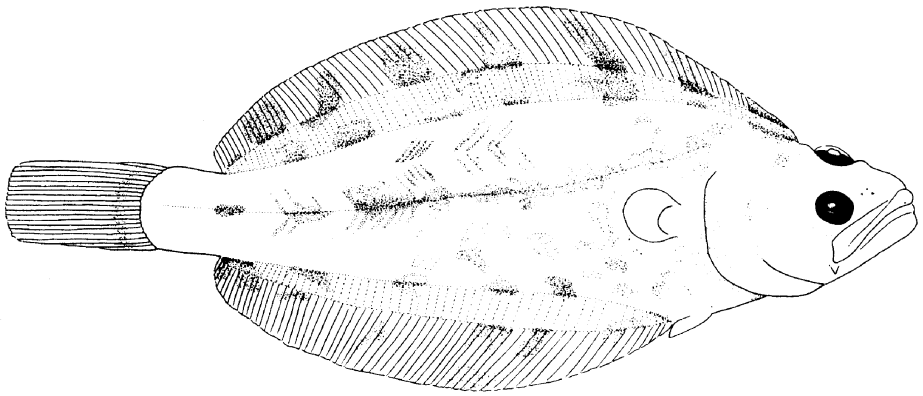


D. 36.5 mm



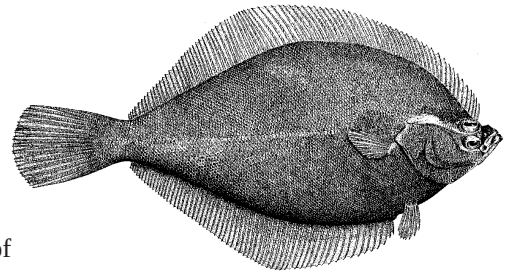
E. 51.0 mm

Pigment band forms on caudal fin near base



F. 65.0 mm

Limanda ferruginea (Storer, 1839)
Pleuronectidae
Yellowtail flounder



Range: Western North Atlantic Ocean from Labrador to Chesapeake Bay

Habitat: Sandy or sand-mud substrates on continental shelf in depths of 10–100 m (mostly 37–73 m); shallower waters (9–64 m) off Cape Cod

Spawning: Mar–Sep (peak Apr–Jun) Scotian Shelf, western Gulf of Maine to southern New England, including Georges Bank; little spawning activity south of Delaware Bay mouth

Meristic Characters

Myomeres:	38–42
Vertebrae:	10–12+30–33=40–45
Dorsal fin rays:	73–91
Anal fin rays:	51–68
Pectoral fin rays:	10
Pelvic fin rays:	6/6
Caudal fin rays:	16–18 (total)

Eggs:
- Pelagic, spherical
- Diameter: 0.76–0.96 mm
- Chorion: smooth
- Yolk: homogeneous
- Oil globules: none
- Perivitelline space: narrow

Early eggs similar in size to those of *Tautogolabrus adspersus*

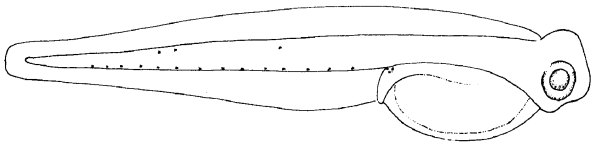
Larvae:
- Hatching occurs at 2.0–3.5 mm; eyes unpigmented
- Head length increases from 20% SL at 6 mm to 32% SL at 14 mm
- Body depth increases from 20% SL at 6 mm to 40% SL at 14 mm
- Flexion occurs at 5–10 mm SL
- Sequence of fin ray formation: C – D, A – P_2 – P_1
- Pigmentation includes significant row of oblique melanophores on myosepta along body between midline and ventral edge; similar to pattern in *Hippoglossoides platessoides*
- Transformation occurs at 11–16 mmSL
- Settle to sand or mud substrates at about 14–17 mm
- See table for separation of similar larvae:

	Hippoglossoides platessoides	*Limanda ferruginea*
Spawns	Mar–May	Mar–Sep
Myomeres	44–47	38–42
Dorsal fin rays	78–98	73–91
Anal fin rays	60–79	51–68
Postanal pigment bars	3 with light scattering between	Weakly defined bars; 2–3 dorsal clusters
Flexion size	9–19 mm	5–10 mm
Ventral pigment	Line of 'stitching' anus to isthmus	Similar line of 'stitching'
Peritoneal pigment	Weakly developed	Strong crescent of pigment
Body depth	Slim and elongate	Deeper at comparable lengths
Transformation size	18–34 mm (usually >25 mm)	11–16 mm (usually about 14 mm)

Figures: Adult: H. L. Todd; **A**, **B**: Colton and Marak, 1969; **C**, **D**: Bigelow and Welsh, 1925 (all redrawn); **E**: Nancy Arthur (original)

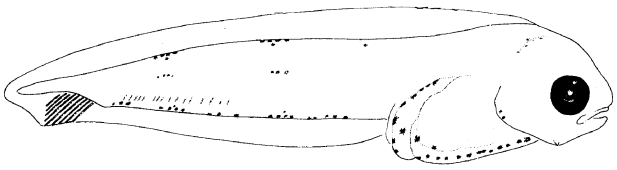
References: Colton and Marak, 1969; VanGuelpen, 1980; Evseenko and Nevinsky, 1981; Markle and Frost, 1985; Berrien and Sibunka, 1999; Sullivan *et al*., 2000

Limanda ferruginea



A. 2.7 mmNL

2-3 clusters of melanophores along dorsal edge,
4-5 clusters along ventral edge

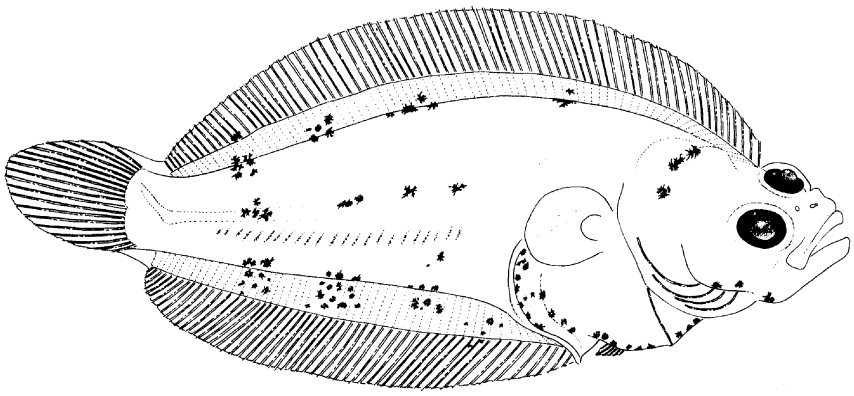


B. 5.9 mmNL

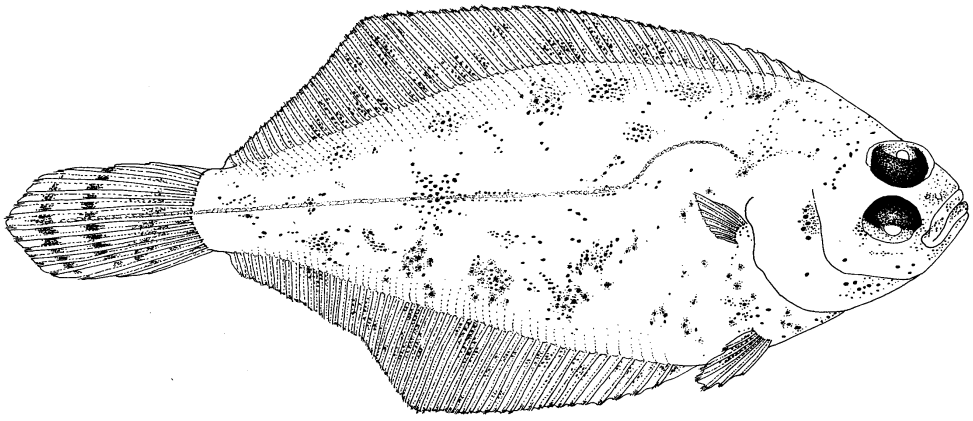
Note prominent crescent-shaped pattern of spots on posterior margin of gut

C. 10.3 mmSL

Row of oblique spots forms between midline and ventral edge

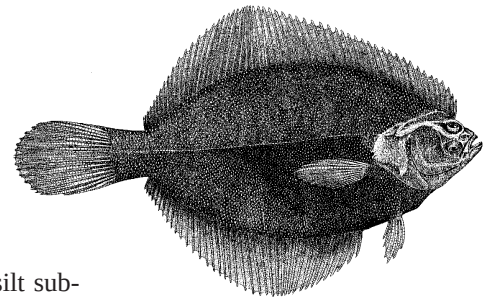


D. 14.0 mmSL



E. Early Juvenile (ca. 25.0 mmTL)

Pleuronectes putnami (Gill, 1864)
Pleuronectidae
Smooth flounder



Range: Western North Atlantic Ocean from Labrador to Rhode Island and Connecticut; abundant from Strait of Belle Isle to Gulf of St. Lawrence (Cape Breton)

Habitat: Coastal bays, estuaries and river mouths, mostly on soft mud or silt substrates, to a maximum of 27 m in coastal waters; fairly abundant around perimeter of Gulf of Maine between 3.6 and 9 m

Spawning: Dec–Mar (Gulf of Maine–New Hampshire) with a peak in Feb (Nova Scotia).

Meristic Characters

Myomeres:	34–38
Vertebrae:	34–38
Dorsal fin rays:	48–59
Anal fin rays:	35–41
Pectoral fin rays:	10–11
Pelvic fin rays:	6/6
Caudal fin rays:	18–20 (total)

Eggs:
- Demersal, non-adhesive and slightly off-round
- Diameter: 1.1–1.4 mm
- Oil globules: none
- Perivitelline space: narrow

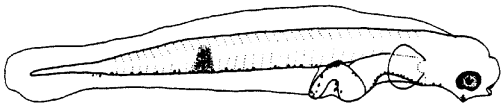
Larvae:
- Hatching occurs at 3.1–3.6 mmNL; eyes pigmented
- Head length increases from 12–14% NL in yolk-sac larvae to 21–28% SL in postflexion larvae
- Preanus length decreases from 39–50% NL in yolk-sac larvae to 36–37% SL in postflexion larvae
- Body depth increases from 5–12% NL in yolk-sac larvae to 21–32% SL in postflexion larvae
- Flexion occurs at 5.9–7.1 mm
- Sequence of fin ray formation: C – D, A – P_2 – P_1
- Pigmentation includes a mid-tail band and a single row of ventral melanophores; latter row becomes double at about 5.4 mm; a preanal row of ventral melanophores extends from isthmus to mid-gut; a single melanophore at lower jaw angle; pigment on head begins to increase at about 6.5 mm
- Transformation occurs at 7–13 mm SL
- See table for separation of similar larvae

	Pleuronectes putnami	*Pseudopleuronectes americanus*
Mean preanus length (yolk-sac)	43.6% NL	33.3% NL
Mean preanus length (preflexion)	41.2% NL	37.6% NL
Total myomeres	34–38	34–40
Dorsal fin rays	48–59	60–76
Anal fin rays	35–41	44–58
Hatching length	3.1–3.6 mmNL	About 2.4 mmNL
Eyes at hatching	Pigmented	Unpigmented
Yolk absorbed	5.2 mmNL	3.7 mmNL
Gut forms loop	About 5.5 mmNL	4.2–4.4 mmNL
Size at flexion	5.9–7.1 mmSL	5.0–7.6 mmSL
Pigment: anal finfold	None before flexion	Scattered at about 3.6 mm
Pigment: internal notochord	Absent	Present
Pigment: median fins	Broken proximal band	Bars form

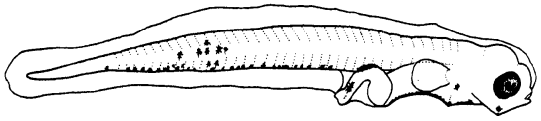
Figures: Adult: H. L. Todd; **A–F**: Laroche, 1981

References: Laroche, 1981; Scott and Scott, 1988; Klein-M^{ac}Phee, 2002u

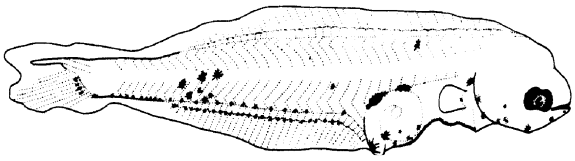
Pleuronectes putnami



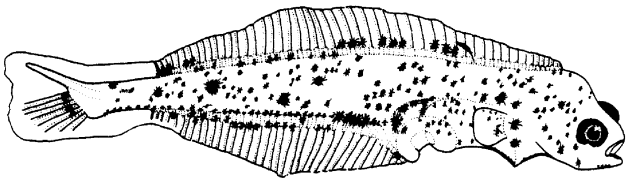
A. 5.4 mmNL



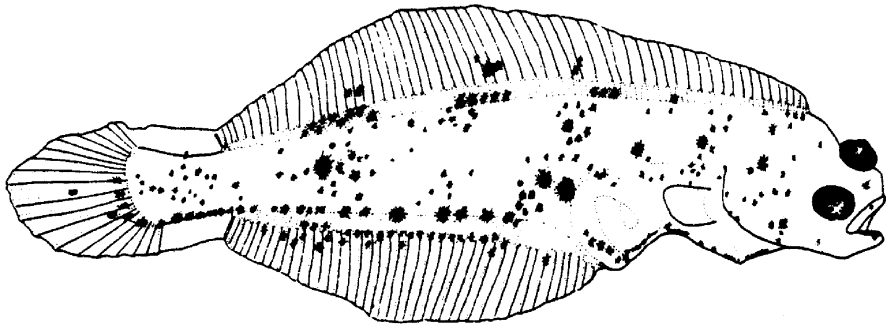
B. 5.9 mmNL Mid-tail band breaks up



C. 6.4 mmSL



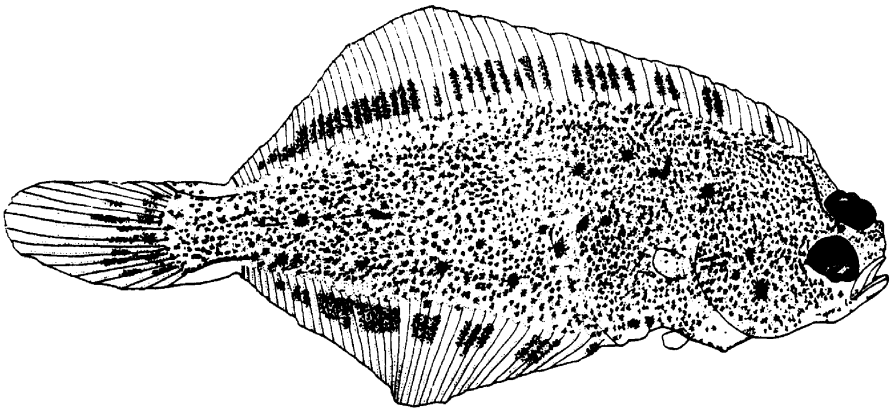
D. 6.6 mmSL Dorsolateral Pigment develops



Mid-tail band obscured

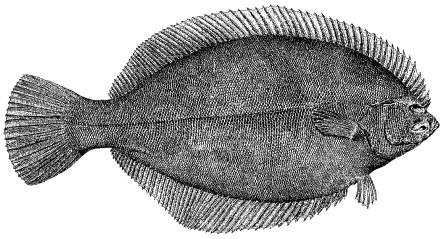
E. 7.1 mmSL

Dense pigment rapidly spreads



F. 7.6 mmSL Pigment band forms on fins

Pseudopleuronectes americanus (Walbaum, 1792)
Pleuronectidae
Winter flounder



Range: Western North Atlantic Ocean from Labrador to Georgia; most abundant between Gulf of St. Lawrence and Chesapeake Bay

Habitat: River mouths and estuaries to brackish or nearly fresh waters; also large embayments and Georges Bank, where it occurs as deep as 82 m; usually found on muddy sand substrates, often associated with eelgrass

Spawning: Late winter to early spring in nearshore waters and Georges Bank; Gulf of Maine Apr–Jun; Georges Bank Mar–Jun; Southern New England Feb–May; Middle Atlantic Bight: Apr

Meristic Characters

Myomeres:	34–40
Vertebrae:	10+26
Dorsal fin rays:	60–76
Anal fin rays:	44–58
Pectoral fin rays:	10–11
Pelvic fin rays:	6/6
Caudal fin rays:	19 (total)

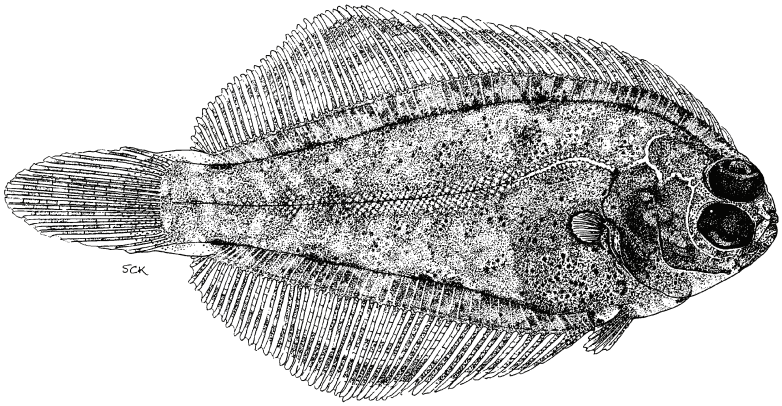
Eggs:
- Non-spherical, demersal, adhesive
- Eggs form clumps on bottom
- Shell: thick, slightly opaque, rough
- Diameter: 0.69–0.95 mm
- Yolk: homogeneous
- Oil globules: none
- Perivitelline space: narrow

Eggs deposited on mud, sand or gravel; sometimes on diatom mats or drifting macroalgae

Larvae:
- Hatching occurs at about 2.4 mmNL; eyes unpigmented
- Head length increases from 12–16% NL in yolk-sac larvae to 24–29% SL after flexion
- Preanus length remains at 30–40% SL throughout development
- Body depth increases from 4–6% NL in yolk-sac larvae to 23–34% SL after flexion
- Flexion occurs at 5.0–7.6 mmNL
- Sequence of fin ray formation: C, D, A – P_2 – P_1
- Pigmentation includes a broken mid-tail band (see figures for pigment notes)
- Transformation occurs at 7.0–13.0 mmSL

Note:
1. Eggs spawned in salinities from 10 to 32 ppt; salinity has little effect on survival or hatch rate
2. Larvae initially planktonic, become strongly bottom-oriented throughout development
3. See *Pleuronectes putnami* for table of comparisons between similar larvae

Early Juvenile:



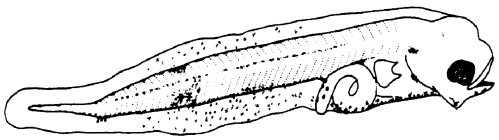
G. 14.0 mmSL

Figures: Adult: H. L. Todd; **A–F**: Laroche 1981; **G**: Susan Kaiser (Able and Fahay, 1998)

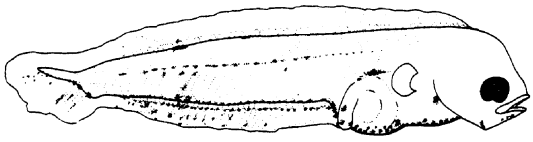
References: Sullivan, 1915; Pearcy, 1962; Dovel, 1971; Chambers and Leggett, 1987; Scarlett and Allen, 1989; Monteleone, 1992; Cooper and Chapleau, 1998; Able and Fahay, 1998; Pereira *et al.*, 1999

Pseudopleuronectes americanus

A. 4.4 mmNL

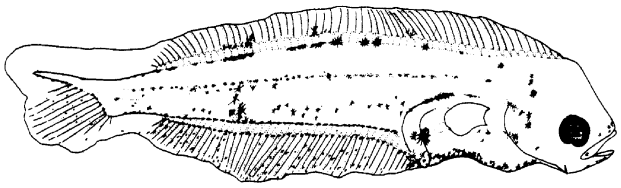


B. 5.3 mmNL Mid-tail band breaks up



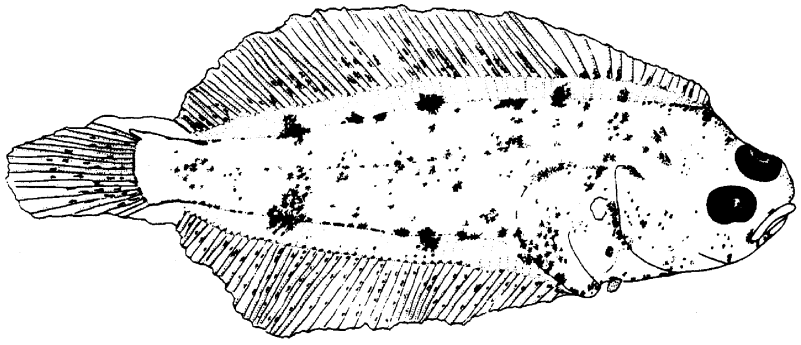
C. 6.4 mmSL

Melanophores move onto caudal finfold

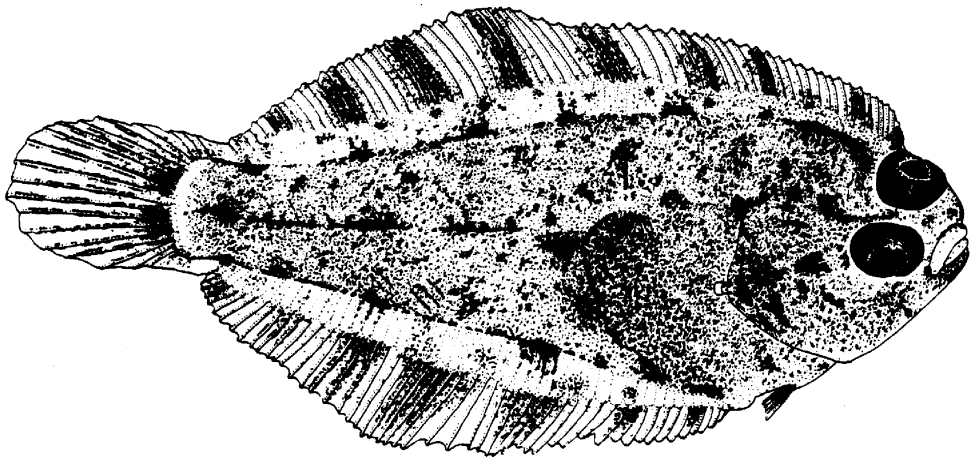


D. 7.4 mmSL

Pigment intensifies along edges of body; head pigment increases

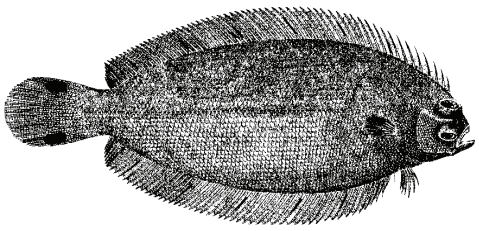


E. 6.9 mmSL



F. 9.8 mmSL Pigment bars develop on fins

Poecilopsetta beanii (Goode, 1880)
Poecilopsettidae
Deepwater dab



Range: Western North Atlantic Ocean from Block Island to northern Brazil, including Gulf of Mexico and Caribbean Sea; mostly in tropical waters, but larvae and young juveniles have been collected from several locations in study area

Habitat: Outer continental shelf and continental slope between 155 and 1,636 m; larvae have been collected near Brown's, Georges and LaHave banks, and transformed juveniles in the vicinity of Hudson Canyon

Meristic Characters

Myomeres:	41–42
Vertebrae:	10+31–32
Dorsal fin rays:	63–68
Anal fin rays:	53–56
Pectoral fin rays:	10
Pelvic fin rays:	6/6
Caudal fin rays:	1+9+8+2

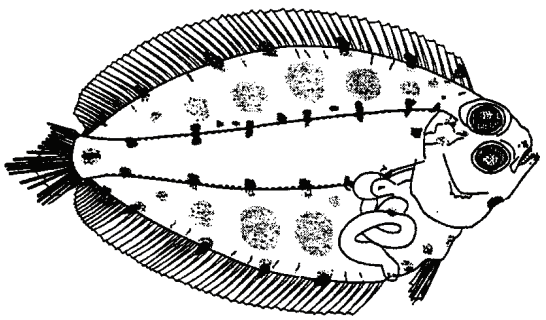
Spawning: Undescribed

Eggs: – Undescribed

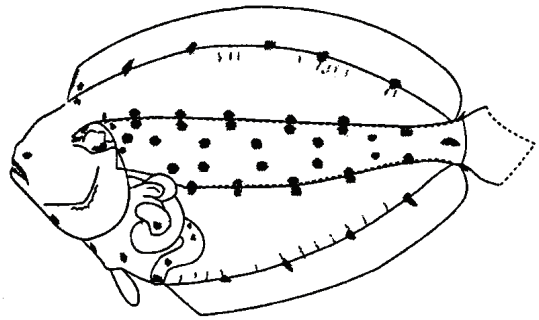
Larvae: – Typically have moderately deep body with very long proximal pterygiophores; musculature over pterygiophores typically wider than musculature over axial body
– Disk-shaped, thin bodies with tightly coiled guts
– Gut long and looping, with moderately protruding anus
– No elongate dorsal or pelvic fin rays
– No spines present on head, preopercle, or anywhere on larval body
– Sequence of fin ray formation: C – D, A, – P_2 – P_1 (pectoral fin rays late to form)
– Pigmentation includes series of bold melanophores on both eyed and blind sides of body; series parallel bases of dorsal and anal fins and dorsal and ventral body margins; prominent melanophores at midline of caudal peduncle and on anterior two dorsal fin rays; later larvae also develop large spots overlying dorsal and anal pterygiophores; scattered small spots over head and gut
– Transformation occurs at about 9.5 mmSL when left eye migrates over top of head
– Settlement occurs at sizes between 36 and 65 mmSL

Note:
1. The single genus (with 2 species) was elevated to family status by Chapleau (1993)
2. Juvenile pigment includes densely black fin ray membranes on distal parts of dorsal and ventral caudal fin margins; melanophores on body remain prominent on blind side
3. Body depth becomes narrow in settlement juveniles

Pre-settlement Juvenile:



E. 36.0 mmSL

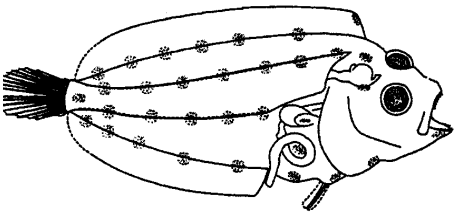


F. 36.0 mmSL (Blind Side)

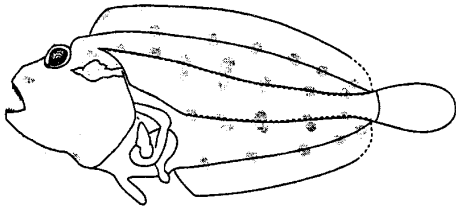
Figures: Adult: Munroe, 2002d; **A–B**, **D–F**: Evseenko and Suntsov, 1993; **C**: Original (collected S.E. of Georges Bank)

References: Goode and Bean, 1895; Norman, 1934; Ahlstrom *et al*., 1984a; Evseenko and Suntsov, 1993; Munroe, 2002d

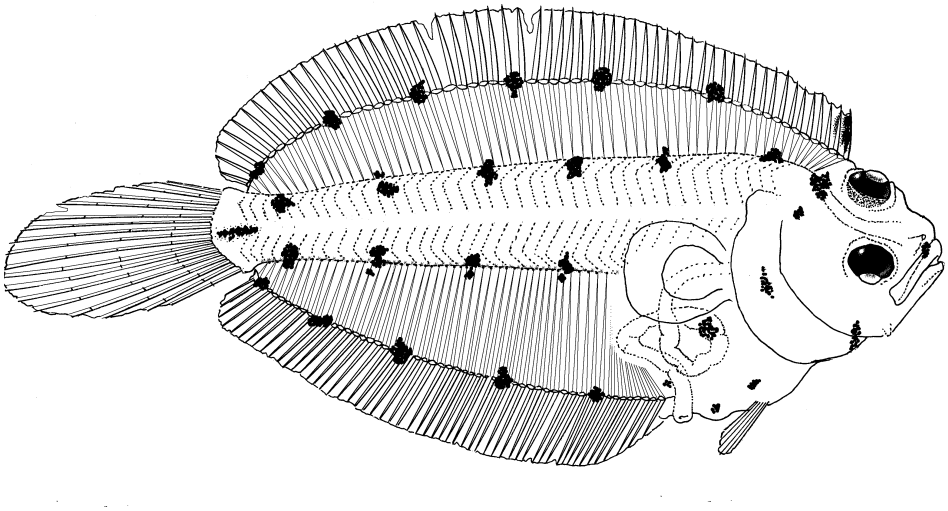
Poecilopsetta beanii



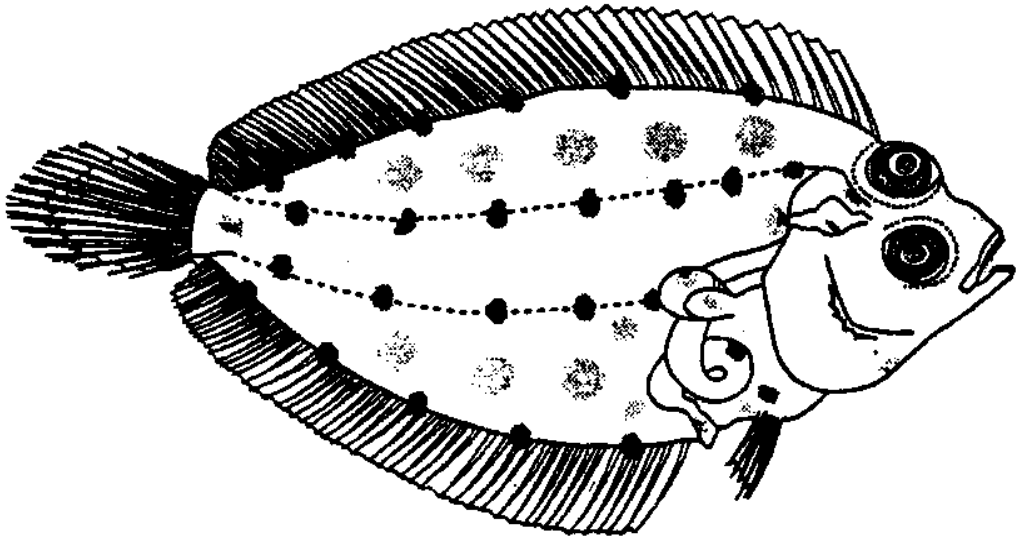
A. 11.7 mmSL



B. 11.7 mmSL (Blind Side)

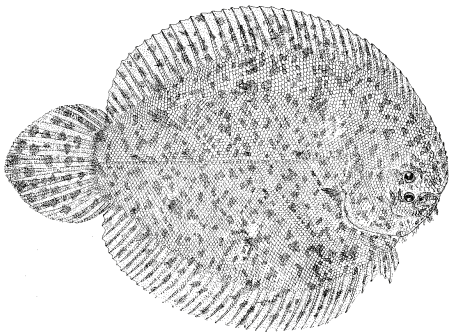


C. 23.5 mmSL



D. 32.0 mmSL

Achirus lineatus (Linnaeus, 1758)
Achiridae
Lined sole



Range: Western North Atlantic Ocean from South Carolina to Uruguay, including Gulf of Mexico

Habitat: Coastal waters, brackish embayments, hypersaline lagoons

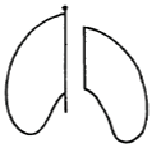
Spawning: Florida and south; larvae rarely drift north into study area *via* Gulf Stream.

Eggs:
- Pelagic, spherical
- Diameter: 0.71–0.76 mm
- Chorion: smooth, thin
- Yolk: homogeneous
- Oil globules: multiple, 0.02–0.09 mm
- Perivitelline space: moderate

Larvae:
- Hatching occurs at <2 mm; eyes unpigmented, wide finfold
- Body deep and laterally compressed
- Head with prominent hump and steep vertical forehead
- Head length increases from about 20% to 40% SL
- Preanus length decreases from <60% SL to about 44% SL
- Body depth (including width of dorsal fin) increases from 38–46% SL to 50% SL
- Head has 3 spiny ridges; body has 4 rows of spinous scales
- Flexion occurs at <3 to 4 mm
- Dorsal fin 'tentacle' develops as fleshy appendage, later supported by a ray
- Sequence of fin ray formation: C, D, A – P_2 – P_1
- Left eye migrates across midline under hook formed by dorsal fin
- No pigmentation at hatching; 2 melanophores form along dorsal edge, then pigment spreads across body and onto fins
- Transformation occurs at 3–5 mm
- Left pectoral fin disappears after transformation

Meristic Characters

Myomeres:	25–27
Vertebrae:	25–27
Dorsal fin rays:	47–58
Anal fin rays:	35–44
Pectoral fin rays:	4–6 (right)
Pelvic fin rays:	5/5
Caudal fin rays:	16 (total)

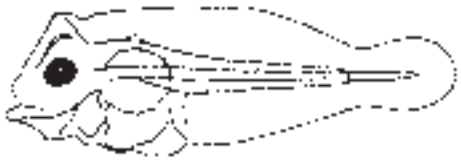


Position of pelvic fins

Figures: Adult: Topp and Hoff, 1972; **A–F**: Houde *et al*., 1970

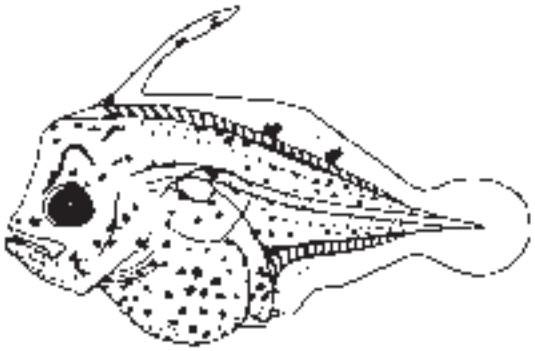
References: Dovel *et al*. 1969; Munroe, 2002d

Achirus lineatus

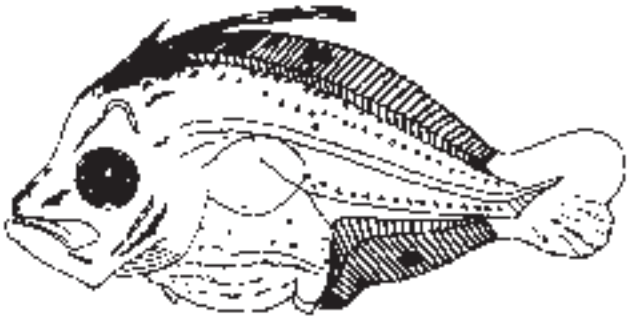


A. 2.0 mmNL

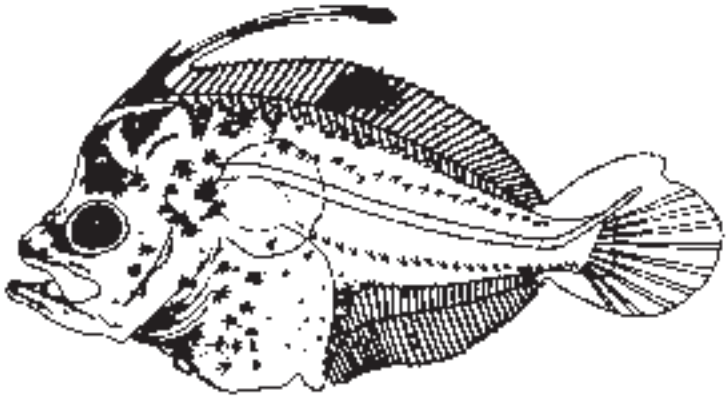
B. 2.3 mmNL



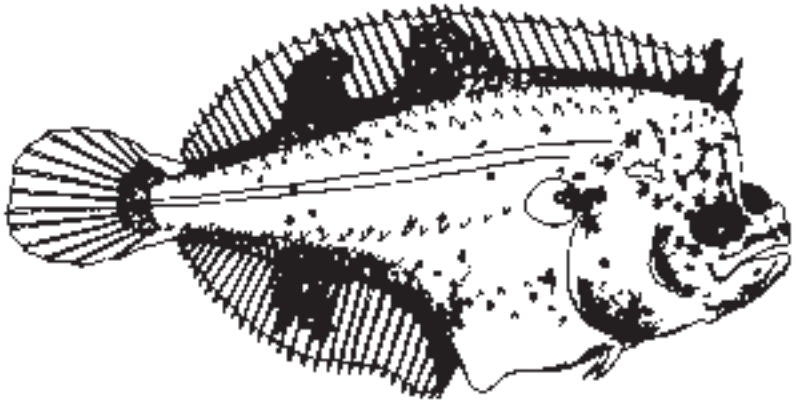
C. 2.9 mmNL



D. 3.4 mmSL

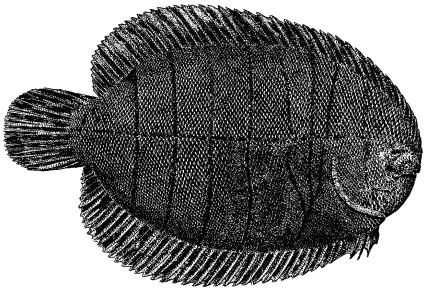


E. 3.6 mmSL



F. 3.7 mmSL

Trinectes maculatus (Bloch and Schneider, 1801)
Achiridae
Hogchoker



Range: Western North Atlantic Ocean from Maine (rarely) to Venezuela, including Gulf of Mexico and western Caribbean Sea

Habitat: Bays and estuaries, usually in brackish to fresh waters, on mud, sand or silty substrates; tolerates wide range of temperatures and salinities, and low oxygen concentrations

Spawning: Apr–Oct with a peak in May–Sep; year-round in Gulf of Mexico

Meristic Characters

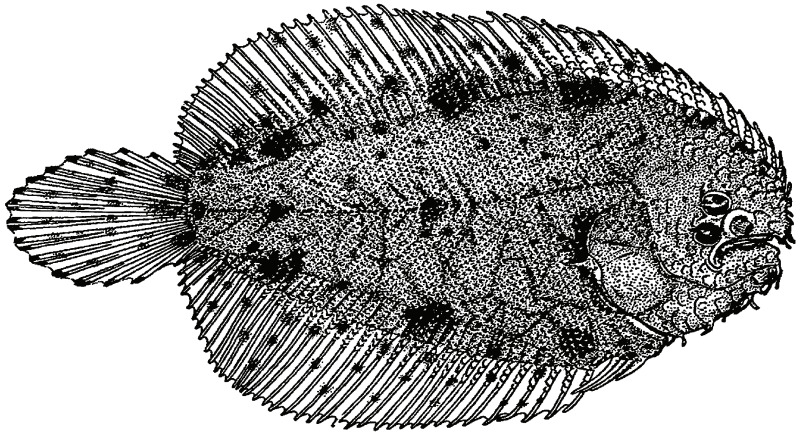
Myomeres:	28–29
Vertebrae:	9+19–20=28–29
Dorsal fin rays:	50–56
Anal fin rays:	36–46
Pectoral fin rays:	None
Pelvic fin rays:	5/5
Caudal fin rays:	14–16 (total)

Eggs:
- Spherical to slightly oval
- Buoyant in higher salinities, demersal in low
- Diameter: 0.67–1.22 mm (smaller in high salinities)
- Chorion: smooth and greenish
- Oil globules: multiple, diameter <0.06 mm
- Perivitelline space: very narrow

Larvae:
- Hatching occurs at 1.7–1.9 mm; eyes unpigmented; prominent hump on head
- Body slender at hatching, becomes deep and laterally compressed early
- Mouth prominent, with projecting lower jaw
- Flexion begins at about 3.8 mm
- Pelvic fins: right pelvic base longer than left; right origin anterior to left; right base on midline, left base above midline
- Fin rays begin to form at about 3.8 mm and are completely ossified by about 5.0 mm
- Left eye migrates through notch formed anterior to right eye
- Pectoral fins lost at transformation
- Pigmentation scattered on head and body in early larvae, bars form on body and fins in later larvae
- Transformation occurs <5.0 mmSL

Position of pelvic fins

Early Juvenile:

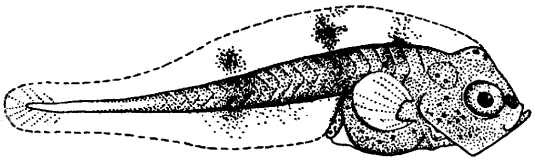


F. 18.0 mmTL

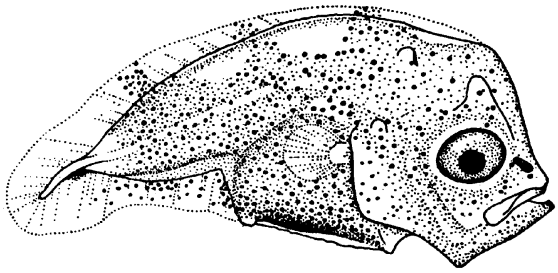
Figures: Adult: Jordan and Evermann, 1896; **A–F**: Hildebrand and Cable, 1938 (A and C reversed)
References: Dovel *et al*. 1969; Smith *et al*., 1975

Trinectes maculatus

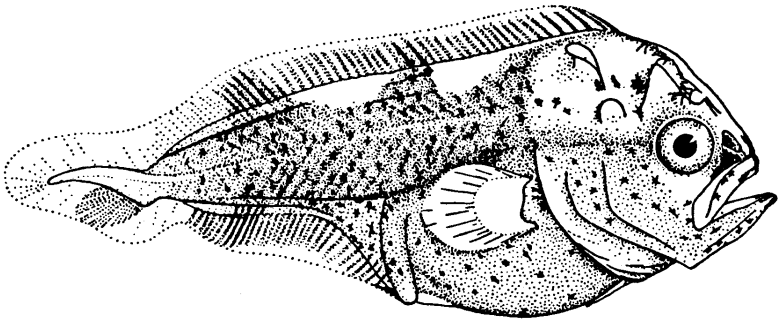
Blotches in finfold composed of greenish pigment



A. 3.0 mm

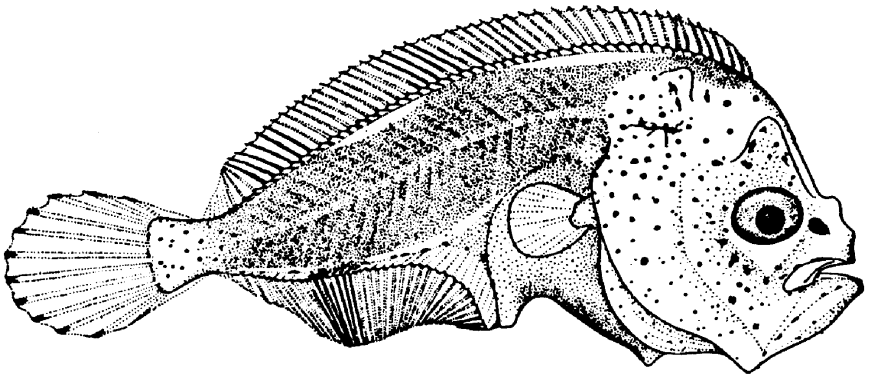


B. 3.8 mm

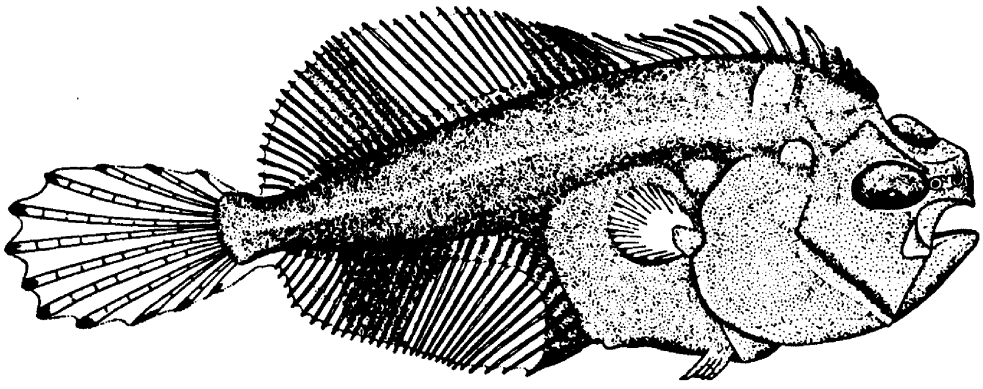


Note: Sizes inferred from discussion (Hildebrand and Cable, 1938)

C. 3.5 mm

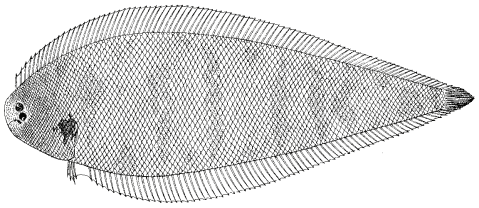


D. 3.0 mm



E. 5.0 mm

Symphurus plagiusa (Linnaeus, 1766)
Cynoglossidae
Blackcheek tonguefish



Range: Western North Atlantic Ocean from New York to the Campeche Peninsula, Mexico, including the Gulf of Mexico; also western Cuba; uncommon Delaware Bay and north

Habitat: Shallow coastal and estuarine waters, usually 1–30 m depth, on silty, fine sandy or muddy bottoms

Spawning: Summer

Eggs: – Undescribed

Larvae:
- Hatching occurs at <1.3 mm
- Body tapered, gut protrudes, mouth large and oblique
- Hump on dorsal edge over cleithrum in early larvae
- Head length increases from 18 to 22% SL; preanus length decreases from <50% SL to 35% SL; body depth increases from 15% to 27% SL
- Flexion occurs at 6.2–8.5 mm SL
- Sequence of fin ray formation: D – A – C, P_2 – P_1
- Few anterior dorsal fin rays elongate
- Pigmentation: Early larvae have few melanophores on brain and on cleithral 'hump' and 3 indistinct clusters along dorsal edge of body; ventral row of spots occurs from gut to isthmus and a double row occurs postanally; larger larvae display increase in dorsal edge pigment and internal melanophores form along dorsal notochord; single spot forms at base of each ray
- Transformation occurs at about 10 mm
- Pectoral fins and right pelvic fin lost at transformation

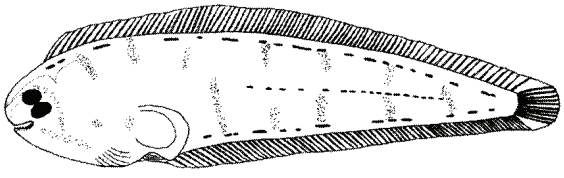
Meristic Characters

Myomeres:	44–49
Vertebrae:	9+ 37–39
Dorsal fin rays:	81–91
Anal fin rays:	66–75
Pectoral fin rays:	none
Pelvic fin rays:	4/0
Caudal fin rays:	9–11 (total)

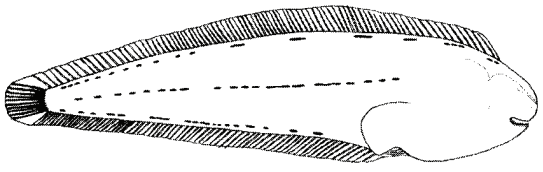
Position of pelvic fin

Note: 1. Six other species of *Symphurus* may occur in the study area (Munroe, 1998). A larval series of *Symphurus civitatium* has been described and illustrated (Farooqi *et al*., 2006). Larvae closely resemble those of *Symphurus plagiusa* except they lack the postanal pigment band, have pigment from the ventral clusters extending onto bases of anal fin rays, lose pigment on dorsal and ventral edges of body at transformation and transform at a larger size (12 mm cf. 8–9 mm in *Symphurus plagiusa*). After transformation, *Symphurus civitatium* larvae have a series of light, narrow and nearly complete bars crossing the body (bars are incomplete in transformed *Symphurus plagiusa*, Fig. E).

Early Juvenile:



E. 8.0 mmSL (Eyed Side)

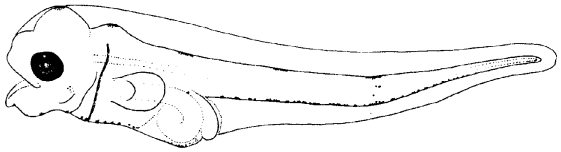


F. 8.0 mmSL (Blind Side)

Figures: Adult: Topp and Hoff, 1972; **A–C**: Olney and Grant, 1976; **D**: Hildebrand and Cable, 1930 (A–D redrawn, pectoral fin added to A); **E–F**: T. Farooqi (Farooqi *et al*., 2006)

References: Munroe, 1998; Farooqi *et al*., 2006

Symphurus plagiusa

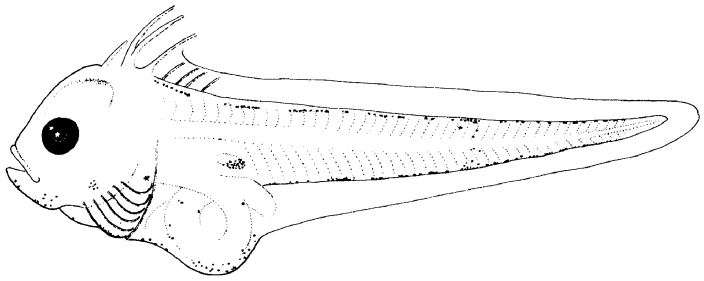


Remnants of band occurs at mid-tail (present in smaller specimens)

Fine melanophores present on both sides of pectoral fin

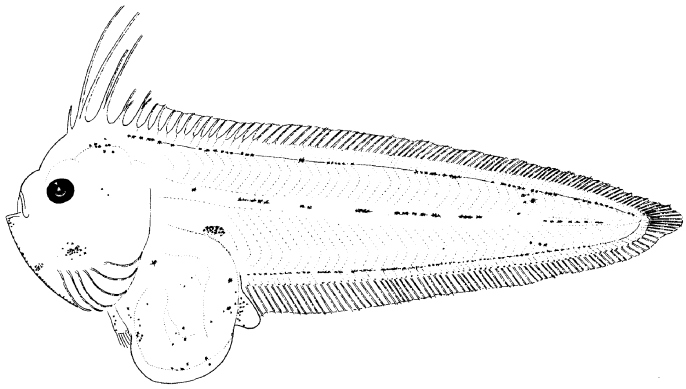
A. 2.4 mmNL

Internal pigment on air bladder



B. 3.6 mmNL

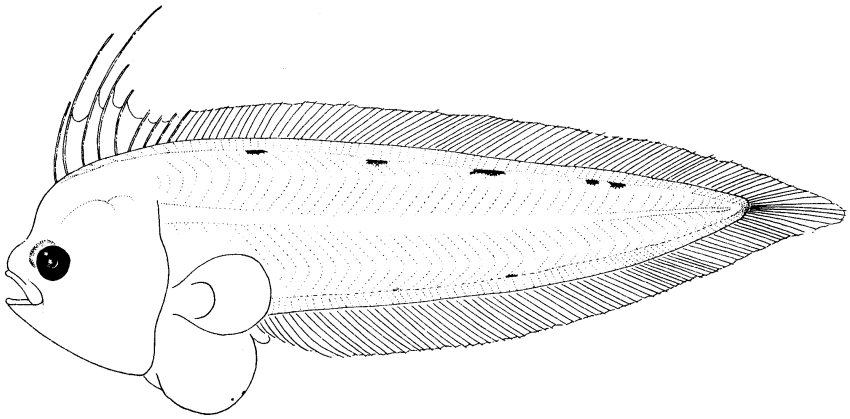
Ventral pigment merges and darkens



Pectoral fins omitted for clarity, Fig. B and C

Internal pigment forms on dorsal notochord

C. 6.2 mmNL



D. 7.0 mmSL