THE EARLY STAGES OF FISHES IN THE CALIFORNIA CURRENT REGION

CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS

ATLAS NO. 33

SPONSORED BY THE
UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES SCIENCE CENTER

SUPPORTED IN PART BY A CONTRACT WITH THE
UNITED STATES DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE
PACIFIC OUTER CONTINENTAL SHELF REGION

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POLYPRIONIDAE: Giant sea basses and wreckfishes

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The giant sea bass, *Stereolepis gigas*, ranges from northern California to Oaxaca, Mexico, including the Gulf of California, and is found in the coastal waters of northern Japan and the Sea of Japan. Until recently, it's relationships have been confused and it has been placed variously in the Serranidae (Jordan and Evermann 1896; Miller and Lea 1972), Percichthyidae (Hubbs et al. 1979; Eschmeyer et al. 1983; Mochizuki 1984), Acropomatidae (Nelson 1994), and Moronidae (Heemstra 1995a). Roberts (1986) suggested that it belongs in the Polyprionidae and some recent classifications (Eschmeyer 1990; Roberts 1993) have placed it there. This is supported by the similarity of *S. gigas* larvae and pelagic juveniles to those of *Polyprion* as shown by this study. Eggs and larvae of *S. gigas* have not been identified in CalCOFI samples although small juveniles are often captured in shallow water habitats (Fitch and Lavenberg 1971; Mochizuki 1984; Nelson 1994).

Polyprionids grow to more than 2 m in length and more than 250 kg. They have deep compressed bodies and a massive head with large jaws that bear bands of villiform teeth; the snout is blunt in *Stereolepis*. In *Stereolepis* the head and body are covered with small ctenoid scales and the head lacks armature except for an inconspicuous opercular spine. Fins are well developed, particularly in juveniles; the strong spinous dorsal rays equal (wreckfishes) or exceed (giant sea basses) the soft rays in number. The caudal fin is rounded in juveniles and truncate in adults. Adult giant sea bass prefer rocky bottom habitat ranging from the edge of kelp forests to about midshelf. They are primarily piscivorous. *Stereolepis gigas* is a desirable recreational and commercial species and is prized by sport divers. Commercial landings in California peaked at 391 mt in 1934 with most of the fish caught off Baja California. Sport and commercial catches have declined drastically in recent years; in California, the commercial catch is severely limited and no recreational catch is permitted (Fitch and Lavenberg 1971; Crooke 1992).

Polyprionids are oviparous and have planktonic eggs and larvae. Eggs are large (1.5–1.6 mm) and have homogeneous yolk and multiple oil globules that coalesce with development. Larvae are heavily pigmented with both black and yellow chromatophores. Early juveniles are disc-shaped, have large fins, and are distinctively pigmented (Fitch and Lavenberg 1971; Hardy 1978b; this study). Juvenile *S. gigas* go through several pigmentation phases. First, white blotches develop on the head, dorsum, abdominal region, and at the caudal fin base; the margin of the soft dorsal fin is white. Between 20 and 50 mm, they become orange to brick red with about six irregular rows of black spots on the body and head. At about 150 mm they become dusky with pale mottling; some of the black spots remain (this study). Juvenile *S. doederleini* have pale discontinuous stripes over a black background (Mochizuki 1984). Early juvenile wreckfish initially develop pale mottling, then develop a yellow background coloration with dark elongate spots (Heemstra 1986b).

The eggs, larvae and most of the juvenile *S. gigas* described here came from rearing experiments at Hubbs-Sea World Research Institute during June to October, 1993[2]. Some field-caught juveniles were obtained from S. H. Kramer (Kramer 1990). The descriptions are based on detailed examination of 40 eggs, 23 larvae (3.0–12.4 mm, yolk-sac through postflexion), and 4 juveniles (18.8–54.7 mm). Meristic and ecological information were obtained from Fitch and Lavenberg (1971), Miller and Lea (1972), Crooke (1992), and observations made during this study.

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[2] We gratefully acknowledge the following: Donald Kent (Hubbs-Sea World Research Institute) and Richard Ford (San Diego State University), Principal Investigators of the Ocean Resources Enhancement and Hatchery Program (ORHEP), provided the specimens; California Department of Fish and Game, ORHEP administrator, provided the opportunity to experiment with this species; the Stephen Birch Aquarium and Museum (SIO) donated the breeding pair of giant sea bass to ORHEP.

MERISTICS

	Range	Mode
Vertebrae:		
Total	25–26	26
Precaudal	11–12	12
Caudal	14–15	14
Fins:		
Dorsal spines	XI+I–II	XI+I
Dorsal rays	9–10	10
Anal spines	III	III
Anal rays	8–9	8–9
Pelvic	I,5	I,
Pectoral	18–19	19
Caudal:		
Principal	9+8	9+8
Procurrent:		
Upper	8–9	8–9
Lower	8	8
Gill rakers:		
Upper	2	2
Lower	7–8	
Branchiostegals	7	7

LIFE HISTORY

Range: Humboldt Bay, California, to Oaxaca, Mexico, including Isla de Guadalupe & Gulf of California; northern Japan & Sea of Japan

Habitat: Young in kelp forests & over sandy bottom near shore, older specimens over rocky bottom at ca. 30–50 m depth

Spawning season: Summer

ELH pattern: Oviparous; planktonic eggs & larvae

LITERATURE

ORIGINAL ILLUSTRATIONS (Illustrator)

Egg, 1.6 mm in diameter (R. C. Walker)
Yolk-sac larva, 4,1 mm (R. C. Walker)
Preflexion larva, 4.2 mm (R. C. Walker)
Preflexion larva, 5.7 mm (N. Arthur)
Transformation specimen, 12.4 mm (R. C. Walker)
Juvenile, 18.8 mm (N. Arthur)

* Snout deformed.

EARLY LIFE HISTORY DESCRIPTION

EGGS

Shell diam.: 1.5–1.6 mm
No. of OG: 1–9, coalescing to 1
Yolk: Homogeneous
Diam. of OG: 0.06–0.27 mm, coalescing to 1: 0.23–0.35 mm
Shell surface: Smooth
Pigment: Melanophores & xanthophores laterally & on dorsum of embryo except none on notochord tip; pigment on OG in later stages.
Diagnostic features: Diameter of chorion & oil globule(s)

LARVAE

Hatching length: 3.0–4.2 mm
Flexion length: >5.7 mm, <12.4 mm
Transformation length: ≥12.4 mm, <18.8 mm
Fin development sequence:
Pigmentation: *Yolk-sac & preflexion*—Heavy on head, trunk, & tail except little or none on last 3–4 myomeres; denser ventrolaterally with broad bar forming near midbody in preflexion stage; 2–4 on dorsal margin of notochord tip, disappearing by end of yolk-sac stage; few on yolk sac & OG; gut with few at terminus early in yolk-sac stage, becoming completely pigmented by end of stage; on P_1 base in preflexion stage; internally in roof of mouth & under brain, becoming dense stripe in preflexion stage. *Transformation & juvenile*—Body & fins completely pigmented except none on P_1 rays & only narrow band proximally on C; early juvenile orange to red with scattered black spots; P_2 & 1D intensely black.
Diagnostic features: Heavily pigmented except end of tail; myomeres 11–12+13–14 (usually 12+14); transformation specimens & juvenile deep-bodied with very large, black P_2; juveniles spotted.

MORPHOMETRICS (range & mean in %)

	Y-S	PrF	F	PoF	Tr	Juv
Sn-A/BL	52–59	55–60				65–71
	56	57			67	68
BD/BL	6–13	21–23				46–48
	8	22			46	46
HL/BL	12–19	21–35				35–39
	15	27			47	37
HW/HL	55–106	69–109				59–82
	79	90			69	70
SnL/HL	10–22	21–27				24–28
	18	24			2*	25
ED/HL	43–66	38–44				25–38
	53	42			32	30
P_1L/BL	0–3					21–22
	1	6			22	21
P_2L/BL	0–0	0–0				31–43
	0	0			41	38

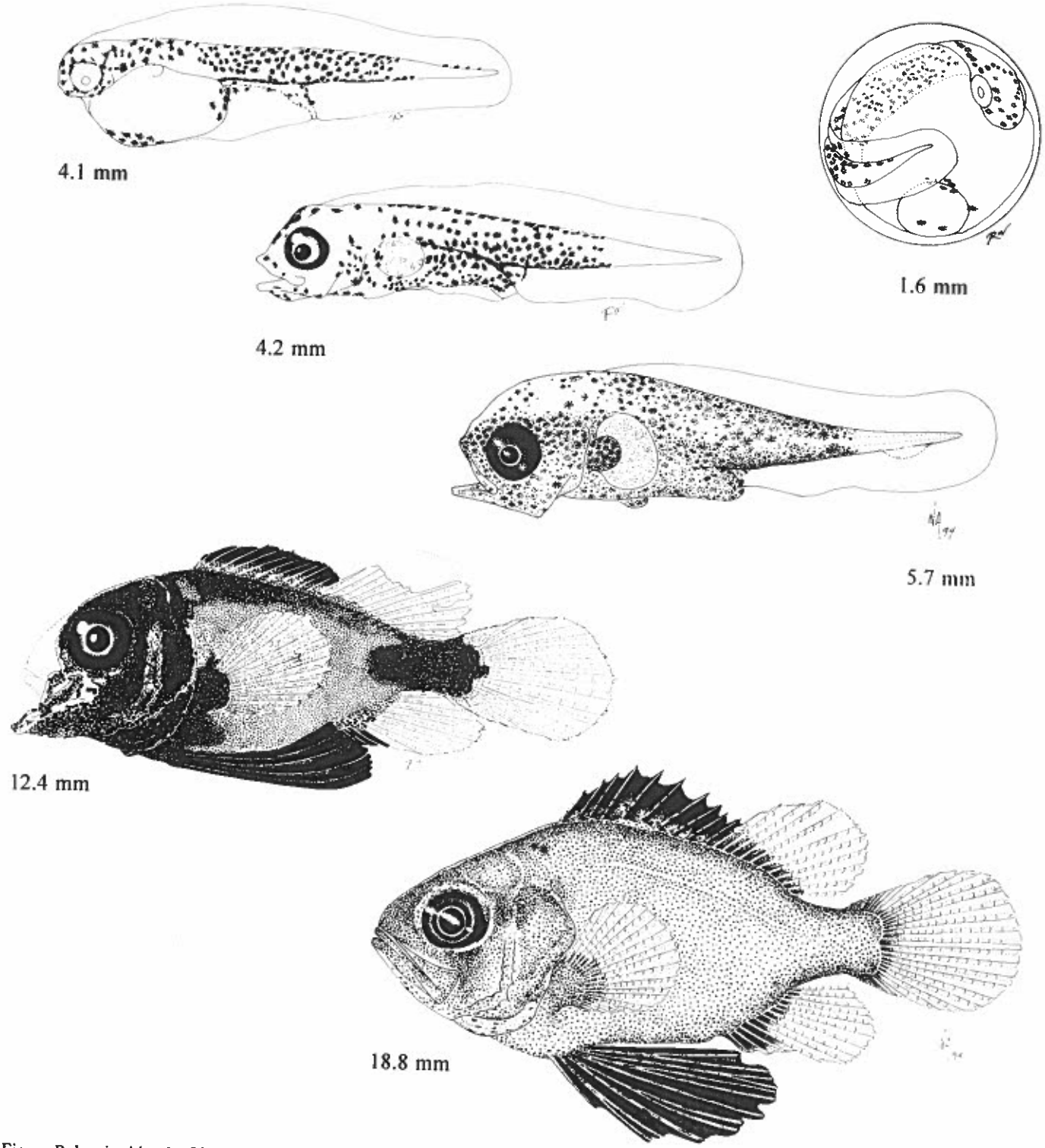

Figure Polyprionidae 1. Giant sea bass reared from aquarium-spawned eggs at Hubbs-Sea World Research Institute, June–July 1993: egg, 1.6 mm; newly hatched yolk-sac larva, 4.1 mm; preflexion larva, 4.2 mm, day 6, ; late preflexion larva, 5.7 mm, day 26, (specimen unavailable, drawn from a photographic slide); transformation specimen, 12.4 mm, day 47, (snout and jaws deformed; dashed line shows approximate profile if specimen had been normal). Field-collected epibenthic juvenile, 18.8 mm (SK, Agua Hedionda Lagoon, September 13, 1988).