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Aging of Common Snook *Centropomus undecimalis* Larvae Using Sagittal Daily Growth Rings

John W. Tucker Jr.
Harbor Branch Foundation

Stanley M. Warlen
National Marine Fisheries Service

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AGING OF COMMON SNOOK *Centropomus undecimalis* LARVAE USING SAGITTAL DAILY GROWTH RINGS

The common snook (*Centropomus undecimalis*), a member of the tropical fish family Centropomidae, is found from Rio de Janeiro, Brazil, to Cape Hatteras in the United States, but is common only in the Caribbean, Gulf of Mexico, and parts of southern Florida. Intolerance to low winter temperatures restricts its normal northern range to southern Texas and central Florida (Tampa and Cape Canaveral). This species is valuable to sport and commercial fisheries throughout most of its range (Rivas, 1962; Fraser, 1968; Merriner *et al.*, 1970).

Common snook spend much of the year in estuaries or freshwater tributaries (especially juveniles), but apparently migrate to ocean inlets or just offshore to spawn. Juveniles and adults are usually found in schools. In Florida, peak spawning occurs in June-July along the southwest and southeast coasts and in August along the east central coast. However, some spawning may occur year-round (Gilmore *et al.*, 1983). The pelagic eggs are 0.7 mm in diameter and hatch in 16-18 hours at 28°C. Hatchlings are about 1.5 mm in body length (BL). Eyes and digestive system are functional 3 days after hatching, and BL is about 2.1 mm. A detailed description of eggs and larvae is given by Lau and Shafland (1982).

In this note, we validate daily aging methodology for common snook larvae with data from 37 laboratory-reared specimens ranging in age from 3 to 26 days after hatching.

MATERIALS AND METHODS

Specimens were obtained from four spawns, occurring between 30 June and 21 September 1984. Adult female snook were induced to ovulate with single injections of human chorionic gonadotropin, and eggs were manually fertilized. Eggs were incubated and larvae reared in 1,000-liter circular fiberglass tanks in a greenhouse, with 35% natural light transmitted through the roof. Salinity was 30-35‰ and mean temperatures for the four groups were 29.8, 28.9, 28.1, and 27.4°C (range 24.6-32.4°C). Most larvae hatched 16-18 h after fertilization. Beginning 2 days after hatching, they were fed *Brachionus plicatilis* on days 2-20, *Tigriopus japonicus* on days 5-26, and *Artemia salina* nauplii on days 12-26. The 20-day old specimens had also been fed *Acartia tonsa* during days 2-20.

Forty larvae of ages 3, 4.5, 12, 20, and 26 days were sampled in the afternoon and were immediately preserved in 75% ethanol. Sagittae were removed in ethanol, cleaned in distilled water, and mounted on a microscope slide with a thin layer of clear acrylic medium.

Concentric growth increments on otoliths (Figure 1) were counted at 400 or 1,000X magnification with a compound microscope and closed circuit television system. On three separate occasions weeks apart, an experienced reader

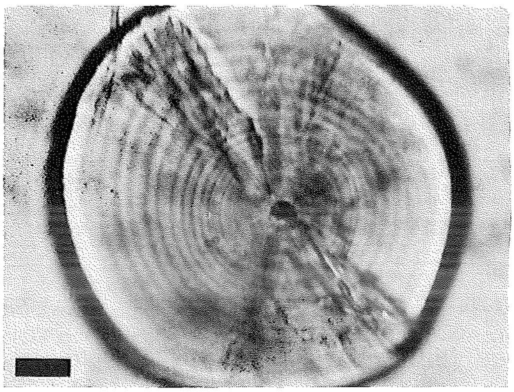

Figure 1. Photomicrograph of sagitta from a 20-day-old laboratory-reared common snook larva (4.2 mm BL). Scale bar represents 10 μm.

counted increments on each otolith. The reader had no knowledge of actual ages. Thirty-six pairs and four single otoliths were randomized and numbered by another person before each reading. Counts could not be obtained for three specimens (7.5%) because rings were indistinct. Thirty-three pairs and four single otoliths were used. Means of the three counts were compared to the known ages of larvae with standard linear regression techniques.

RESULTS AND DISCUSSION

The number of otolith growth increments was linearly related to the known age of snook larvae up to age 26 days (Figure 2). There was a significant regression of increment number on age (F-test, $P < 0.01$). The slope of this regression was not significantly different from 1.0 (t-test, $P > 0.01$), indicating that, on the average, one growth increment was formed per day. Thus, at least for the first 26 days, the number of otolith growth increments is a direct predictor of the age of larval snook. Repeated counts usually did not vary by more than ±2 rings. Variations in counts and deviations from expected values (Figure 2) may have resulted from irregularity of increment spacing and the counting of sub-daily increments, or from difficulty in resolving closely spaced increments.

Age at first increment formation is estimated by the y-intercept, 0.0443, which was not significantly different from zero (t-test, $P > 0.01$), and we conclude that increment formation

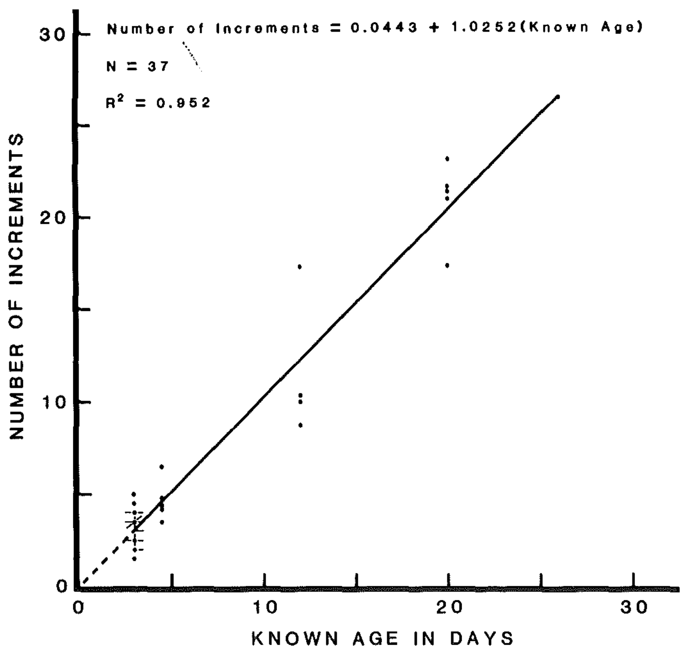

Figure 2. Relationship of number of observed otolith growth increments with known age (days after hatching) of 37 laboratory-reared common snook, *Centropomus undecimalis*. Overlapping points are indicated by the "Sunflower" symbols of Chambers *et al.* (1983).

Key to figures: · = 1 observation
·· = 2 observations
··· = 3 observations
etc.

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begins on the day of hatching. Increment formation at hatching has been noted for other species (Tanaka *et al.*, 1981; Miller and Storck, 1982; Rosenberg and Haugen, 1982). However, increment formation may begin prior to hatching in precocious species (Radtke and Dean, 1982) or at some point after hatching (Brothers *et al.*, 1976; Laroche *et al.*, 1982; Tsuji and Aoyama, 1984; Warlen and Chester, 1985), and is often coincident with first feeding. First increment formation in larval snook begins about 2 days before they have pigmented eyes and a functional mouth (Lau and Shafland, 1982) and are capable of feeding.

Recent declines in U.S. snook populations have stimulated research activity in Texas and Florida, and have prompted the State of Florida to classify snook as a "species of special concern," one step removed from "threatened." One aspect of this increased research is an effort to collect and identify wild snook larvae, which are essentially unknown. Although the juvenile and adult life history is relatively well documented (e.g., Gilmore *et al.*, 1983), spawning locations and times have mostly been speculative. Collection and aging of snook larvae will provide much-needed documentation of snook early life hsitory and will help to identify potential conflicts between human activities and successful snook recruitment.

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John W. Tucker, Jr., *Division of Applied Biology, Harbor Branch Foundation, RR 1, Box 196, Fort Pierce, FL 33450, and* Stanley M. Warlen, *National Marine Fisheries Service, Southeast Fisheries Center, Beaufort Laboratory, Beaufort, NC 28516.*

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