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GROWTH OF CAPTIVE JUVENILE TRIPLETAIL *LOBOTES SURINAMENSIS*

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ABSTRACT Early-juvenile tripletail *Lobotes surinamensis* (n = 27; range 45–115 mm TL, 0 = 73.0 mm; range 3.2–34.7 g TW, 0 = 12.9 g) captured in pelagic *Sargassum* algae off coastal Mississippi in mid-July 1999 were reared in a recirculating seawater system for 210 days. Fish were maintained on a natural light-dark cycle and fed to satiation 3 times per day. Water temperature ranged from 25.2° to 29.0° C and salinity was 28.0‰. All fish were measured for length and weight on days 1, 60, 135 and 210 of the study. Between these dates, mean daily TL growth rates were 2.2 mm/day, 1.2 mm/day, and 1.0 mm/day, respectively, where as 0 daily TW growth rates were 2.9 g/day, 4.3 g/day, and 7.1 g/day. Over the entire study, 0 TL and TW growth rates were 1.4 mm/day and 4.9 g/day, respectively. There was a significant correlation between length and weight vs. date of measurement. At the end of the study, specimens ranged from 272–431 mm TL (0 = 359 mm) and from 443.9–2,380.0 g TW (0 = 1,012.5 g).

Introduction

The tripletail, *Lobotes surinamensis*, is a migratory, pelagic fish that occurs throughout the tropical and subtropical seas of the world (Fischer 1978). In the western Atlantic Ocean, tripletail is distributed from Massachusetts and Bermuda to Argentina, including the Gulf of Mexico (Gulf) and the Caribbean Sea (Robins and Ray 1986). Tripletail occur seasonally from April through October in offshore waters, sounds, bays, and estuaries along the northern Gulf coast (Benson 1982) and appear in greatest concentrations along the Mississippi coast during summer (Baughman 1941).

The life history and ecology of tripletail in the Gulf are not well known. Franks et al. (1999) reported on age and growth of tripletail from northern Gulf waters. Ditty and Shaw (1994) described larval development and distribution of tripletail in the Gulf and reported that it spawns from May through September, probably in offshore waters. Brown-Peterson and Franks (In press) reported that tripletail collected from waters offshore Mississippi were batch spawners throughout the summer. Modde and Ross (1981) collected 242 specimens (size range not given) in the surf zone of Horn Island, Mississippi during 1975–1977. Breder (1949) reported that young tripletail may frequent estuaries as nurseries, although the degree to which juvenile tripletail utilize Gulf estuaries is unknown (Ditty and Shaw 1994).

Little is known about the biology of juvenile tripletail, and there are no published data on rearing captive juvenile tripletail. Studies of juvenile fish growth are essential in order to better understand life history and biological aspects of young fish, particularly since variability in growth rates can affect early life stage duration, potentially influencing survival and subsequent recruitment (Houde 1987). The purpose of this note is to report rearing procedures and growth rates for captive juvenile tripletail.

Materials and Methods

In mid-July 1999, early-juvenile tripletail (Figure 1) were captured by dip net (8.0 mm mesh) from pelagic *Sargassum fluitans* found in northern Gulf waters off the coast of Mississippi. The capture site (lat. 30°08', long. 89°01') was located about 4 km south of West Ship Island.Surface temperature and salinity at the capture site were 31.0° C and 27.0‰, respectively. Fish were immediately placed in a 45 L ice chest containing aerated seawater for transfer to The University of Southern Mississippi, Institute of Marine Sciences Aquaculture Facility. Handling of the fish was kept to a minimum to reduce stress, and time from capture to arrival at the facility was about 6h.

Juveniles selected for the growth study (n = 27) were measured for total length (TL, mm) and total weight (TW, wet weight to nearest 0.1 g) on day-1 of the study (31 July 1999). Specimens were placed in a 1.9 m^3 circular tank which was part of a 1,890 L indoor, closed, recirculating system. The entire water volume was filtered about 3.5 times per h through a biological and sand filter, plus a protein skimmer. Specimens were maintained on a natural light-dark cycle and fed commercially available feed until satiated 3 times per day. During the study, water temperature ranged between

Figure 1. Photograph of a small (82 mm TL) juvenile tripletail *Lobotes surinamensis* used in the growth study.

25.2° to 29.0° C and salinity was maintained at 28.0‰. Juveniles were reared for 210 days and all specimens survived until the end of the experiment.

Since all fish were reared in the same tank, individual fish were not identifiable throughout the study; thus, growth data presented correspond to pooled specimens periodically measured during the study. Fish were weighed and measured on days 1, 60, 135, and 210, and the mean TL and TW were determined for each date. The mean daily growth rate (TL, TW) of fish for each time interval ($n = 3$) was determined as the difference between mean sizes for 2 consecutive dates divided by the number of intervening days. Correlations between mean size (TL and TW separately) vs. date of measurement were determined with the Pearson correlation coefficient (Statgraphics Plus 1998). Daily growth rate over the duration of the study was expressed as an increase in $\bar{x}$ TL and TW divided by the 210 days of the experiment. A length-weight regression ($\log_{10}$) was calculated for specimens at the end of the study.

RESULTS

Summary TL and TW metrics for all 4 examination dates are shown in Table 1. Mean (± 2SE) TL and TW for the 27 fish on each of the 4 dates are shown in Figure 2. There was a significant correlation between $\bar{x}$ TL ($r = 0.99$, $P = 0.0248$, $n = 4$), $\bar{x}$ TW($r = 0.99$, $P = 0.0121$, $n = 4$), and date of measurement.

Mean daily TL and TW growth rates were calculated for specimens during the 3 time intervals (Table 1). The overall $\bar{x}$ growth rate in TL and TW for specimens during the study was 1.4 mm/day and 4.9 g/day, respectively. The highest $\bar{x}$ TW growth rate was attained during the last 75 days in captivity (Table 1). The length-weight relationship for specimens at the end of the study is: $\log_{10}TW = -12.7717 + 3.3432 \log_{10}TL$ ($r^2 = 0.836$, $n = 27$).

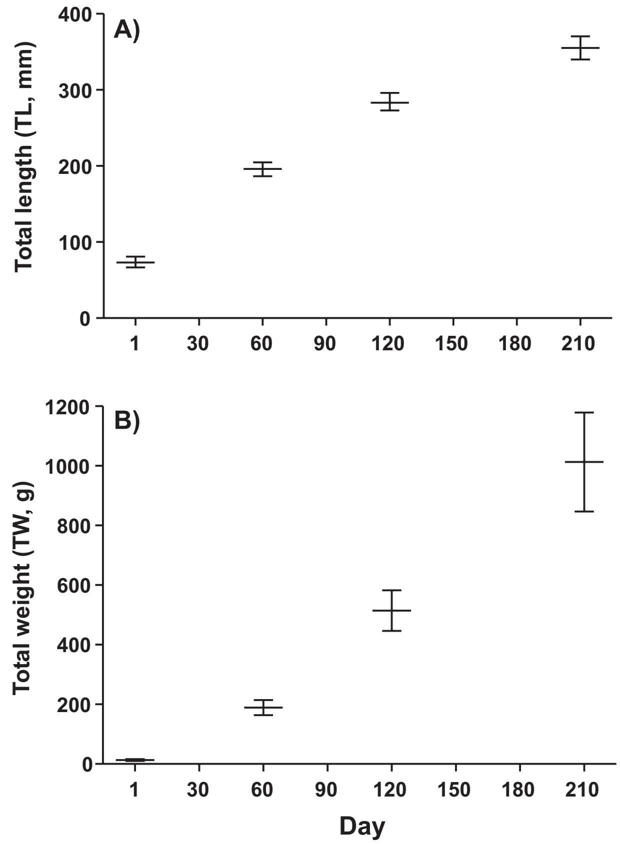

Figure 2. Plots of $\bar{x}$ ± 2SE for total length (A) and total weight (B) for 27 juvenile tripletail *Lobotes surinamensis* 0n 4 different days during captivity.

DISCUSSION

Based on size-at-age estimates reported for tripletail by Merriner and Foster (1974), as well as preliminary findings of age studies of tripletail from northern Gulf waters by Franks et al. (1999), all specimens used in the current study were less than one year old. Brown-Peterson and Franks (In press) reported tripletail from the northern Gulf were summer spawners (May through August), and juveniles used in our study most likely were spawned during the early part of the reproductive season.

To our knowledge, this study represents the only study in which early-juvenile tripletail were collected in the wild and reared in captivity for growth studies. An undesirable aspect of our study was the necessity of rearing all juveniles in one tank, thereby making it impossible to determine specific growth rates for individual specimens. However, the periodic and overall TL and TW growth rates calculated for the sample represent important information on growth of young tripletail.

Tripletail grow rapidly during the first year of life. Mean TL and TW of juveniles at the end of the study were 359 mm and 1,012.5 g, respectively. The largest

TABLE 1

Summary of body size metrics and mean growth rates for juvenile tripletail (*n* = 27) captured off coastal Mississippi and used in the growth study. Growth rates shown are the mean daily growth between 2 consecutive dates.

	Total length (mm)				Total weight (g)			
Date	Range	Mean	SE	Growth mm/day	Range	Mean	SE	Growth g/day
07-30-99	45.0–115.0	73.6	3.56		3.2– 34.7	12.7	1.54	
				2.2				2.9
09-28-99	160.0–235.0	195.5	4.56		100.0–319.6	188.7	12.66	
				1.2				4.3
12-15-99	210.0–350.0	282.9	6.53		274.1–795.0	514.1	33.99	
				1.0				7.1
02-09-00	272.0–431.0	355.0	7.59		443.9–2,380.0	1,012.5	83.02	

fish attained a size of 431 mm TL and 2,380.0 g TW. On the final day of the study, 14 fish (52%) exceeded 350 mm in TL and 11 fish (41%) exceeded 1,000 g in TW. Juveniles demonstrated a progressively slower $\bar{x}$ growth rate in TL, whereas there was a conspicuous increase in $\bar{x}$ TW.

Although the study was conducted in an indoor facility, the south wall of the room which housed the rearing system contained large windows designed to allow natural light to enter throughout the day. Even though the room was heated during winter, water temperature varied seasonally. Water temperature at the beginning of the study (July 1999) was 29° C, averaged 28.1° C for the following 2 warm-weather months, then gradually decreased over the next 5 months ($\bar{x}$ = 26° C) until termination of the study in February 2000 (25.2° C). The fish increased substantially in $\bar{x}$ TW over the entire range of water temperature, with the largest $\bar{x}$ growth in TW occurring during the latter part of the study when water temperatures were lowest.

Juveniles were fed to satiation throughout the study, which necessarily required an increase in the amount of food with increased time. The quantities of food provided the fish were not well documented, and we did not examine food/fish growth relationships or feed conversion ratios. Future experimental rearing of juvenile tripletail should include constant documentation of rations and investigation of the synergistic effects of different feeds and water temperatures on the growth of young tripletail. The growth rates reported here might represent near-upper limits for captive juvenile tripletail which are fed manufactured food. No published information exists on growth of juveniles in rearing systems or in the natural environment for purposes of comparison with our findings.

Since the early life stages of tripletail are spent in the epipelagic zone (Ditty and Shaw 1994) where predation risk for small fishes is considerable, the rapid growth observed for juveniles in captivity may be characteristic of young tripletail in the wild. Our specimens were collected from floating *Sargassum* which provides some measure of protection for young fishes as they drift with the algae (Dooley 1972). Baughman (1943) reported that juvenile tripletail often associate with pelagic *Sargassum*. However, the size at which young tripletail become associated with *Sargassum* habitat is unknown (Ditty and Shaw 1994).

Additional research on growth of young tripletail under controlled laboratory conditions, and in nature, is needed to better understand how physical and biotic variability in the marine environment affects growth rates, recruitment and life stage duration.

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