



REPRODUCTIVE BIOLOGY OF SILVER PERCH, *BAIRDIELLA CHRYSOURA*, FROM THE NORTH-CENTRAL GULF OF MEXICO



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ABSTRACT

Silver perch (*Bairdiella chrysoura*; Family Sciaenidae) are an important component of the estuaries in the northern Gulf of Mexico (GOM). We collected 485 silver perch (70.0 – 171.0 mm standard length (SL)) from April 2002 through June 2003 in estuaries along the coast of Mississippi to investigate the reproductive biology of this little studied species. Estimated ages using sagittal otoliths ranged from young-of-the-year (YOY, 0 yrs) to 4 yrs. Silver perch in the north-central GOM became sexually mature at the end of their first year of life (0 yrs), with 50 % sexual maturity of the population occurring in the 91 – 95 mm SL size class. Gonadosomatic index values (GSI) for females began to increase in January and peaked in April (mean GSI = 11.99). Mean male GSI values peaked in March at 1.70. Histological examination of ovarian tissue showed asynchronous oocyte development, indicating females are capable of multiple spawns during the reproductive season. Female silver perch were reproductively active for 6 months (mid January – mid July), but peak spawning occurred from March to May. Females have a spawning frequency of 1.25 days at the peak of the season, and 24 % of the females sampled were capable of daily spawning, based on the presence of 24 h postovulatory follicles (POF) and hydrated oocytes in the same ovary. The high spawning frequency reported here is unusual compared to most sciaenids previously studied.

RESULTS AND DISCUSSION

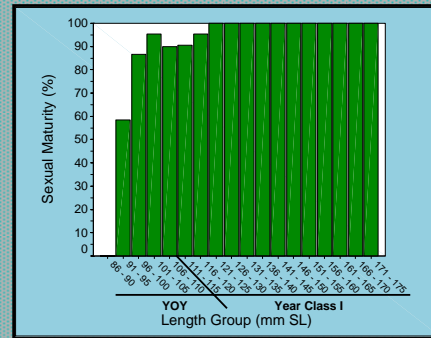


Figure 2: Mean percent sexual maturity by length group from January - June. Silver perch in the Mississippi Sound attained a maximum age of 4 yrs and size of 171 mm SL. Fifty percent sexual maturity is estimated to be in the 91 – 95 mm SL length class. The majority of silver perch reach sexual maturity just before their first birthday as YOY fish. This occurs approximately between 106 and 115 mm SL.

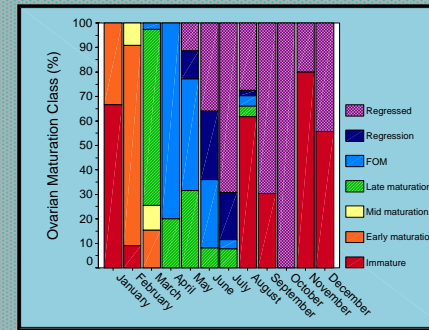


Figure 4: Seasonality of ovarian maturation classes. Monthly percentages of female silver perch in various ovarian maturation classes. Ovarian recrudescence begins in January, and silver perch within the Mississippi Sound have the potential to spawn for 6 months (March through August) based on the presence of oocytes undergoing FOM. No immature fish were present in the population during the main portion of the spawning season; therefore, all fish hatched in the previous year were mature by their first birthday.

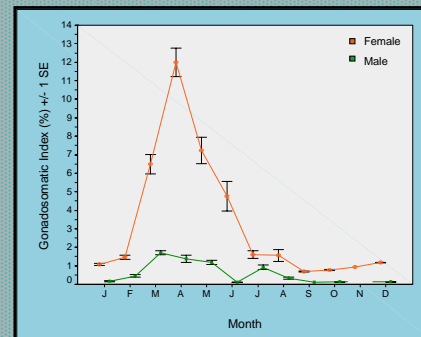


Figure 3: Plot of mean GSI (% ± 1 S.E.) by month (females: N = 279; males: N = 113) for fish collected between April 2002 and June 2003. Peak spawning occurs from March through May, which corresponds to the May – July recruitment pulse of juvenile silver perch to marsh-edge habitats in the Mississippi Sound. In general, the GSI values reported here for silver perch are much higher than those reported for other multiple spawning sciaenids with an extended reproductive season. Additionally, the shorter spawning season in silver perch (3 mo) compared with other spring-summer spawning sciaenids may also contribute to the higher GSI values, as this species has less time to spawn and thus spawns more frequently.



Figure 5: Histological section of silver perch ovary showing final oocyte maturation (FOM) and 24 hr post ovulatory follicles (POFs). Asynchronous oocyte development and the presence of POFs provide definitive proof that silver perch are multiple spawners. Furthermore, silver perch have the potential to spawn daily, as shown by the presence of both FOM and 24 hr POFs in ovaries at the same time in 24% of the fish examined. Daily spawning frequency in silver perch appears to be a strategy to maximize reproductive potential.

Table 1: Spawning frequency of silver perch within the Mississippi Sound using both the FOM and POF calculation methods. Daily spawning is unusual in other well studied sciaenids. However, silver perch do not have a long life span (4 yrs) or spawning season (3 mo) compared to most sciaenids. Therefore, silver perch would need higher spawning frequencies and relative fecundities to maximize their reproductive potential over a shorter time period. More frequent spawning may be a strategy adopted by the smaller or “lesser” sciaenids (Waggy *et al.*, in press).

	Total number of fish in analysis	FOM Spawning Frequency (days)	POF Spawning Frequency (days)
March	29	28.99	NA
April	50	1.25	3.57
May	26	1.63	4.33
Peak Season (April – May)	76	1.36	3.80
Late Season (June – August)	16	1.60	16.00

SUMMARY

- We have found silver perch to be an estuarine resident that is short lived, matures at a small size and young age, and has high spawning frequencies and GSI values.
- Most silver perch reach sexual maturity as YOY fish (106 – 115 mm SL).
- Mississippi sound silver perch spawn for 6 months, with peak spawning between March and May.
- Daily spawning occurred in 24 % of females examined during the peak reproductive season.
- Many of these life history characteristics contrast with those of better-studied, larger sciaenids.
- Highlighting these differences suggests the need for a better understanding of life history patterns of small, but trophically-important, sciaenids.
- This information on silver perch will likely provide insight to the relatively unknown reproductive biology of other small or “lesser” sciaenids such as cubby (*Parquetus umbrosus*), highhat (*Parquetus acuminatus*), jack-knife fish (*Equetus lanceolatus*), spotted drum (*Equetus punctatus*) and star drum (*Stellifer lanceolatus*).

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INTRODUCTION

The silver perch is one of the top five most abundant species of sciaenids in estuaries along the Gulf of Mexico (GOM) and the Atlantic coast of the United States (Chao and Musick 1977; Getwick *et al.* 2001), and supports a small commercial fishery in the southern GOM (Ocaña-Luna and Sánchez-Ramírez 1998). This species ranges from New York to Mexico and is abundant in estuaries on the Atlantic and Gulf coasts from the end of April to mid-July, with a shift toward later months as latitude increases (Welsh and Breder 1924; Gunter 1938).

Silver perch are an essential component of estuarine systems in terms of abundance, residence, and trophic interactions. Despite this importance, their life history has not been well documented. Silver perch spawn at dusk in estuaries (Holt *et al.* 1985) between March and June in the southeastern United States. Size and age at maturity varies from 2 years at 150-210 mm TL in Beaufort, N.C. (Welsh and Breder 1924) to 5 months and 100 mm TL in Terminos Lagoon, Mexico (Chavance *et al.* 1984). However, there has been no histological examination of the gonads or estimates of spawning frequency.

The specific objective of this study was to investigate reproductive characteristics of silver perch in Mississippi Sound including reproductive seasonality, spawning frequency, and age and size at 50 % maturity.

METHODS

- We collected adult silver perch monthly from April 2002 through June 2003 by trawling, gill netting, and hook and line within Mississippi Sound (Figure 1) for histological analysis of female gonads, the determination of spawning frequency, gonadosomatic indices (GSI), and age-size relationships.
- We measured total length (TL, mm), standard length (SL, mm), gender, gross maturation, total weight (0.001 g), gonad weight (GW, 0.001 g), and eviscerated somatic weight (EWW, 0.001 g).
- Sagittal otoliths were removed, embedded in epoxy resin, sliced and mounted for annular age estimation.
- Gross maturation of the ovarian tissue is based on descriptions by Brown-Peterson (2003) for spotted seatrout (*Cynoscion nebulosus*).
- We calculated the GSI monthly for all male and female adult fish.
- Histological analysis was performed following standard histological procedures based on Brown-Peterson and Warren (2001).
- Spawning frequency was estimated using the FOM and POF methods described by Brown-Peterson and Warren (2001).