Reproductive Biology of Vermilion Snapper (*Rhomboplites aurorubens)* from the North Central Gulf of Mexico

Biología Reproductiva de Besugo (*Rhomboplites aurorubens*) desde el Centro Norte de Golfo de México

Biologie de la Reproduction de Vermilion Snapper (*Rhomboplites aurorubens*) du Centre Nord du Golfe du Mexique

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EXTENDED ABSTRACT

Vermilion Snapper are a commercially and recreationally harvested reef fish throughout their range, including the Gulf of Mexico (GOM). Vermilion Snapper account for a combined harvest of around 1,300 tons annually and eight million dollars of sale in the commercial industry (NMFS 2016). Despite their economic influence and recreational popularity, information on Vermilion Snapper is limited in the northern GOM. Currently, most data collected for stock assessments comes from the eastern GOM. In the most recent assessment (SEDAR 45) Vermilion Snapper from the eastern GOM accounted for 93% of the total fish from the entire GOM (Fitzugh et al. 2015). Aside from data collected for stock assessments, only two studies (Collins et al. 2003 and Hood and Johnson 1998) have described the reproductive biology of Vermilion Snapper in the GOM. Both of these studies collected fish from the Eastern GOM and found fish were 100% mature by 250 mm and spawning season was from May through September (Hood and Johnson 1998) or April through September (Collins et al. 2003). Batch fecundities had a large range (5,535 – 415,000 eggs) and spawning periodicity was 1.6 days/between spawns. The objective of this study was to describe the reproductive biology of the Vermilion Snapper in the north-central GOM. Specifically, we described the spawning seasonality, spawning periodicity, reproductive strategy and fecundity of the Vermilion Snapper.

A total of 396 fish were collected for reproductive analysis from May 2015 through September 2016 using fishery dependent sampling onboard charter and recreational vessels. Samples were also collected during fishery independent sampling cruises including trawl and vertical line sampling. Our study area spanned from Pensacola to the Mississippi River outflow, out to 200 m of water. For each of the fish collected, gonads were removed, weighed and histologic samples were taken within 24 hours. For each fish, macrophase was assigned during gonad removal, and histological analysis was used to confirm reproductive phase of each fish. Phases were assigned based on terminology from Brown-Peterson et al. 2015.

Spawning seasonality describes the time throughout which, Vermilion Snapper are actively spawning. We determined this in two ways, the gonadosomatic index (GSI) and histological analysis of reproductive tissues. The measurement of GSI is known as the gonad weight divided by the eviscerated body weight, and is often converted into a percentage by multiplying by 100. Analysis of GSI values for female Vermilion Snapper showed elevated values from April to September, indicating a level of spawning preparedness consistent with individuals in the spawning capable and actively spawning phases. Highest values for GSI occurred in May, with a second peak in August, which could indicate a bimodal spawning pattern (Figure 1). In order to confirm that Vermilion Snapper were actively spawning during this period, we took samples of reproductive tissue for histological analysis. To assign fish in the actively spawning phase, we looked for evidence of lipid coalescence, germinal vesicle migration/breakdown or hydrated oocytes, since these all are indicators of the final stage of oocyte maturation. The earliest actively spawning fish was found on April 24th while the first spawning capable fish was found on April 5th. The last actively spawning fish was collected on the 26th of September which was also the same date as the last spawning capable individual as well. This led us to hypothesize an April through September spawning season, which supports previous findings in the GOM (Figure 2).

Spawning frequency was calculated by using histological examination and identifying individuals in the actively spawning phase. The number of fish found in the actively spawning phase divided by the number of fish capable of spawning gave us a percent daily spawning rate which informed spawning periodicity. For Vermilion Snapper in the north-central GOM, we estimated a spawning periodicity of 2.2 days, given them a spawning frequency (number of times spawning occurs per season) of 83.

Although fish were captured down to 137 mm total length, no immature individuals were found during this study. This is slightly different from estimates of length-at-maturity documented in Hood and Johnson (1998) which found that 90% of individuals were mature by 200 mm total length. However, when comparing to Collins et al. (2003), maturity estimates are nearly the same as they found individuals down to 157 mm TL which were actively spawning.

Estimates of reproductive output and parameters found in this study can be directly used in stock assessments. When compared to estimates from the GOM, reproductive biology of this species is similar to estimates documented from past studies. This is also the first study directed at the reproduction of Vermilion Snapper in the north-central GOM, which gives a more robust understanding of this species life-history throughout its range.

KEYWORDS: Vermillion Snapper, reproduction, spawning, fecundity, *Rhomboplites aurorubens.*

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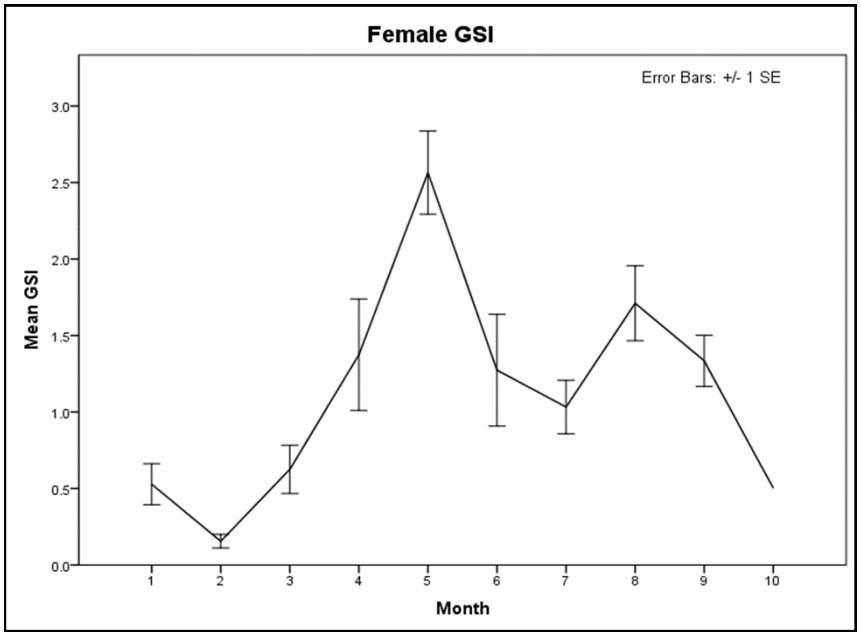

Figure 1. Plot of the Gonadosomatic Index (GSI) values for female Vermilion Snapper throughout all months sampled. Error bars are equal to one standard error from the mean.

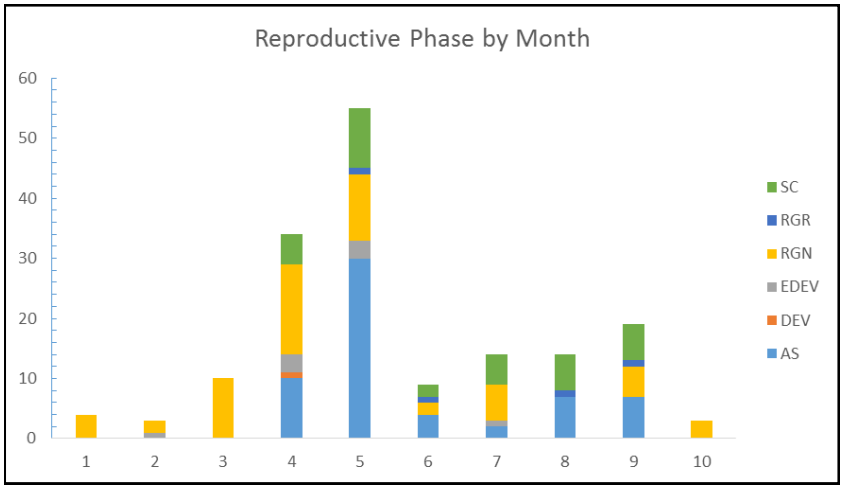

Figure 2. Plot of the female Vermilion Snapper phase distribution by month. As you can see, fish in the actively spawning phase (light blue), are found from April through September, supporting the evidence of a April through September spawning season as seen with GSI values.