

Grouper Reproduction at Shelf-edge Banks in the Northwestern Gulf of Mexico

Reproducción Mero en Bancos Borde de Estantes en el Noroeste de Golfo de México

Mérou Reproduction dans les Banques Plateau de Pointe dans le Nord-ouest du Golfe du Mexique

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EXTENDED ABSTRACT

Grouper species are ecologically and economically important, supporting both recreational and commercial fisheries. Fishing pressure has been shown to alter sex ratios in hermaphroditic species, including protogynous species of Groupers, by preferentially targeting larger male individuals (Coleman et al. 1996). This selective pressure can negatively affect reproduction and population growth by decreasing the size and fecundity of mature individuals. Data on grouper (Epinephelidae) spawning and reproduction is limited, mostly originating from the Pacific and Caribbean. The vast majority of Grouper studies in the Gulf of Mexico involve only species off the Florida coast, whereas this study examines grouper species in the northwestern Gulf of Mexico where banks along the shelf-edge off the Louisiana and Texas coasts provide important habitat for grouper species, including Scamp Grouper (*Mycteroperca phenax*), Yellowedge Grouper (*Hyporthodus flavolimbatus*), and Coney Grouper (*Cephalopholis fulva*). This study investigates the reproductive characteristics of Grouper species in the northwestern Gulf of Mexico, specifically size at sexual transition, to assess reproductive potential.

Understanding the reproductive health and biology of these groupers will inform stock assessments and management, especially for populations in the western Gulf of Mexico. Reproductive variables such as sex ratio and size at sexual transition are critical to estimates of spawning stock biomass, which is critical to maintain a healthy population. Lack of information on groupers' susceptibility to changes in sex ratio due to fishing pressure, may result in incorrect management (Bates and Randy 2016). These bank populations may become even more important to these species' growth and reproduction as oil and gas platforms serving as artificial reefs are removed, climate change progresses, and other reef communities continue to degrade.

Groupers were collected at six shelf-edge banks (Rankin, Bright, McGrail, Sidner, Alderdice, and Jakkula) approximately 180 - 270 km offshore from September 2011 to June 2016. Fish were caught using single hooks and vertical long lines deployed for at least two hours at a time. Total length (TL, mm), fork length (FL, mm), standard length (SL, mm), total weight (TW, kg), and eviscerated body weight (EW, kg) were measured and recorded for each individual Grouper. Gonads were removed and refrigerated at sea. Upon return to land, gonads of each fish were weighed and fixed in 10% formalin for at least two weeks. Histological slides were prepared using established methods, cut to 4 μ m and stained and counterstained with hematoxylin and eosin. Gender and sex ratio were studied through histological analysis as well as determination of average length at sexual transition for those species with sample sizes of nine and larger.

Size at sexual transition was determined for three species from a total of 60 individuals (Table 1 and Figure 1). Results of this study suggest Yellowedge Grouper sexually transition at approximately 774 mm total length, a smaller size than in previous literature. Scamp in this study transition at about 644 mm TL (582 mm FL), similar or somewhat larger than previous a study. The size at sexual transition found for Coney was 400 mm TL, much larger than the 200 mm TL found in previous literature; however, low sample size limits more conclusive determination (n = 9). Overall, sample sizes were small and are one of the critical limiting factors of the current study.

The data indicate scamp and coney Groupers in the northwestern Gulf of Mexico transition at similar or somewhat larger sizes than previously reported, indicating no change or potentially more productive populations. These data suggest continuation of the long-term trend of declining size at sexual maturity and size at transition in Yellowedge Grouper for over 25 years which have been found since the onset of commercial fishing (Cook 2007). This continuing change in size and sex structure have important implications for stock assessment and management. The stock biomass of Yellowedge Grouper was still unknown in 2011 and their management only began in 2013 (SEDAR 2011). Sex ratio and size at transition must be taken into account of spawning stock biomass. Especially in light of the relatively recent onset of management, managers must acknowledge the significantly different historical baseline compared to parameters at the beginning of management.

Continued sampling will be focused primarily on collection of additional samples to allow more robust analyses and conclusions as well as the study of more grouper species. The complete study will determine spawning season, size at sex transition, spawning frequency, and batch fecundities for grouper populations in the northwestern Gulf of Mexico. We also hope to compare populations on the natural bank habitats to those living around oil and gas platforms which serve as artificial reefs.

KEYWORDS: Groupers, reproduction, Gulf of Mexico, Yellowedge Grouper, hermaphrodite

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Table 1. Size at sexual transition for Scamp, Yellowedge Grouper, and Coney determined in the current and previous studies.

Length at 50% transitioned		
Species	Current study	Literature
Scamp	644 mm TL 582 mm FL	566 mm FL (Lomabrdi-Carlson et al. 2012)
Yellowedge	774 mm TL	865 mm TL (Cook 2007) 815 mm TL (SEDAR 2011)
Coney	400 mm TL	200 mm TL (Heemstra & Randall 1993)

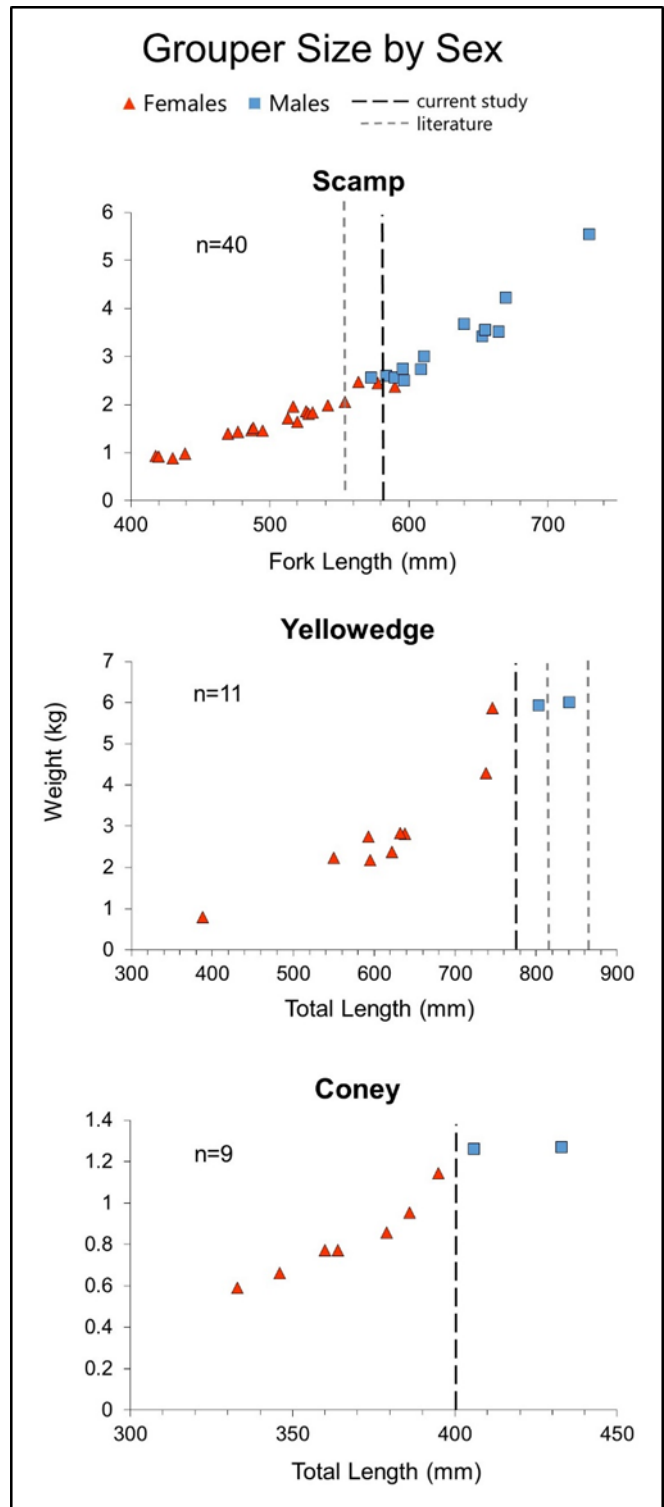


Figure 1. Size by sex for Scamp, Yellowedge Grouper, and coney sampled from the northwestern Gulf of Mexico. Size at sexual transition based on these samples is indicated by black dashed line; grey dashed lines indicate size at sexual transition found in previous literature. Literature values correspond to those found in Table 1.