AN EVALUATION OF THE FIRST ANNULUS FOR RED SNAPPER OFF ALABAMA

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Introduction

In an effort to improve the accuracy of the age determination for red snapper in the Gulf of Mexico, the Gulf of Mexico states have been charged with the collection, processing and reading of otoliths. Most state facilities lacked experience in the ageing of red snapper and looked to the Gulf States Marine Fisheries Commission (A Practical Handbook for Determining the age of Gulf of Mexico Fishes, VanderKooy and Guindon-Tisdel 2003) and the National Marine Fisheries Service (NMFS) for guidance.

Current training by the NMFS indicates that the precision for Alabama readers is 3.7 APE compared to the NMFS reads. However, key concern about accuracy has been the identification of the first annulus. Current training by NMFS indicates three different core types present in cross sections of otoliths used for determination of the first annulus; small core ring (Figure 1A, summer spawned), large core ring that merges with an annulus (Figure 1B), and a large core ring (Figure 1C, fall spawned). In the case of both the small and merging core types the first annulus is identified along the sulcus. However, otoliths with the large core, the core is counted as an annulus because it is held that these fish was spawned late in the season. The reason to count the core ring is the region between the sulcus and core ring can be somewhat opaque, and the annulus is indistinct (NMFS training, Wilson and Nieland 2001). Concerns are, determining a large from a small core is rather subjective (Figures 2A & 2B), and the large core ring should not be counted as an annulus. Additionally, mean length at age for red snapper off Alabama exceeds length at age estimates from current Von Bertalanffy equations. Szedlmayer and Shipp (1994) and Patterson et al. (2001) estimate age 2 red snapper at 266 mm TL and 306 mm TL, respectively. Length at age information from 360 individual age two red snapper caught off Alabama indicate a mean length of 424 mm TL.

Figure 1A. Small core

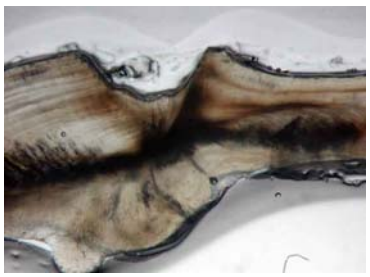

Figure 1B. Merge core

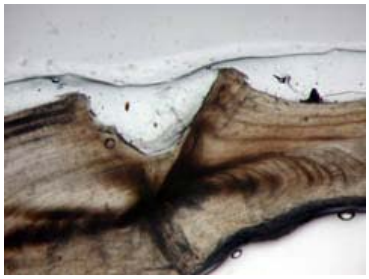

Figure 1C. Large core

Figure 2A NMFS Large core

Figure 2B NMFS Small core

Methods

One hundred twenty red snapper sampled from the month of October 2003 were used to back calculate individual length at age using the direct proportion method (LeCren 1947, Szedlmayer 1998). Manooch and Potts (1997) determined a linear relationship for red snapper otolith radius to length. Lengths were determined at the completion of the core ring, first and second annulus along the sulcus. The sample was equally divided between males and females and then within each sex was equally divided into the three core types. All back calculated lengths were tested using analysis of variance (Proc ANOVA, SAS, 1999). Additionally, 81 red snapper collected during SEAMAP in October and November (2003) were examined for core types.

Results

Using the current ring identification, mean back calculated lengths for red snapper at annulus one indicated that large core fish were significantly smaller by a mean length of 100 mm compared to the small and merge core types (Table 1). At annulus two, the large core type was again significantly smaller by a mean of 35 mm. Gutreuter (1987) recommended looking at specific years to reduce variation in growth rates. Using only age two red snapper, the large core fish were again significantly smaller compared with the other core types.

Table 1. Mean back calculated lengths at annulus formation for red snapper off Alabama using current method of ring identification.

	ANNULUS	SMALL	MERGE	LARGE
ALL	ONE	238 mm	229 mm	135 mm
ALL	TWO	346 mm	333 mm	307 mm
AGE 2'S	ONE	237 mm	240 mm	138 mm
AGE 2'S	TWO	350 mm	354 mm	322 mm

Comparison at the completion of the core ring indicated no significant differences in back calculated lengths between the small and merge core types. The large core was significantly larger by a mean of 20 mm (Table 2). The back calculated lengths for age two red snapper at annulus one were not significant between small and merge core types. By using an alternative ring identification for large core type only (count annuli along the sulcus, not the core ring), the large core type was significantly larger at annulus one compared to the others by a mean length of 60 mm. At annulus two no significant differences were detected among the three core types and mean length for the large core differed by 20 mm.

Table 2. Mean back calculated lengths at annulus formation for red snapper off Alabama using an alternate method of ring identification.

	ANNULUS	**SMALL**	**MERGE**	**LARGE**
ALL	CORE RING	110 mm	117 mm	135 mm
AGE 2'S	ONE	237 mm	240 mm	300 mm
AGE 2'S	TWO	350 mm	354 mm	370 mm

Inspection of juvenile red snapper collected during the months of October and November indicated that red snapper 49 – 100 mm FL were still forming the core ring. Red snapper 100 – 257 mm FL containing small core rings and would be considered age 0's. Red snapper with large core rings were 175 – 260 mm FL.

Discussion

Under the current method, large core red snapper collected during SEAMAP in October and November would be classified as age 1+ red snapper (175-260 mm FL), while those from the same sample with small cores (100 – 257 mm FL) would be considered age 0's. Szedlmayer and Conti (1998) looked at red snapper 25 – 125 mm SL to estimate hatching dates. Based on the size and the ages (days) of red snapper Szedlmayer and Conti collected and the juvenile red snapper sections I viewed from SEAMAP in conjunction with back calculated length at core completion (110-135 mm FL), the upper lengths in Szedlmayer and Conti study corresponds with the completion of the core ring. Szedlmayer and Conti (1998) also noted the absence of larger age 0's and attributed this to movements to reef structures. The larger age 0's (up to 260 mm FL) were collected during SEAMAP evening trawls, and one trawl passed in close proximity to a reef (personal comm. Mark Van Hoose, AMRD). These red snapper with small cores would also be considered age 0's. The question remains, are the large core types Age 0's or 1's.

Confusion about the first core arises from the presence of small red snapper present in May. Current contention is that these fish remained stunted from a late September spawning date and will be represented as a large core ring with an indistinct annulus continuous with the core. I contend small fish will be represented by a merging

core type and annuli should only be counted along the sulcus. I agree with the current ring identification of the small and merge core types. I recommend studies be conducted for the validation of the first annulus in red snapper within different regions of the Gulf of Mexico.

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