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Blueline Tilefish Growth Curve in US Atlantic Waters Based on South Carolina Department of Natural Resources Derived Ages

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Background

The South Carolina Department of Natural Resources (SCDNR), in collaboration with the National Marine Fisheries Service (NMFS), has been collecting otoliths from Blueline Tilefish, *Caulolatilus microps*, through fishery-independent and fishery-dependent programs using a variety of gears since 1979. The Reef Fish Age-Growth Lab at SCDNR has been responsible for processing and reading those otoliths to provide age estimates to be used for stock assessment purposes. Members of the SCDNR Reef Fish Age-Growth Lab participated in the Blueline Tilefish ageing meetings, calibration set exchanges, and the workshop held prior to SEDAR-50 (Potts et al. 2016). While there was a systematic disagreement between the two SCDNR readers and the one official NMFS Blueline Tilefish reader, age estimates from SCDNR readers were consistent with another experienced NMFS reader that was not the official reader, and readers from Old Dominion University. SCDNR-derived ages were also used in a recent peer-reviewed publication validating the ageing method through bomb-radiocarbon (Spanik and Ballenger 2023). Due to the difficulty in reading Blueline Tilefish otoliths, there was a concern about utilizing the age estimates for age compositions due to the inability to distinguish cohorts, which is why they were not used in SEDAR-50 (Potts et al. 2016). However, if there is no bias in the age estimates, the central tendency should still characterize growth of fish within the population.

Objective

This report presents a growth curve derived from SCDNR-aged individual Blueline Tilefish collected from Atlantic waters off the southeastern United States. Data presented in this report are based on the SCDNR Reef Fish Database accessed on December 17, 2024.

Methods

Sample Acquisition

Blueline Tilefish were obtained from both fishery-independent and fishery-dependent sources in the Atlantic waters off the eastern United States, using a variety of gears, between 1979 and 2023. Location of capture was recorded, maximum total length (TL) of individual fish was measured to the nearest millimeter, and sagittal otoliths were removed. Individual Blueline Tilefish without TL or associated latitude of capture were excluded from analysis.

Otolith Processing and Reading

Otoliths were embedded and sectioned according to standard SCDNR Reef Fish Age-Growth Lab protocols (Smart et al. 2015). Sectioned otoliths were examined under transmitted light with a dissecting microscope at a magnification between 40x and 100x depending on the location of the increments being counted. Two readers independently assigned increment counts to each section without knowledge of the fish lengths, date of capture, or location of capture in the same manner as those from Spanik and Ballenger (2023). Increment counts were then compared between readers and in cases where there was disagreement, readers would simultaneously view the otolith and attempt to reach a consensus. If consensus could not be reached or the readers were not able to count increments due to a variety of reasons, that specimen was excluded from analysis. Edge

types were not recorded for all individuals due to the difficulty in reading Blueline Tilefish otoliths and the compressed outer increments, so increment counts are considered the ages.

Growth Curve Analysis

Final growth curve analysis was based on discussions during SEDAR-92 Life History Topical Working Group webinars I-III, with topics of sexually dimorphic growth/longevity, temporal sample collection, gear selectivity, region of capture, weighting of growth curves, and fixing specific growth function parameters being considered. Ultimately, a von Bertalanffy (VB) growth curve of all individuals, regardless of gear, between 1990 and 2023 that combined sexes and regions was produced, with no weighting or fixing of parameters. Coefficients of variation (CV) were calculated for each VB parameter. Statistical analysis was performed with R version 4.4.1 (R Core Team 2024).

Results

Sample Acquisition

Gillnet, hook and line, longline, and trap were the four gear types which captured fish between 1990 and 2023 for this analysis, with the vast majority coming from longlines (Table 1). Blueline Tilefish used for the analysis ranged from 333 to 940 mm TL with the average TL of 610 mm TL, though that varied by gear (Table 1). The location of capture ranged from 24.3° N latitude to 38.4° N latitude and from January – October, excluding February.

Table 1. Blueline Tilefish summary by gear used for the growth curve analysis, including the number of fish and associated lengths.

Gear Type	Number of Fish	Average TL (mm)	Minimum TL (mm)	Maximum TL (mm)
Longline	2,103	615	333	940
Trap	219	583	373	743
Hook and Line	64	542	443	765
Gillnet	3	481	427	527
Grand Total	**2,389**	**610**	**333**	**940**

Growth Curve Analysis

Age estimates were obtained from 3,036 individuals. After removing samples collected before 1990, those without an associated TL, or without a latitude of capture, a total of 2,389 individuals, ranging from 1-35 years of age, were used to fit the growth curve (Fig. 1). The VB growth curve fit produced the following parameters: L_∞ = 679.01 (CV = 0.014), k = 0.16 (CV = 0.141), and t_0 = -6.16 (CV = 0.190).

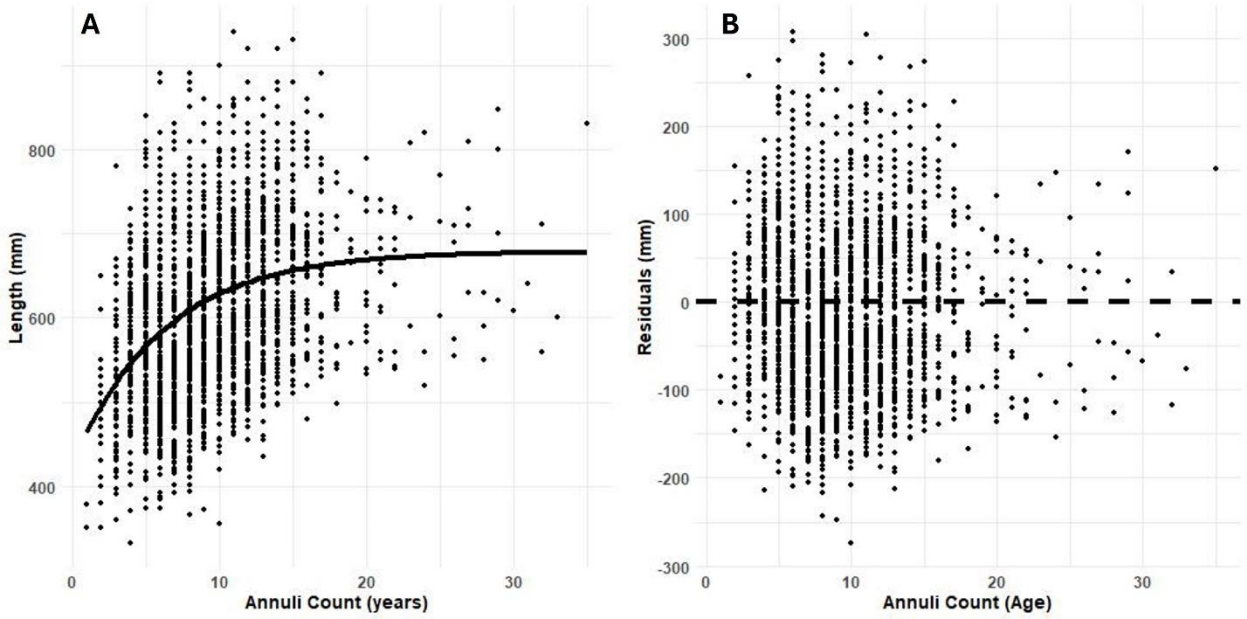

Figure 1. (A) Fitted growth curve (solid black line) and individual data points (black dots) for Blueline Tilefish in the Atlantic waters off the eastern United States from SCDNR estimates age. (B) Residuals from the fitting process of individual points (black dots) around the fitted growth curve, with the dashed black line indicating no difference from the fitted growth curve.

Literature Cited

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