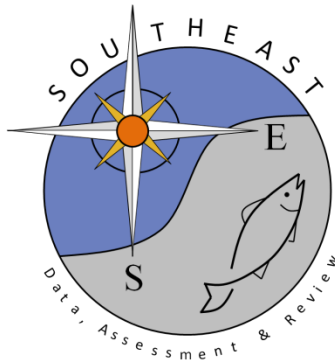


In search of the *Great South Atlantic Red Snapper Count*: Additional empirical data-based selectivity considerations for the SEDAR 73 Red Snapper model

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SEDAR73-WP08

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In search of the *Great South Atlantic Red Snapper Count*: Additional empirical data-based selectivity considerations for the SEDAR 73 Red Snapper model

SEDAR 73 WP-08

Jimmy Hull and Peter Barile

Summary:

The NOAA Sea Grant program, recognizing significant methodological flaws in data collection used to estimate South Atlantic Red snapper stock assessment benchmarks, has solicited external proposals to provide “a more precise estimate of absolute Red snapper abundance of adult (spawning stock).” Limitations in current NMFS-SEFSC fisheries independent surveys to estimate South Atlantic Red snapper stock structure have contributed to model uncertainty.

We present here additional (2014-15) and more recent (2017-18) fisheries independent and fisheries dependent (2017-2019) age-structure comparison data from East Florida FWC assessments of Red Snapper in the core area of the South Atlantic population. The fisheries independent gear and fisheries dependent hook and line fleet age-structure data sets are compared to chevron trap age-structure and capture-based selection from the 2016 paired-method assessment (see SEDAR 73 RD-02) and other years and fleets. All gears, including the fisheries-independent Repetitive Time Drop hook and line, and fisheries-dependent fleet data, from both recreational and commercial hook and line fleets, suggest that the Chevron trap continues to underestimate South Atlantic Red Snapper age-based stock structure.

The Chevron trap experiences significantly decreased capture probability of Red Snapper over 600mm FL (~ >age 4), and accompanying stereo cameras can only measure fork length of Red Snapper. These methods, collectively utilized as a Chevron trap-video index, become less reliable for use in an age-structured models as the fork length versus age relationship becomes asymptotic (undiscernible) past age 10. This is problematic, because as the South Atlantic Red Snapper stock rebuilds, these methods cannot provide reliable assessment of age-structure, and will continue to underestimate stock productivity and biomass. From Florida’s fisheries dependent recreational and commercial fleets, the respective 2019 fleet age-structure data indicate strong 12-14 year old Red snapper cohorts, whose age cannot be discerned by fork length measurements from camera images in the combined Chevron trap-stereo camera index.

Additionally, hook and line gear, from both recreational and commercial fleets for Red Snapper, utilize the smallest hook size (8/0) of the three (8, 11 and 15/0) assessed in FWC’s paired choice assay. As such, the retention of large (>700mm) Red Snapper using industry standard 8/0 hooks is exceedingly low, approaching 10%. The SEDAR 73 model should account for the fact that the hook and line fleet’s low retention of large adult Red snapper cannot reliably represent relevant proportions of the mature Red snapper population > age 10.

1.0 Chevron Trap and Video index versus fisheries independent Hook and Line selectivity

To provide better visual comparison, we re-plotted, below (see Figure 1), the age-structure of the Florida FWC's fisheries independent paired-method assay results from SEDAR 73 RD-02 (Figure 32), to compare the age-structure retention of Red snapper from the Chevron trap, Repetitive time drop handline and Captain's choice handline methods. This assay was performed at 93 sites in the core of the South Atlantic Red snapper population in east Florida as described in S73 RD-02. Each of these direct retention methods were compared to resident "population" length structure utilizing a video stereo-camera system, where Red snapper appearing in the video could be measured from frame grabs.

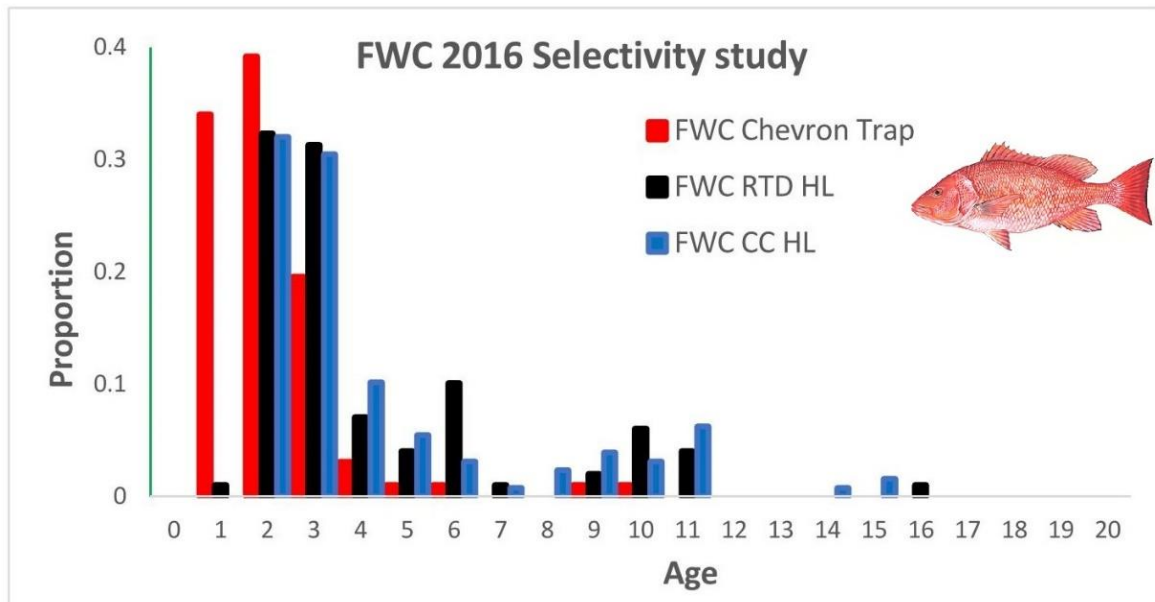


Figure 1. Comparison of FL FWC age structure analysis from 2016 selectivity study of fisheries independent and dependent gear-based paired-method assays (from S73 RD-02, Fig. 32), for Chevron trap (n=92), Repetitive Time Drop hook and line (RTD, n=96), and Captain's Choice hook and line (CC, n=121).

From S73 RD-02 (pg. 21), the Florida FWC reported:

“Overall, Red snapper captured in Chevron traps had smaller average length than those in the stereo-camera. This is largely attributable to decreasing capture probability with increasing size, especially in individuals over 600 mm FL [\sim > age 4].

In contrast, the hooked gears captured larger Red snapper on average than were observed on stereo-video.”

Additional fisheries independent Repetitive Timed Drop (RTD) hook and line survey data from the Florida FWC’s east Florida sampling from 2014 to 2018, see Figure 3 below, indicate marked disparities in capture of adult Red snapper between the Chevron trap and these fisheries independent hook and line surveys. Specifically, as with the direct comparison in 2016, the Chevron trap grossly underperforms capture of the RTD in age 4 and older Red snapper during all years.

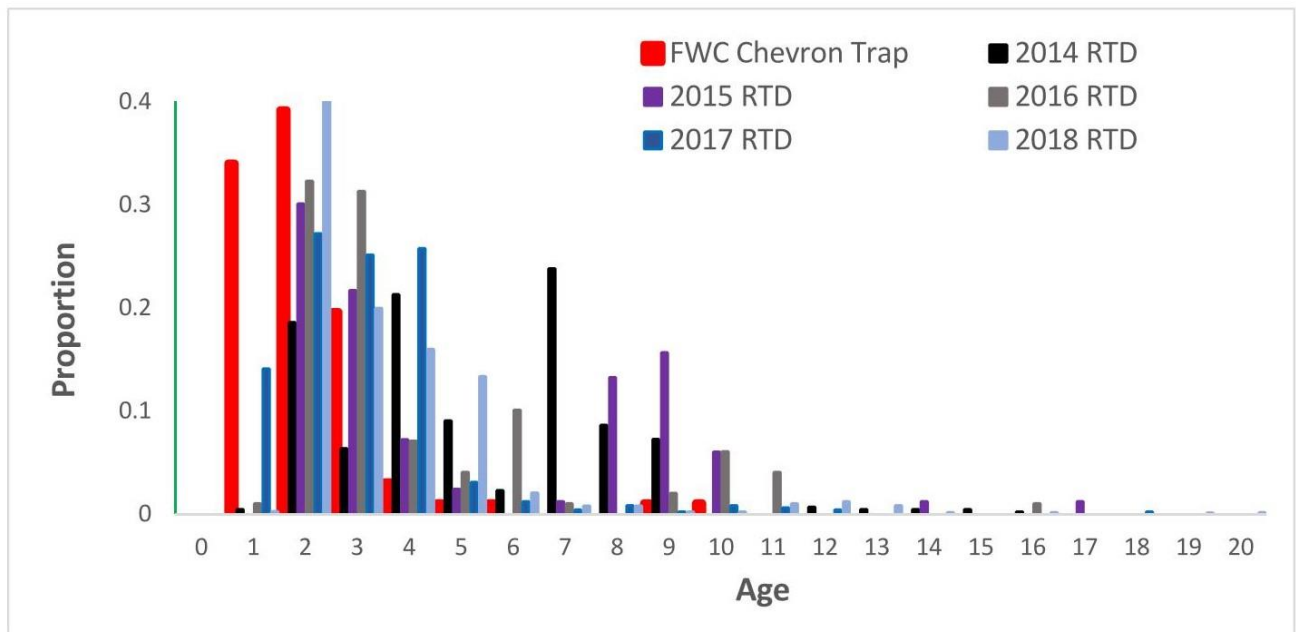


Figure 3. Comparison of FL FWC age structure analysis for fisheries independent hook and line, Repetitive Time Drop (RTD, 2014-2018) and Chevron trap age-structure selection from the 2016 FWC paired-method assay.

These findings, above, suggest that the Chevron trap-video index is inadequate, on its own as the sole fisheries independent survey, for characterizing the age-structure of Red snapper in a statistical “catch-at-age” model without a complementary and standardized fisheries independent hook and line index of abundance.

2.0 Stereo-cameras on Chevron traps cannot adequately estimate Red snapper age-structure

NMFS-SEFSC has affixed stereo-video cameras onto Chevron traps in the attempt to characterize abundance and lengths of South Atlantic snapper-grouper complex individuals not retained in trap deployments, but located in proximity to the trap. Per Figure 2, below, the Red snapper length-age relationship becomes “asymptotic” at ~ age 10. As such, with the Chevron traps “decreasing capture probability with increasing size,” and the stereo-video camera, by measuring fork length, likewise cannot adequately inform Red snapper age-structure past ~ age 10.

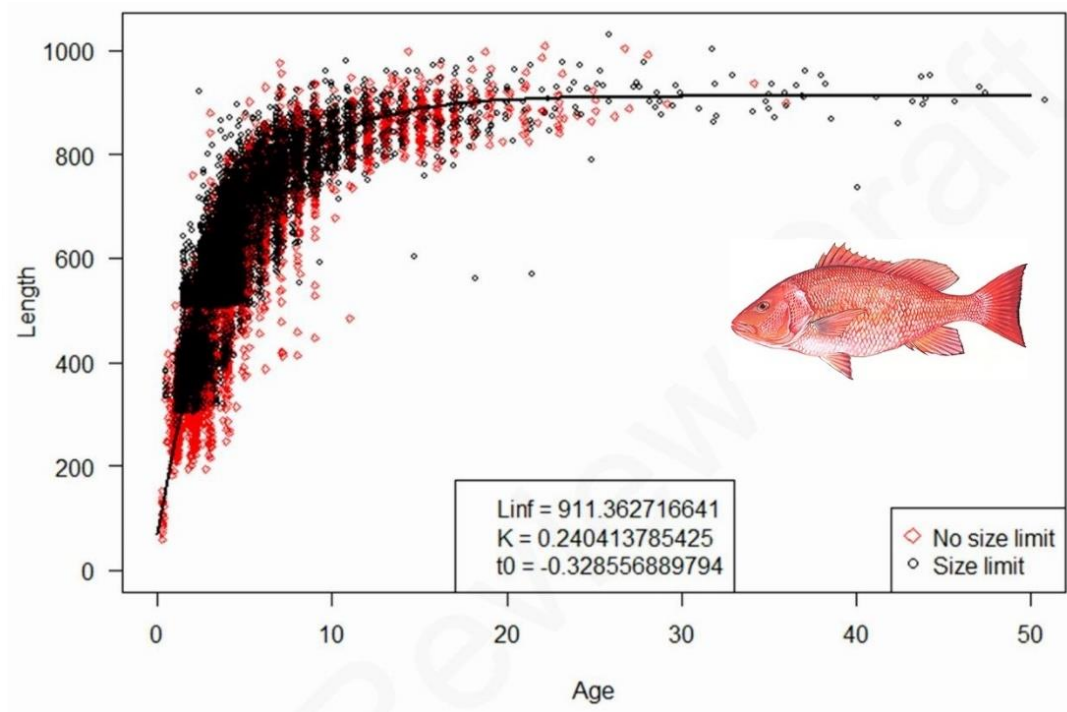


Figure 2. Population growth model of length versus age comparison for South Atlantic Red Snapper. From SEDAR 41 Data Workshop report (Figure 2.6, September 2015).

3.0 Chevron Trap/ Video index versus fisheries dependent Hook and Line fleet selectivity

When the fisheries independent Chevron trap age-structure is compared to the most recent (ca. 2019) fisheries dependent private recreational and commercial fleet age structure for the South Atlantic Red snapper stock in east Florida, it is clear that the trap's "decreasing capture probability with increasing size" underrepresents Red snapper older than age 4. Further, it is clear that the rebuilding of the South Atlantic Red snapper stock, as seen in significant age classes of 12-14 in both the private recreational (Figure 4) and commercial (Figure 5) fleets, is outside of the capture capability of the Chevron trap.

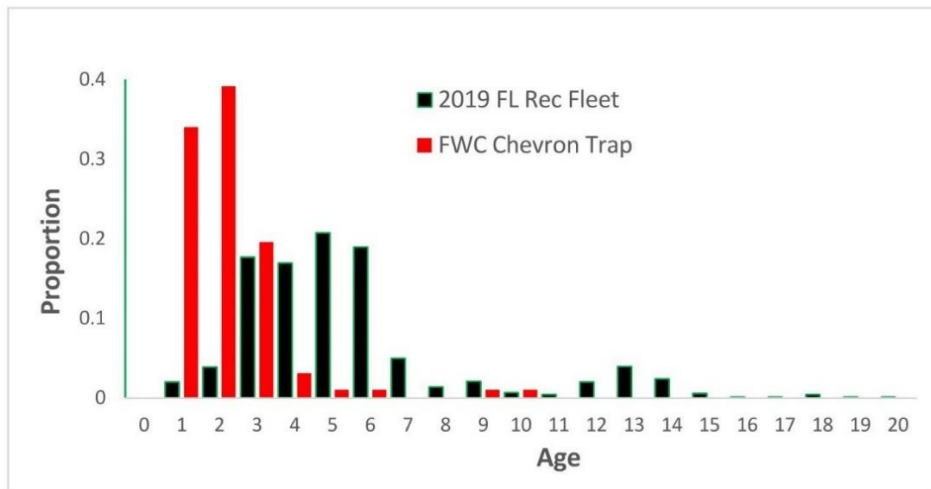


Figure 4. Comparison of FL FWC age structure analysis for the private recreational fisheries dependent fleet (n=1594) and Chevron trap age-structure selection from the 2016 FWC paired-method assay.

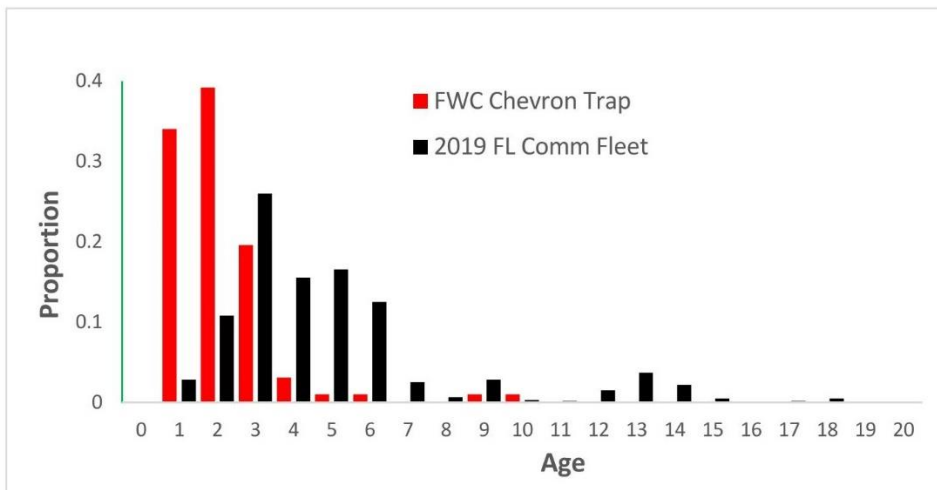


Figure 5. Comparison of FL FWC age structure analysis for the commercial fisheries dependent hook and line fleet (n=537) and Chevron trap age-structure selection from the 2016 FWC paired-method assay.

3.0 Problems with commercial hand line fleet selectivity

The commercial handline selectivity was set to a flat-topped or full logistical selection in SEDAR 41, based upon the presumption that the commercial handline fleet can fully capture the largest sized adult Red snapper in the population. But based upon Red snapper hook selection experiments in east Florida (see S72-RD-02, Figure 41), as summarized in Figure 6, below; and general knowledge that smaller sized 8/0 hooks are most often used in the commercial handline fleet, the commercial handline selectivity for SEDAR 73 should be revisited. Specifically, relative retention of larger Red snapper to 800mm drops to about 10% retention using 8/0 hooks.

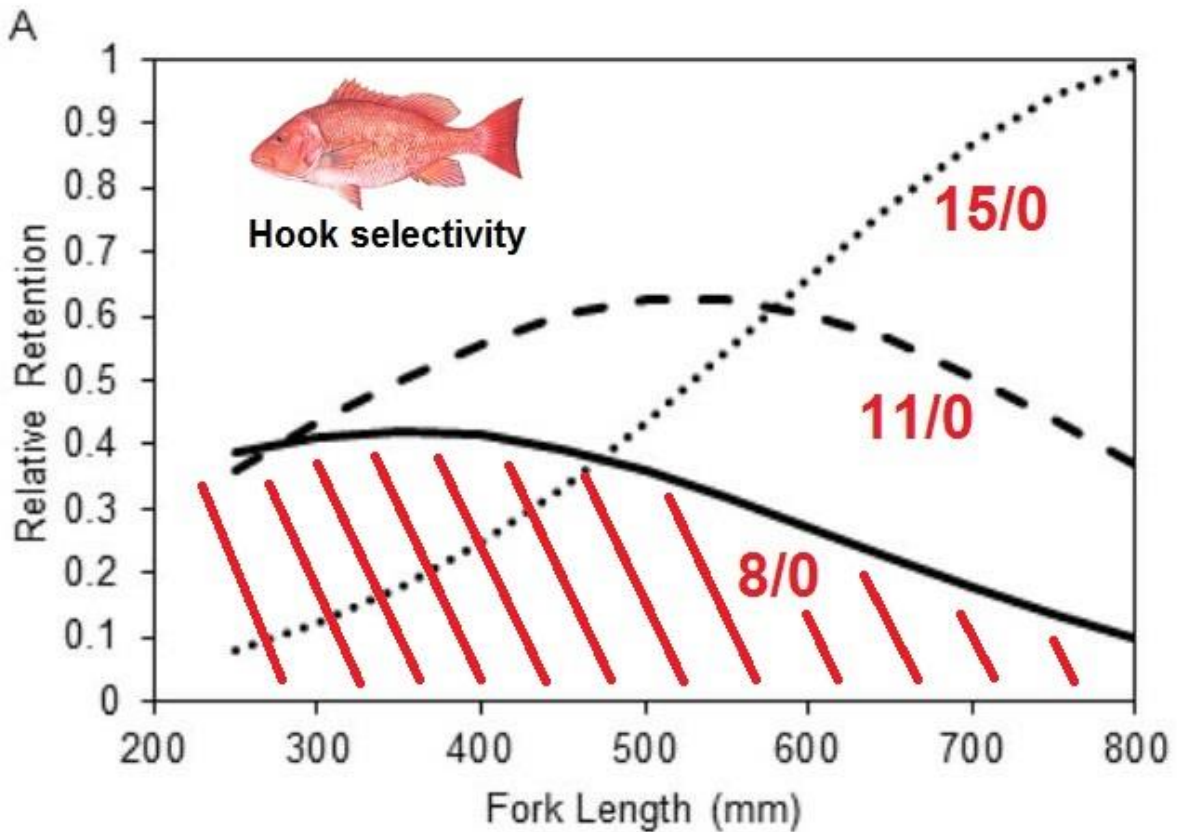


Figure 6. Comparison of FL FWC relative retention versus Red snapper length (fork length) as a function of hook size. From: S72-RD-02, Figure 41.