Fisheries management actions confound the ability of the Beaufort Assessment Model (BAM) to explain dynamics of the golden tilefish fishery off of east Florida

Jimmy Hull and Peter Barile

SEDAR25-RW08

Date Submitted: 26 September 2011

SouthEast Data, Assessment and Review (SEDAR 25)
Review Workshop- Working Document
Golden TileFish

Fisheries management actions confound the ability of the Beaufort Assessment Model (BAM) to explain dynamics of the Golden Tilefish fishery off of east Florida

Jimmy Hull and Peter Barile
Southeastern Fisheries Association
East Coast Fisheries Section

Abstract

Several problems have confounded the validation of the Beaufort Assessment Model (BAM) for the South Atlantic Golden Tilefish (GT) fishery in SEDAR 25 with respect to existing observed fishery landing data. The most significant problem being the inability of BAM to produce a realistic recruitment model estimate as a function of the significant yearly increase in commercial long-line Catch Per Unit Effort (CPUE) from ~ 2000-2010. Here we suggest that factors other than the BAM's prediction of a single recruitment event have resulted in an increasingly sustainable GT stock, as the BAM assumes no immigration into the adult GT population.

We believe that the increase in GT biomass and a sustainable fishing effort is supported by management actions from over a decade ago intended to support sustainable fishing of the snapper-grouper complex along east Florida. Specifically, several management actions have contributed to an increasingly sustainable commercial GT long-line (CLL) fishery, reflected in a temporal trend of increasing CPUE. These include: 1) potential benefits resulting from adjacent reserves, including the establishment of an experimental *Oculina* Bank fishery reserve in 1995, and the expansion of this reserve in 2000, as well as the restriction of CLL fishing from a latitude south of St. Lucie Inlet on the SE coast of FL, and 2) NOAA/ NMFS policy promoting coastal shark fishing, which has served as an alternative CLL fishery to GT, and 3) changes to the South Atlantic Fishery Management Council (SAFMC) Snapper-Grouper Fishery Management Plan (FMP) that have affected access to the adult GT population, thereby affecting the life history of the GT population.

In summary, it is inconceivable that the BAM could accurately assess the complex South Atlantic GT stock without considering these issues, which may affect GT population biology beyond what can be accounted for in a simple stock assessment model.

Problems with the BAM in the assessment of the South Atlantic Golden Tile fishery

Some issues have arisen with respect to the Beaufort Assessment Model's (BAM) ability to reasonably assess the stock dynamics of South Atlantic GT in SEDAR 25. A major issue being an assumption of the BAM that the GT population is "closed" to immigration and emigration by adults. This assumption is problematic when clearly there is so little evidence in the scientific literature to support this concept. In the SEDAR 25 GT Assessment Final Report, the authors state "In general, tilefish are not known to migrate as adults." This statement, although not cited with evidence, is presumably supported by a tagging study, performed by Grimes (1983, see SEDAR DW Final Report, pg. 20) outside of the SAFMC boundaries on the North Atlantic GT population where 386 individual golden tilefish were tagged but only 7 were recovered (2% recovery rate). In this study, these 7 fish did not travel more than 2 km. Despite this assumption in the SEDAR 25 AW Final Report, the previous DW Final Report was a bit more conservative in stating "Little is known on the movements and migrations of [Golden] Tilefish."

This issue is important because the age-composition data from the most rigorous data set used in the SEDAR 25 GT assessment, the commercial long-line data, do not show a large cohort of recruits moving through the annual adult age-composition curves, as CPUE, abundance, biomass, and increasing average size fish have all significantly increased over the past decade. The BAM base run shows a single strong recruitment class in 2001; however, again this recruitment event is not supported by either the age-composition data or the observed landings data. So as a result of the best output of the BAM, the SEDAR 25 GT AW Final Report states "The increase in [GT] abundance appears to be the result of one unusually strong year class in 2001."

However, the following note of caution in the AW final report is directed to reviewers and managers. "Are observed patterns of increased abundance 1) a single large year class, 2) several moderate to large year classes, or 3) an immigration of fish into the fished area." It is very disappointing that here in the 21st century NOAA- NMFS continues to presume an understanding of fishery population dynamics based almost exclusively as a function of fishing pressure, with models such as the BAM, that function in spite of larger ecosystem dynamic principles. Ironically, almost all federal and state resource management agencies have adopted "ecosystem management" as a policy management directive.

Below, we suggest several plausible mechanisms by which recent NMFS and SAFMC management decisions may affect the population biology of South Atlantic Golden Tilefish, whereby the assumptions of the BAM may be violated, making the model invalid as a stock assessment tool.

Potential Benefits of Adjacent Reserves

Oculina Bank Expansion

As a result of interest in protecting a deepwater reef habitat and associated fisheries assemblage offshore of east-central Florida, the SAFMC instituted the "*Oculina* Bank" Experimental Closed Area effective June 1994. This closed *Oculina* Bank marine reserve was later expanded in June 2000 to include a larger portion of the shelf expanding roughly from Ft. Pierce to Cape Canaveral, FL, and also extending eastward across the shelf to include Golden Tilefish habitat at the 100 fathom depth contour (see **Figure 1**.). The *Oculina* bank closure was designated to restrict the impacts of fishing gear on the deep reef structure and removal of associated species such as large groupers, but may have likewise resulted in benefits to the Golden Tilefish stock.

Presumably, this marine reserve has reduced fishing pressure on Golden Tilefish by reducing commercial long-lining activity within the closure zone. As Golden Tilefish burrow into specific "muddy" substrate endemic to specific portions of the shelf, reduction of long-lining for Golden Tilefish within the *Oculina* Reserve may have resulted in an adult population that is protected from fishing.

The inflection point of increasing Golden Tilefish CPUE in the early 2000's (see **Figure 2**.) by the adjacent commercial long-line fishery coincides with the expansion of the adjacent *Oculina* Bank protected area. Greater than 75% of the South Atlantic commercial Golden Tilefish landings are made in proximity to this reserve (see SEDAR DW-09, Figure 1).

Figure 1. Map of *Oculina* Bank Experimental Closed Area and Expansion area off of east Florida. Source: http://www.safmc.net/Portals/0/Oculina/OculinaMapJune07.pdf

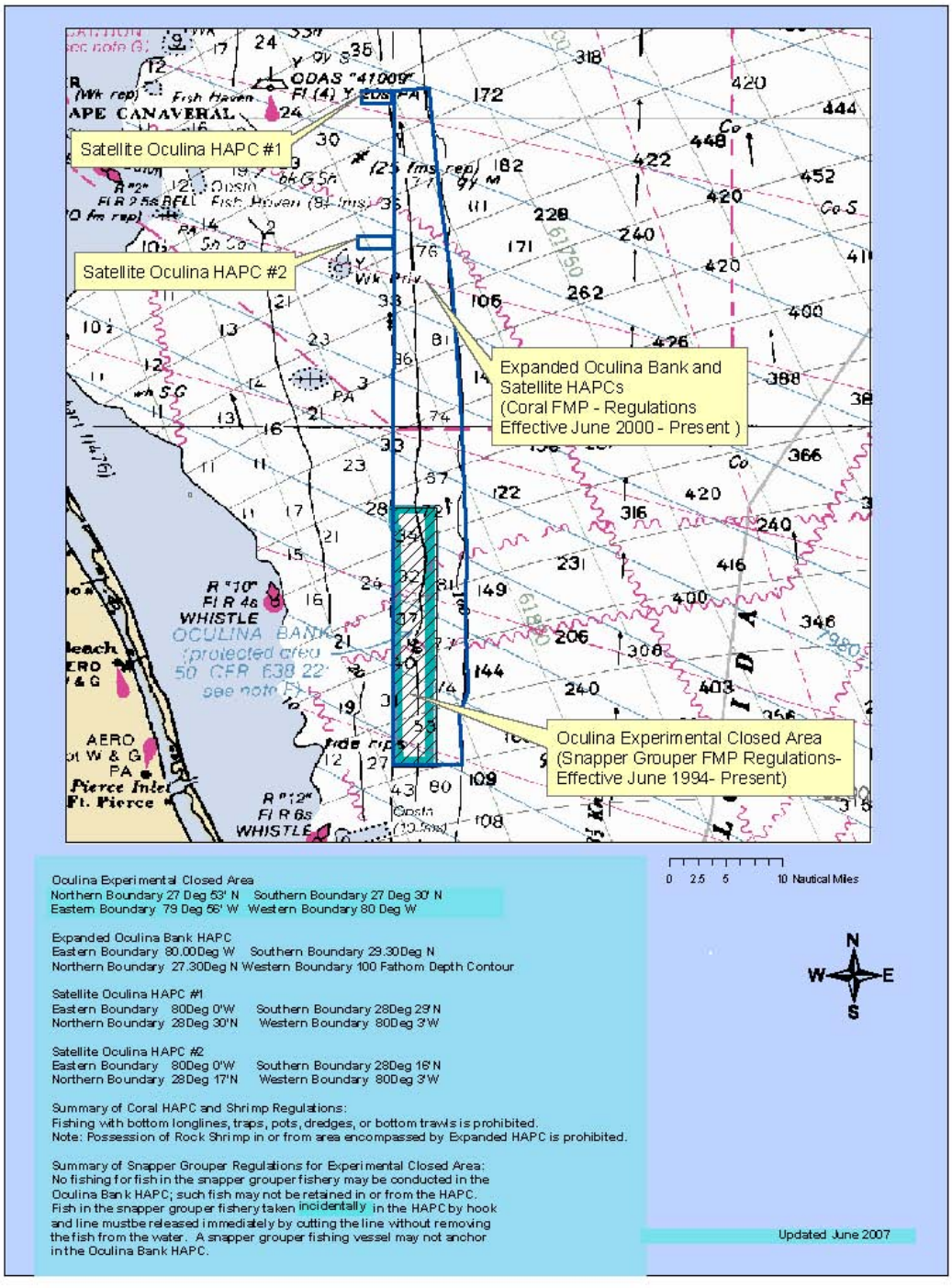
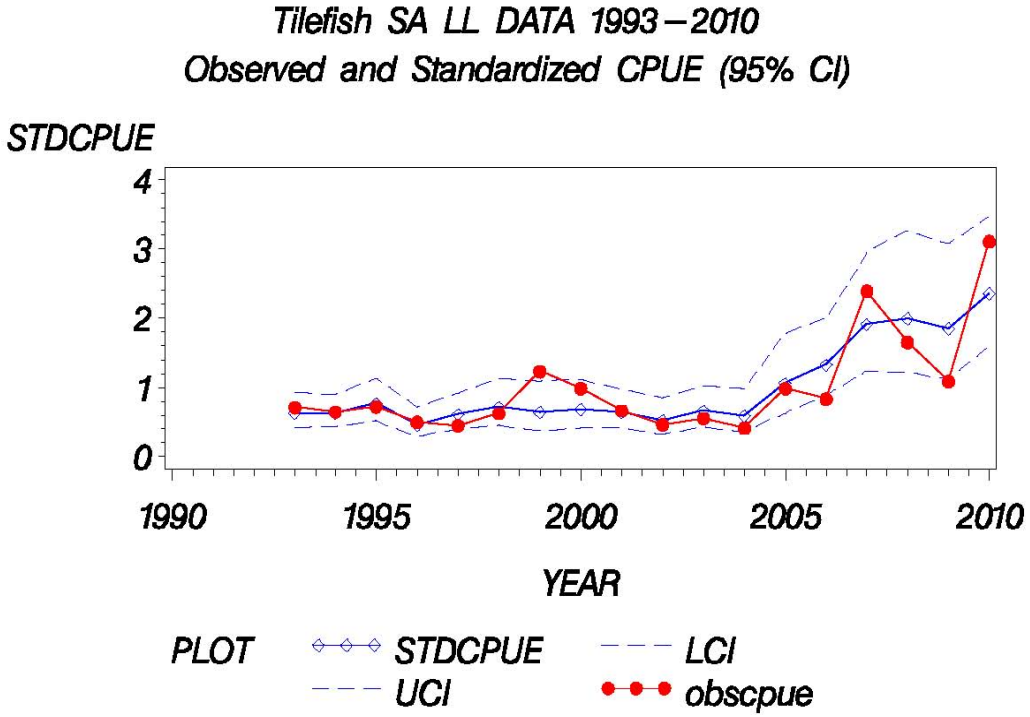


Figure 2. Golden Tilefish CPUE from South Atlantic Commercial Long-Line landings. From: McCarthy SEDAR 25 DW-07 workshop report (Figure 3).

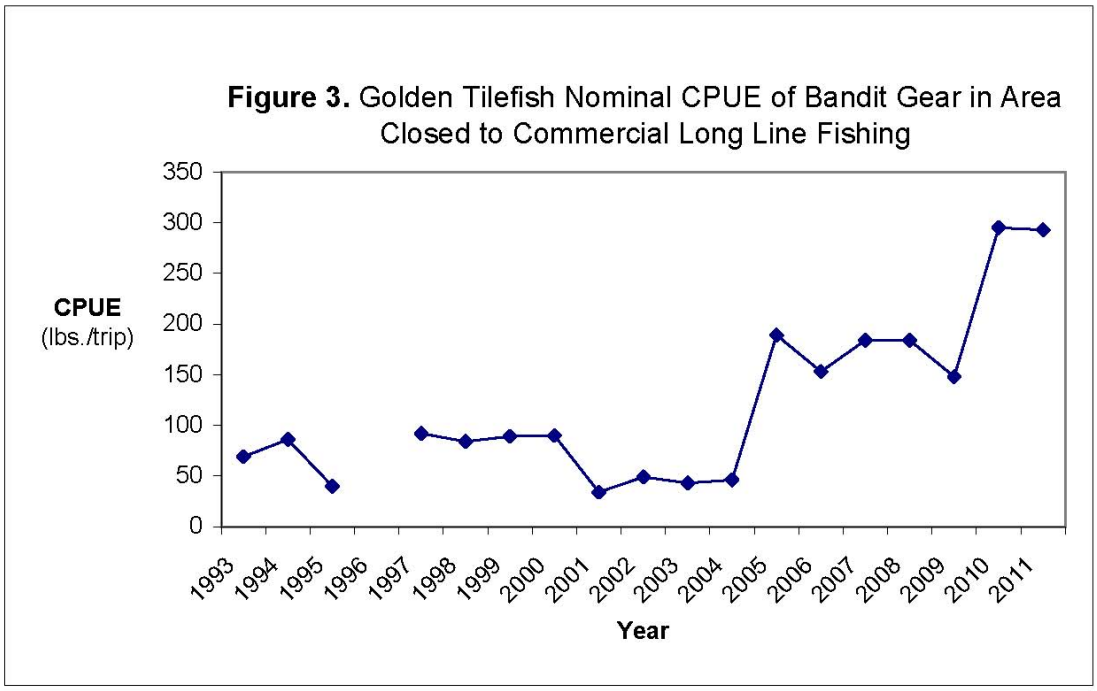


Southern- Boundary of East Florida Commercial Long-line (CLL) Fishery

As a result of Amendment 7 to the Snapper-Grouper FMP for the South Atlantic region, bottom long-lining is only permitted north of St. Lucie Inlet, FL (27˚ 10' latitude). The effective date of this closure was 23 January 1995. The result of this management action was to essentially create a "marine reserve" whereby commercial long-lining would not affect this southerly portion of the east Florida Golden Tilefish population. Here only hook and line methods (Bandit gear) with an efficiency of ~ 10x less biomass removal could only be utilized to fish the stock at any point south within the South Atlantic Fisheries Management region. Moreover, in terms of commercial landings of Golden Tilefish, CLL is responsible for > 92% of south Atlantic region landings (see SEDAR DW-09, Figure 1). The designation of this boundary was an important fishery management action, as a significant Golden Tilefish population has traditionally been fished just south of this line, and a traditionally important fishery, likewise, existed more southerly offshore of the Florida Keys.

Evidence of significantly increasing CPUE in this southern CLL- exclusion zone is reflected in a historical bandit-rig landings data base from 1993 to 2011, encompassing the pre- and post- management time period (see **Figure 3**). It is likely that surplus adult biomass from the non-CLL zone south of the St. Lucie Inlet provides adult biomass to the CLL fishery to the north of this boundary. Industry experts suggest that many successful CLL fishermen routinely fish just north of this boundary.

With both the Golden Tilefish habitat included in the *Oculina* Bank closed area to the north, and the habitat closed to long-lining south of St. Lucie Inlet, there is considerable opportunity for replenishment of adjacent areas that are routinely receiving fishing pressure. Further, this vast amount of adjacent "closed" area supports the concept that Golden Tilefish is an "open" population with the opportunity for adults from adjacent areas to recruit into the fishery stock.

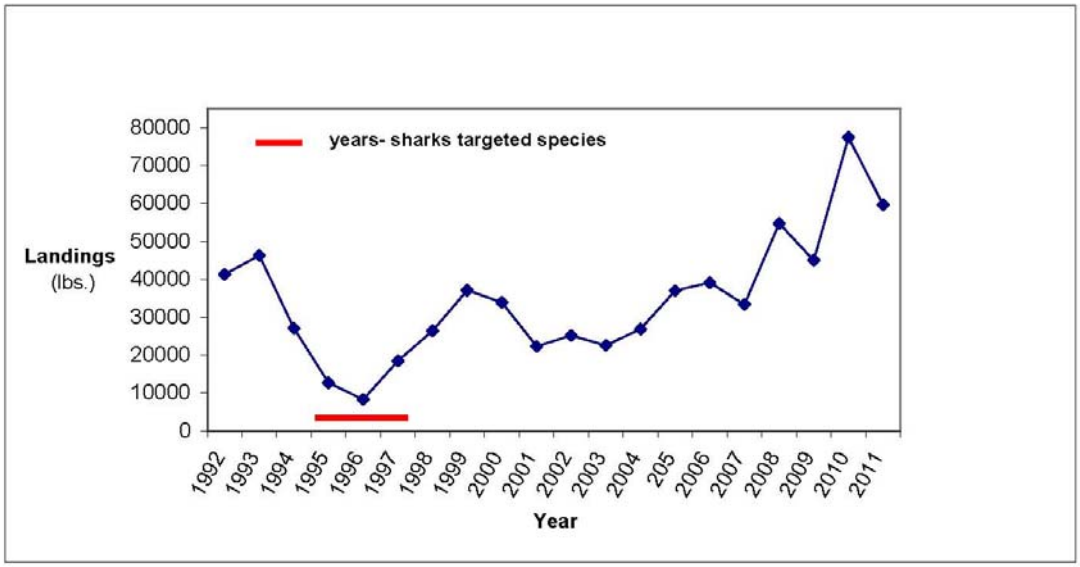


NOAA-NMFS/ Sea Grant Directives supporting long-line fishery species selectivity

In the 1980's, a policy directive of the NOAA- Sea Grant Program identified coastal sharks as an "under-utilized" fishery resource, leading to the promotion of shark meat as an alternative seafood source, with the promotion by NOAA/ NMFS for increased commercial shark fishing in the south Atlantic region. With an active coastal shark fishery in the south Atlantic, in 1993 NMFS created an Atlantic Shark FMP that instituted trip limits and quotas for long-line fisherman targeting large coastal sharks (LCS). Along the South Atlantic region east of Florida, long-liners targeted Golden Tilefish before fishing for LCS became economically viable as an alternative to fishing for Golden Tilefish. The Atlantic Shark FMP created what became known as "derby fishing" where directed and intense targeting of sharks replaced long-lining of, at that time, less lucrative Golden Tilefish trips. This led to a decline in annual Golden Tilefish landings by long-liners for several years in the mid-1990's until a 50% reduction to the LCS quota during 1997 subsequently resulted in elevated Golden Tilefish landings by the late 1990's (see **Figure 4**.). This hiatus in directed fishing for Golden Tilefish in the mid-

1990's may have resulted in a stock surplus and increased landings by long-liners in the late 1990's.

Figure 4. Annual total landings of Golden Tilefish in east Florida by boat "A" from 1992- 2011. Years when large coastal sharks were primarily targeted are denoted.



Snapper-Grouper Fishery Management Plan Affects Population Biology

The economic value of the coastal shark fishery, particularly LCS, have certainly resulted in east Florida long-liners making more lucrative directed LCS trips as an alternative to Golden Tilefish trips. Likewise, Snapper-Grouper Fishery Management Plan (FMP) directives have affected Golden Tilefish fishing effort and landings, and certainly the population biology of the stock. Amendment 8 to the Snapper-Grouper FMP for the South Atlantic region in 1998 limited initial eligibility for the snapper-grouper fishery. Amendment 13C to the Snapper Grouper FMP in 2006 set a Golden Tilefish annual quota of 295,000 lbs. for the South Atlantic with a 4,000 lb. gutted weight trip limit, that is reduced to 300lbs. when 75% of the quota is achieved. More recently, the Draft Amendment 18B to the Snapper Grouper FMP is a proposal to further limit participation in the fishery, and adjust quota as a function of gear-type.

Although the SAFMC's SEDAR 4 stock assessment stated that "overfishing is not occurring" the tenuous classification of the Golden Tilefish as "overfished" has resulted in conservative annual quotas on the SAFMC region. As a consequence, the 295, 000 lb. quota has been landed earlier each year since its establishment in 2006 (see **Table 1**.) Where Golden Tilefish life history parameters are fundamental to creation of stock assessment models, the effects of a limited season for removal of adults from the population must be considered. For example, if the quota is reached in a short ~ 60 day window from January to March, by virtue of this species having a late spring to early summer reproductive season, how does the BAM account for the removal of a limited

proportion of gravid adults from the population. Further, can it account for an adult population that that is not fished for ¾ of the year.

In summary, limited life history data, and an inability of the model to account for management related effects on meta-population biology, and stochastic fishing pressure on a population that may not be "closed" make findings of the BAM, questionable.

Table 1. Commercial Golden Tilefish quota statistics for SAFMC region. Data from NOAA- SERO archives.

Year	***Actual quota landed x 10^3 (lbs.)***	***Closure Date***
2006	299	23 October
2007	296	3 October
2008	290	17 August
2009	295	15 July
2010	328	12 April
2011	375	9 March