

Modeling the Seasonal Closures for the Gulf of Mexico Greater Amberjack Recreational Sector

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Introduction

Greater amberjack (*Seriola dumerili*) are one of 31 reef fish species in the Fishery Management Plan (FMP) for the Reef Fish Resources of the Gulf of Mexico. The FMP provides management for reef fish species in the federal waters of the Gulf of Mexico.

In 2016, a stock assessment was conducted for the Gulf of Mexico greater amberjack (SEDAR 33 Update). Results from the assessment showed the greater amberjack stock is overfished and experiencing overfishing. A Framework Action is currently being drafted and its purpose is to establish management measures that will rebuild the stock. The current management measures for the recreational sector are a minimum size of 34 inches fork length (FL), closed season from June 1 to July 31, and one greater amberjack per angler bag limit. The Framework Action proposes changes to the Annual Catch Limit (ACL) and Annual Catch Target (ACT). A recreational decision tool was created to allow evaluation of the efficacy of the different closed seasons.

Data Sources

Recreational landings data for Gulf of Mexico greater amberjack were obtained from the Southeast Fisheries Science Center (SEFSC) Marine Recreational Information Program (MRIP), the Texas Parks and Wildlife Department (TPWD) Creel Survey, Louisiana Creel survey (LA Creel) and the Headboat Survey (Headboat). MRIP, TPWD, and LA Creel conducted dockside intercepts to collect information on the size and number of greater amberjack caught by mode (charter, private, shore). Headboat collected size and number of greater amberjack through logbooks completed by headboat operators.

Methods

Reductions in landings are necessary to achieve the Framework Action's proposed Annual Catch Limits (ACL) and Annual Catch Targets (ACT). The management measure of different closed seasons was explored as a tool to reduce harvest. All the calculations were done using SAS (SAS Institute, Cary, NC).

2017 Predicted Landings

The Framework Action currently being drafted will be imposed on the 2017 fishing year. An estimate of the 2017 landings are required to explore the impact of different closed season, and determine the predicted landings relative to the ACLs and ACTs.

Frequently future landings are determined from taking a three-year average of the three most recent years of complete data. Therefore, data from 2014 through 2016 are believed to be the

best approximation of future harvest patterns. The average landings from 2014-2016 by two-month wave were calculated to be the predicted 2017 landings from January through June. However, the landings may change because the Gulf greater amberjack stock recently had a size limit increase from 30 to 34 inches fork length in January of 2016. The percent reductions from increasing the size limit was defined in SERO-LAPP-2014-9 which was an analysis for the 2015 Framework Action, and these reductions are shown in Table 1. Therefore, the 2014 and 2015 landings were modified to account for the change in the size limit. Additionally, the stock has been closed from June 1 through July 31 every year since 2011. Landings in June were determined from calculating the daily catch rate in May then multiplying it by the number of days in June. This method assumes the daily catch rate in May is the same as the daily catch rate in June. The June landings were calculated using the average landings in May from 2014-2016. The most recent years that the stock was open in August are 2012, 2013, and 2015. These landings were modified for the size limit change then the average daily catch rate for August was determined from 2012, 2013, and 2015 landings because the fishery was open in August during these years. Then the August daily catch rate was applied to July to determine the predicted June landings. This method assumes the daily catch rate in August is the same as the daily catch rate in July. The stock has been closed in September to December every year since 2014. September to December landings were determined from taking the average landings by two-month wave from the most recent years when the recreational sector was open (2011-2013). Details of the landings used to create the 2017 landings are shown in Table 2. The 2017 predicted landings and the landings used to generate the predicted landings are shown in Figure 2.

Table 1. Projected percent reductions of greater amberjack landings by mode for increasing the minimum size limit from 30 to 34 inches fork length. These numbers came from the size limit analysis done for the 2015 Framework Action (SERO-LAPP-2014-09).

Mode	Reduction
Headboat	15.7%
Charter	18.2%
Private	16.3%

Table 2. Details of the landings used to determine the predicted 2017 recreational landings for greater amberjack.

	Jan/Feb	Mar/Apr	May/June	July/Aug	Sep/Oct	Nov/Dec
Details	2014 and 2015 landings were modified due to the size limit increase. Average landings by wave from 2014-2016.		Determined average daily catch rate for May from 2014-2016 landings and applied it to number of days in June. Pooled average landings from May and June.	Determined average daily catch rate for August from 2012, 2013, and 2015 landings and applied it to number of days in July. Pooled average landings from July and August.	2011-2013 landings were modified due to the size limit increase. Average landings by wave from 2011-2013.	

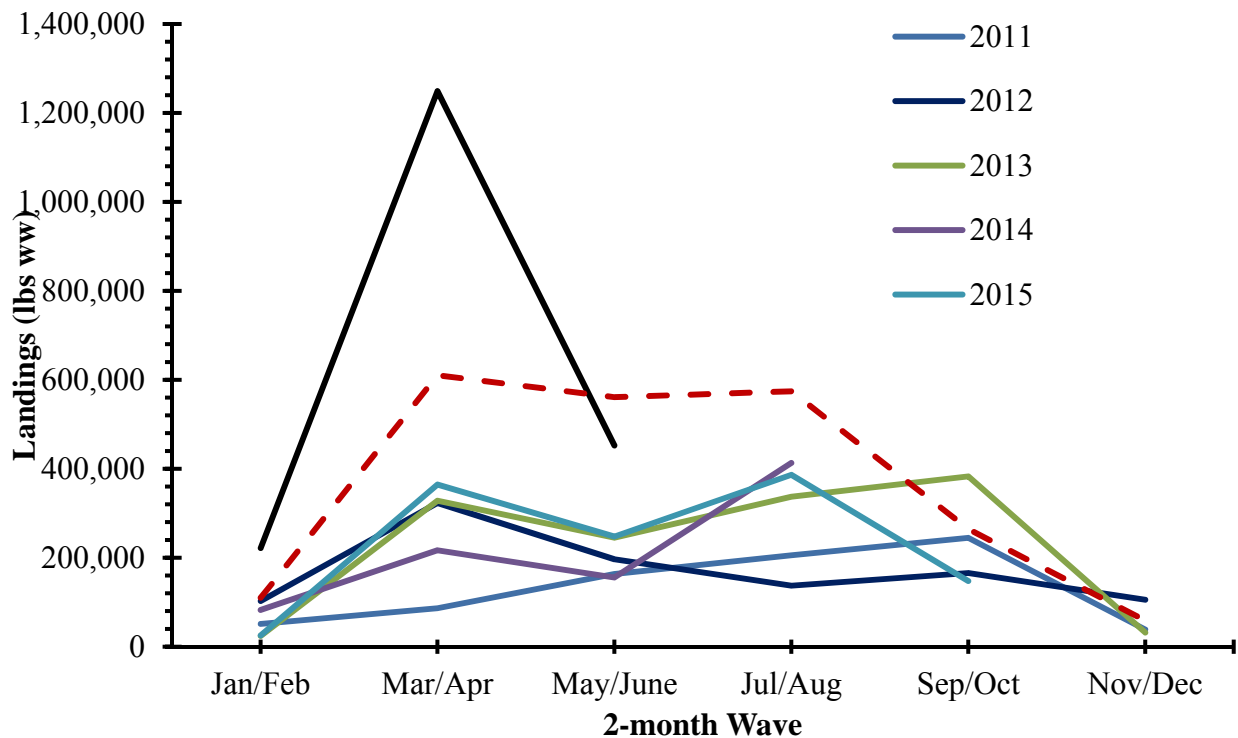


Figure 1. Gulf of Mexico greater amberjack recreational landings by wave from 2011 through 2016 and predicted 2017 landings. All of the landings before 2016 were modified to account for the increase in the size limit in 2016. The 2017 landings in May/June and July/August are higher than other years because they have been adjusted for the June-July closure.

Discards and Total Removals

The relative change in dead discards from exploring different regulations was calculated. A baseline of landings was established by assuming no regulation changes and the season was open all year. Then when a regulation change is implemented the reduced landings were converted to numbers of greater amberjack by dividing by the landings by the average weight. The current average weight of greater amberjack for the recreational sector was determined from the most recent assessment (SEDAR 33 Update), and was determined to be 23.81 pounds whole weight. The numbers of greater amberjack released due to a regulation change were converted to dead discards by multiplying the discard mortality rate of 20%. This discard mortality rate came from the most recent assessment (SEDAR 33 Update). Additionally, the landings in weight were converted to numbers of greater amberjack by dividing by the average weight. Then total removals were determined from summing both the dead discards and the dead greater amberjack from landings.

Closed Season Analyses

Landings of greater amberjack are highly seasonal in the Gulf of Mexico; thus, reductions associated with seasonal closures differ greatly depending upon the time period selected for

closure (Figure 2). The Headboat landings are available by month. The MRIP, TPWD, and LA Creel landings are available by two-month wave and were separated into months by multiplying the proportion of days in each month relative to the total days in a wave. For example wave 3 consists of May/June where May has 31 days and June has 30 days (total wave landings = 61 days). Therefore, May landings are estimated by multiplying the wave 3 landings by 0.508 (31/61 = 0.508). The predicted 2017 landings by month are shown in Figure 4.

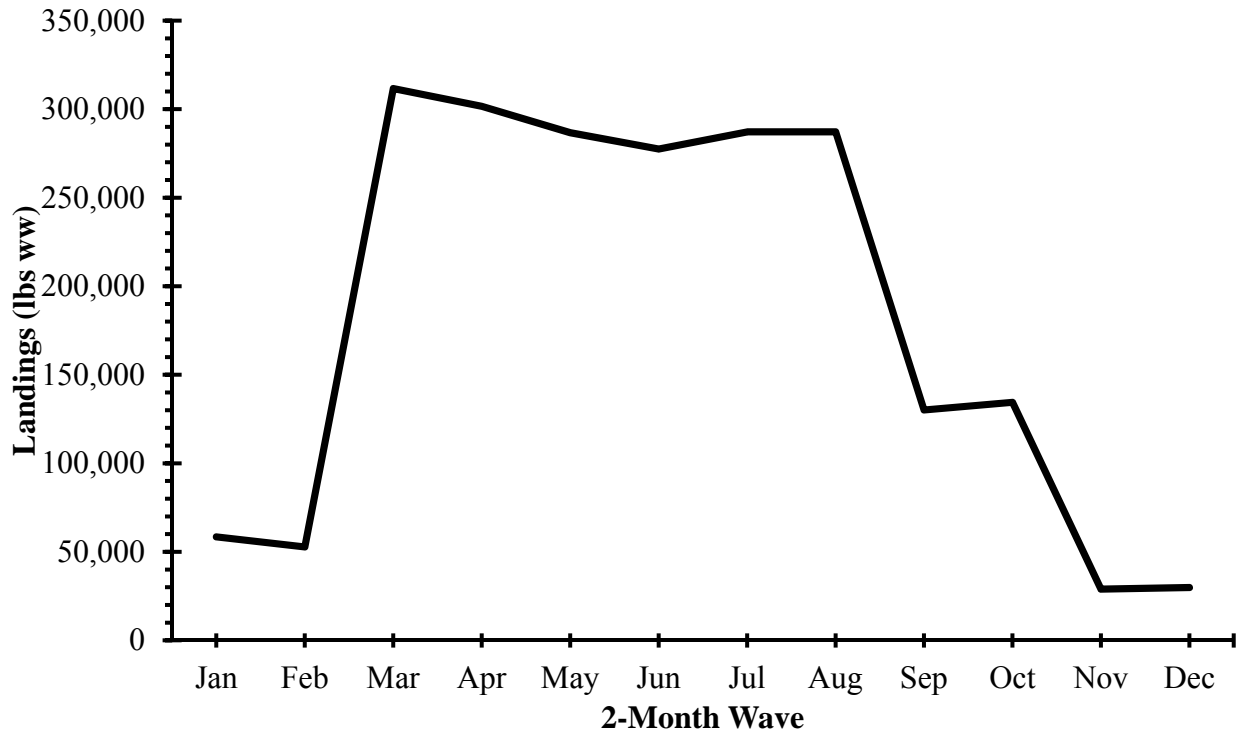


Figure 2. Distribution by month of projected 2017 landings for the Gulf of Mexico greater amberjack recreational landings. The recreational landings include projected MRIP, Headboat, TPWD, and LA Creel landings.

The impact of a seasonal closure was modeled by converting the number of days closed into a percentage of days closed for a given month. The projected landings during that month were then reduced by the percentage of the month that was closed.

Decision Tool

Percent reductions calculated from changes in the closed season were applied to 2017 monthly projected landings to determine how much harvest would be reduced. These results were incorporated into a recreational decision tool. If month (*m*) was 100% closed, landings were set to zero pounds for all sectors. If a month was partially or fully open, the projected monthly recreational landings (RL) were computed as follows:

$$RL_{sector,m} = PRL_{sector,m} * O_m$$

where PRL is the projected 2017 recreational landings and O is the percent of month open to fishing.

The projected monthly recreational landings (RL) and projected 2017 landings (PRL), were calculated for each sector (headboat, private, and charter). The sector landings (RL_{sector}) were combined to predict the total recreational landings.

The recreational decision tool (RDT) was implemented in Microsoft Excel using drop-down menus for inputting desired management measures (Figures 3). Excel was chosen because it is widely available for constituent use.

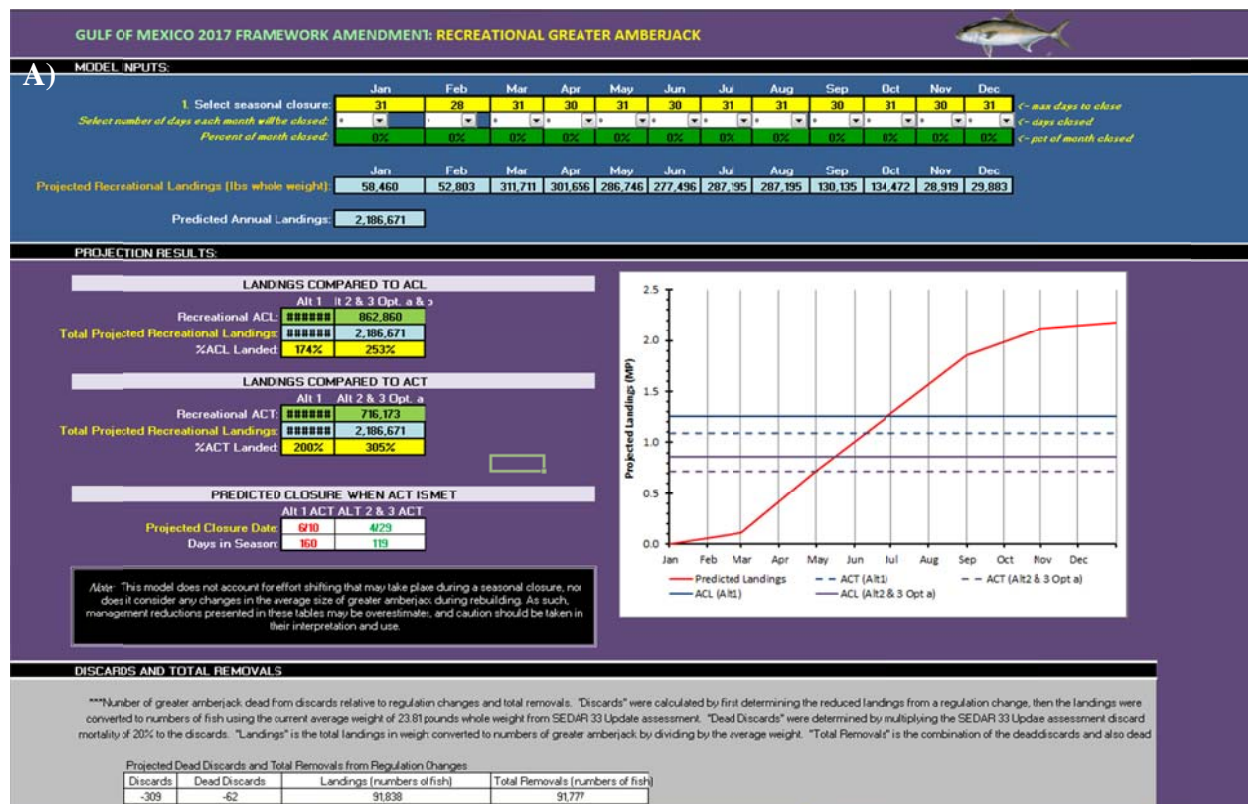


Figure 3. Screenshot for the recreational decision tool.

Results

The RDT allows a range of closed seasons and then the modified landings are compared to the proposed ACTs and ACLs of the Framework Action. Table 3 presents projected recreational landings and days open in the season for a variety of management alternatives for the current ACT (1,092,372 pounds ww). A mix of management measures can reduce the landing to prevent the ACT from being exceeded.

Table 3. Projected recreational landings (lbs ww) of Gulf of Mexico greater amberjack under a variety of proposed management measures that predict landings below the current ACT of 217,100 lbs ww. These results assume no effort shifting.

Closed Season	Days Open	Total Projected Landings (lbs ww)
Jun – Jul	160	1,621,980
Jan – Jul	184	897,800
Jan – Apr	118	1,462,042
Jul – Dec	160	1,288,872

Discussion

As with most projection models, the reliability of the RDT results are dependent upon the accuracy of their underlying data and input assumptions. We have attempted to create a realistic baseline as a foundation for comparisons, under the assumption that projected 2017 landings will accurately reflect actual 2017 landings. Uncertainty exists in this projection, as economic conditions, weather events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from this assumption.

The RDT does not incorporate any changes in the average size of greater amberjack during rebuilding. As the stock rebuilds it is likely that the average size will increase. An increased average size would lead to fishermen capturing their quota more rapidly relative to previous years under similar effort levels. All of these factors would result in more pessimistic projections. As such, management reductions may be overestimates, and caution should be taken in their interpretation and use. By contrast, continued adverse economic conditions and rising fuel prices may reduce effort, which would counter these other trends.

References

SEDAR 33 Update. 2016. Stock assessment update report Gulf of Mexico greater amberjack (*Seriola dumereli*). Southeast Data, Assessment and Review. North Charleston, South Carolina. <http://www.sefsc.noaa.gov/sedar/>.

SERO-LAPP-2014-09. Modeling the combined effects of Gulf Framework Action proposed management measures for commercially and recreationally caught greater amberjack. LAPP/DM Branch. NOAA Fisheries Service, Southeast Regional Office. http://sero.nmfs.noaa.gov/sustainable_fisheries/lapp_dm/archives/documents/pdfs/2014/sero-lapp-2014-09_descrip_of_gaj_decision_tools_02242015.pdf