

Updated 2013 Gulf of Mexico Red Snapper Recreational Season Length Estimates
NOAA Fisheries Service
Southeast Regional Office
St. Petersburg, FL
May 21, 2013; updated June 4, 2013
SERO-LAPP-2013-02 Addendum

Introduction

In February 2013, the Gulf of Mexico Fishery Management Council requested the National Marine Fisheries Service (NMFS) promulgate an emergency rule for the 2013 recreational red snapper season. This emergency rule was implemented on March 25, 2013, and allowed for implementation of state-specific closure authority of the federal exclusive economic zone off states not adopting consistent federal recreational red snapper regulations. NMFS completed a report (SERO 2013) on March 19, 2013, estimating the season lengths off each state in support of the emergency rulemaking. Previous estimates were based on Marine Recreational Fisheries Statistics Survey (MRFSS) landings data, as well as preliminary 2012 Southeast Headboat Survey and Texas Parks and Wildlife (TPWD) Creel Survey landings. The analysis also predicted catch rates in Florida and Louisiana state waters based on historical landings information.

On May 7, 2013, the NMFS Southeast Fisheries Science Center provided the NMFS Southeast Regional Office with updated landings for monitoring annual catch limits. The data file contained final landings estimates for TPWD and Headboat, as well as Marine Recreational Information Program (MRIP) based landings estimates. Recreational red snapper season length projections were re-run using these updated landings. MRIP based landings were used in the recently completed 2013 benchmark stock assessment. Monitoring the quota using MRIP is consistent with how yields are specified by the stock assessment. Methods used to project season lengths were similar to those described in SERO (2013) and any differences in methods are described herein.

State Regulations

Texas has maintained a year-round state waters red snapper season, 4-fish bag limit, and 15-inch total length minimum size limit for numerous years. In May 2012, the Louisiana Wildlife and Fisheries Commission voted to establish regulations that allow harvest in state waters on three-day weekends from March through September (88 days) and to increase the bag limit to three red snapper per person in state waters. In April 2013, the Florida Fish and Wildlife Conservation Commission voted to establish a 44-day red snapper fishing season in Florida state waters with a 2-fish bag limit. Mississippi or Alabama will implement compatible regulations (**Table 1**).

Table 1. Proposed Gulf state recreational red snapper regulations for 2013. Cells highlighted in gray indicate regulations incompatible with 2013 federal regulations.

State	Size Limit	Bag Limit	Season	Days Open
Florida	16" TL	2-fish	Jun 1-Jul 14	44
Alabama	16" TL	2-fish	Same as federal season	Same as federal season
Mississippi	16" TL	2-fish	Same as federal season	Same as federal season
Louisiana	16" TL	3-fish	Mar 23-Sept 30 (3-day weekends)	88
Texas	15" TL	4-fish	Jan 1-Dec 31	365

Data Sources

Recreational red snapper landings were obtained from three data sources:

1. Marine Recreational Information Program (MRIP), including the For-hire charter survey;
2. Southeast Fisheries Science Center Headboat survey (HBS); and,
3. Texas Parks and Wildlife Department (TPWD) charter and private/rental creel survey.

MRIP and For-hire red snapper landings are estimated using a combination of dockside intercepts (landings data) and phone surveys (effort data). Landings are estimated in both numbers and whole weight (lbs) by two-month wave (e.g., Wave 1 = Jan/Feb, ..., Wave 6 = Nov/Dec), area fished (inland, state, and federal waters), mode of fishing (charter, private/rental, shore), and state (west Florida, Alabama, Mississippi, and Louisiana). MRIP has replaced MRFSS as the primary methodology for collecting and estimating recreational catches in the Gulf of Mexico. MRIP is a more scientifically sound method for estimating catch and includes new procedures for conducting dockside intercepts and new statistical methods for estimating catch. Additionally, new sampling methodologies for collecting effort data have been tested through MRIP pilot studies and will allow for anglers to be directly contacted to collect effort data.

Headboat landings are collected through logbooks completed by headboat operators. Landings (lbs ww) are reported by vessel, day/month, and statistical reporting area (i.e., area 18 = Dry Tortugas off west coast of Florida, ..., area 27 = Southeast Texas).

The TPWD creel survey generates estimates of landings in numbers for private/rental boats and charter vessels fishing off Texas. Landings are reported in numbers by high (May 15-November 20) and low-use time periods (November 21-May 14), area fished (state vs. federal waters), and mode of fishing (private vs. charter). To convert TPWD landings in numbers to landings in pounds, red snapper average lengths by mode, wave, and area fished were converted to weights using length-weight conversion formula from SEDAR 7 (2005).

At this time, final MRIP and Headboat landings are available from January 1-December 31, 2012 and final TPWD landings are available from November 21, 2011-November 20, 2012. **Table 2** summarizes recreational red snapper landings by state.

Table 2. Gulf of Mexico 2012 recreational red snapper landings by state and mode.

State	Landings (lbs ww)				% Landings
	Charter	Headboat	Private	All Modes	
FLW	641,437	205,114	1,289,253	2,135,804	41.5%
AL	359,469	72,199	1,013,460	1,445,129	28.1%
MS	997	5,894	182,767	189,658	3.7%
LA	236,302	21,199	501,704	759,205	14.8%
TX	39,128	419,671	157,726	616,526	12.0%
Total	1,277,333	724,077	3,144,911	5,146,321	100.0%

Note: Headboat landings from Area 23 (AL + FL Panhandle) were proportionally distributed by state based on logbook records.

Methods

Four methods were used to estimate the red snapper season length for 2013. These methods use various combinations of estimated catch rates per day and average weights per day based on regressions fit to historical data. Methods were similar to SERO (2013) for estimating average weight and catch per day.

Average Weights

Average weights were obtained from the Southeast Fisheries Science Center’s ACL database (**Figure 1**). Generalized linear regression methods were used to estimate Eastern and Western Gulf average weights for 2013. Projections were run in SAS using Proc GENMOD. Average weights for 2007-2012 were used. Year was a predictor variable for estimating average weight.

Model fits for both regions were excellent (Eastern: $r^2=0.96$, $p<0.0001$; Western: $r^2=0.83$, $p<0.0001$) and indicated rapidly increasing trends in average weight (**Figure 1**). Projected 2013 average weights were 7.49 lbs ww per fish (95% CL: 7.01-7.97) for Eastern Gulf states (Florida-Mississippi) and 8.20 lbs ww per fish for Western Gulf states (Louisiana, Texas; 95% CL: 7.24-9.17).

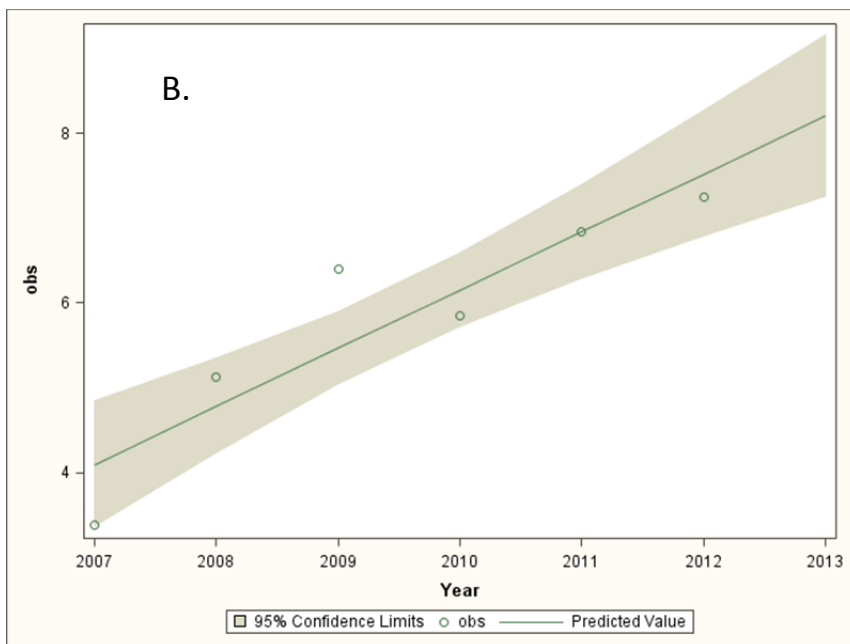
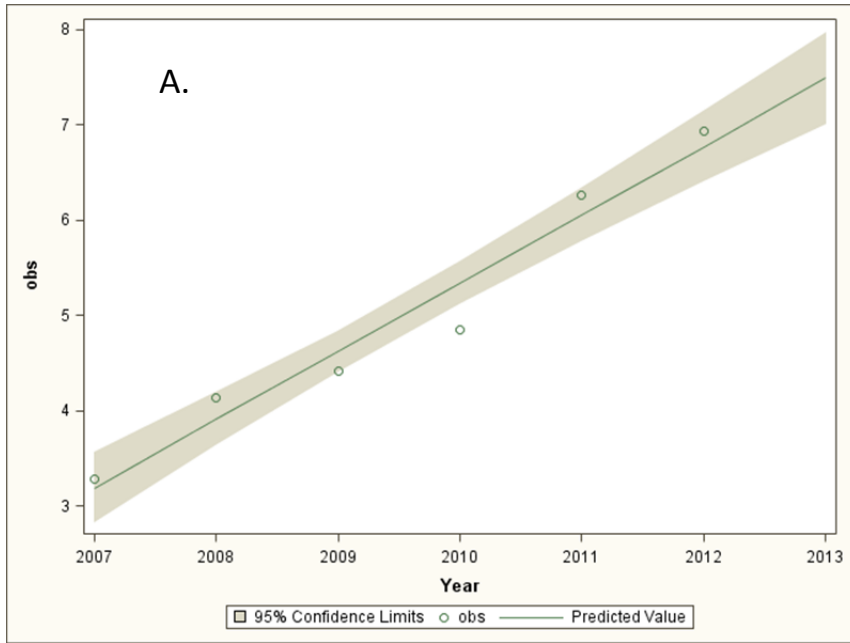


Figure 2. Generalized linear regression model fits to observed recreational red snapper average weights (open circles) for the **a)** Eastern (i.e., Florida, Alabama, Mississippi) and **b)** Western (i.e., Louisiana, Texas) Gulf of Mexico, with 95% confidence bands.

Federal Season Catch Rates

Federal in-season catch rates were based upon generalized linear and log-link negative binomial regressions of Eastern and Western Gulf of Mexico in-season catch rates through time. Monthly catch-per-day was computed using the SEFSC ACL Recreational Dataset (May 2013), which includes headboat, MRIP, and TPWD landings. MRIP and TPWD landings are estimated on a bimonthly wave basis, while headboat landings are estimated monthly. Wave landings in numbers were distributed to months as follows:

1. If the federal fishing season was only open for one month within a wave, all landings from the wave were assigned to the federal season.
2. If the federal season was partially open within two months of a wave, landings were distributed proportional to the number of federal days open within each month of the two month wave.
3. If the federal season was not open at all during the wave, landings were distributed to months proportional to the number of days in each month.

Total landings in-season (i.e., from months during which the federal season was open) were summed across data sources for the Eastern and Western Gulf of Mexico by year. In-season catch-per-day was computed for the Eastern and Western Gulf of Mexico as in-season landings divided by days in the federal season, by year. Catch per day for the entire Gulf of Mexico was computed as the sum of catch-per-day from the Eastern and Western Gulf of Mexico.

Because the red snapper population is in a rebuilding plan, population abundance is expected to increase, leading to increased quotas and higher catch rates. Abundance at age was obtained from the 2013 red snapper benchmark assessment (J. Tetzlaff, SEFSC, pers. comm.) and converted to exploitable abundance using the selectivity at age for the recreational sector (SERO 2012; SEDAR-7 2011). Exploitable abundance, scaled to 2011 values, was investigated as a predictor variable in the generalized linear regression on in-season catch rate versus year for the years 2005-2012, to correspond with 2013 SEDAR 31 assessment. The regression analysis was implemented in SAS Proc GENMOD and exploitable abundance was not a significant factor for any model.

Four regression models were fit to catch rate data. Generalized linear regressions with year as a predictor variable were fit to red snapper Eastern Gulf catch-per-day for the years 2005-2012 and 2009-2012 (**Figures 3 (A)** and **(C)**). Catch per day for the year 2010 was dropped due to the Deepwater Horizon (DWH) oil spill that year. Both models indicated a strong positive linear trend for the Eastern Gulf (2005-2012: $R^2 = 0.94$; 2009-2012: $R^2 = 0.98$). Because catch per day was overestimated for 2012 using data from 2005-2012, and catch per day appears to be reaching an asymptote after 2009, the linear relationship between catch-per-day and year was investigated using only data for 2009-2012.

Log-link negative binomial regressions were used to fit Western Gulf catch-per-day with year as a predictor variable. Data for 2005-2012 were used and estimates for 2010 or 2010-2011 were

removed (**Figures 3 (B) and (D)**). Data for 2010 were removed due to the DWH oil spill. Additionally, because the Western Gulf catch per day estimate was very low in 2011, an additional regression was fit removing both 2010 and 2011 data points (**Figure 3(D)**). Both models indicated a strong increasing trend in catch per day by year for the Western Gulf (2005-2012, drop 2010: $R^2 = 0.70$; 2005-2012, drop 2010-2011: $R^2 = 0.96$), although the model incorporating 2011 data estimated 2012 catch per day to be lower than observed.

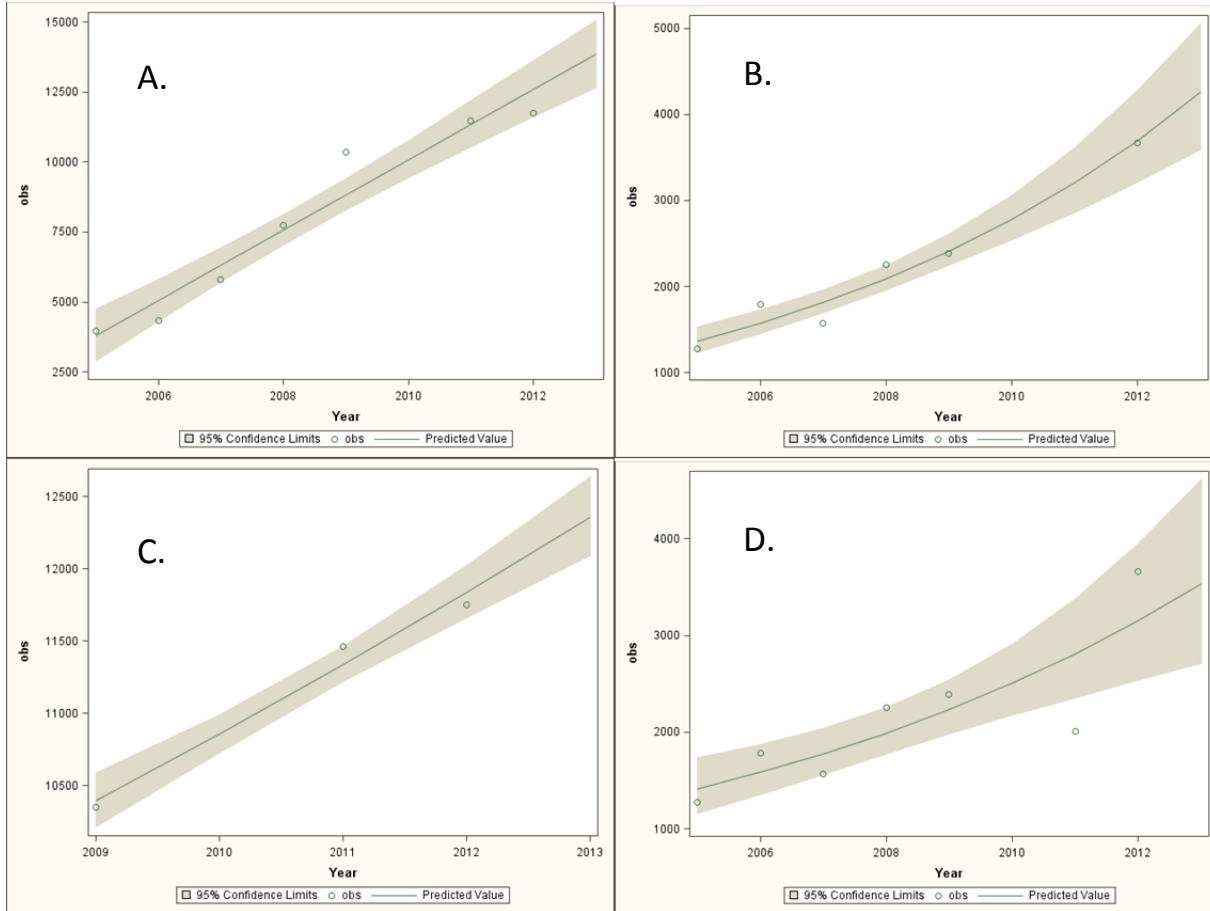


Figure 3. Regression model fits to observed recreational red snapper catch rates (open circles) for the Eastern (**A** and **C**) and Western (**B** and **D**) Gulf of Mexico, with 95% confidence bands.

Federal Season Lengths If States Adopt Incompatible Regulations

The federal season off of every Gulf state will need to be shortened if proposed state-specific accountability measures are not implemented. To determine how much the federal season needs to be shortened requires estimates of landings in state and federal waters while the federal season is open, and estimates of landings that would occur in state waters when the federal season is closed. Similarly, to calculate the federal season off of each state adopting

incompatible regulations requires an estimate of that state’s annual landings relative to Gulf-wide landings. The following describes methods used for calculating out-of-season landings.

State Water Out-of-Season Catch Rates

When state waters are open and the federal season is closed, there will be more landings originating from that state waters than there would be under a compliant regulatory scenario. To evaluate the impacts of incompatible regulations, it is necessary to predict each state’s contribution to the 2013 red snapper quota under compatible regulations. Estimated 2013 catch rates by state were calculated using a combination of predicted regional catch rates and average weights (see above).

- Method 1 used average projected weights by region, projected landings per day for the Eastern Gulf based on 2005-2012 regression data (dropping 2010 only; **Figure 3A**), and projected landings per day for the Western Gulf based on 2005-2012 regression data (dropping 2010 and 2011; **Figure 3B**).
- Method 2 was similar to Method 1, but used 2005-2012 regression data (dropping 2010 only; **Figure 3D**) for the Western Gulf.
- Method 3 was similar to Method 1, except used 2009-2012 regression data (**Figure 3C**) for the Eastern Gulf to predict catch per day.
- Method 4 used average projected weights by region, projected landings per day for the Eastern Gulf based on 2009-2012 regression data (dropping 2010 only; **Figure 3C**), and projected landings per day for the Western Gulf based on 2005-2012 regression data (dropping 2010 only; **Figure 3D**).

Table 3 summarizes average in-season catch rates per day by method. **Table 4** summarizes each state’s proportional 2013 landings by method.

Table 3. Estimated in-season red snapper landings per day by state and Gulfwide.

State	In-season Landings per Day (lbs ww)			
	Method 1	Method 2	Method 3	Method 4
FLW	58,516	52,256	58,516	52,256
AL	39,922	35,651	39,922	35,651
MS	5,242	4,681	5,242	4,681
LA	21,435	21,435	17,788	17,788
TX	13,524	13,524	11,223	11,223
Gulfwide	138,640	127,548	132,691	121,599

Table 4. Estimated landings accounted for by each state if compatible state-federal regulations were in effect in 2013 and the proportional landings attributed to each state for the 2013 fishing year.

State	Proportional Landings by State (lbs ww)				Percent 2013 Landings by State (%)			
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4
FLW	1,749,500	1,698,200	1,827,932	1,781,277	42.2%	41.0%	44.1%	43.0%
AL	1,193,581	1,158,583	1,247,091	1,215,261	28.8%	28.0%	30.1%	29.3%
MS	156,719	152,124	163,745	159,566	3.8%	3.7%	4.0%	3.8%
LA	640,859	696,590	555,651	606,336	15.5%	16.8%	13.4%	14.6%
TX	404,342	439,504	350,581	382,560	9.8%	10.6%	8.5%	9.2%
Gulf-wide	4,145,000	4,145,000	4,145,000	4,145,000	100.0%	100.0%	100.0%	100.0%

Texas Out-of-Season Catch Rates

In recent years, Texas state waters have been open year round. In 2012, 85,945 red snapper weighing 616,525 lbs whole weight were landed off Texas (Table 2). To determine what proportion of these landings occurred outside the federal season, Texas headboat landings were summed for months when the federal season was closed and added to TPWD charter and private landings during two-month waves when the federal season was closed. A total of 21,235 red snapper were estimated to be landed during months in 2012 when the federal season was closed. Landings when the federal season was closed were divided by the total number of days when the federal season was closed (n = 319 days) to calculate an out-of-season catch rate of 66 red snapper per day. This estimate was then multiplied by the average red snapper weight from the Western Gulf (see *Average Weights* discussion above) to project daily out-of-season landings per day in pounds from Texas (=544 lbs ww).

Louisiana Out-of-Season Catch Rates

The state of Louisiana implemented a quota monitoring program for offshore species beginning in 2013. Red snapper landings by weekend were provided by LDWF staff to NMFS on May 15, 2013. A total of 3,873 red snapper weighing 30,172 lbs ww were landed during the first 20 days of Louisiana's state waters season (March 23-May 5, 2013). Landings were highly variable by weekend, ranging from a minimum of 112 fish (March 23-24) to a maximum of 1,181 fish (April 5-7). Landings varied greatly due to weather, which reduced fishing effort on some weekends. On average 194 red snapper were landed per day (=1,511 lbs ww per day). The maximum catch per day on any weekend was 394 red snapper (=3,069 lbs ww). The average weight of red snapper sampled by LDWF staff was 7.79 lbs ww. Out of season landings were estimated to range from 194-394 fish per day and were multiplied by the average LDWF weight to project daily out of season landings per day in pounds for Louisiana. Because landings are expected to be higher during summer when weather is better and effort is higher, season estimates were also explored using an average daily catch rate of 294 fish per day (=2,290 lbs ww per day).

Florida Out-of-Season Catch Rates

Florida waters will be open 44-days in 2013. Landings occurring in state waters were calculated in a similar manner as described in SERO (2013). Florida out-of-season catch rates were computed by multiplying 2013 Florida in-season catch rates (Table 3) by the proportion of landings by private anglers from Florida state waters during the 2012 federal red snapper season. Private anglers in 2012 reported 20.8% of Florida's total landings from state waters. Out-of-season daily catch rates ranged from 10,883 to 12,187 lbs ww per day depending on the catch rate assumed (Methods 1-4). As discussed in SERO (2013), significant effort shifting is expected to occur when federal waters close. This was previously observed in 2008 when Florida waters remained open after federal waters closed – landings per day increased by 1.56 times. To account for effort shifting, catch estimates per day were multiplied by 1.56 and 2.0 to evaluate the sensitivity of season lengths to estimated out-of-season catch rates.

Estimation of Gulf-wide Federal Season Lengths

Gulf-wide red snapper season lengths assuming all states adopt compatible regulations were estimated by dividing the 2013 quota by total in-season landings. To determine the Gulf-wide red snapper season length without compatible regulations, out-of-season landings were estimated for each state based on the average out-of-season catch rate per day times the number of days state waters will be open when federal waters are closed. These out-of-season landings were subtracted from the 2013 quota. The remaining landings were then divided by the daily Gulfwide catch rate in pounds per day when the federal season was open to determine the estimated length of the federal season Gulf-wide. The number of federal days open was iteratively solved using Excel Solver, until the total landings exactly matched the quota (Equations 1-3).

$$\text{Inseason landings} = \text{Inseason CPD}(\text{lbs ww}) \times \text{fed days open} \quad (1)$$

$$\text{Out of season landings} = \text{Out of season CPD}(\text{lbs ww}) \times (365 - \text{fed days open}) \quad (2)$$

$$\text{Inseason landings} + \text{Out of season landings} = 4,145,000 \text{ lbs ww} \quad (3)$$

where CPD = catch per day (lbs ww).

Estimation of State-Specific Federal Season Lengths

Federal season lengths off of states not adopting compatible regulations were estimated in a similar manner as describe above for calculating the Gulf-wide season length. The only difference was the proportion of the 4.145 mp quota accounted for by each state was used to estimate the federal season length rather than the entire Gulfwide quota (Equations 4-6).

$$\text{State inseason landings} = \text{State inseason CPD}(\text{lbs ww}) \times \text{fed days open} \quad (4)$$

$$\text{State out of season landings} = \text{State out of season CPD (lbs ww)} \times (365 - \text{fed days open}) \quad (5)$$

$$\text{State inseason landings} + \text{State out of season landings} = \text{State \% of Gulfwide quota} \quad (6)$$

where CPD = catch per day (lbs ww).

Results

Table 5 summarizes Gulf-wide season lengths for red snapper based on various in-season catch rates and assuming all states adopted compatible regulations in 2013. Gulf-wide season lengths ranged from 30-34 days if state and federal regulations are consistent. **Table 6** summarizes Gulf-wide season lengths for red snapper based on various in-season and out-of-season catch rates and taking into account incompatible Texas, Louisiana, and Florida regulations. Gulf-wide season lengths accounting for incompatible regulations ranged from 23-30 days.

Table 5. Gulfwide recreational red snapper season lengths based on various in-season catch rates (Methods 1-4; see page 7) and assuming all states adopt compatible regulations for 2013.

Federal Season (days)			
Method 1	Method 2	Method 3	Method 4
30	32	31	34

Table 6. Gulfwide recreational red snapper season lengths based on various in-season (Methods 1-4; see page 7) and out-of-season catch rates and assuming TX, LA, and FL do not adopt compatible regulations for 2013.

Out of Season CPD (lbs ww)					Federal Season (days)			
FL *	AL **	MS	LA	TX	Method 1	Method 2	Method 3	Method 4
12,187	3	0	1,511	544	26	29	27	30
19,012	3	0	2,290	544	24	27	26	29
24,374	3	0	2,290	544	24	26	25	28
24,374	3	0	3,069	544	23	25	24	27

* Represents Florida out of season landings when state waters are open and federal waters are closed. An additional 70 lbs ww per day of out of season landings was estimated to occur when both state and federal waters were closed based on 2012 landings data.

** An estimated 3 lbs ww per day of out of season landings was estimated to occur when both state and federal waters were closed based on 2012 landings data.

Table 7 summarizes state-specific federal season lengths based on various in-season and out-of-season catch rates. Federal season lengths for Alabama and Mississippi ranged from 30-34 days and matched the season length if all states adopted compatible regulations. The federal season length for Texas ranged from 14-19 days, the federal season length for Florida ranged from 19-31 days, and the federal season length for Louisiana ranged from 17-28 days.

Table 7. State-specific federal season lengths based on various in-season (Methods 1-4; see page 7) and out-of-season catch rates.

State	Season Length (Days)			
	Method 1	Method 2	Method 3	Method 4
Alabama	30	32	31	34
Florida (12,187 lbs/day)	26	29	27	31
(19,012 lbs/day)	23	26	25	29
(24,374 lbs/day)	19	24	23	26
Louisiana (1,511 lbs/day)	24	27	25	28
(2,290 lbs/day)	22	25	21	24
(3,069 lbs/day)	20	23	17	20
Mississippi	30	32	31	34
Texas	16	19	14	17

Discussion

State-specific federal season lengths projected using final 2012 landings from MRIP, TPWD, and the SE Headboat Survey, as well as Louisiana quota monitoring data indicate the federal season could be 2-6 days longer than projected in SERO (2013). Catch rates per day, especially in the Eastern Gulf were less using MRIP, resulting in a longer projected season. Additionally, Louisiana quota monitoring landings indicate previous season estimates by NMFS (SERO 2013) overestimated the portion of landings expected to come from Louisiana state waters when federal waters are closed. Because landings from Louisiana state waters are less, the federal season length of Louisiana can be extended considerably. Previously it was estimated that Louisiana would have a 9 day federal season taking into account incompatible regulations. Estimates presented here indicate the Louisiana season could be 17-28 days based on average and maximum observed daily catch rates from Louisiana's quota monitoring program. The longer estimated federal seasons are contingent on state water catch rates remaining low throughout the summer, which will likely not be the case given improving weather conditions and more fishing effort in summer. It is recommended that catch rates intermediate to the observed average and maximum catch rates during March 23-May 5 be used to set the federal season length for Louisiana at this time.

For Florida, season lengths ranged from 19-31 days. Using MRFSS, Florida was previously estimated to have a 21-25 day federal season. Historical data from 2008 did indicate effort

shifting into state waters when the federal season closed. Catch per day in state waters in 2008 was 1.56X greater after the federal season closed than during the federal season. This is expected to be the minimum increase in state water catch rates expected for 2013, especially given that the extended state waters season will occur during mid-summer over the 4th of July holiday weekend. For this reason, it is recommended that Florida's federal season length be based on a two fold increase in state water private angler catch rates once the federal season closes. This would result in a 19-26 day federal season for Florida.

Projection Methods 1 and 2 overestimate in-season catch rates for the Eastern Gulf of Mexico (**Figure 3(A)**). Catch per day appears to be reaching an asymptote in the Eastern Gulf of Mexico after 2009. Methods 3 and 4 more appropriately account for the slowing catch rate in the Eastern Gulf in more recent years, resulting in longer projected seasons. Similarly, Methods 1 and 3 provide better fit to the catch rates in the Western Gulf of Mexico (**Figure 3(B)**). By dropping Western Gulf catch rate data for 2010 and 2011, regression model fits were greatly improved, resulting in the predicted 2012 catch rate closely matching the observed 2012 catch rate. Confidence limits do however encompass the 2012 catch rate when the 2011 Western Gulf catch rate data are included. Taking into account model fits, Methods 3 and 4 are the most appropriate models for estimating the 2013 fishing season length. Based on Methods 3 and 4, the federal season lengths for each state would be: Florida (23-26 days), Alabama (31-34 days), Mississippi (31-34 days), Louisiana (21-24 days), and Texas (14-17 days).

Although not presented in this report, confidence limits for each of the estimated season lengths are approximately ± 5 to 6 days when accounting for uncertainty in catch per day and average weight estimates (see **Figures 2 and 3**). Considerable uncertainty exists in projecting season estimates given variability in average weights, catch per day, and implementation of incompatible state regulations. If projections presented herein under- or over-estimate the season length needed to constrain harvest, then the quota may not be met or could be exceeded. Preliminary results from the 2013 stock assessment indicate the acceptable biological catch may be increased to 12 mp ww or more. The Gulf of Mexico Fishery Management Council's Scientific and Statistical Committee will meet in late-May 2013 to discuss the assessment and recommend an acceptable biological catch (ABC) level for the red snapper stock. The Gulf Council will then meet in mid-June to discuss the SSC's recommended ABC and specify an annual catch limit for red snapper. If the ABC is increased based on new scientific data, then the probability of not exceeding the red snapper quota based on season lengths presented in this report will be reduced. Similarly, depending on the amount of the quota increase, additional days of fishing may also be added to the 2013 season.

References

SERO. 2013. Gulf-wide and State-specific Projected 2013 Red Snapper Federal Season Closure Dates. NMFS, Southeast Regional Office, St. Petersburg, Florida 16 pp.