2011 Recreational Red Snapper Quota Closure Analysis

NOAA Fisheries Service
Southeast Regional Office
St. Petersburg, FL

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Introduction

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires NOAA Fisheries Service to close recreational red snapper in the Gulf of Mexico when the quota is reached. Last year, the quota was projected to be reached in 53 days; however, due to area closures and reductions in fishing effort associated with the Deepwater Horizon oil spill, the quota was not reached during the June 1-July 23 fishing season. NOAA Fisheries Service implemented an interim rule in fall 2010 reopening the red snapper recreational season on weekends (Friday-Sunday) from October 1-November 22, 2010.

The 2011 recreational quota for red snapper will be 3.525 million pounds whole weight (mp ww). The intent of this analysis is to predict when the 2011 quota will be met, given a season starting on June 1, 2011. Given the short length of the red snapper fishing season and lags in the timeliness of landings data, in-season quota monitoring of red snapper is not possible. Historical red snapper landings adjusted for increases in average weight are used as a proxy for predicting when the 2011 quota will be met.

2010 Recreational Red Snapper Landings

Recreational red snapper landings were obtained from three data sources:

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

MRFSS 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).

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).

Gulf of Mexico recreational red snapper landings for 2010 totaled 2.23 mp ww, resulting in a 1.17 mp ww recreational quota underage. MRFSS accounted for 1.62 mp, or 72.8 percent of the overall landings (Table 1). Headboat landings accounted for 0.43 mp or 19.2 percent of the overall landings (Table 1). Texas Parks and Wildlife landings accounted for 0.18 mp or 7.9 percent of the overall landings (Table 2). Charter landings accounted for 20.5 percent of the total recreational red snapper landings in 2010, private/rental landings accounted for 60.3 percent of total landings in 2010, and headboat landings accounted for 19.2 percent of total landings.

Table 1. 2010 MRFSS and Headboat red snapper landings by wave and mode.

	Landings (lbs ww) by Mode			
Wave	**Charter**	**Private**	**Headboat**	**Grand Total**
Jan-Feb	0	0	11,625	11,625
Mar-Apr	0	0	14,158	14,158
May-Jun	152,816	244,001	166,213	563,030
Jul-Aug	41,605	244,436	86,281	372,322
Sep-Oct	149,883	347,205	106,130	603,218
Nov-Dec	66,526	378,222	45,126	489,874
Grand Total	410,830	1,213,865	429,533	2,054,227

Table 2. 2010 TPWD red snapper landings by season and mode.

	Landings (lbs ww) by Mode		
Season	**Charter**	**Private**	**Grand Total**
Nov 21-May 14	29,617	13,720	43,337
May 15-Nov 20	16,277	117,647	133,924
Grand Total	45,894	131,367	177,261

Quota Closure Methods

The start date for the federal recreational red snapper fishing season begins June 1, 2011. The federal season was estimated to be closed when projected landings reached the 3.525 mp quota. Analyses described herein assume all Gulf states, except Texas, will adopt compatible fishing seasons for recreational red snapper. All Gulf states, except Texas, implemented federally consistent fishing seasons for red snapper in 2010. With a few exceptions, landings from 2010 were not used for projections, as they are not representative of expected fishing conditions during the 2011 summer red snapper fishing season. In 2010, large fishery closures were implemented in the Gulf of Mexico following the BP/Deepwater Horizon oil spill.

Two methodologies were used to project when the recreational quota will be reached in 2011. Method 1 is based on methods summarized in last year's report (SERO 2010) and uses 2009 landings as a proxy to project 2011 landings and the quota closure date (Appendix 1). Method 2 uses historical trends in red snapper fishing effort and catch rates to project when landings will reach the closure.

Method 1: 2009 and 2010 Landings Used as a Proxy for 2011 Landings

Adjustments to MRFSS landings

All MRFSS-reported landings in wave 3 (May-June) during 2009 were assumed to occur in June, since Gulf federal waters and state waters in Louisiana, Mississippi, west Florida, and Alabama were closed to red snapper harvest prior to June 1, 2009. Similarly, wave 4 landings were assumed to occur between July 1 and August 14, 2010, since Gulf federal waters and state waters in Louisiana, Mississippi, west Florida, and Alabama were closed to red snapper harvest beginning August 15, 2009. Landings during wave 4 were divided by the total number of days open in 2009 during wave 4 (n=45) to derive a daily landings rate. To project landings in wave 4 of 2011, the wave 4 daily landings rate for 2009 was multiplied by the number of days Gulf federal waters and state waters in Louisiana, Mississippi, west Florida, and Alabama would be open to red snapper harvest during wave 4 of 2011.

Adjustments to Headboat Landings

Headboat landings were summarized by month. In 2009, new regulations were implemented for federally permitted for-hire vessel operators through Amendment 30B to the Reef Fish Fishery Management Plan requiring them to abide by the more restrictive of federal or state regulations when fishing for reef fish. Despite this new regulatory requirement, headboat landings were reported in all months (Table 1), with the highest rates of out-of-season landings occurring off Texas. In 2010, landings continued to be reported by headboats when the federal fishing season was closed, but to a lesser extent than 2009 (Table 3). Headboat landings for 2010 rather than 2009 were used to estimate 2011 landings when the federal season would be closed (e.g., Jan 1-May 31 and from 2011 Projected Closure Date-Dec 31, 2011), as 2010 headboat landings are likely to be more representative of fishing conditions after implementation of Amendment 30B restrictions. For months when the federal season was open in 2010, but will be closed in 2011 (i.e., October and November), average 2010 monthly headboat landings during months when the federal season was closed (i.e., 4,258 lbs ww) were used to approximate landings during these months. For months when the federal season was closed in 2010 (i.e., January-May, Sept, and Dec), actual reported headboat landings were used. When the fishing season was estimated to be open for an entire month, no adjustments to headboat landings were made. If the 2011 season was projected to close within a particular month, projected landings for that month were computed by multiplying 2009 monthly landings for that month by the ratio of days open in the month to the total number of days in the month.

Table 3. Comparison of 2009 and 2010 headboat red snapper landings during months when the federal fishing season was closed. Note: In 2009, the federal fishing season was open June 1-August 14; in 2010, the federal fishing season was open June 1-July 23 and on weekends (Fri-Sun) between October 1 and November 22.

Month	Landings (lbs ww) 2009	2010	Percent Change
Jan	14,386	7,319	51%
Feb	20,198	4,306	21%
Mar	42,850	8,959	21%
Apr	22,175	5,199	23%
May	22,321	2,403	11%
Jun			
Jul			
Aug		2,448	
Sep	1,896	0	0%
Oct	4,403		
Nov	2,862		
Dec	7,045	3,430	49%
Total	138,137	34,064	25%
Average	27,627	4,258	15%

Adjustments to Texas Landings

TPWD landings were provided by high (May 15-Nov 20) and low use (Nov 21-May 14) waves. Charter landings in federal and state waters and private landings in federal waters during the high-use period were all assumed to occur during the June 1-August 14 open season in 2009. Private and charter landings in state waters from the 2009-2010 low use wave (Nov 21-May 14) were not adjusted, since the state of Texas maintains a year-round fishing season.

Average weight adjustment

Analyses evaluated changes in the projected quota closure date taking into account increases in the average weight (lbs ww) of red snapper caught. Between 2007 and 2010, the average weight of a red snapper landed in the Gulf of Mexico increased from 3.32 to 5.34 lbs ww per fish. Between 2007 and 2008, there was a 29 percent increase in the average weight of red snapper landed. Between 2008 and 2009 there was an 18 percent increase in the average weight of red snapper landed. Between 2009 and 2010 there was a 5.4 percent increase in the average weight of red snapper landed. Between 2010 and 2011, stock assessment projections indicate average weight will increase by 10%. Increases in average weight appear to be tracking stock assessment projections, but at a slightly lower rate of increase (Figure 1). Increases in average weight are expected as the stock rebuilds and the number of older, larger fish in the population increases. To assess the sensitivity of the quota closure date, average sizes ranging from 5.53 lbs ww (10% percent less than projected) to 6.14 lbs ww (projected average weight for 2011 from stock assessment) were used.

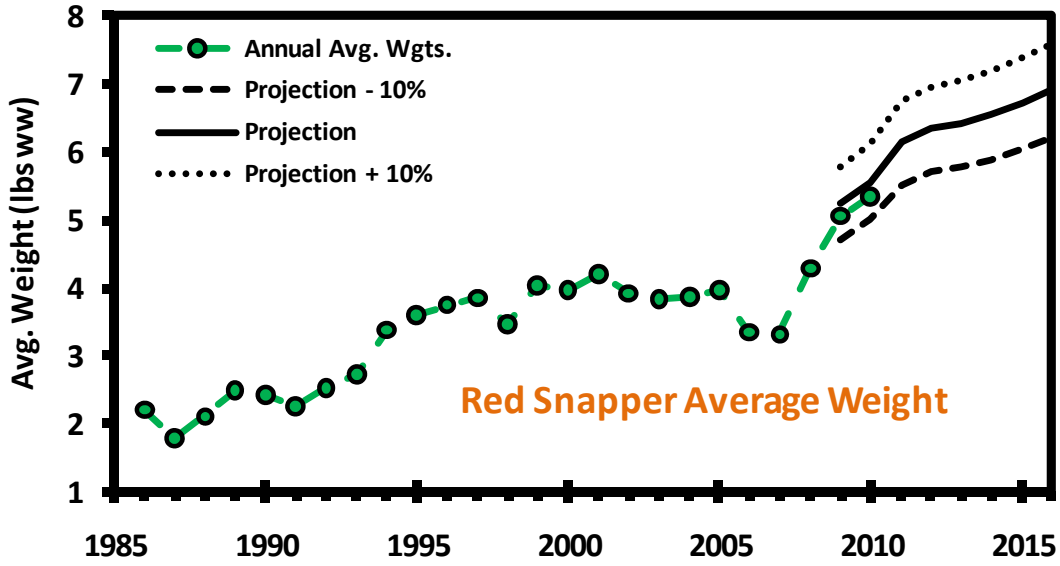

Figure 1. Estimated and projected red snapper average weights, 1986-2015.

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Method 2: Historical Trends in Fishing Effort

A second methodology was used to assess when the red snapper quota would be met. This methodology uses trends in fishing effort, historical catch rates, and projected average weights of red snapper from the stock assessment to estimate when the quota will be reached. Data for this model were obtained from MRFSS, the TPWD creel survey, and the SEFSC Headboat survey. To calculate recreational catch in pounds per day, Equation 1 was used:

$$\frac{Catch_{lbs}^{Rec}}{day} = AvgWgt * \left(\frac{Catch_{N}^{For-Hire}}{trip} * \frac{Trips_{N}^{For-Hire}}{day} + \frac{Catch_{N}^{Private}}{trip} * \frac{Trips_{N}^{Private}}{day}\right) \quad (1)$$

where *Rec* represents both sectors combined and catch in numbers is denoted by *N*. Average weight was obtained from the 2009 stock assessment. $Catch_N$ per trip was computed based on dividing the total number of red snapper caught in 2008 and 2009, by the total estimated number of directed angler trips. The years 2008-2009 were chosen to calculate angler catch-per-trip as the bag and size limits during this time period were constant and catch rates were stable. Trips-per-day were computed as described below.

To calculate the effective season length (in days), Equation 2 was used:

$$Effective\ Season\ Length\ {}_{days}^{Rec} = \frac{2011\ Quota_{lbs}^{Rec}}{\left(\frac{Catch_{lbs}^{For-Hire}}{day} + \frac{Catch_{lbs}^{Private}}{day}\right)} \quad (2)$$

Increasing Average Weight

The average weight of red snapper for 2011 is estimated by the stock assessment to be 6.14 pounds (SEFSC 2009). This average weight is a 15% increase from the reported average weight in 2010 (= 5.34 lbs ww). In 2009, the average weight projected was 5.25 pounds ww, compared to a reported average weight of 5.06 pounds ww. In 2010, the average projected weight was 5.56 pounds ww, compared to an average reported weight of 5.34 pounds ww. Average weights in 2009 and 2010 were approximately 4 percent less than projected estimates. To evaluate the sensitivity of the model to different red snapper average weights, projections were run using: 1) the stock assessment projected average weight for 2011, 2) an average weight of 5.90 pounds, which is ~4% less than the average projected weight, and 3) the stock assessment average weight for 2011 minus 10 percent.

Angler-Trips

Annual estimates of angler-trips for red snapper were computed using MRFSS, HBS, and TPWD data. An angler-trip was counted for each angler on a boat if any angler on the boat reported harvesting a red snapper. This approach is taken because if one person caught a red snapper, theoretically, anyone on the vessel could have, because the vessel fished in waters where red snapper occur.

Red snapper angler-trips were computed using MRFSS data using a modification of a catch-effort program described in Holiman (1996). The catch-effort program uses 'Type 2' (i.e., unavailable or Type B catch), 'Type 3' (i.e., available or Type A catch) and 'Type 4' (group catch) records. The program uses MRFSS effort files for expansion of intercepted catch-effort to final Gulf-wide estimates.

The SEFSC Headboat survey generates estimates of angler days, but estimates of total angler trips are not produced. To generate estimates of angler trips directly comparable to MRFSS, the following methods were used to produce estimates of headboat angler trips. The SEFSC obtains office records from operators to determine the total number of angler-trips conducted by a headboat. Based on dockside interviews and sampling, the SEFSC determines if a vessel has reported or partially reported for each month. If no records are obtained from a vessel during a month, then a proxy vessel is used to estimate landings and effort. The SEFSC uses expansion factors ('K-factors') to account for trips taken with no corresponding logbook records, both for vessels with records for some of their trips during the month (e.g., A→A expansion) and for vessels with no records during the month (e.g., A→B expansion).

For the computation of catch effort for red snapper, if a vessel reported that an angler on a trip caught a red snapper, the total angler-trips for red snapper from that headboat record is equal to the total number of anglers reported on the vessel during the trip times the relevant expansion factor. If a vessel did not report during a month, but its proxy vessel had trips reporting landings of red snapper, the total angler-trips for red snapper from the non-reporting headboat is equal to the total number of anglers reported on the proxy vessel during its trips that month times the relevant A→B expansion factor.

To compute angler-trips from TPWD data, Dr. Mark Fisher (Science Director, TPWD) queried the number of trips by area (i.e., state and federal waters) landing red snapper, and summed the number of anglers by year, area, mode, and season to get observed snapper angler-trips. Next, he summed the number of anglers by area to get observed angler-trips, match-merged the two data sets, and calculated the proportion of snapper angler-trips by dividing by total angler-trips. He then multiplied this proportion by the TPWD expanded angler-trip estimates to get snapper angler-trips.

In general, angler-trips for red snapper have increased through time, although for-hire trips have declined somewhat in recent years (Figure 2).

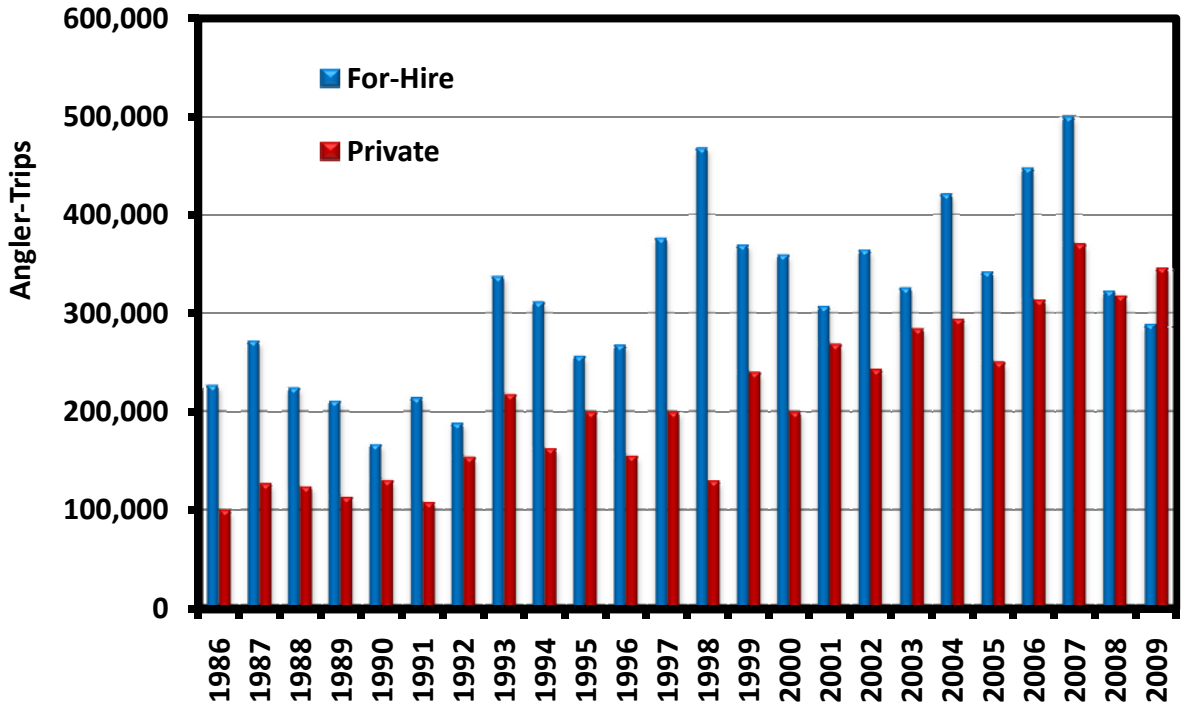

Figure 2. Angler-trips for red snapper by sector, 1986-2009.

As fishing pressure on red snapper has intensified, management measures have become increasingly restrictive, in attempts to keep the recreational sector from exceeding their quota. A primary mechanism utilized by managers has been shortening the red snapper fishing season. However, the Gulf states have not always adopted seasons compatible with the federal season. To account for this discrepancy, 'effective season length' for red snapper was computed as the weighted average of the federal and Gulf states season lengths, with the weighting terms being percent landings in federal waters and in state waters, by state.

Estimates of angler-trips per day were generated by dividing the number of angler-trips by effective days open (Figure 3). As the length of the red snapper season has decreased, the number of angler trips per day has increased.

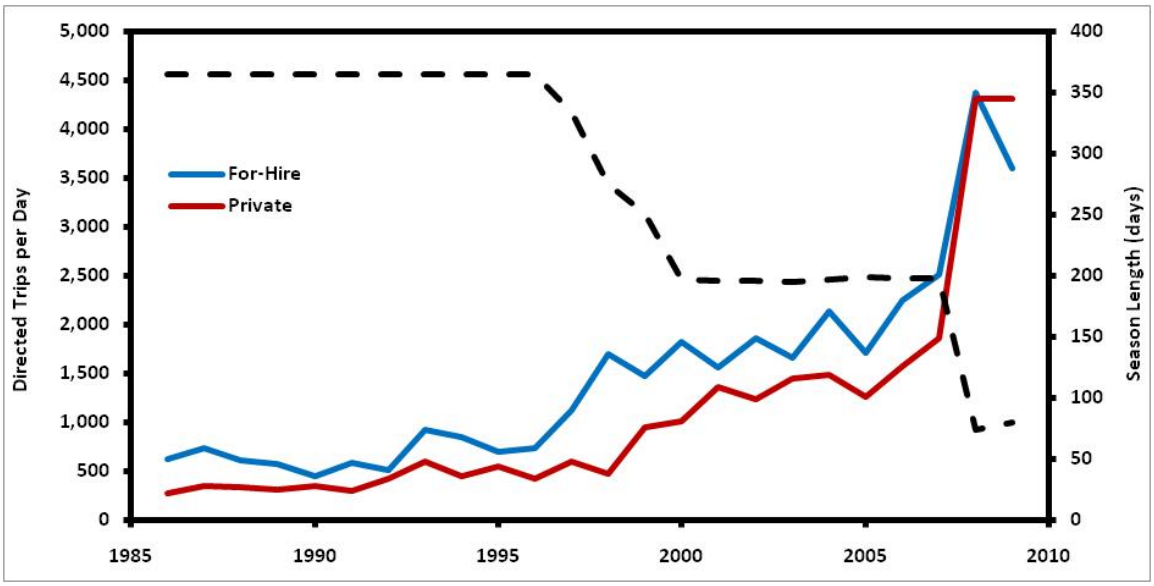

Figure 3. Red snapper angler-trips per day and effective season length, 1986-2009.

An important dynamic in the recreational red snapper fishery that can affect season length is the ability of the recreational sectors to compensate for reductions in season length by compressing their effort into a limited season. This dynamic has been observed in other fisheries, such as the red snapper commercial fishery prior to implementation of the Individual Fishing Quota program, and is commonly referred to as 'effort compensation', 'effort stuffing', or a 'derby fishery.' The term 'effort compensation' includes the dynamics of more anglers on the water during the open season (rather than spreading their effort across the year), and the ability of individual anglers or for-hire vessels to run multiple trips in a day.

The *Curve Estimation* procedure in SPSS 17.0 (PASW Statistics Inc.) was used to fit logarithmic regressions to effective season length and angler trips per day for both the for-hire and private sectors (Figure 4). Regression fits were significant (For-Hire: $F_{1,33}$=333.5, p<0.001; Private: $F_{1,33}$=278.5, p<0.001), with log-transformed effective season lengths explaining 94% of the variability in for-hire angler trips per day and 93% of the variability in private angler trips per day. Regression coefficients are provided in Appendix 2.

Predicting the ability of the fishery to compensate for a season potentially shorter than 65 days is challenging, given the lack of data beyond this point. The regression relationships in Figure 4 were used to simulate angler effort compensation under two scenarios: (1) Assuming effort compensation increases as the season gets shorter, and (2) Assuming effort compensation peaked at the highest observed annual average value (For-Hire: 4,377 angler trips per day; Private: 4,318 angler trips per day).

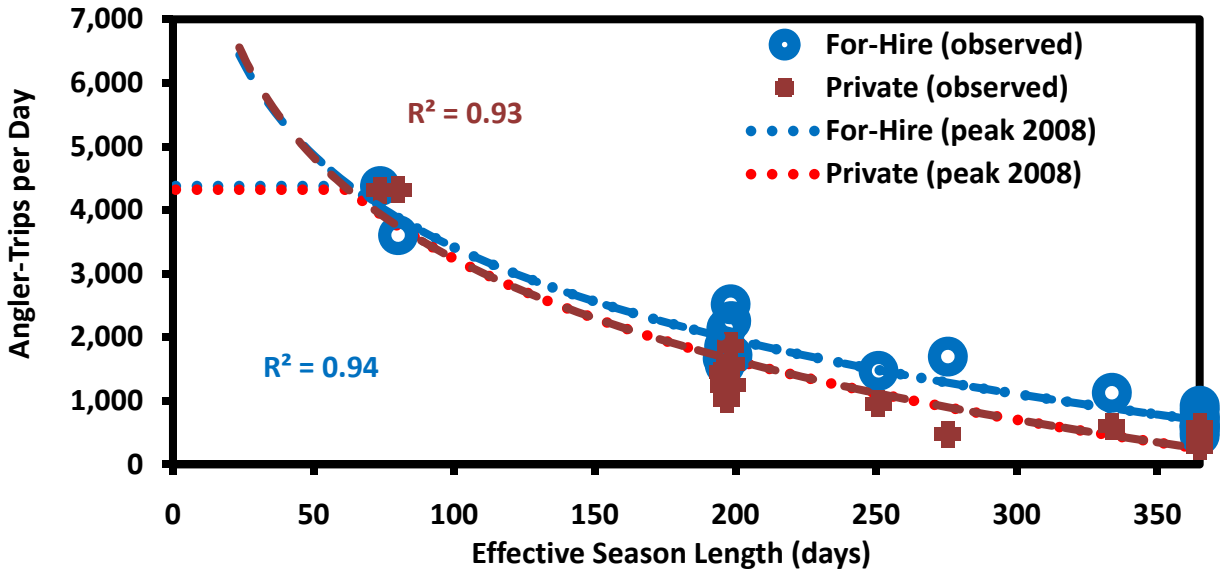

Figure 4. Logarithmic relationship between red snapper angler-trips per day relative to effective season length used to predict effort compensation dynamic. Dotted lines represent simulated effort compensation with saturation at highest observed point.

The maximum allowable season is estimated utilizing *Solver* to calculate the effective season length that would minimize the difference between the projected catch and the allocated catch. As Texas is not expected to adopt compliant regulations, the projected season was adjusted to account for landings in Texas state waters. During 2010, 43,337 pounds of red snapper were landed by charter and private vessels in Texas during the low-use wave (see Table 2). An additional 34,064 pounds of red snapper were landed by headboats in 2010 during months when the federal season was closed. These landings represent 2.1% of the 2011 quota, and result in in a loss of one day to the federal season.

Results and Discussion

The recreational Gulf of Mexico red snapper quota is projected to be met in mid-July, if all Gulf States except Texas adopt fishing seasons consistent with the federal fishing season (Tables 4 and 5). If Gulf States do not adopt consistent fishing seasons, then the federal fishing season is expected to be substantially shorter than predicted herein.

Method 1 estimates the season length to be between 45 and 50 days depending on the average weight of red snapper harvested. Method 2 estimates the season length to be between 46 and 51 days if effort saturates at the highest observed levels, and between 36 and 44 days if effort compensation continues to increase as the season is shortened (see Figure 4). Similar to Method 1, the length of the season estimated by Method 2 is contingent on the average weight of red snapper harvested.

Reported average weights of red snapper during 2009 and 2010 were approximately 4 percent less than projected. If average weights for 2011 remain 4 percent less than projected (=6.14 lbs

ww), then the average weight will be approximately 5.9 lbs ww. Based on an average weight of 5.9 pounds, the season length is estimated to be between 39 and 48 days. The shortest season is based on effort compensation continuing to increase as the season is shortened, while the longest season assumes effort becomes saturated and anglers cannot compress any additional effort into the open season as the season becomes shorter. Based on methods used historically to project the red snapper season and an average weight of 5.9 lbs ww, the season is estimated to be 46 days. It is estimated that each day the red snapper is open, an average of 72,000-88,000 lbs of red snapper are landed.

Method 1 assumes effort will remain consistent at 2009 levels, while Method 2 allows effort to either saturate at peak historic levels or continue to increase as the season length is reduced beyond the shortest observed. If 2011 effort is lower than projected, owing to high fuel prices, after-effects of the BP/DeepWater Horizon oil spill, and economic factors, then a longer season than those presented in this report might be required to catch the entire recreational quota. However, it should be noted that in 2008, relative economic conditions in the Gulf were worse than those anticipated in 2011, the red snapper season was limited to 65 days, and although less than that predicted for 2011, average fuel prices were the highest on record (Appendix 3). Despite these constraints, angler trips per day were the highest on record, and the 2.45 mp ww recreational quota was exceeded by 1.26 million lbs.

Setting the season length based on shorter season estimates will reduce the risk of a quota overage, but increases the likelihood that the quota may not be harvested. An increase in the 2012 recreational quota of 147,000 pounds is contingent on the annual catch limit not being exceeded in 2011. If the annual catch limit is exceeded, then the quota would not be increased. Additionally, if the fixed summer season results in an underage in quota harvested, the NOAA Fisheries Service Assistant Administrator has authority to reopen the recreational red snapper season to harvest any remaining quota (50 CFR 622.42).

The Gulf of Mexico Fishery Management Council has also requested their Scientific and Statistical Committee (SSC) review the acceptable biological catch (ABC) for 2011. The Southeast Fisheries Science Center will provide update projections to the SSC during their May 2011 meeting. The SSC may decide to increase the ABC for red snapper based on these projections. If the ABC is increased then season lengths projected in this report would be longer.

Table 4. Projected 2011 recreational red snapper federal season lengths using Method 1.

Scenario	Avg Weight	Federal Season	Days Open
1	6.14	Jun 1-Jul 15	44
2	5.90	Jun 1-Jul 16	46
3	5.53	Jun 1-Jul 20	50

Table 5. Projected 2011 recreational red snapper federal season lengths using Method 2. Scenario 1 uses the average weight projected from SEDAR (2009). Scenario 2 assumes an average weight of 5.9 lbs, which is ~4% less than the projected average weight from SEDAR (2009). Scenario 3 uses an average weight projected from SEDAR (2009) minus 10%.

		Days Opens if:	
Scenario	Avg. wgt	Effort comp saturates	Effort comp continues
1	6.14	46	36
2	5.90	48	39
3	5.53	51	44

References

SEDAR 7. 2005. Stock assessment report of SEDAR 7 Gulf of Mexico red snapper. SEDAR (http://www.sefsc.noaa.gov/sedar/), Charleston, South Carolina. 480 p.

SEDAR Red Snapper Update. 2009. Stock assessment of red snapper in the Gulf of Mexico: Report of the update assessment workshop, Miami, Florida. 224 p.

SERO. 2010. 2010 recreational red snapper quota closure analysis. SERO-LAPP-2010-01. NMFS, Southeast Regional Office, St. Petersburg, Florida. 8 p.

Appendix 1: 2009 Red Snapper Landings

Table A1(a). 2009 recreational red snapper landings by mode. Charter and private landings are from MRFSS and headboat landings are from the SEFSC.

	Landings (lbs ww) by Mode			
Wave	Charter	Private	Headboat	Grand Total
Jan-Feb	0	0	34,585	34,585
Mar-Apr	0	0	65,027	65,027
May-Jun	423,816	1,259,635	286,019	1,969,470
Jul-Aug	737,271	1,192,545	404,066	2,333,882
Sep-Oct	6,445	1,292	6,300	14,036
Nov-Dec	0	0	9,908	9,908
Grand Total	1,167,532	2,453,471	805,905	4,426,908

Table A1(b). 2009 recreational red snapper landings from the TPWD creel survey.

	Landings (lbs ww) by Mode		
Season	Charter	Private	Grand Total
Nov 21-May 14	0	11,287	11,287
May 15-Nov 20	28,783	120,327	149,110
Grand Total	28,783	131,614	160,397

Appendix 2: Logarithmic regression coefficients for angler trips per day vs. effective season length.

Table A2(a). Logarithmic regression coefficients for for-hire sector angler trips per day vs. effective season length.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
ln(E_Days)	-2098.150	114.899	-.969	-18.261	.000
(Constant)	13073.875	637.909		20.495	.000

Table A2(b). Logarithmic regression coefficients for private sector ATPD vs. effective season length.

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
ln(E_Days)	-2303.798	138.037	-.963	-16.690	.000
(Constant)	13842.264	766.369		18.062	.000

Appendix 3: Observed (1992-2010) and predicted (2011-2012) economic conditions in the Gulf of Mexico.

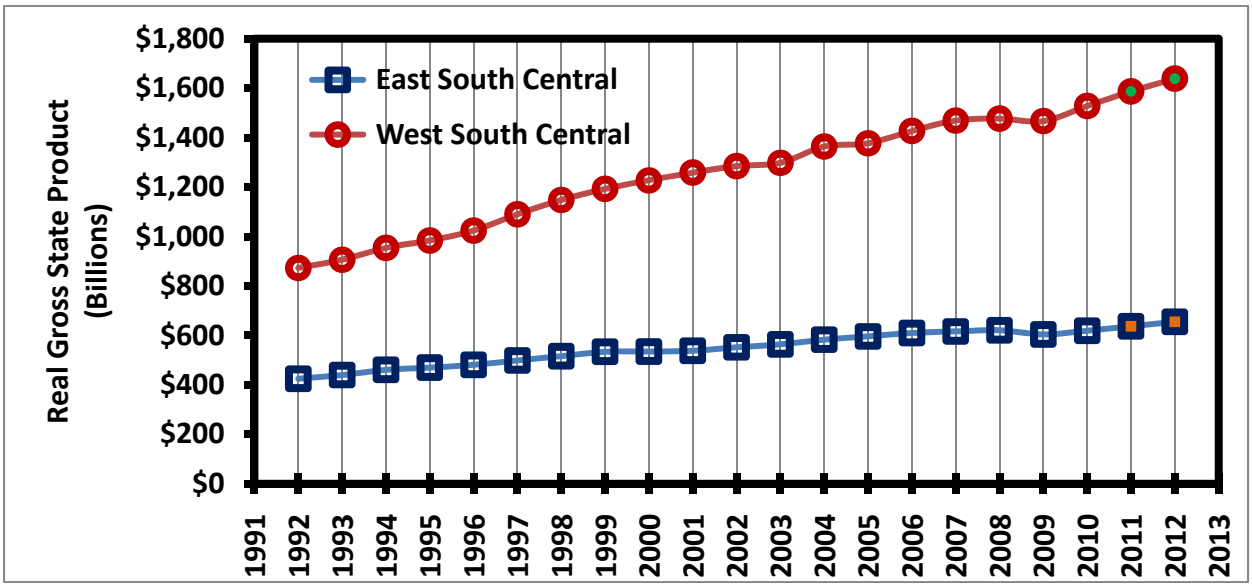

Figure A3(1). Observed (1992-2010) and predicted (2011-2012) economic conditions in the Gulf of Mexico (both U.S. Census regions) as expressed by Real Gross State Product (billion chained 2005 dollars). Source: U.S. Energy Information Administration; http://www.eia.doe.gov/emeu/steo/pub/contents.html (Accessed April 18, 2011).

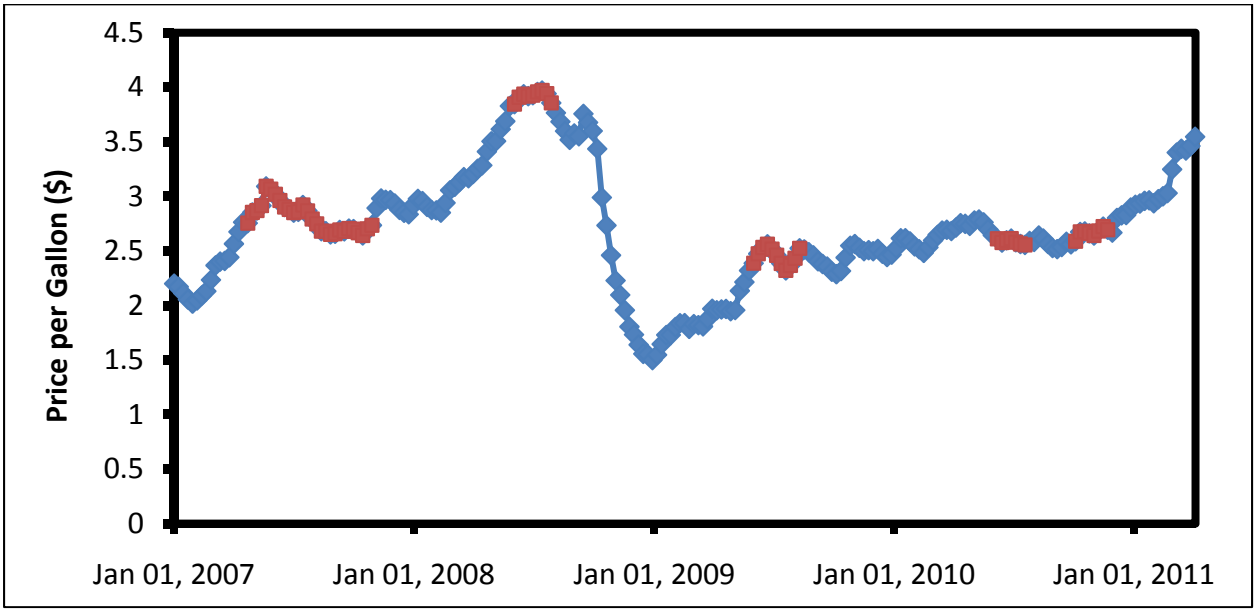

Figure A3(2). Observed (Jan 2007-Apr 2011) weekly Gulf coast regular gas prices, including taxes. Prices in red were during red snapper open seasons. Source: U.S. Energy Information Administration; http://www.eia.doe.gov/emeu/steo/pub/contents.html (Accessed April 18, 2011).