Five Year Projections of the Recreational Red Snapper Fishing Season Length

NOAA Fisheries Service
Southeast Regional Office
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Abstract

Since 2007, the Gulf of Mexico recreational red snapper season length has been reduced from 194 days to 46 days. In 2013, the season length is projected to be 27 days (range 24-30 days; SERO 2012-01). Five year projections (2013-2017) were developed to evaluate if a stable season length can be achieved over the next five years (2013-2017). Because catch rates and average weights are difficult to predict more than a few years out, several analyses were performed using different projected recreational catch rates and average weights. Scenario 1 allowed catch rates per day (in numbers) and average weights to increase at linear rates consistent with current trends. Scenario 2 increased average weights at a linear rate but scaled increases in recreational landings per day relative to stock assessment projected increases in exploitable abundance (age 3+ fish). Scenario 3 increased recreational landings per day at a linear rate but scaled increases in average weight relative to assessment estimated increases in average weight. Scenario 4 scaled both average weights and recreational landings per day relative to projected average weights and exploitable abundance, respectively. Three allocation scenarios were investigated. These included: 1) maintaining the status quo 51% commercial: 49% recreational allocation, 2) incrementally shifting the allocation until the commercial sector achieves a 4.65 million pound quota in 2017, and 3) shifting future increases in catch entirely to the recreational sector,. Results indicate under most scenarios the season will continue to get shorter under status quo regulations and the current 51:49 allocation. Only Scenario 4 catch rates predicted the season length would stabilize at approximately 27-28 days over the next five years. Incrementally shifting allocation until the commercial allocation equaled 4.65 million pounds in 2017 resulted in the season length still declining under all scenarios except Scenario 4, albeit more slowly. Reallocating all future quota increases from the commercial sector to the recreational sector resulted in the season length stabilizing at 30 days under Scenarios 2 and 3 and increasing under Scenario 4. Only Scenario 1, which estimated the highest landings per day resulted in the fishing season continuing to get shorter. Although this analysis focused on shifts in allocation, other regulatory measures may also exist to extend or stabilize the length of the fishing season. These include, but are not limited to, shifting the start and end dates of the fishing season to time periods with lower effort, establishing a lower bag limit, establishing a slot limit to reduce the average weight of fish caught, implementing effort limitation (e.g., days at sea, reef fish stamp, etc.), and state-by-state regional management.

Introduction

The red snapper rebuilding plan was revised in 2007. At that time, lower quotas and bag limits were implemented to reduce fishing mortality and end overfishing of red snapper. As the stock has rebuilt, recreational anglers have experienced higher catch rates and caught larger, heavier fish (SERO 2012-10). Despite quota increases in 2010-2012, the recreational fishing season has become increasingly shorter over time. Since 2007, the recreational fishing season has shrunk from 194 days to 46 days. In 2013, the recreational fishing season is estimated to be even shorter at 27 days (SERO 2012-10). If recent trends continue, the recreational fishing season will continue to get shorter as derby fishing conditions persist. The following analysis evaluates the length of the red snapper fishing season under various assumed catch rates, average fish weights, and allocations to determine if a stable season length can be achieved over the course of the next five years (2013-2017).

Data Sources

Data used for this analysis are from multiple sources. For more information about data sources used in this report see SERO (2012-10), SEDAR (2009), and SEFSC (2012). Data used from SERO-2012-10 included projected recreational landings per day and projected average weights (Figures 1-2). Additionally, projected average weights, acceptable biological catches, and exploitable abundance estimates (age 3+) through 2017 were obtained from the red snapper stock assessment (see Figures 3-4 and Table 1; B. Linton, pers. comm., Nov/Dec 2012).

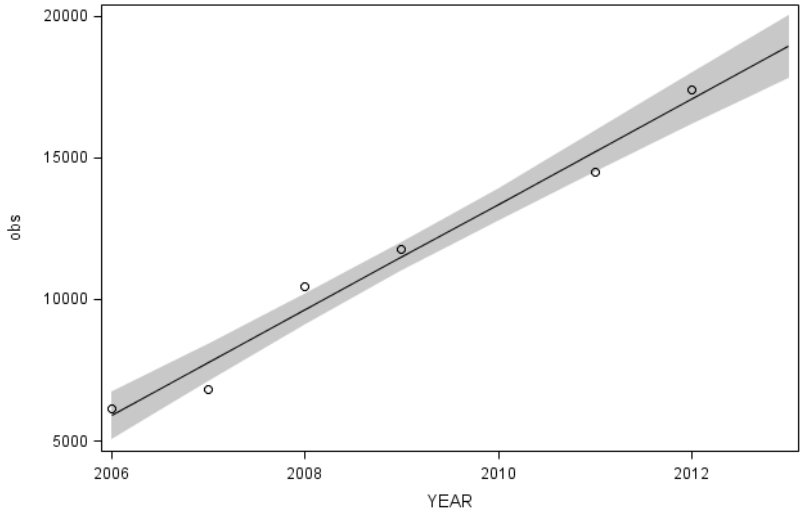


Figure 1. Observed (circles) and predicted (line) in-season catch rates (numbers of fish per open day) for Gulf recreational red snapper, 2006-2013. Shaded gray area denotes 95% confidence limits.

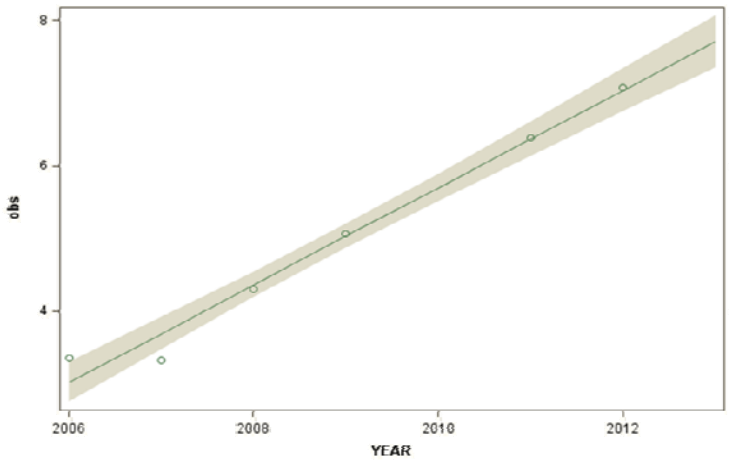


Figure 2. Observed (circles) and predicted (line) average weights of red snapper, 2006-2013. Shaded gray area denotes 95% confidence limits.

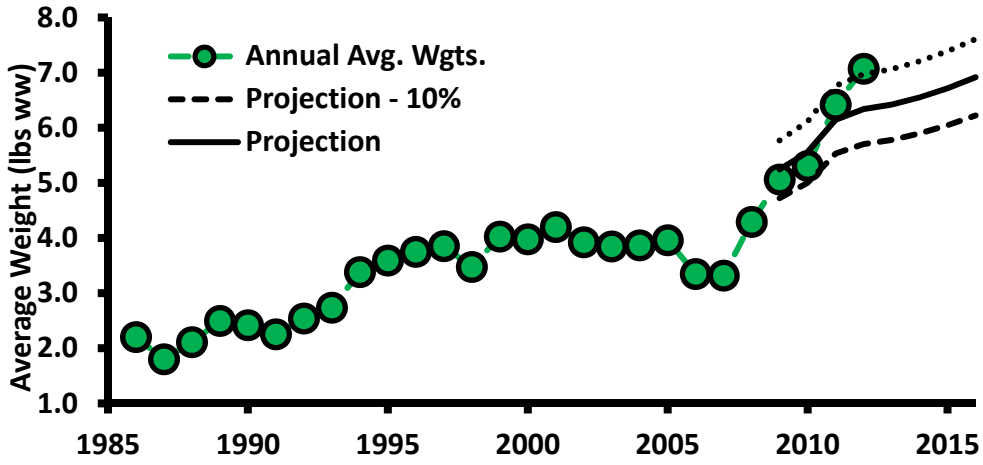


Figure 3. Reported and predicted average weights of red snapper, 2000-2013.

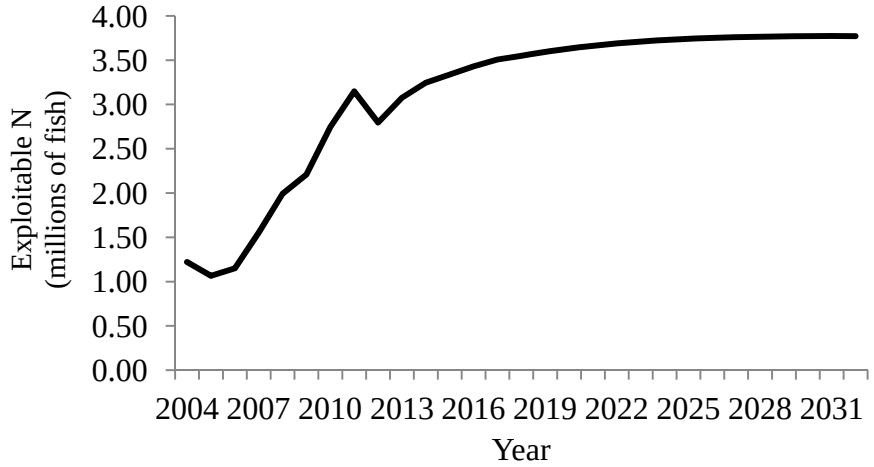


Figure 4. Projected change in abundance (age 3+) of recreationally exploitable Gulf red snapper (SEDAR-7 2009; B. Linton, pers. comm., Nov 2012).

Table 1. Projected Gulfwide red snapper yields at 75% of Fspr26% (i.e., Foy). Yields are reported in millions of pounds whole weight and are based on the AS3 stock assessment model assuming shrimp effort is consistent with effort levels assumed in the red snapper rebuilding plan (SEFSC 2012).

Year	Projected Yield (ABC)
2013	8.462
2014	9.038
2015	9.624
2016	10.224
2017	10.678

Methods

Estimated recreational red snapper season lengths were predicted for 2013-2017. To calculate season lengths, recreational landings per day (in numbers) and average weights for 2013-2017 were estimated using general linear models (see Figures 1-2, Table 2) per SERO 2012-10. Because increases in exploitable abundance are predicted to slow as the stock rebuilds, (Figures 3-4), linear increases in recreational landings per day and average weights may overestimate future catch rates. To account for the slowing rate of exploitable abundance, in-season catch rates for 2014-2017 were adjusted relative to the 2013 catch rate using the relative rate of change in exploitable abundance estimated from the red snapper stock assessment (Table 2). Similarly, to account for slower growth of fish as the stock rebuilds, average weights for 2014-2017 were adjusted relative to the 2013 estimated average weight using the relative rate of change in average weight predicted by the red snapper stock assessment (Table 2; SEDAR 2009).

Table 2. Relative rates of change in exploitable abundance (age 3+) and average weight from the red snapper stock assessment. Rates of change are relative to 2013.

	% Change Relative to 2013	
Year	Exploitable N	Avg. Wgt
2013	0.0%	0.0%
2014	4.3%	1.7%
2015	6.8%	4.1%
2016	10.1%	7.1%
2017	12.7%	9.2%

Four catch rate/average weight combinations were used for projections:

1) Scenario 1: Catch rates per day (in numbers) and average weights increase at linear rates over the next five years (see Figures 1-2).

2) Scenario 2: Average weights increase at a linear rate over the next five years (Table 6), but catch rates per day (in numbers) increase at the same rate as exploitable abundance (age 3+ fish) after 2013 (Table 5).
3) Scenario 3: Catch rates per day (in numbers) increase at a linear rate over the next five years (Table 5), but average weights increase at the same rate as stock assessment projected average weights after 2013 (Table 6).
4) Scenario 4: Average weights increase at the same rate as projected by the stock assessment and catch rates per day (in numbers) increase at the same rate as exploitable abundance (age 3+ fish) after 2013 (Tables 5-6).

Using the various catch rates and average weights described above, numerous allocation scenarios were then explored to calculate the length of the recreational fishing season. Allocation scenarios included: 1) maintaining the status quo 51% commercial: 49% recreational allocation; 2) incrementally shifting the allocation during annual quota increases until the commercial sector achieved a 4.65 million pound whole weight (mp ww) quota in 2017; and 3) shifting future increases in quota entirely to the recreational sector (Tables 3-4). Under the third allocation scenario, the commercial quota would be maintained at 4.121 mp ww.

Table 3. Recreational:commercial allocations explored in this analysis

	Scenario 1: Status Quo		Scenario 2: Incremental		Scenario 3: Rec Increase Only	
Year	Rec	Comm	Rec	Comm	Rec	Comm
2013	49%	51%	51%	49%	51%	49%
2014	49%	51%	53%	47%	54%	46%
2015	49%	51%	54%	46%	57%	43%
2016	49%	51%	56%	44%	60%	40%
2017	49%	51%	56%	44%	61%	39%

Table 4. Recreational and commercial quotas explored in this analysis based on yields summarized in Table 1 and allocations summarized in Table 3.

	Scenario 1: Status Quo		Scenario 2: Incremental		Scenario 3: Rec Increase Only	
Year	Rec	Comm	Rec	Comm	Rec	Comm
2013	4.146	4.316	4.341	4.121	4.341	4.121
2014	4.429	4.609	4.785	4.253	4.917	4.121
2015	4.716	4.908	5.239	4.386	5.503	4.121
2016	5.010	5.214	5.706	4.518	6.103	4.121
2017	5.232	5.446	6.028	4.650	6.557	4.121

To calculate the recreational season length for each year, Excel Solver was used to solve for the number of federal season days in the following equation:

$$\frac{Lbs}{Inseason\ Day} \times Fed\ Season + (365 - Fed\ Season) \times \frac{Lbs}{Out\ of\ Season\ Day} - (ABC \times \%Rec.\ Alloc.) = 0$$

In season landings per day (in pounds) were calculated as the product of landings per day in numbers times the estimated annual average weight. Catch rates were also calculated for out-of-season landings to account for non-compatible state regulations and illegal harvest. SERO 2012-10 provides additional details on how out-of-season catch rates were computed. Out-of-season landings per day in numbers were held constant over time at approximately 73 fish per day (based on 2012 data when available, 2011 data when 2012 unavailable), but did increase when converted to pounds at the same rate as average weight increases.

Results

Landings per day in numbers estimated by the general linear model and by scaling landings relative to changes in exploitable abundance are summarized in Table 5. The generalized linear regression model fit for red snapper landings-per-day indicated a strong positive linear trend (LR χ^2=22.17, p<0.0001, R^2 = 0.98) in catch rates over time. Catch rates were estimated to increase by approximately 1,860 fish per day per year (Figure 1). Landings per day were projected to increase from 18,922 fish in 2013 to 26,362 fish in 2017. Scaling increases in landings per day relative to exploitable abundance resulted in landings per day increasing from 18,922 fish in 2013 to 21,342 fish in 2017.

Table 5. Estimated in-season landings per day (in numbers). Projected landings per day calculated using : 1) a general linear model (Linear) of historical catch per day by year, and 2) by scaling landings per day in 2014-2017 relative to landings per day in 2013 using the relative change in exploitable abundance from the red snapper stock assessment (Scaled to Exp_N).

	Landings per day (n)	
Year	Linear	Scaled to Exp_N
2013	18,922	18,922
2014	20,782	19,730
2015	22,642	20,205
2016	24,502	20,827
2017	26,362	21,324

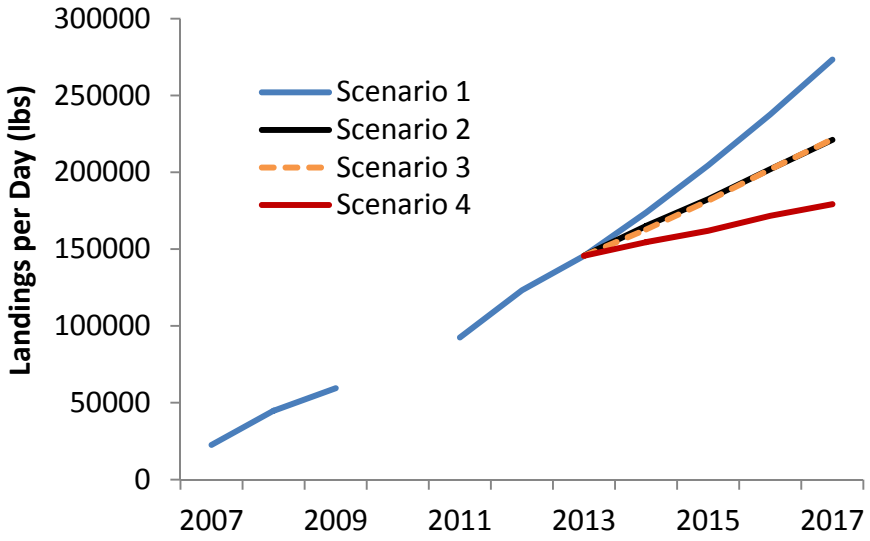
Average weights estimated by general linear modeling and by scaling average weights relative to projected average weights from the stock assessment are summarized in Table 6. Generalized linear regression model fits for red snapper average weights (LR χ^2=23.32, p<0.0001, R^2 = 0.98) indicated a rapidly increasing linear trend of approximately 0.67 lbs ww per year (Figure 2). The general linear model predicted average weight would increase from 7.7 pounds in 2013 to 10.37 pounds in 2017. Scaling average weight to projected average weights resulted in average weight increasing from 7.7 pounds in 2013 to 8.4 pounds in 2017.

Table 6. Estimated average weights of red snapper (lbs). Projected average weights were calculated using: 1) a general linear model (Linear) of historical average weight by year, and 2) scaling average weights in 2014-2017 relative to the projected 2013 average weight using relative changes in predicted average weights from the stock assessment (Scaled to Exp_N).

	Average Weight (lbs)	
Year	Linear	Scaled to Proj Avg. Wgt.
2013	7.70	7.70
2014	8.37	7.83
2015	9.03	8.01
2016	9.70	8.24
2017	10.37	8.40

Estimated landings per day (in pounds) are summarized in Figure 5. Landings per day increased from 145,642 pounds in 2013 to 273,390 pounds in 2017. Scenarios 2 and 3 resulted in nearly identical changes in landings per day. By 2017, both scenarios predicted landings per day of approximately 221,000 pounds. Scenario 4 resulted in the smallest change in landings per day over the five year time period. Landings per day (in pounds) increased from 145,562 pounds in 2013 to 179,214 pounds in 2017.

Figure 5. Projected landings per federal season day. See pages 4-5 for a description of each scenario.



Tables 7-10 summarize projected season lengths under a variety of allocations and catch rates. With the exception of Scenario 4, the recreational red snapper season was projected to get shorter each year under the status quo 51:49 allocation (Tables 7-10). Only Scenario 4 catch rates predicted the season length would stabilize at approximately 27-28 days over the next

five years (Table 10). Incrementally shifting allocation until the commercial allocation equaled 4.65 million pounds in 2017 resulted in the season length still declining under all scenarios (Tables 7-10) except Scenario 4 (Table 10), albeit more slowing. Reallocating all future quota increases from the commercial sector to the recreational sector resulted in the season length stabilizing at 30 days under Scenarios 2 and 3 (Tables 8-9) and increasing based on Scenario 4 (Table 10). Only Scenario 1, which estimated the highest landings per day resulted in the fishing season continuing to get shorter (Table 7).

Table 7. Projected season lengths for various recreational: commercial allocations based on Scenario 1 landings per day (in lbs).

	Maintain 51:49 status quo allocation		Incrementally shift allocation until 4.65 mp comm quota		Shift future quota increases to rec sector	
Year	Quota	Days Open	Quota	Days Open	Quota	Days Open
2013	4.146	27	4.341	30	4.341	30
2014	4.429	24	4.785	28	4.917	28
2015	4.716	22	5.239	26	5.503	27
2016	5.010	20	5.706	24	6.103	26
2017	5.232	18	6.028	22	6.557	24

Table 8. Projected season lengths for various recreational: commercial allocations based on Scenario 2 landings per day (in lbs).

	Maintain 51:49 status quo allocation		Incrementally shift allocation until 4.65 mp comm quota		Shift future quota increases to rec sector	
Year	Quota	Days Open	Quota	Days Open	Quota	Days Open
2013	4.146	27	4.341	30	4.341	30
2014	4.429	26	4.785	29	4.917	30
2015	4.716	25	5.239	29	5.503	30
2016	5.010	24	5.706	28	6.103	30
2017	5.232	22	6.028	27	6.557	30

Table 9. Projected season lengths for various recreational: commercial allocations based on Scenario 3 landings per day (in lbs).

	Maintain 51:49 status		Incrementally shift		Shift future quota	
Year	Quota	Days Open	Quota	Days Open	Quota	Days Open
2013	4.146	27	4.341	30	4.341	30
2014	4.429	26	4.785	29	4.917	30
2015	4.716	25	5.239	29	5.503	30
2016	5.010	24	5.706	28	6.103	30
2017	5.232	23	6.028	28	6.557	30

Table 10. Projected season lengths for various recreational: commercial allocations based on Scenario 4 landings per day (in lbs).

	Maintain 51:49 status quo allocation		Incrementally shift allocation until 4.65 mp comm quota		Shift future quota increases to rec sector	
Year	Quota	Days Open	Quota	Days Open	Quota	Days Open
2013	4.146	27	4.341	30	4.341	30
2014	4.429	27	4.785	31	4.917	32
2015	4.716	28	5.239	32	5.503	34
2016	5.010	28	5.706	33	6.103	36
2017	5.232	28	6.028	34	6.557	37

Discussion

The results of this analysis are highly contingent on predicted future catch rates and red snapper average weights. Historical trends in catch rate and average weight clearly show increasing linear trends, but it is unclear how long these trends will continue. As the red snapper stock rebuilds, exploitable abundance and average weights are predicted to slow. If this occurs, then future quota increases should result in slightly longer fishing seasons.

Under status quo management regulations (i.e., fixed open season, 2-fish bag limit, 16" size limit), projections indicate that the recreational fishing season length will continue to get shorter. Only the most optimistic scenario (Scenario 4), which predicts greatly slowing average weights and catch rates in the next five years indicates a stable fishing season can be achieved (see Table 10). Incrementally shifting allocation slows the rate of decline of the recreational fishing season, but still may not be sufficient to prevent it from getting shorter. Shifting all future quota increases from the commercial sector to the recreational sector may be sufficient to stabilize the length of the recreational fishing season. Only under the most pessimistic

scenario (Scenario 7), does the season get shorter despite reallocating all future quota increases to the recreational sector.

Many other factors not considered herein may affect future trends in catch and fish size. These include, but are not limited to: changes in fuel prices, prevailing economic conditions, recruitment of fish to the fishery, faster or slower than expected rebuilding progress, hi-grading of fish, angler behavior in response to regulatory changes, etc. It is not possible to fully predict what affects these and other factors would have on projections summarized herein. Higher fuel prices and poor economic conditions are expected to reduce effort and slow catch rates. Progress made toward rebuilding will be determined during the 2013 red snapper benchmark assessment, at which time these projections can be refined. Hi-grading would lead to larger than expected fish being landed, resulting in shorter fishing seasons. Given many unknowns, our analysis used a wide range of scenarios to capture variability in catch rates and average weights.

Although this analysis focused on reallocating between the commercial and recreational sector to examine trends in season length, numerous other management measures could be considered by the Gulf of Mexico Fishery Management Council (Gulf Council) to extend or stabilize the length of the fishing season. These include, but are not limited to: shifting the start and end dates of the fishing season to time periods with lower effort, establishing a lower bag limit, establishing a slot limit to reduce the average weight of fish caught, implementing effort limitation (e.g., days at sea, reef fish stamp, etc.), and state-by-state regional management.

Shifting the start and/or end date of the fishing season may result in more fishing days. Fishing effort is lower during winter and fall and higher during spring and summer in most areas of the Gulf of Mexico. Moving the season to time periods of lower fishing effort will allow for more fishing days. However, fishing conditions may be worse during these time periods and summer tourists would not have the opportunity to harvest red snapper beginning June 1.

Establishing a lower bag limit would reduce the amount of fish landed per angler. Analyses summarized in SERO (2012-11) indicate a reduction in the bag limit from 2 to 1 fish would increase the red snapper season length by as much as 1.61X (27 -> 44 days) assuming fishermen do not compensate for the lower bag limit by harvesting larger fish. Lowering the bag limit would result in more red snapper being discarded during the open season. However, because the open season would be longer, less fish would be discarded during the closed season.

Implementing a slot limit could extend the fishing season if it results in a lower average weight of fish landed. The current minimum size limit is 16 inches total length. Analyses would need to be conducted to determine how various maximum size limits would affect the average weight of fish landed. Negatives to this approach would include higher discards and discard mortality of older, larger fish. Additionally, tournament fishermen would be unable to retain trophy catches.

Effort limitation is another option that could aid in lengthening the recreational red snapper season. Limited access permits are already required for the charter for-hire fleet, but the Gulf Council has discussed developing a days-at-sea program for for-hire vessels. Catch share programs for the for-hire sector could also rationalize effort but would be challenging to implement due to a lack of catch history. Currently the private recreational sector remains open access. Given growing coastal population growth, the Gulf Council may want to consider ways to limit or restrict recreational fishing effort. Recreational tag programs have been previously discussed by the Gulf Council. A reef fish stamp for fishing licenses has also been discussed, although mostly in the context of data collection and not effort limitation.

Lastly, regional management by states may provide an avenue for lengthening the season. States could work directly with their constituents to determine time periods to open and close red snapper. States would need to agree on a formula for setting state quota allocations for recreational red snapper. Additionally, state regulations would need to e consistent with the Gulf Council's reef fish fishery management plan, as well as the Magnuson-Stevens Act and other applicable federal laws.

In conclusion, the federal red snapper fishing season is predicted to continue to get shorter under status quo management regulations for most scenarios. Reallocating red snapper may slow the decline in season length or potentially stabilize it, but results are highly contingent on catch rates and average weights assumed. Additionally, reallocation would negatively affect the commercial sector through increased bycatch. Beyond reallocation, numerous other regulatory options exist that the Gulf Council could also consider to extend or stabilize the red snapper season length.

References

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