

Investigating the Impact of Carrying Over a Theoretical Landings Underage on the Ability to Achieve Rebuilding Targets for Gulf of Mexico Red Snapper

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1. INTRODUCTION

At its August 2016 meeting, the Gulf of Mexico Fishery Management Council ('the Council') requested that Council staff and the National Marine Fisheries Service analyze the impacts of carrying over unharvested red snapper quota from one year to the next. Because of the implementation of a 20% Annual Catch Target (ACT) buffer in 2014, the recreational sector has recently harvested less than the allocated Annual Catch Limit (ACL). Concerns have been raised that, due to the recreational fishery not achieving its allocated catch, projected catches might be lower than necessary to achieve rebuilding targets. The Southeast Fisheries Science Center (SEFSC) was tasked with providing information on the impacts of a carry-over provision for Gulf of Mexico red snapper including recommendations on the percentage of unharvested quota that can be carried over without negatively impacting the red snapper rebuilding plan.

Using the 2014 SEDAR 31 Update Stock Synthesis 3 model (terminal year 2014), a series of fixed catch projections were performed to investigate the impact of a theoretical underage in 2015, which was then carried over to 2017. A base projection (assuming landings that achieved rebuilding) was compared to an underage projection to investigate whether a carry-over provision could be expected to maintain rebuilding goals. The underage projection implemented a 20% underage, for all commercial and recreational fleets, because it was thought to represent the maximum possible underage for red snapper (given the 20% recreational buffer and recent realized catches).

2. METHODS

The results presented in this paper were based on deterministic projections conditioned on the base model from the 2014 update of the SEDAR 31 Gulf of Mexico red snapper assessment (SEDAR, 2015). Utilizing the results of the base assessment model, two sets of projections were implemented using Stock Synthesis (SS3, V3.24U; Methot and Wetzel, 2013). The base projections fixed landings at the level that achieved rebuilding to a spawning potential ratio (SPR) of 26% by 2032 (catches were taken from the final SEDAR 31 Update projections; SEDAR, 2015). The underage projections differed in that projected landings in 2015 were assumed to be 20% less than the base landings (Table 1). The underage was implemented as a 20% reduction in landings for each of the directed fleets (in native units for that fishery; pounds for the commercial fleet and number of fish for the recreational fleet). A carry over was then implemented where the underage for each directed fleet in 2015 was then added back to the corresponding fleets' landings, in its entirety, in 2017 (Table 1). Landings for the remainder of the timeseries (2018-2032) were then fixed at the same values as the base projection (Table 2).

Except for differences in 2015 and 2017 landings, all assumptions for both projections followed those outlined in the 2014 SEDAR 31 Update Assessment document (SEDAR, 2015) including: fishery selectivity, discarding, and retention practices continued as they had in the three most recent years of the assessment (2011 – 2013); forecasted recruitments were assumed to continue at the average of the recent time period (1984 - 2013); the fishing mortality levels for the 6 bycatch fleets (shrimp, recreational closed season, and commercial without IFQ allocation, each with an eastern and western component) were held constant at the 2013 estimated level for all years of the projections; the relative distribution of fishing

mortality for fleets within each sector was assumed to remain in a constant proportion based on the average distribution from 2011-2013; and the fishing mortality rates for the directed fleets were constrained to maintain the current catch allocations of 48.5% to the commercial sector and 51.5% to the recreational sector.

Timeseries of realized SPR were compared between the two projection runs in order to determine if the carry-over of the theoretical 2015 underage would be expected to maintain the federally mandated rebuilding schedule for red snapper. Given that the projected 20% underage was utilized because it represented the theoretical maximum that might be expected for red snapper, any percentage underage below this value would be expected to demonstrate similar, if not better, qualities in relationship to maintaining rebuilding timelines.

3. RESULTS

The 2015 underage resulted in a nearly 3 million pound difference in landings compared to the base projection, which then resulted in a similar increase in landings for the underage projection compared to the base projection in 2017 (Table 1, Figure 1). When compared in pounds, a slight discrepancy in the value of the underage compared to the resulting overage occurred due to the conversion of numbers to weight (for the recreational fisheries) within SS caused by the growth and improved age structure for the underage projection (Table 2). In other words, by not catching fish in 2015, older, heavier fish were available to be caught in 2017, resulting in a slight increase in the weight of landed fish for the recreational fishery. The long-term impact of the underage and carry-over in relationship to long-term rebuilding goals was almost imperceptible (Table 2). The underage resulted in a brief increase in SPR, but, following the carry-over, SPR levels were identical. As noted in the projections for the 2014 SEDAR 31 Update assessment, divergent patterns in population trajectories between the eastern and western Gulf of Mexico are expected under extant fishery patterns and recruitment dynamics (Figure 2). Despite gulf-wide rebuilding to SPR 26% by 2032, much of the biomass is expected to be concentrated in the western Gulf (~SPR 36%) compared to the eastern Gulf (~7%).

4. DISCUSSION

Given the results of the projected underage and resulting carry-over, it is expected that rebuilding timelines will not be impacted by a carry-over provision assuming that the carry-over is less than or equal to the underage. Although these results are expected to hold for underages less than our hypothesized potential maximum of 20%, it is unclear how well the stock can maintain its rebuilding schedule for values much larger than the projected underage level. Additionally, because the projected underage value is completely hypothetical, the results are not meant to be used as the basis of setting future catches for Gulf of Mexico red snapper. It is unlikely that all directed fisheries would have the same level of underages, and it is necessary to know the fleet-specific underages before any projections can be undertaken with the purpose of providing management advice. Similarly, the carry-over was only projected on a fleet-specific basis, which means that these results only hold when a given underage is given back (in the form of a carry-over) to the fleet that didn't harvest its entire allocation. Given differences in selectivity and discarding patterns, reassigning carry-overs to fleets other than the one that originally observed an underage may lead to unexpected impacts on rebuilding.

It is worth noting that the 2014 SEDAR 31 Update assessment, which was utilized as the basis of both presented projections, included provisional landings for 2014 (i.e., 2014 landings were not projected, but fixed at known values). Because reported landings were utilized, the model already directly accounts for any potential underage that may have resulted in comparison to previous projections. Therefore, 2015 and 2016 are the first years where potential underages may be unaccounted for in the final SS3 projections (SEDAR, 2015).

Although these results are expected to hold for a variety of underage scenarios, it would not be expected that the opposite approach could be undertaken when an overage occurs (i.e., an overage cannot be offset by an equivalent underage in subsequent years) and still be able to maintain rebuilding. Unlike an underage where the resource is left better off and harvest is delayed allowing further growth, an overage will leave the resource worse off and will require underages greater than the overage to account for the potential growth that was removed earlier than expected by original projections. However, further investigations would need to be carried out to determine the exact extent of the subsequent underages that would be needed to account for a given overage.

5. ACKNOWLEDGEMENTS

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6. LITERATURE CITED

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TABLES

Table 1. 2015 and 2017 landings for the projections. The base projection assumed landings that would achieve a 26% SPR by 2032 and the underage projection assumed a 20% underage for all directed fleets (in native units; i.e., pounds for commercial fleets and numbers for recreational fleets) in 2015, which was then carried over and added to the base landings in 2017.

Commercial (million lbs)					
	Hypothetical 2015 Landings			Hypothetical 2017 Landings	
	Landings	With 20% Reduction	Underage	Landings	Plus 2015 Underage
HL_E	2.32	1.85	0.46	1.91	2.38
HL_W	4.67	3.74	0.93	4.78	5.72
LL_E	0.09	0.07	0.02	0.07	0.09
LL_W	0.06	0.05	0.01	0.06	0.08
Total	7.14	5.71	1.43	6.83	8.26
Recreational (1000s of Fish)					
	Hypothetical 2015 Landings			Hypothetical 2017 Landings	
	Landings	With 20% Reduction	Underage	Landings	Plus 2015 Underage
MRIP_E	813.92	651.14	162.78	750.88	913.66
MRIP_W	263.99	211.19	52.80	303.76	356.56
HBT_E	61.36	49.09	12.27	57.19	69.46
HBT_W	82.83	66.26	16.57	98.24	114.81
Total	1222.09	977.67	244.42	1210.08	1454.49

Table 2. Landings and resulting SPR for each year of the projections. The base projection assumed landings that would achieve a 26% SPR by 2032 and the underage projection assumed a 20% underage for all directed fleets (in native units; i.e., pounds for commercial fleets and numbers for recreational fleets) in 2015, which was then carried over and added to the base landings in 2017.

Landings (Millions of Pounds) and SPR Comparison						
YEAR	Projected Landings			Projected SPR		
	Landings	With Underage	Difference	SPR	With Underage	Difference
2015	14.72	11.77	-2.95	0.164	0.164	0.000
2016	14.32	14.37	0.05	0.175	0.179	0.004
2017	14.09	17.07	2.98	0.186	0.191	0.005
2018	13.73	13.78	0.05	0.196	0.197	0.002
2019	13.17	13.19	0.02	0.204	0.205	0.001
2020	12.78	12.78	0.00	0.212	0.213	0.001
2021	12.55	12.54	-0.01	0.219	0.219	0.001
2022	12.43	12.42	-0.01	0.225	0.225	0.000
2023	12.41	12.41	0.00	0.230	0.230	0.000
2024	12.43	12.43	0.00	0.235	0.235	0.000
2025	12.45	12.44	-0.01	0.239	0.239	0.000
2026	12.46	12.45	-0.01	0.243	0.243	0.000
2027	12.47	12.46	-0.01	0.247	0.246	0.000
2028	12.48	12.47	-0.01	0.250	0.249	0.000
2029	12.49	12.48	-0.01	0.253	0.252	0.000
2030	12.50	12.49	-0.01	0.255	0.255	0.000
2031	12.50	12.50	0.00	0.258	0.257	0.000
2032	12.51	12.51	0.00	0.260	0.260	0.000

FIGURES

Figure 1. Landings for each year of the projections. The base projection assumed landings that would achieve a 26% SPR by 2032 and the underage projection assumed a 20% underage for all directed fleets (in native units; i.e., pounds for commercial fleets and numbers for recreational fleets) in 2015, which was then carried over and added to the base landings in 2017.

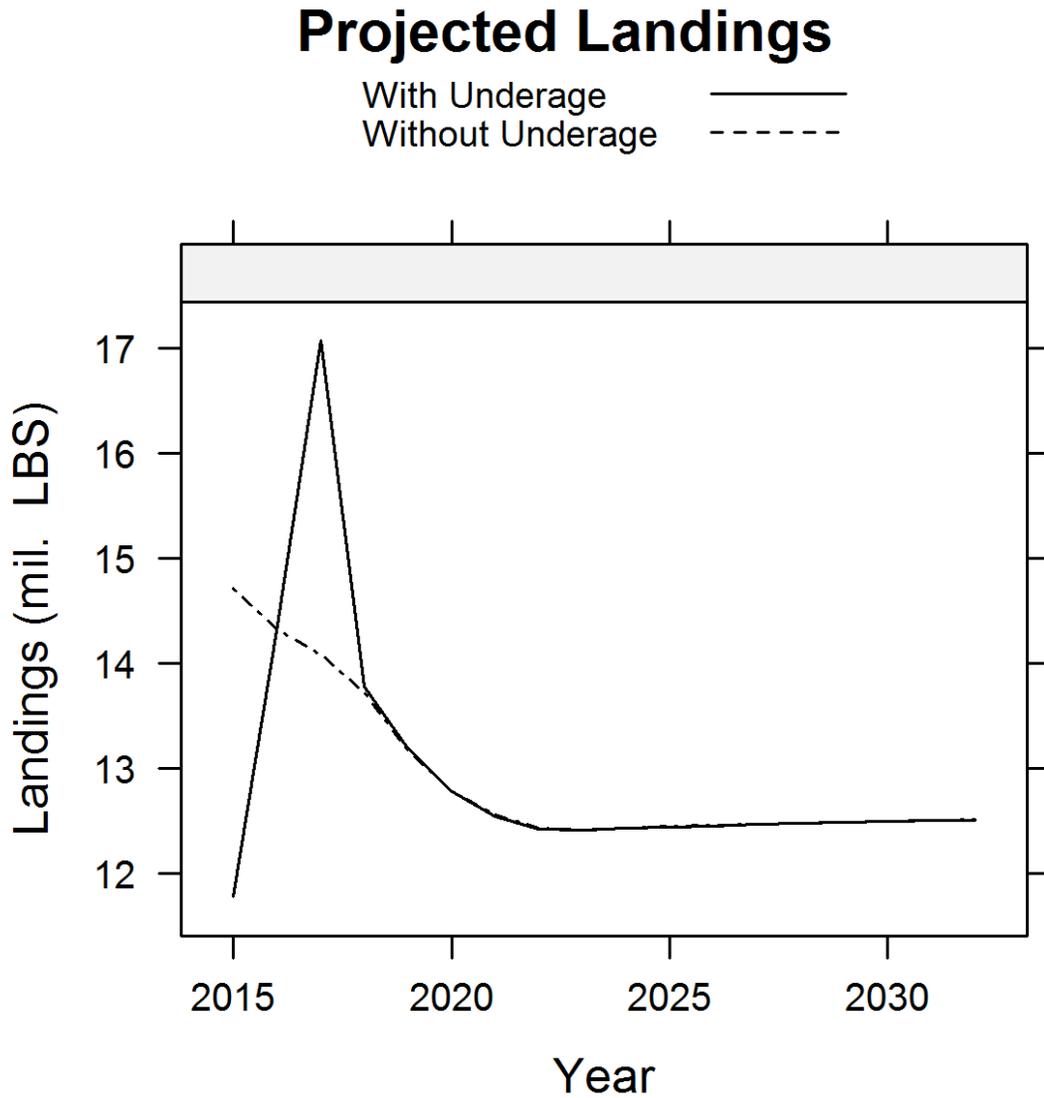


Figure 2. Regional SPR for the eastern and western Gulf of Mexico with a 2032 rebuilding date (gulfwide SPR of 26%).

