Update to Unharvested Gulf of Mexico Red Snapper Quota Carry-over Analysis

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Previous Analysis

Provide recommendations on the **percentage of unharvested quota that can be carried over** without negatively impacting the red snapper rebuilding plan.

- **Goal**: Demonstrate that 100% of unharvested quota could be carried over without negative consequences to the rebuilding plan
- **Assume**: One 20% underage across all directed fleets carried over the following year
- **Result:** Carry-over did not affect rebuilding schedule

Council Request to SEFSC

- Simulate fleet-specific carry-over events that are consecutive along with one-year and multi-year intervals.
- Discount carry-overs for natural mortality
- Cap carry-overs at 95% of the annual OFL.

- **Goal**: Demonstrate how the rebuilding timeline is affected when multiple carry-overs occur with and without being discounted for M and with and without being capped by OFL.

Methods

- Used base projection model (SS3) from 2014 update to SEDAR 31 with a terminal data year of 2014
  - Updated 2014, 2015 and 2016 landings data. Projections began in 2017
  - Bycatch rates fixed at values from SEDAR 31 update

- Conducted six projection scenarios:

  Base cases: $F_{REBUILD}$; ABC time-series accounting for updated landings
  $F_{SPR26\%}$; OFL time-series accounting for updated landings

  Carry-over: Fixed annual landings at the ABC, the ABC – underage, or ABC + carry-over. Carry-over amount was capped in one of 4 ways

  a) No adjustment for M; OFL cap not applied
  b) No adjustment for M, OFL cap applied
  c) Adjust for M; OFL cap not applied
  d) Adjust for M; OFL cap applied

Establish Baselines (ABC & OFL)

- Project $F_{REBUILD}$ for ABC
- Project $F_{SPR26\%}$ for OFL
- Projections include updated 2014, 2015 & 2016 landings.

Year	ABC (Million Lbs)	OFL (Million. Lbs)
2015	14.72	14.72
2016	14.33	14.33
2017	13.52	15.19
2018	13.36	14.60
2019	12.94	13.86
2020	12.61	13.35
2021	12.41	13.06
2022	12.30	12.89
2023	12.30	12.87
2024	12.34	12.88
2025	12.36	12.89
2026	12.39	12.90
2027	12.41	12.91
2028	12.43	12.92
2029	12.45	12.92
2030	12.46	12.93
2031	12.48	12.94
2032	12.49	12.94

Calculate Fleet-specific ABC's

- Utilized 51:49 commercial:recreational allocation
- Utilized 57.7:42.3 rec. private:rec. for-hire allocation

Year	ABC	Comm. Yield	Rec. For-hire Yield	Rec. Private Yield
2015	6678.9	3406.3	1384.3	1888.3
2016	6500.9	3315.4	1347.4	1838.0
2017	6130.8	3126.7	1270.7	1733.4
2018	6060.1	3090.6	1256.1	1713.4
2019	5868.8	2993.1	1216.4	1659.3
2020	5720.5	2917.5	1185.7	1617.4
2021	5630.5	2871.5	1167.0	1591.9
2022	5579.6	2845.6	1156.5	1577.5
2023	5581.1	2846.4	1156.8	1577.9
2024	5595.4	2853.7	1159.8	1582.0
2025	5607.7	2860.0	1162.3	1585.5
2026	5618.7	2865.5	1164.6	1588.6
2027	5628.2	2870.4	1166.6	1591.3
2028	5636.8	2874.8	1168.3	1593.7
2029	5645.1	2879.0	1170.1	1596.0
2030	5652.6	2882.8	1171.6	1598.1
2031	5659.5	2886.3	1173.0	1600.1
2032	5666.3	2889.8	1174.4	1602.0

Compute Underage

- Underage range 5 – 20%
- One consecutive, one single-year interval & three multi-year intervals
- Rec. private (80.2% east, 19.8% west); Rec. for-hire (72.2% east, 27.8% west)

	% underage by SERO Fleet			Underage by SERO fleet and region (metric tons)				
Year	Rec. Private	Rec. For-Hire	Commercial	Private East	Private West	For-Hire East	For-Hire West	Commercial
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	20	0	5	278.1	68.6	0	0	156.3
2018	10	20	0	137.4	33.9	181.6	69.6	0
2019	0	10	0	0	0	87.9	33.7	0
2020	0	0	0	0	0	0	0	0
2021	0	0	10	0	0	0	0	287.2
2022	10	20	0	126.5	31.2	167.2	64.1	0
2023	0	0	0	0	0	0	0	0
2024	10	0	10	126.9	31.3	0	0	285.4
2025	0	10	0	0	0	84.0	32.2	0
2026	0	0	0	0	0	0	0	0
2027	20	10	5	255.3	63.0	84.3	32.3	143.5
2028	0	0	10	0	0	0	0	287.5
2029	0	0	0	0	0	0	0	0
2030	20	20	20	256.4	63.3	169.4	64.9	576.6
2031	0	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0	0

Convert to SS fleet & calculate carry-over

- MRIP = private + CBT portion of for-hire (69.3% E & 24.3% W)
- HBT = HBT portion of for hire (30.7% E,& 75.7% W)

Underage by SERO fleet and region (metric tons)

Year	Commercial	Private East	Private West	For-Hire East	For-Hire West
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	156.3	278.1	68.6	0	0
2018	0	137.4	33.9	181.6	69.6
2019	0	0	0	87.9	33.7

Year	Commercial	MRIP_E	MRIP_W	HBT_E	HBT_W
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	-156.3	-278.1	-68.6	0	0
2018	156.3	-263.3	-50.8	-55.7	-52.7
2019	0	76.5	25.7	-27.0	-25.5
2020	0	61.0	8.2	27.0	25.5
2021	-287.2	0	0	0	0
2022	287.2	-242.5	-46.8	-51.3	-48.5
2023	0	242.5	46.8	51.3	48.5
2024	-285.4	-126.9	-31.3	0	0
2025	285.4	68.6	23.5	-25.8	-24.4
2026	0	58.3	7.8	25.8	24.4
2027	-143.5	-313.7	-70.8	-25.9	-24.5
2028	-287.5	313.7	70.8	25.9	24.5
2029	287.5	0	0	0	0
2030	-576.6	-373.8	-79.1	-52.0	-49.1
2031	576.6	373.8	79.1	52.0	49.1
2032	0	0	0	0	0

Apply natural mortality adjustment

Year	Commercial	MRIP_E	MRIP_W	HBT_E	HBT_W
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	-156.3	-278.1	-68.6	0	0
2018	142.3	-263.3	-50.8	-55.7	-52.7
2019	0	69.6	23.4	-27.0	-25.5
2020	0	55.5	7.5	24.5	23.2
2021	-287.2	0	0	0	0
2022	261.3	-242.5	-46.8	-51.3	-48.5
2023	0	220.6	42.6	46.7	44.1
2024	-285.4	-126.9	-31.3	0	0
2025	259.7	62.5	21.4	-25.8	-24.4
2026	0	53.0	7.1	23.5	22.2
2027	-143.5	-313.7	-70.8	-25.9	-24.5
2028	-287.5	285.5	64.5	23.5	22.3
2029	261.6	0	0	0	0
2030	-576.6	-373.8	-79.1	-52.0	-49.1
2031	524.7	340.2	71.9	47.3	44.7
2032	0	0	0	0	0

Apply OFL cap

No natural mortality adjustment

Year	Commercial	MRIP_E	MRIP_W	HBT_E	HBT_W
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	-156.3	-278.1	-68.6	0	0
2018	156.3	-263.3	-50.8	-55.7	-52.7
2019	0	76.5	25.7	-27.0	-25.5
2020	0	15.2	2.0	6.7	6.4
2021	-287.2	0	0	0	0
2022	287.2	-242.5	-46.8	-51.3	-48.5
2023	0	0	0	0	0
2024	-285.4	-126.9	-31.3	0	0
2025	0	0	0	-25.8	-24.4
2026	0	0	0	0	0
2027	-143.5	-313.7	-70.8	-25.9	-24.5
2028	-287.5	156.1	35.3	12.9	12.2
2029	0	0	0	0	0
2030	-576.6	-373.8	-79.1	-52.0	-49.1
2031	0	0	0	0	0
2032	0	0	0	0	0

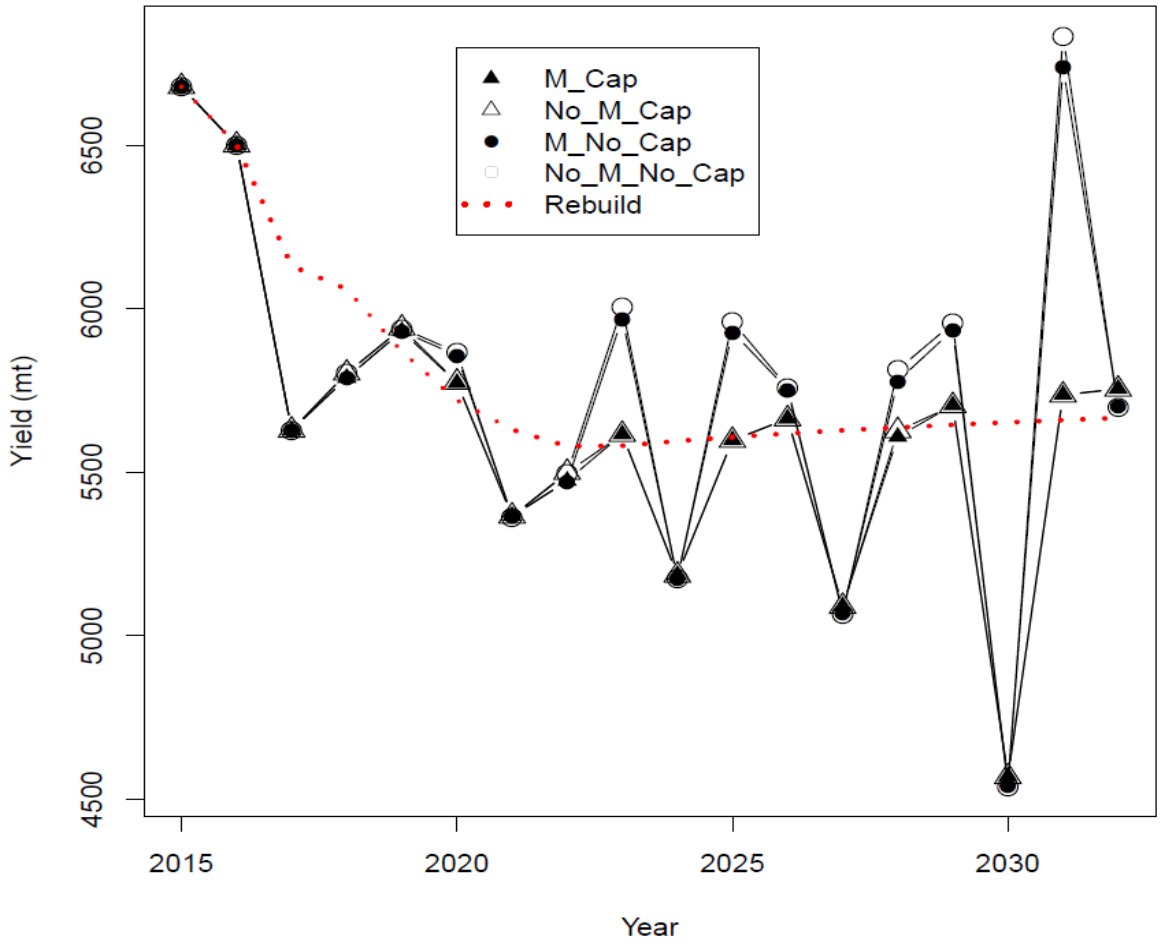
OFL cap virtually eliminates late carryovers

Natural mortality adjustment applied

Year	Commercial	MRIP_E	MRIP_W	HBT_E	HBT_W
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	-156.3	-278.1	-68.6	0	0
2018	142.3	-263.3	-50.8	-55.7	-52.7
2019	0	69.6	23.4	-27.0	-25.5
2020	0	13.9	1.9	6.1	5.8
2021	-287.2	0	0	0	0
2022	261.3	-242.5	-46.8	-51.3	-48.5
2023	0	0	0	0	0
2024	-285.4	-126.9	-31.3	0	0
2025	0	0	0	-25.8	-24.4
2026	0	0	0	0	0
2027	-143.5	-313.7	-70.8	-25.9	-24.5
2028	-287.5	142.1	32.1	11.7	11.1
2029	0	0	0	0	0
2030	-576.6	-373.8	-79.1	-52.0	-49.1
2031	0	0	0	0	0
2032	0	0	0	0	0

Results (Yield)

- M adj. little effect on carry-over yield
- OFL cap major effect on carry-over yield

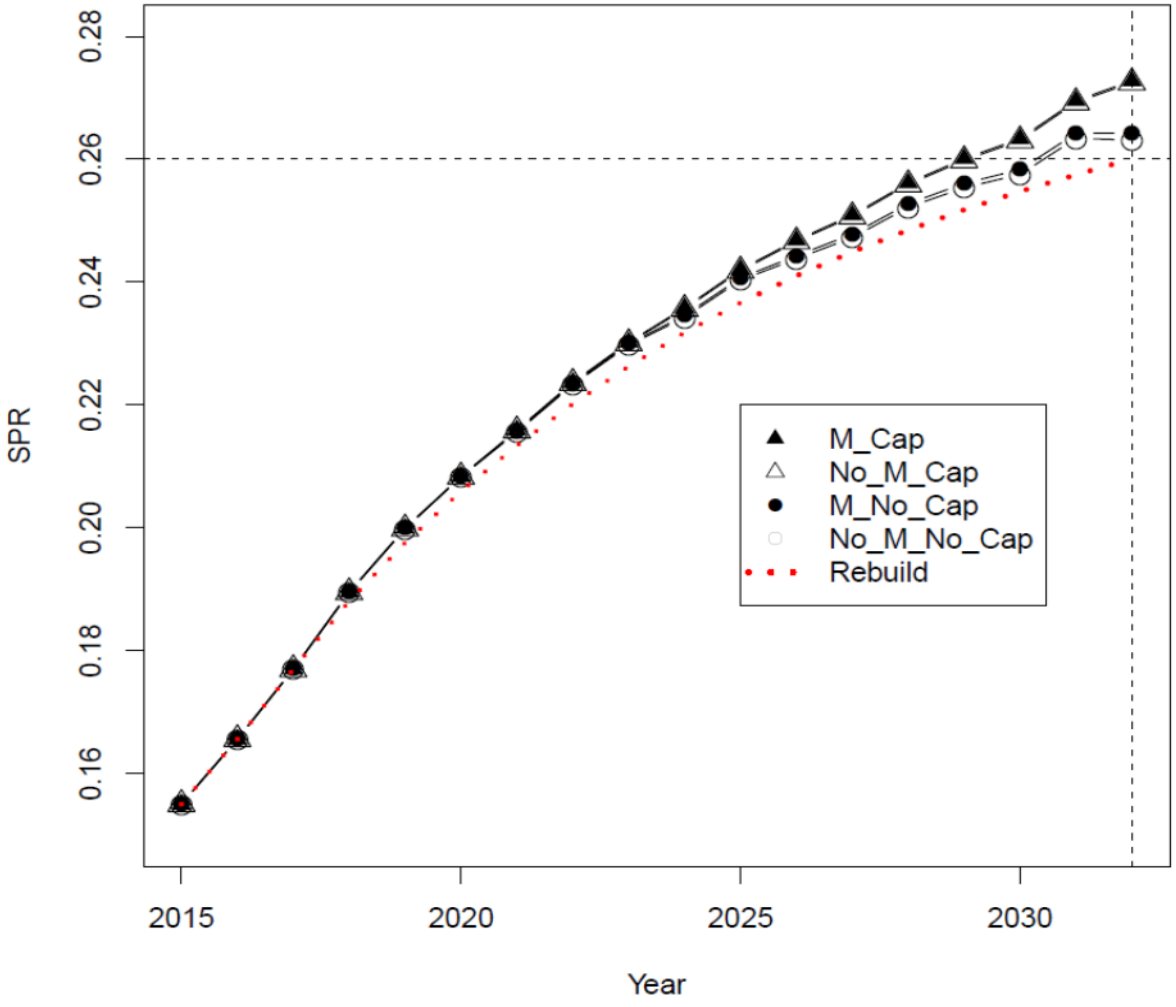


Results (SPR)

Year	Rebuild	No_M_No_Cap	No_M_Cap	M_No_Cap	M_Cap
2015	0.155	0.155	0.155	0.155	0.155
2016	0.166	0.166	0.166	0.166	0.166
2017	0.177	0.177	0.177	0.177	0.177
2018	0.188	0.190	0.190	0.190	0.190
2019	0.198	0.200	0.200	0.200	0.200
2020	0.206	0.208	0.208	0.208	0.208
2021	0.213	0.216	0.216	0.216	0.216
2022	0.220	0.223	0.224	0.223	0.224
2023	0.226	0.230	0.230	0.230	0.230
2024	0.232	0.234	0.236	0.235	0.236
2025	0.237	0.240	0.242	0.241	0.242
2026	0.241	0.244	0.247	0.244	0.247
2027	0.245	0.247	0.251	0.248	0.251
2028	0.248	0.252	0.256	0.253	0.256
2029	0.252	0.255	0.260	0.256	0.260
2030	0.255	0.258	0.263	0.258	0.263
2031	0.257	0.263	0.269	0.264	0.270
2032	0.260	0.263	0.272	0.264	0.273

- Slight differences in landings are due to recreational catch being in numbers and subsequent growth (improved age structure) in underage scenario

Results (SPR)


SPR
0.16
0.18
0.20
0.22
0.24
0.26
0.28
2015
2020
2025
2030
Year
M_Cap
No_M_Cap
M_No_Cap
No_M_No_Cap
Rebuild

Important Assumptions/Caveats

- Results are hypothetical and are **not meant as the basis for management advice**
- Results are expected to hold for underages <20% and/or fewer fleets with underages (still < 20%), but extreme underages (>20%) and their resulting carry-over are untested and may demonstrate different dynamics
- Results only hold if carryover is applied to the fleet for which the underage occurred
  - Differing selectivities by fleet imply that **carry-overs are non-transferable across fleets**
- The same approach is **not** expected to hold for an overage and subsequent underage

Questions?

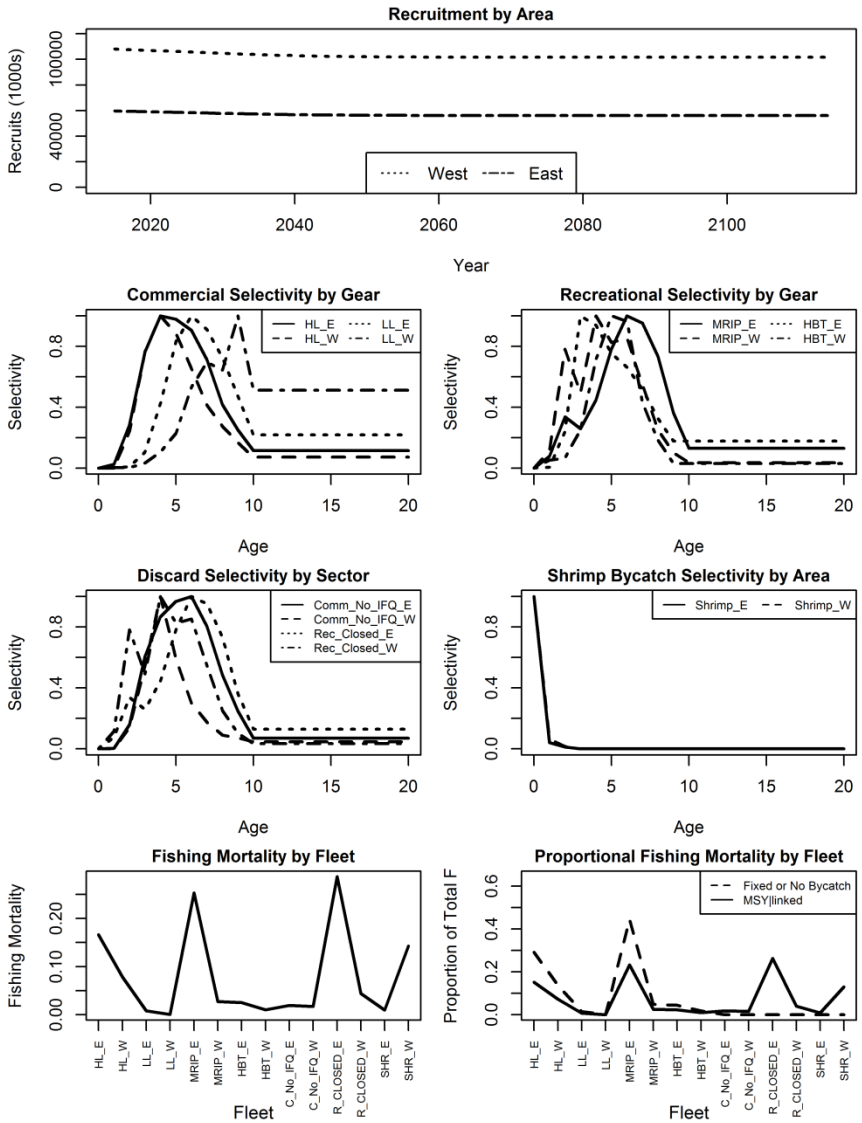
Landings breakdown

Year	CBT_E	PRV_E	HBT_E	CBT_W	PRV_W	HBT_W	%For-hire E	%For-hire W	%Private E	%Private W
2010	77891	275427	35943	7674	38343	51514	0.658	0.342	0.878	0.122
2011	186618	611648	69187	10655	85282	50656	0.807	0.193	0.878	0.122
2012	183782	521163	54178	27609	217293	54283	0.744	0.256	0.706	0.294
2013	166141	992803	43985	19922	113293	43743	0.767	0.233	0.898	0.102
2014	40992	350087	42750	12481	94791	34890	0.639	0.361	0.787	0.213
2015	224849	359159	NA	8670	192989	NA	NA	NA	0.650	0.350
2016	195223	629581	NA	34773	139568	NA	NA	NA	0.819	0.181
							0.723	0.277	0.802	0.198

Fleet breakdown

Year	CBT_E	HBT_E	%HBT_E	%CBT_E	CBT_W	HBT_W	%HBT_W	%CBT_W
2010	77891	35943	0.32	0.68	7674	51514	0.87	0.13
2011	186618	69187	0.27	0.73	10655	50656	0.83	0.17
2012	183782	54178	0.23	0.77	27609	54283	0.66	0.34
2013	166141	43985	0.21	0.79	19922	43743	0.69	0.31
2014	40992	42750	0.51	0.49	12481	34890	0.74	0.26
			0.307	0.693			0.757	0.243

SEDAR 31 update ABC

ABC	Annual Retained Yield (lbs) @ $F_{Rebuild}$	Million LBS (WW)
	2015	14.29
	2016	13.96
	2017	13.75
	2018	13.39
	2019	12.85
	2020	12.49
	2021	12.29
	2022	12.18
	2023	12.17
	2024	12.19
	2025	12.21
	2026	12.22
	2027	12.23
	2028	12.24
	2029	12.25
	2030	12.26
	2031	12.27
	2032	12.27
	2031	12.28
	2032	12.29
	Equilibrium	12.40

Model Inputs