Red Snapper ABC subcommittee report

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Outline

- Today's agenda:
  - Working group membership, task, and terms of reference
  - Summary of vetted options
  - Additional topics of interest to the SSC or Council

- See report and supplementary documents for specifics on the methods

Membership and task

- Rob Ahrens, Luiz Barbieri, Scott Crosson, Eric Johnson, Genny Nesslage, Amy Schueller, and support from Council and SEFSC staff

- Working group task:
    - To collate data, analyses, stock assessments, and any other background information on Red Snapper in order to determine an Acceptable Biological Catch (ABC). If necessary, work on additional analyses for providing an ABC or tracking an ABC.

Terms of Reference

1. Collate and evaluate existing information on Red Snapper
2. Determine if an ABC can be determined from existing information
3. If an ABC cannot be determined from existing information, provide a plan of action for moving forward to determine an ABC
    a) Plan of action should include evaluation of index based methods for tracking ABC, as well as consideration of the index based method can be used to determine an ABC
4. Assess to the extent possible newly developed methods providing strengths and weaknesses of each method
5. Provide a final ABC recommendation and also include any viable alternatives in priority order based on the science and data available

Vetted options

- Center Interim Analysis (Preferred Recommendation)
- Stock assessment and projections – SEDAR 41 (Recommended)
- Data Limited Methods [DLM] (Not recommended)
- Index methods used in other Science Centers (Not recommended)
- Amendments 43 and 46 (Not recommended)

Center Interim Analysis (Preferred Recommendation)

- Pros
  - Uses best available science and data from the stock assessment
  - Uses up to date (terminal year 2016) catch, discards, fishery independent index ages, and index values to forecast recruitment cohorts
  - Least delay between catch and index terminal year (2016) and when management will be put into place
- Cons
  - Uncertainty in the inputs including discards and MRIP

Stock assessment and projections – SEDAR 41 (Recommended)

- Pros
  - Uses best available science and data up to terminal year (2014) of the assessment
  - Projections use up to date (terminal year 2016) catch and discards
  - Reviewed by external CIEs
- Cons
  - Projections do not use updated, available data on the ages and index
  - Uncertainty in the inputs including discards and MRIP, as discussed during the review process, remain
  - Current age of assessment with a terminal year of 2014 (versus Center Interim Analysis)

Data Limited Methods [DLM] (Not recommended)

- Pros
  - Easy to calculate
- Cons
  - Does not use all of the best data available for Red Snapper
  - Average catch method does not perform well if a stock is assumed overfished
  - Mean length methods have not been formally vetted and do not work with noisy length data
  - Methods were developed for active fisheries, rather than small or closed fisheries as is the case with Red Snapper

Index methods used in other Science Centers (Not recommended)

- Pros
  - Fishery independent index was updated
- Cons
  - None of the indices have a time series that covers the current time period and spans a time during which the stock was either not exploited or only lightly exploited
  - We do not know the scale of the index
  - We do not have an estimate of catchability

Amendments 43 and 46 (Not recommended)

- Pros
  - Fishery independent index was updated
- Cons
  - None of the indices have a time series that covers the current time period and spans a time during which the stock was either not exploited or only lightly exploited
  - We do not know the scale of the index
  - We do not have an estimate of catchability
  - Uses an index that didn’t sample Red Snapper habitat sufficiently during the entire duration of sampling
  - Method hasn’t been peer reviewed or reviewed by the SSC
  - Assumes that the 2012-2014 fishing level is sustainable

Center Interim Analysis (Preferred Recommendation)

- If the full SSC formally recommends the Preferred Recommended method, which is the Center Interim Analysis, then the table below (Table 3 from the Center Interim Analysis report) provides the ABC values for a 50% probability of rebuilding by 2044.

Center Interim Analysis (Preferred Recommendation)

Table 3. Projection results based on IA1 under Scenario 2, with fishing mortality rate fixed at F = $F_{rebuild}$ starting in 2018. R = number of age-1 recruits (in 1000s), F = fishing mortality rate (per year), B = biomass (mt), S = spawning stock (1E8 eggs), L = landings expressed in numbers (1000s) or whole weight (1000 lb), and D = dead discards expressed in numbers (1000s) or whole weight (1000 lb), pr.rebuild = proportion of stochastic projection replicates with SSB greater than or equal to $SSB_{F30\%}$. The extension .base indicates expected values (deterministic) from the base run; the extension .med indicates median values from the stochastic projections.

year	R.base(1000)	R.med(1000)	F.base	F.med	B.base(mt)	B.med(mt)	S.base(1E8)	S.med(1E8)	L.base(1000)	L.med(1000)	L.base(1000 lb)	L.med(1000 lb)	D.base(1000)	D.med(1000)	D.base(1000 lb)	D.med(1000 lb)	pr.rebuild
2017	439	316	0.17	0.19	2539	2323	118189	104120	27	27	241	248	59	56	307	303	0.024
2018	442	317	0.14	0.14	2801	2523	155517	133854	27	24	268	239	50	43	296	260	0.06
2019	444	316	0.14	0.14	3018	2717	191334	163695	29	26	316	280	49	43	314	275	0.101
2020	445	316	0.14	0.14	3171	2857	221801	189350	30	27	345	306	48	42	319	280	0.149
2021	445	322	0.14	0.14	3283	2959	246743	210182	30	27	362	322	47	42	319	281	0.2
2022	446	315	0.14	0.14	3369	3037	266706	226573	30	27	376	334	47	42	318	281	0.246
2023	446	320	0.14	0.14	3437	3109	282289	240079	30	27	386	344	47	42	318	282	0.288
2024	446	320	0.14	0.14	3490	3153	294543	250860	31	27	394	351	47	42	319	284	0.326
2025	446	318	0.14	0.14	3532	3201	303787	258943	31	28	401	358	47	42	321	287	0.361
2026	446	320	0.14	0.14	3565	3233	310844	265804	31	28	406	364	47	42	323	288	0.386
2027	446	318	0.14	0.14	3590	3258	316286	270669	31	28	410	367	47	42	325	290	0.405
2028	447	318	0.14	0.14	3610	3285	320395	274758	31	28	413	370	47	42	326	292	0.42
2029	447	321	0.14	0.14	3625	3304	323575	277859	31	28	416	373	47	42	327	293	0.433
2030	447	321	0.14	0.14	3637	3315	326053	280887	31	28	418	376	47	42	328	294	0.446
2031	447	322	0.14	0.14	3647	3326	327976	282835	31	28	419	378	47	42	328	294	0.456
2032	447	317	0.14	0.14	3655	3339	329478	284448	31	28	421	380	47	42	329	295	0.465
2033	447	321	0.14	0.14	3661	3355	330635	285754	31	28	422	380	47	42	329	295	0.469
2034	447	318	0.14	0.14	3665	3362	331507	286417	31	28	422	382	47	42	329	297	0.475
2035	447	318	0.14	0.14	3669	3371	332191	287620	32	29	423	383	47	43	330	297	0.479
2036	447	321	0.14	0.14	3672	3372	332725	288830	32	29	423	383	47	43	330	297	0.486
2037	447	324	0.14	0.14	3674	3372	333153	289327	32	29	424	384	47	42	330	297	0.491
2038	447	320	0.14	0.14	3676	3372	333494	290528	32	29	424	384	47	42	330	297	0.493
2039	447	321	0.14	0.14	3677	3370	333767	290656	32	29	424	383	47	42	330	297	0.496
2040	447	320	0.14	0.14	3679	3375	333985	290827	32	29	424	383	47	42	330	297	0.497
2041	447	325	0.14	0.14	3680	3381	334158	290834	32	29	425	385	47	43	330	298	0.5
2042	447	321	0.14	0.14	3680	3379	334296	291357	32	29	425	385	47	42	330	298	0.499
2043	447	323	0.14	0.14	3681	3390	334406	290894	32	29	425	386	47	43	330	299	0.499
2044	447	323	0.14	0.14	3681	3390	334494	291332	32	29	425	387	47	43	330	299	0.502

Additional topics of interest to the SSC or Council

- Landings and discards when setting an ABC
  - RS ABC based on landings and discards; under moratorium, ABC tracked as discards
  - Discard mortality and effort levels can be high enough to exceed ABC under a moratorium
  - If so, managers need to consider alternatives to reduce effort and discard mortality
- ACL monitoring, as opposed to ABC determination
  - ABC determination has been used interchangeably with ACL monitoring
  - ACL is dependent upon ABC, but monitoring of ACL is not dependent on the ABC
  - ACL monitored using best data *available* for landings and discards; in some circumstances, data sets are used for monitoring, but still not ideal; however, ACL must still be monitored and no alternative data are available for monitoring
  - An ACT could be considered for further buffering given the uncertainties

Additional topics of interest to the SSC or Council

- Merits of CVID index
  - Developed from data collected through partner-led survey (SERFS)
  - Sampling coverage expanded, primarily in FL; sampling between Cape Hatteras, NC, and St. Lucie Inlet, FL
  - Spatial coverage of the survey after 2010 adequately covered the center of the distribution of RS and % +s increased to levels high enough to develop an index
  - DW provided a SERFS chevron trap and video index separately; data were collected from the same sampling platforms, the two indices were not independent measures of abundance; panel decided to combine the two using the Conn (2010) method
  - CVID index selectivity was assumed logistic and informed by chevron trap age comps

Additional topics of interest to the SSC or Council

- Use of chevron trap index from 1990 - present (not used for last 2 assessments)
  - Not used to provide an index of abundance for RS for the years of 1990 to 2009
  - Used truncated time series (2010 – 2014) to provide the best information on RS trends in abundance
  - Prior to 2010, spatial coverage was not adequate to cover the center of the distribution of RS and %+ were extremely low
- Usefulness of the Chevron trap data in general versus the usefulness for RS
  - Useful for other species such as black sea bass, vermilion snapper, red porgy, red grouper, and gray triggerfish (SEDAR 55, 56, 1 [updates thereafter], 53, and 41)
  - Adequately samples habitats, and fluctuations in index were deemed to indicate changes in relative abundance
  - Introduction of video recordings has significantly increased the value of the data
  - Provides biological information (age, reproduction, diet, genetics) critical for stock assessments and management

Additional topics of interest to the SSC or Council

- Validity of indices at low population size and examples of interpreting data
  - Indices of abundance can be used as indicators of population trend, recruitment, changes in age/size structure
  - Used in conjunction with life history, fishery catch, and age/size structure information to estimate biomass, fishing mortality, and sustainable fishing levels
  - Only fishery-independent indices of abundance have the potential to provide trend information about portions of the stock not encountered by the fishery
  - However, several circumstances exist where even fishery-independent indices of abundance must be interpreted with caution:
    - Apparent trends in relative abundance may be dampened greatly or even disappear completely when plotted with associated confidence intervals, indicating that annual trends can be insignificant relative to the error in those relative abundance estimates
    - At low population size, surveys may rarely encounter existing individuals such that changes in relative abundance over time may be indicative of rare catches of the target species, not trends in the overall population
    - Changes in management may not result in immediate changes in index trend depending on the spatial extent of the survey and the selectivity of the gear
    - Interpretation of trends independent of other stock assessment information can lead to misinterpretation

Additional topics of interest to the SSC or Council

- Observation versus process error in index
  - Interpreting changes in stock abundance from indices of abundance must consider the potential relative impact of both the expected variation in abundance (process error) and variation in sampling (observation error)
  - Most index methods have associated SE estimates, providing insight into observation error, but understanding of process error is limited to the length of the index
- Fine scale shifts in spatial targeting and the inability to track them
  - Changes in the spatial distribution of fisheries and research surveys has the potential to obscure changes in stock abundance when catch and effort information are not geospatially referenced at spatial scales at which the assumption of representative sampling can be made
  - Resulting catch/effort that is commonly used to generate relative abundance trends will tend to not be proportional to stock abundance (hyperstable or hyperdeplete)
  - In general the issue of non-proportionality is greater with fishery-dependent data that is documented at broad spatial scales