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August 14, 2016

Kevin Anson, Chair
Gulf of Mexico Fishery Management Council
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Ocean Conservancy's Comments for the August, 2016 Gulf of Mexico Fishery Management Council Meeting in New Orleans, Louisiana

Dear Chairman Anson,

Ocean Conservancy[1] is writing to provide comments to the Gulf of Mexico Fishery Management Council ('GMFMC', 'the Council') in advance of its upcoming August meeting in New Orleans, Louisiana. Regarding **Amendment 44**, Ocean Conservancy commends the Council on wanting to set overfishing thresholds for all species, however based on the recommendations of the Southeast Fisheries Science Center ('SEFSC'), **we urge the Council to take caution when setting new Minimum Stock Size Thresholds ('MSSTs') by including an option for 0.85*B_{MSY}**. This would expand the range of alternatives to include options that set an overfishing threshold default for Gulf stocks that will not unduly impede rebuilding. **We also recommend that Council conducts an analysis of the 40-10 Rule currently used by the Pacific Fishery Management Council and considers application of such a rule to the Gulf, including such an alternative in this amendment.**

The Science and Statistical Committee ('SSC') and SEFSC have had numerous opportunities to review the utility of this amendment and the SEFSC has undertaken an analysis of the amendment's ability to prevent erroneous declaration of overfished status due to natural fluctuations in the environment. The results from the SEFSC and the subsequent discussions by the SSC in March, 2015, and June, 2016 indicate:

1.) The current formulation of the definition of MSST which uses natural mortality is sufficient to capture natural fluctuation in the stocks modeled and will not trigger unneeded rebuilding plans.

The use of natural mortality is a good proxy to account for a given stock's natural fluctuations in abundance. For example, long lived reef fish stocks, such as red snapper, with low

[1] Ocean Conservancy is a non-profit organization that educates and empowers citizens to take action on behalf of the ocean. From the Arctic to the Gulf of Mexico to the halls of Congress, Ocean Conservancy brings people together to find solutions for our water planet. Informed by science, our work guides policy and engages people in protecting the ocean and its wildlife for future generations.

predation (natural mortality) fluctuate far less than shorter lived species, such as menhaden, that are prey for a number of species.

Analysis by both the SEFSC and the SSC suggests lowering the MSST proxy for reef fish species is not needed as the stocks analyzed are not expected to naturally fluctuate to an overfished state. Therefore default rules which arbitrarily lower the overfishing threshold, such as those proposed in Alternative 3, 4, and 5, are not needed and are a solution in search of a problem as the cost of rebuilding from a lower MSST will be greater.

2.) If the amendment is to go forward it should include a default MSST formulation that reflects natural mortality of stocks in the Gulf of Mexico such as ($0.85*B_{MSY}$) and not an arbitrary value.

An alternative that uses $0.85*B_{MSY}$ as the default will provide an additional buffer to avoid declaring a stock overfished due to natural fluctuations (even though the probability is already extremely low) while applying a default value that reflects the natural mortality of stocks in our region.

The SSC recommended a low natural mortality option be analyzed and reflects a more appropriate default value for stock in the Gulf of Mexico (rough average of natural mortality ('M') for all reef fish). Two stocks of concern, gray triggerfish and greater amberjack, may require additional consideration; application of Alternative 3 or 4, which apply default proxies for all stocks do nothing to address issues that could seriously jeopardize rebuilding of these stocks. Further, if a default rule is applied to gag, and the anecdotal information that is skeptical of actual rebuilding success for the stock is true, Alternatives 3-5 may exacerbate the problem of avoiding severe catch reductions.

3.) More time is needed to develop suitable proxies for MSST, and the Council should develop an ad hoc panel or a working group to fully address this issue. Specific attention should be focused on a Gulf of Mexico analogue to the 40-10 Rule currently utilized by the Pacific Fishery Management Council.

Items that would require further analysis either by an ad-hoc panel or working group or by Council staff include the NS1 recommendation that states MSST should be "one-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years, if the stock or stock complex were exploited at the MFMT specified under paragraph (e)(2)(ii)(A)(1) of the NS1 guidance."[2]

[2] National Marine Fisheries Service, *Technical guidance on the use of precautionary approaches to implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act*, http://www.nmfs.noaa.gov/sfa/NSGtkgd.pdf (accessed June 17, 2016).

We also strongly urge Council to have staff or a working group or advisory panel analyze the development of a rule that avoids severe remedial catch reductions by way of a Gulf of Mexico-specific analogue to the 40-10 rule, such as that currently used by the Pacific Fishery Management Council, which would provide improved stability to catch advice by enacting a formal rule where extra precaution is applied as the stock approaches MSST thresholds and more closely reflects the Annual Catch Limit ('ACL') when healthy. The image below illustrates the 40-10 rule.[3]

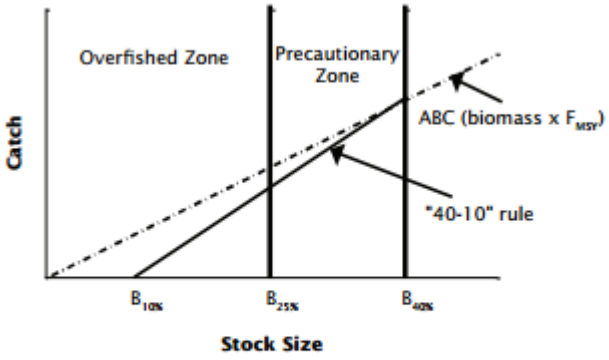

Figure 1. The 40-10 control rule used by the Pacific Fishery Management Council (PFMC).

40-10 applies extra precaution as the stock approaches the overfished reference point resulting in more stable catches as less draconian catch reductions are needed to rebuild the stock to B_{MSY} or proxy. The 40 refers to the point at which the rule is applied and the difference between the Allowable Biological Catch ('ABC') and ACL will continually increase as the stock approaches its overfished threshold. A similar type of rule can be implemented using Spawning Potential Ratio ('SPR') reference points and if implemented correctly will ensure the stock never requires a rebuilding plan as MSST becomes increasingly difficult to reach.

Given these issues regarding MSST and real concerns about species of interest such as gray triggerfish, greater amberjack, and gag, the Council should rethink implementing default overfished thresholds for those stocks with current estimates of natural mortality. Setting a wider buffer can allow a greater opportunity for management to end a decline in a stock that is approaching an overfished condition and rebuild the stock without the constraints imposed by a rebuilding plan that is required if the stock drops below MSST and is declared overfished. However, if a stock does drop below MSST and is declared overfished, a more restrictive rebuilding plan may be needed than if there were a narrower buffer between B_{MSY} and MSST.

[3] Alaska Sea Grant College Program, *Biology, Assessment, and Management of North Pacific Rockfishes – A Management Strategy Evaluation of Rebuilding Revision Rules for Overfished Rockfish Stocks,* https://swfsc.noaa.gov/publications/FED/00747.pdf (accessed August 11, 2016). (Punt and Ralston, 2007).

We also note that the Northwest Fishery Science Center has indicated such MSST defaults may not be necessary and that they may do nothing to alleviate the real problems council is facing, and in fact may instead exacerbate these issues.

Finally, Ocean Conservancy reminds the Council that while the Magnuson-Stevens Fishery Conservation and management Act requires science based sustainable catch levels and to achieve optimum yield on an ongoing basis, MSST is meant to act as an insurance policy around implementing drastic remedial catch reductions for the sake of rebuilding the stock in a timely manner.

We appreciate the opportunity to provide these comments. Feel free to contact the undersigned with any comments or questions.

Best regards,

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August 12, 2016

Mr. Kevin Anson, Chairman
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RE: Deep-Sea Corals Protections and Minimum Stock Size Threshold Default Levels

Dear Chairman Anson,

On behalf of The Pew Charitable Trusts (Pew), please accept these comments on protections for deep-sea corals, and proposed changes to the overfished threshold default levels for reef fish. At the August 2016 meeting, the Gulf Council will have a number of important decisions to make regarding these issues. We encourage the Council to:

- **Ensure that the scoping document to protect deep-sea corals, scheduled for review in October, includes all of the possible Habitat Areas of Particular Concern (HAPC)** recommended by the Council's Coral Scientific and Statistical Committee (SSC) and Coral Advisory Panel.
- **Include two additional alternatives in Action 1 of Reef Fish Amendment 44 addressing Minimum Stock Size Threshold (MSST) that would set the default MSST level for all reef fish species in line with SSC discussions:**
  - New Alternative 1: MSST = 0.90*B_{MSY} (or proxy), for all stocks.
  - New Alternative 2: MSST = 0.85*B_{MSY} (or proxy), for all stocks.
  - Additionally, we recommend requesting additional analysis from the Southeast Fisheries Science Center on the pros and cons of various MSST levels and alternatives, and subsequent review by the SSC.

Amendment for Protections of Deep-Sea Corals

When the Council reviews a scoping document at the October 2016 meeting that considers new protections for deep-sea corals in the Gulf of Mexico, **we strongly urge you to include all of the sites recommended by your Corals Expert Working Group for consideration as Habitat Areas of Particular Concern in the draft amendment.** All areas identified by the coral experts are high-quality coral habitat. Although the Gulf Council originally took action more than a decade ago to protect deep-sea corals as HAPC, that amendment defined HAPC

boundaries, but with a few notable exceptions, (*i.e*., Pulley Ridge and Stetson Bank) did not establish specific regulations to safeguard the corals from adverse impacts.[1] However, these sites are now included in the recommendations from the Council's Coral SSC/AP for specific protections from bottom contact gear.

In addition, at the June Council meeting, the Flower Garden Banks National Marine Sanctuary superintendent presented proposals to expand the sanctuary boundaries, which could protect additional coral habitat. The Sanctuary's proposed expansion includes some sites that overlap with sites proposed by the Corals Expert Working Group as HAPCs. However, not all areas are included in the Sanctuary's preferred alternative, and the outcome of that process is uncertain. Therefore, it is important for the Council to consider all recommended areas in the new coral amendment. **In addition, we encourage strong coordination between the Council and the Sanctuary to ensure boundaries and regulations are adequate to protect corals from damage by fishing gear, and are consistent.**

Researchers and fishermen have known about the presence of corals in the deep waters of the Gulf of Mexico for many decades. However, exploration in the past fifteen years has provided new insight into the vastness, distribution, complexity, diversity, uniqueness, and fragility of corals living in depths from about 150 feet to beyond several thousand feet. Coral communities in waters shallower than about 300 feet, where sunlight is lower but still penetrates to the bottom in an area called the mesophotic zone, can be much different from corals that live in dark, colder waters often associated with the continental slope. **In the ocean depths, corals often grow very slowly, and individual coral can sometimes be hundreds to thousands of years old. Mounds of corals, which may include live and dead corals, can date to tens of thousands to millions of years old.**[2]

Scientists have documented a variety of corals scattered across the Gulf at various depths. While many have a low-relief profile, some grow bushy or tree-like up to several feet high. One of the more prominent corals, *Lophelia pertusa*, forms colonies that morph into extensive deepwater reefs similar to *Oculina* coral banks off the South Atlantic coast. *Lophelia*, a type of stony coral found throughout the world, is one of the primary reef-building species in the northern and eastern Gulf. Black coral, a common coral with more than 20 individual species in the northern Gulf, can live at great depths and be thousands of years old. *Gorgonians*, which contain more than 2,000 species worldwide, also form habitat at depths in the Gulf. All of these reef-building and habitat-forming corals provide shelter, food, and nurseries for a diverse community of marine organisms, from worms to large fish.

[1] Final Generic Amendment 3 for Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing. March 2005. Gulf of Mexico Fishery Management Council, Tampa, FL.
[2] Brooke, S. and W.W. Schroeder (2007) Chapter 7: State of deep coral ecosystems in the Gulf of Mexico region: Texas to the Florida Straits In: The State of Deep Coral Ecosystems of the United States (Eds. SE Lumsden, TF Hourigan, and AW Bruckner), NOAA Technical Memorandum NOS-CRCP-3, Silver Spring MD: p 271-306.

Deep-sea coral communities can also harbor economically important fish species such as deep-water groupers, which are targeted by commercial and recreational fishermen. Commercial shrimpers also target species that co-exist with deep corals, particularly royal red shrimp. Most fishing, however, occurs at shallower depths where diverse corals also live and the potential for coral disturbance is greater. **Certain fishing practices and gear can be destructive to corals, which are extremely fragile, and may take dozens to tens of thousands of years to recover, if at all. Hence, it is important to protect this delicate, long-lived habitat from potentially destructive fishing activities.**

The Council convened its Coral SSC/AP in April 2014 to look at recommendations from a Council-sponsored coral workshop in May 2013. At their urging, the Council formed a corals working group that included experts not on the SSC/AP. The expert working group's recommendations went to the Coral SSC/AP in December 2014. They identified 47 individual and discrete areas of coral habitat in need of protection. The original configurations of these discrete areas range in size from about five to over two hundred square miles, with the majority less than thirty.

Along with the documentation of these newly observed corals, scientists have also begun building computer models for the Gulf to indicate areas of habitat suitable to harbor corals.[3] These habitat suitability models use environmental and ocean bottom parameters, such as bottom temperature, dissolved oxygen levels, rugosity or the roughness of the seafloor, slope, sediment type and size, and relief profile, to predict potential coral locations. While the current recommended HAPCs are based primarily on scientific observation and not modeling, this predictability model can be useful, along with other data such as high-resolution mapping and fishermen input, in defining areas where corals potentially reside for future research and possible management of broad coral zones. For example, the Mid-Atlantic Council used this type of modeling to adopt deep-sea coral protections covering 38,000 square miles earlier this year.[4]

We urge the Council to ensure that at this early stage, the coral amendment considers the full range of areas proposed as HAPCs by the Coral Working Group and potential gear regulations needed to protect fragile corals from damage. We also suggest identifying and including broad zones for coral protections in the amendment, based on the habitat suitability modeling, high-resolution mapping, and fishermen input.

Amendment 44 – Minimum Stock Size Threshold Defaults

Reef Fish Amendment 44 considers setting a default threshold for determining the overfished stock status for all reef fish species – known as the minimum stock size threshold or MSST.

[3] Predictive Modeling of Deep Sea Coral Habitat Suitability in the U.S. Gulf of Mexico. Presentation to the Gulf Council Coral SSC/AP meeting, April 24, 2014. Agenda item VI.d(i).
[4] Mid-Atlantic Council Approves Deep-Sea Coral Amendment. http://www.mafmc.org/newsfeed/2015/council-approves-deep-sea-coral-amendment.

When a population level falls below the MSST, the stock is overfished. This triggers a rebuilding plan per the MSA. Amendment 44 seeks to set default MSST levels for all reef fish, specifically at 75% of B_{MSY} (see explanation below). The SSC last discussed this issue in May 2015[5] and suggested that a default MSST at 90% of B_{MSY} may be appropriate. **Thus, we recommend adding two new alternatives in Action 1 of Amendment 44, in line with SSC discussions**:

- **New Alternative 1: MSST = 0.90*B_{MSY} (or proxy), for all stocks.**
- **New Alternative 2: MSST = 0.85*B_{MSY} (or proxy), for all stocks.**

Additionally, we recommend that the Council request the SEFSC to undertake additional analysis on the pros and cons of the various MSST levels proposed in Amendment 44, and that that the SSC review this information and provide advice to on these alternatives before the amendment comes back to the Council.

Currently, only six[6] of the 31 managed reef fish have an MSST defined, based on the formula:

MSST = (1-M) * B_{MSY}, or 50% of B_{MSY} (whichever is less)

In the above equation, M refers to the calculated natural mortality rate and B_{MSY} is the estimated biomass of the population at maximum sustainable yield (MSY). For most species, the calculated MSST falls in the range of 80-90% of B_{MSY}, particularly for those species with lower natural mortality rates (M). The 90% of B_{MSY} alternative suggested above is supported by SSC discussion, whereas the 85% of B_{MSY} alternative falls at the mid-point of MSST calculations for most species, with the exception of greater amberjack (72% of B_{MSY}), gray triggerfish (73% of B_{MSY}) and vermilion snapper 75% of B_{MSY}).

The primary rationale for considering changes to the MSST default is to avoid triggering rebuilding plans unnecessarily because of a perceived small buffer between the overfished threshold and B_{MSY} currently. The notion is that this small buffer does not allow for natural fluctuations in environmental conditions that in turn affect population size and could trigger a rebuilding plan. However, analysis by the SEFSC presented to the Standing/Reef Fish SSC in March 2015[7] indicated that the current MSST buffer seems to be sufficient and does not result in overfished conditions. Species such as red snapper with natural mortality rates less than 0.1 may be the exception. The SSC suggested additional analysis for species with M less than 0.1, as the SEFSC analysis did not appear to hold true for those species.

[5] Standing and Special Reef Fish SSC Meeting Summary, Tampa, Florida. March 11-12, 2015. Tab B, No.13, March 2015 Gulf Council briefing book.
[6] Species with MSSTs: gag, red grouper, red snapper, greater amberjack, gray triggerfish, and vermilion snapper
[7] Standing and Special Reef Fish SSC Meeting Summary, Tampa, Florida. March 11-12, 2015. Tab B, No.13, March 2015 Gulf Council briefing book.

As discussed by the SSC, having a larger MSST buffer may alleviate the need to initiate rebuilding plans for some species until population levels fall substantially. **However, having a lower MSST may also make it potentially harder to rebuild the population by causing more severe fishing restrictions and economic hardships for longer periods.** Tradeoffs in setting the MSST default need additional analysis and careful consideration. While the SSC did not make specific recommendations, it indicated the current formula for setting MSST seems to be sufficient without additional analysis and a reasonable default level would be 90% of B_{MSY}. Hence, we recommend adding two alternatives at 85% and 90% of the B_{MSY} in Amendment 44.

Conclusion

Thank you for considering these comments. As always, we look forward to continuing to work with the Council and stakeholders on these and other important issues.

Sincerely,

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The Pew Charitable Trusts

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October 28, 2013

Mr. Doug Boyd, Chair
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RE: Scoping Document for a Generic Amendment to Define Status Determination Criteria and Optimum Yield, and to formally adopt Annual Catch Limits for Red Snapper

Dear Chairman Boyd:

On behalf of Ocean Conservancy[1], please accept the following comments on the Gulf of Mexico Fishery Management Council's (Council) Scoping Document for a Generic Amendment to Define Status Determination Criteria and Optimum Yield, and to formally adopt Annual Catch Limits for Red Snapper (Generic SDC Amendment).

We applaud the Council for comprehensively taking up the important issue of determining status determination criteria and optimum yield for its managed fisheries and for making red snapper management consistent with the ACL framework used for the Council's other fisheries. We offer the following recommendations for the development of the options paper, and we look forward to working with the Council to bring the Council's FMPs into compliance with the objectives of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) with respect to National Standard One.

Background

The Magnuson-Stevens Act requires that each fishery management plan "specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished" and must include an analysis of how those criteria were determined and their relationship to the reproductive potential of stocks in that fishery.[2] These criteria help fishery managers to identify

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[1] Ocean Conservancy, a non-profit organization with over 120,000 members, educates and empowers citizens to take action on behalf of the ocean. From the Arctic to the Gulf of Mexico to the halls of Congress, Ocean Conservancy brings people together to find solutions for our water planet. Informed by science, our work guides policy and engages people in protecting the ocean and its wildlife for future generations.

[2] 16 U.S.C. § 1853(a)(10).

when a stock is approaching an overfished condition, and trigger the development of management and conservation measures to prevent overfishing and rebuild the stock.[3]

As per the National Standard One (NS1) Guidelines, fishery management plans must evaluate and describe for all stocks in the fishery maximum sustainable yield (MSY), optimum yield (OY), and status determination criteria (SDC).[4]

The National Standard One (NS1) Guidelines specify that a fishery management plan must evaluate and describe the following items for all stocks that are in the fishery:

- Maximum sustainable yield (MSY);[5]
- Objective and measurable criteria for determining when a fishery is overfished (otherwise known as Status Determination Criteria, or SDC);[6]
- Optimum yield (OY);[7]
- Acceptable biological catch (ABC) control rule;[8]
- Mechanisms for specifying annual catch limits (ACLs) in relationship to acceptable biological catch (ABC);[9] and
- Accountability measures (AMs).[10]

SDC include the overfishing limit (OFL), the maximum fishing mortality threshold (MFMT) by which the Council determines whether overfishing is occurring, and the minimum stock size threshold (MSST) by which the Council determines whether a stock is overfished.[11]

The Gulf Council attempted to define MSY, OY, MFMT, and MSST for all stocks in its Generic Sustainable Fisheries Act (SFA) Amendment in 1999. However, the National Marine Fisheries Service (NMFS) rejected the proposals for MSY, OY and MSST because they were based on spawning potential ratio (SPR) and not biomass. The default definition for the MFMT is the only item that was approved, and it was set at an SPR of 30 percent. Subsequently, SDC and OY definitions have been defined on a species-by-species basis when a stock assessment finds that a species is in need of a rebuilding plan and a plan amendment has to be developed. The OY definition that has been put in place for most stocks follows the recommendations of the 1998 Technical Guidance on implementing NS1, which is to set OY as the yield that corresponds to

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[3] *Id*.
[4] 50 C.F.R. § 600.310(c)(1) and 50 C.F.R. § 600.310(c)(2).
[5] 50 C.F.R. § 600.310(c)(1).
[6] 50 C.F.R. § 600.310(c)(1).
[7] 50 C.F.R. § 600.310(c)(2).
[8] 50 C.F.R. § 600.310(c)(3).
[9] 50 C.F.R. § 600.310(c)(4).
[10] 50 C.F.R. § 600.310(c)(5).
[11] 50 C.F.R. § 600.310(e)(2)(i)(A) and 50 C.F.R. § 600.310(e)(2)(i)(F).

fishing at 75% of the fishing mortality rate at MSY ($75\%_{FMSY}$).[12] If a stock assessment finds no rebuilding plan is needed, the assessment may recommend management reference points but those reference points are not actually specified in the management plan, as is the case with yellowedge grouper, for example, where SDC were proposed in SEDAR 22 but never formally adopted in the Reef Fish FMP. The Council's Generic ACL Amendment of 2011 did define OFL for all species as part of the acceptable biological catch (ABC) control rule,[13] but there are still no OY and MSST definitions for managed species that have not been assessed or assessed species that did not require a rebuilding plan.

The Generic SDC Amendment scoping document seeks input for actions to a) adopt default definitions of SDC for all species that do not currently have them, b) potentially re-evaluate existing default SDCs, c) reconcile OY and ACL, and d) formally adopt ACLs for red snapper, which is still under a quota system. Below, we offer recommendations for consideration by the Council, Council staff, and the IPT on each proposed action.

Summary of Recommendations

The Generic SDC Amendment options paper should:

- Carefully evaluate the different options for MSST and MFMT that should be informed by advice from the Scientific and Statistical Committee and, if possible, be based on simulation analyses.
- Include F = 0.87M as an option to be analyzed for an F_{MSY} proxy.
- Regarding currently unassessed species:
    - include a list of unassessed species and description of current and future plans to assess them;
    - discuss the applicability of traditional options for MSST and MFMT to unassessed species;
    - discuss alternative options for determining overfishing and overfished status for unassessed species, including use of indicators (such as based on average length).
- Include the option to set OY at the level corresponding to the application of the ACL/ACT control rule or yield at 75% of F_{MSY}, whichever is lower.
- Include options to bring red snapper management under the ACL framework, including accountability measures.
- Include options for use of an ACT for the red snapper fishery, based on the Council's ACL and ACT control rule.

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[12] Restrepo, V et al. (1998) Technical guidance on the use of precautionary approaches to implementing National Standard 1 of the Magnuson–Stevens Fishery Conservation and Management Act. National Oceanic and Atmospheric Administration (US) Technical Memorandum NMFS-F/SPO-31. 54 pp.

[13] GMFMC (2011). Generic Annual Catch Limits/Accountability Measures Amendment for the Gulf of Mexico Fishery Management Council's Red Drum, Reef Fish, Shrimp, Coral and Coral Reefs, Fishery Management Plans. Gulf of Mexico Fishery Management Council, Tampa, Florida.

Action 1 – Specification of maximum fishing mortality threshold

The maximum fishing mortality threshold (MFMT) is the annual level of fishing mortality (including catch that is retained and catch that is discarded) above which overfishing is occurring. The MFMT is usually set at the fishing mortality rate that corresponds to MSY, termed F_{MSY}. However, when MSY cannot be reliably estimated, proxies for MSY and F_{MSY} must be used. SPR is the most frequently used MSY proxy in the United States. SPR measures the spawning potential of the exploited stock as compared to the spawning potential of the unexploited stock, usually measured by egg production. Which SPR level to choose depends on life history characteristics, but the Gulf Council commonly chooses 30% SPR. A recent study, however, questions the across-the-board application of this SPR level. Brooks et al. (2009), for example, state "our derivations indicate that only the most resilient stocks would be assured of fishing not exceeding F_{MSY} when using a reference point based on 30% SPR. Very long-lived, slow-maturing species would require much higher levels of SPR to ensure that $F < F_{MSY}$".[14]

Another MSY proxy used for some Gulf species is F_{MAX}, which is the fishing mortality rate that maximizes the yield per recruit. F_{MAX} is a controversial reference point as it can lead to very high fishing mortality rates that often exceed F_{MSY} and may not be sustainable. There are other F_{MSY} proxies but they are typically not used in U.S. fisheries management. The Generic SDC Amendment scoping document mentions the example that fishing mortality should equal the natural mortality rate (F = M). However, there is evidence that this rate of fishing mortality might be too high. A recent empirical study evaluated this rule of thumb and found that for teleosts, $F_{MSY} = 0.87M$.[15] This option should be included in the document.

Recommendations for Action 1:

Ocean Conservancy recommends that the Council analyze and evaluate a broad range of options for MFMT, including various levels of F_{SPR}, F_{MAX}, and the results of Zhou et al. (2012) of F = 0.87M. The Council should conduct an extensive literature review on MSY proxies and ask its Scientific and Statistical Committee (SSC) for advice regarding the suitability of the various proposed F_{MSY} proxies for Gulf species, given the various life history characteristics of these species. The Council should also seek the advice of its SSC regarding whether or not SDC should be set at the stock complex level.

One important issue that the Generic SDC Amendment does not address is the fact that there are a number of species under Council management that are lacking the analyses (and maybe the data) for determining traditional F_{MSY} proxies or estimating current fishing mortality rates. The Generic SDC Amendment should discuss this challenge, specifically by a) including a list of the stocks for which estimates of F currently do not exist, b) describing ongoing or future efforts to

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[14] Brooks E, Powers J, Crotes E (2009) Analytical reference points for age-structured models: application to data-poor fisheries. ICES Journal of Marine Science 67: 165-175.

[15] Zhou S, Yin S, Thorson JT, Smith ADM, Fuller M et al. (2012) Linking fishing mortality reference points to life history traits: an empirical study. Canadian Journal of Fisheries and Aquatic Sciences 69(8): 1292-1301.

estimate F (such as any planned data-poor SEDAR assessments), and c) discussing the potential of alternative methods for estimating mortality (such as non-equilibrium length-based estimators[16]) for application to Gulf species. A data-poor SEDAR had been planned for 2015; however, as of this writing, it no longer appears on the SEDAR schedule. We strongly urge the Council to make the data-poor SEDAR a priority.

Action 2 – Specification of minimum stock size threshold

The minimum stock size threshold (MSST) is the level below which a stock is considered overfished.[17] According to NMFS's interpretation in the NS1 Guidelines, the MSST for a species should equal the greater of two levels: one-half the stock size that would support maximum sustainable yield, or the minimum stock size at which rebuilding to maximum sustainable yield would be expected to occur within ten years, assuming that the stock were fished at the maximum fishing mortality threshold.[18]

For most stocks, the Council has set the MSST as the biomass at MSY as reduced by the natural mortality rate according to the following formula, recommended in the 1998 Technical Guidance for implementing NS1:[19] MSST = (1-M) * B_{MSY} (or B_{MSY} proxy). The rationale is that species with high natural mortality rates tend to be more productive and more resilient to the effects of fishing than species with low natural mortality rates. Consequently, species like groupers and some snappers will have more conservative MSST levels than species like mackerel or cobia.

The Gulf Council has indicated the desire to consider changing the current MSST definition to half of B_{MSY}. This would allow biomass to drop lower before an overfished declaration is made and a formal rebuilding plan has to be enacted. The scoping document points out that "this is the most lenient setting for MSST allowed by the NS1 guidelines. It has the advantage of allowing more flexibility to take action to stop the decline and rebuild the stock without the constraint of the rebuilding timeline required for a stock that is declared overfished." However, the scoping document also points out that the stock will have further to go to rebuild if it is declared overfished at the 50% of B_{MSY} level. Fifty percent of B_{MSY} (or B_{MSY} proxy) corresponds to a stock level of most likely less than 15% of the biomass or reproductive potential of unfished levels.

Although this MSST definition is allowed by the NS1 Guidelines, we believe it is risky and problematic, and should be avoided. Allowing biomass to drop even lower before an overfished declaration is made, thus delaying a rebuilding plan, will weaken the health of the stock, require longer rebuilding timelines with potentially more severe reductions in catch and perpetuate a cycle of reactionary management. The long term sustainability, and thus the long term viability

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[16] Gedamke T, Hoenig J (2006) Estimating Mortality from Mean Length Data in Nonequilibrium Situations, with Application to the Assessment of Goosefish. Transactions of the American Fisheries Society 135: 476-487.

[17] 50 C.F.R. § 600.310(e)(2)(i)(F).

[18] 50 C.F.R. § 600.310(e)(2)(ii)(B).

[19] Restrepo, V et al. (1998), *supra* note 12.

and profitability, of Gulf fisheries would be better served by keeping the current definition of MSST.

It is also important to point out that—as is the case for the MFMT discussions—the Generic SDC Amendment scoping document does not address the issue of MSST for unassessed species. As noted in our recommendations for Action 2, below, the Generic SDC Amendment should contemplate the issue of unassessed species. Further, we urge the Council and the SSC to make the data-poor SEDAR a priority.

Recommendations for Action 2:

Similar to our recommendations for MFMT determination, we suggest careful evaluation of MSST options. Such evaluations are best carried out through generic simulation analyses that evaluate the effects of different MSSTs in terms of rebuilding timelines and probability of success of rebuilding measures. Such analyses should be conducted by analysts at the Science Center or the NMFS Regional office, or by academics, and should consider the impact of things like recruitment variability, stock productivity and susceptibility to the fishery in order to determine stock characteristics (or specific species) for which low stock size carries more risk. Again, we recommend that the Council consult its SSC regarding advice on different MSST levels for Council-managed species. We also recommend the inclusion of a discussion on MSST for unassessed species, including a) a list of the stocks for which estimates of biomass currently do not exist, b) description of ongoing or future efforts to estimate biomass, and c) discussion of the potential of alternative methods for determine whether a stock is overfished for application to Gulf species including methods based on indicators.

We further recommend that the Generic SDC Amendment scoping document include in the section on MSST a discussion of the effects of allowing species biomass to get to extremely low levels, including effects on resilience to adverse environmental conditions, variability in biomass trends, and variability in yield. Depleted populations are often made up predominantly of younger fish with population dynamics dominated by recruitment variability that is largely influenced by environmental factors. This leads to greater fluctuations in biomass and fishery yield, instability and unpredictability in the fishery.[20] Increased variability combined with low population size is a factor in increased extinction risk.[21] In addition, the likelihood of fishing-induced regime shifts increases when key populations are highly depleted. A regime shift in marine ecosystems occurs when ecological systems and the services they provide are transformed from one stable state to an alternative state. Examples of this can be found in several North Atlantic large marine ecosystems where trophic cascades due to fishing-induced changes

[20] Hsieh, C. et al. (2006) Fishing elevates variability in the abundance of exploited species. Nature 443:859-862; Shelton, AO, Mangel, M (2011) Fluctuations of fish populations and the magnifying effects of fishing. Proceedings of the National Academy of Sciences 108:7075-7080; and Brunel, T, GerJan, J (2013) Is age structure a relevant criterion for the health of fish stocks? ICES Journal of Marine Science 70:270-283.

[21] Johst, K, Wissel, C (1997) Extinction risk in a temporally correlated fluctuating environment. Theoretical Population Biology 52: 91–100.

in top predator abundance (most notably cod) have led to an increased abundance of lower trophic species.[22] The best way to prevent such sudden and catastrophic ecosystem changes is to maintain ecosystem resilience by maintaining large, stable populations and maintaining biodiversity.[23]

Action 3 – Optimum Yield

National Standard One of the MSA requires that "[c]onservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery . . . ."[24] "Optimum yield" is defined as the amount of fish which "will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems," and "is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor."[25] While NMFS has a degree of discretion to balance among seemingly competing interests such as economic impact and allocation, the agency must always place first priority on the conservation objectives embodied in NS1. To that end, the MSA requires that any fishery management plan prepared by a Council or the Secretary shall specify "annual catch limits" and measures to ensure accountability that prevent overfishing.[26]

Unfortunately, it is unclear both in the MSA and in the NS1 Guidelines how OY and ACL relate to each other in the catch setting process. The NS1 Guidelines introduce the concepts of overfishing limit (OFL),[27] acceptable biological catch (ABC),[28] and (optionally) annual catch target (ACT),[29] as well as ABC and ACT control rules[30] that describe how ABC and ACT are set based on available data. The dilemma the Council finds itself in is that the ACLs and ACTs that have been established through the ACL and ACT control rule defined in the Council's Generic ACL Amendment[31] do not relate to the established OY definition for those species, which is the yield at 75% of F_{MSY}. In addition, most managed species do not have an MSA-compliant OY definition specified in the FMP.

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[22] For example: Frank, K et al. (2005) Trophic cascades in a formerly cod-dominated ecosystem. Science 308(5728)1621-1623; and Österblom, H, et al. (2007) Human-induced trophic cascades and the ecological regime shifts in the Baltic Sea. Ecosystems 10:877-889.

[23] Folke, C. et al. (2004) Regime shifts, resilience, and biodiversity in ecosystem management. Annual Review of Ecology, Evolution, and Systematics 35:557-581; Scheffer, M, et al. (2001) Catastrophic shifts in ecosystems. Nature 413:591-596.

[24] 16 U.S.C. § 185l(a)(1).

[25] 16 U.S.C. § 1802(33).

[26] 16 U.S.C. § 1853(a)(15).

[27] 50 C.F.R. § 600.310(e)(2)(i)(D).

[28] 50 C.F.R. § 600.310(f)(2)(ii).

[29] 50 C.F.R. § 600.310(f)(2)(v).

[30] 50 C.F.R. § 600.310(f)(2)(ii). and 50 C.F.R. § 600.310(f)(2)(vi).

[31] GMFMC (2011), *supra* note 12.

The concept of optimum yield has been notoriously difficult to operationalize, partially because social, economic, and ecological factors have been hard to quantify and agreement on operational management objectives that allows prioritizing the different OY factors is difficult to achieve. There are now tools that allow evaluation of trade-offs between different management options which could be used to evaluate OY definitions. For example, these include management strategy evaluation or the management procedure approach. These simulation-based decision support tools could also be used to evaluate ecological factors in setting OY and to evaluate management for data-poor species.[32]

Recommendations for Action 3:

Ocean Conservancy recommends that the Council apply the above mentioned simulation-based decision support tools to Gulf species to inform the specification of OY. However, in the absence of these analyses, setting ACLs that provide adequate protections against overfishing and keeping the existing default OY definition may be the best course of action for now. We recommend that the Council continue setting OY at the yield level corresponding to fishing at 75% of F_{MSY}, or set it at the catch level corresponding to the application of the ACL/ACT control rule, whichever one is lower. Management measures and regulations should then be set to achieve OY.

Action 4 – Red snapper annual catch limit

ACLs were never formally adopted for red snapper. Instead, quotas are being used for the recreational and commercial fishery and serve as sector-ACLs. The Council is considering establishing a formal ACL system for red snapper so as to be consistent with its other managed fisheries and to facilitate the creation and implementation of accountability measures.

Recommendations for Action 4:

Ocean Conservancy recommends that the options paper for the Generic SDC Amendment include options to formally adopt the ACL terminology for red snapper, to use an ACT for red snapper based on the Council's ACL/ACT control rule, and to include a variety of options for accountability measures, including overage adjustments and bag limit reductions in the year following an ACL overage by the recreational sector.

Conclusion

We commend the Council for taking up the issue of re-evaluating status determination criteria and optimum yield. If the maximum fishing mortality threshold is set appropriately and

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[32] For example see Butterworth DS, Johnston SJ, Brandão A (2010) Pretesting the Likely Efficacy of Suggested Management Approaches to Data-Poor Fisheries. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 2: 131-145. Or Ye Y, Cochrane K, Qiu Y (2011) Using ecological indicators in the context of an ecosystem approach to fisheries for data-limited fisheries. Fisheries Research 112(3): 108-116.

management measures (including OY) are set such that it is not exceeded, the likelihood that a stock will become overfished is greatly reduced. This, in turn, will result in higher resilience of stocks to environmental and anthropogenic disturbances, more fishery predictability and less need for disruptive management intervention. The actions in the Generic SDC Amendment have the potential to greatly improve the long term sustainability, and long term viability and profitability, of the red snapper fishery as a whole.

As always, we look forward to working with the Council on the development of this much needed FMP amendment.

Sincerely,

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