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ENVIRONMENTAL DEFENSE FUND

finding the ways that work

September 22, 2008

Mark R. Millikin
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Office of Sustainable Fisheries
1315 East-West Highway, Room 13357
Silver Spring, MD 20910

Re: Comments on NMFS Proposed Rule to Revise the National Standard 1 Guidelines (73 Fed. Reg. 32526 (June 9, 2008)) (Docket No. 0648-AV60)

Dear Mr. Millikin:

On behalf of more than 500,000 members, Environmental Defense Fund (EDF) submits these comments on the National Marine Fisheries Service's (NMFS) Proposed Rule to revise the National Standard One (NS1) Guidelines of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). We are pleased that NMFS has been able to make progress in publishing this rule, but we are concerned that, as drafted, it does not take the steps necessary to meet Congress's intent to end overfishing. Indeed, the current rule largely perpetuates the status quo, which has failed fishermen and fisheries for decades. NMFS must give individuals and communities the incentives and tools they need to restore their fisheries. Only then will we escape the downward spiral caused by overfishing. We offer several recommendations intended to help restore U.S. fisheries to abundance and enhance the important economic and recreational opportunities they provide our nation.

I. Summary

The main goal of Congress in amending the MSA in 2006 was to end and prevent overfishing.[1] Congress recognized that "ten years after enactment of the [Sustainable Fisheries Act] . . . overfishing is still occurring in a number of fisheries," and sought to solve the problem by requiring science-based Annual Catch Limits for all fisheries and Accountability Measures to ensure compliance with the limits.[2] This chance to revise the NS1 Guidelines and to set the nation on a course for fisheries abundance is a once-a-decade opportunity. Fishing industry

[1] Magnuson-Stevens Fishery Conservation and Management Reauthorization Act, Pub. L. No. 109-479 (Jan. 12, 2007).
[2] S. Rep. No. 109-229 (Apr. 4, 2006) at p. 6.

participants, scientists, conservation groups and other stakeholders recognize that change is needed. Thus, NMFS has a unique opportunity to implement new rules that can finally work to sustain U.S. fisheries and the coastal communities that depend on them.

EDF is pleased that NMFS has published the Proposed Rule and, in concept, we concur that effective Annual Catch Limits and Accountability Measures together offer good opportunities to reduce the risk of overfishing. Annual Catch Limits are the scientific foundation in fisheries management because they set a limit on how many fish can safely be harvested. Accountability Measures are the mix of tools used to ensure that fishermen can comply with Annual Catch Limits. Clearly, the best tools improve compliance with Annual Catch Limits and contribute to achieving the goals of all of the MSA's National Standards. Unfortunately, the current proposal perpetuates the failed status quo of overfishing and the problems that stem from it – reduced catches, economic hardship, intense conflicts, and declining ecosystems. The Proposed Rule must be overhauled to make sure that our fisheries are better off in 2018 – not worse – than they are today.

Performance-based fishery management has been tested with impressive results around the world. *Science* magazine just published the most definitive report ever on how to prevent the collapse of the world's fisheries[3] (Appendix A). Scientists examined the fate of over 11,000 fisheries around the world, and found that the key to preventing collapse is performance-based catch shares. The report concluded that if catch shares had been implemented in 1970, instead of the current global estimates of 27% fisheries collapse, "the percent collapsed is reduced to just 9% by 2003; *this fraction remains constant*" (emphasis added). This is strong evidence that catch shares end and prevent overfishing.

The most important action NMFS can take in revising NS1 is to give individuals and communities the incentives and tools they need to meet clearly-defined performance standards and restore their fisheries. To do this, the Proposed Rule must require managers to explore catch shares, or Limited Access Privilege Programs (LAPPs) as an Accountability Measure in commercial fisheries because they are proven to help industry comply with Annual Catch Limits, provide accurate data, cut dead discarded fish, fish year-round, and improve business practices.

The responsibility for complying with Annual Catch Limits should be shared by all sectors of the fishery. Therefore, NMFS must also ensure that separate Annual Catch Limits and Accountability Measures are required for all distinct fishery sectors. Otherwise, the NS1 Guidelines will continue to allow one sector to overfish if another compensates for the overage, creating a disincentive for people to comply with an Annual Catch Limits and an unfair burden on top performing sectors.

In developing Accountability Measures for recreational fisheries, managers should encourage development and implementation of LAPPs in for-hire sectors. In developing Accountability Measures for other recreational sectors, managers should develop effective performance-based mechanisms. Managers should work in consultation with recreational fishermen and other stakeholders to achieve these objectives.

[3] *See* Costello, C., et al. 2008. "Can Catch Shares Prevent Fisheries Collapse?" Science, 321 (5896), 1678-1681.

Finally, NMFS must fix the serious flaw that allows an Annual Catch Limit to be set equal to the Allowable Biological Catch, and the Allowable Biological Catch to be set equal to the Overfishing Limit, a problem that undermines the NS1 Guidelines because it falsely assumes that there is no scientific or management uncertainty in setting those limits.

EDF's recommendations are intended to ensure that the revisions to the NS1 Guidelines finally end overfishing, and that fishery goals described in the other National Standards are met. In summary, NMFS should lay the foundation for success in four key ways:

1. Require Councils to evaluate performance-based LAPPs as a preferred Accountability Measure for commercial fisheries, because they are the most effective tool to date proven to ensure compliance with Annual Catch Limits, end and prevent overfishing, and achieve the goals of the other National Standards.
    - For Accountability Measures to be effective, the concept must be expanded (beyond a trigger to prevent an Annual Catch Limit overage) to include catch monitoring, data collection and enforcement.
    - For Accountability Measures that are not LAPPs, managers should demonstrate how the measures will ensure compliance with the Annual Catch Limits as well as improve data and enforcement, reduce bycatch, promote safety, and minimize adverse economic impacts at least as well as LAPPs.

2. Require (not just allow) managers to establish separate Annual Catch Limits and Accountability Measures for each distinct sector of a fishery, and ensure that Accountability Measures are equally rigorous for each.
    - Furthermore, each sector's responsibilities should be described, and sectors should be rewarded for conservation by tying allocation and reallocation of fish to compliance with Annual Catch Limits and equally rigorous Accountability Measures.

3. In developing Accountability Measures for recreational fisheries, managers should encourage development and implementation of LAPPs in for-hire sectors. In developing Accountability Measures for other recreational sectors, managers should develop effective performance-based mechanisms in consultation with recreational fishermen and other stakeholders.

4. Ensure that Annual Catch Limits and other catch limits and targets are set appropriately accounting for uncertainty and are below the Allowable Biological Catch and Overfishing Limit.
    - Transparent accounting of dead discards and all fishing related mortality and deductions for overages are essential.
    - Additional guidance is needed to protect especially vulnerable species, distinguishing between average and low productivity stocks in setting "chronic overfishing" performance standards, and ensuring that new species groupings do not threaten some species.
    - Clarify that the MSA requires that rebuilding take place as rapidly as possible.

- Ensure that newly-empowered Science and Statistical Committees are constituted and supported to do their job.

EDF's detailed recommendations are discussed below.

II. Recommendations

1. Require managers to evaluate performance –based LAPPs as a preferred Accountability Measure for commercial fisheries, because they are the most effective tool to date proven to ensure compliance with Annual Catch Limits, end and prevent overfishing, and achieve the goals of the other National Standards.

Accountability Measures are the tools used to ensure that fishermen comply with an Annual Catch Limit. The Proposed Rule falls short in important ways: 1) it lacks guidance on which tools are proven to help people comply with Annual Catch Limits; 2) it fails to acknowledge that catch monitoring, data collection and analysis, and enforcement are essential parts of Accountability Measures; and, 3) it does not consider the consequences of its proposals on the other National Standards. Instead, NMFS guides managers solely towards punitive Accountability Measures that shut down fisheries in-season, shrink seasons in future years, and reduce catch targets. Decades of experience have demonstrated that these lead to a destructive "race-for-fish" characterized by overfishing, economic hardships, foregone sporting opportunities, and threats to life and property. At the same time, such measures do not do a good job of reducing fishing mortality because they force fishermen to waste millions of fish accidentally captured and discarded dead during long closures, or as a result of daily catch limits and catch-and-release strategies. As written, the Proposed Rule will not help end overfishing and it will lead to conflicts with several National Standards including those intended to minimize adverse economic impacts from regulations, reduce bycatch, and promote safety.[4] This is not the result Congress intended when it amended the MSA.

Instead, NMFS must give individuals and communities the incentives and tools they need to restore their fisheries and escape the downward spiral caused by overfishing. To do this, the Rule should require managers to explore Limited Access Privilege Programs[5] as preferred Accountability Measures for commercial fisheries because they are the only tool available to date that ensures that fishermen and communities comply with Annual Catch Limits,[6] incorporates catch monitoring and enforcement, and boosts compliance with the other National Standards.

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[4] *See* 16 U.S.C. §§ 1851(a)(1), (5), (8), (9), (10).

[5] LAPPs are known by a variety of names. Collectively, they may be called "catch shares." Common designs are Individual Fishing Quotas, Community Development Quotas, and Angling Management Organizations among others. References to LAPPs in this letter incorporate all of these.

[6] For example, *see* Lee G. Anderson and Mark C. Holliday, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *The Design and Use of Limited Access Privilege Programs*, NOAA Technical Memorandum NMFS-F/SPO-86 (Nov. 2007); Environmental Defense Fund, *Sustaining America's Fisheries and Fishing Communities: An Evaluation of Incentive-Based Management* (2007), *available at* www.sustainingfisheries.com.; and James N. Sanchirico and Richard Newell, Resources for the Future, *Catching Market Efficiencies: Quota-Based Fishery Management*, Resources 150 (Spring) 2003.

In fact, compliance with Annual Catch Limits is built into LAPPs. They work by setting a scientifically-sound Annual Catch Limit and allocating it as shares (percentages), which are often transferable, to individuals or communities. Rigorous monitoring, data collection and analysis, and enforcement are used to carefully track each vessel's catch. In other words, LAPPs are the best Accountability Measure available. An evaluation of several of North America's LAPPs documents that fishermen harvest on average five percent below the Annual Catch Limit.[7] Furthermore, LAPP participants support and work to improve compliance because the health of fisheries and the success of their businesses depend on it.[8]

The vastly different performance of the commercial and sport sectors of the Gulf of Mexico red snapper fishery demonstrates why Accountability Measures like those in the Proposed Rule perpetuate the status quo, while LAPPs ensure compliance with Annual Catch Limits. The tools (i.e., Accountability Measures) in place to help the recreational sector comply with its catch limit are season closures coupled with daily bag limits, a minimum size limit (to make the season as long as possible), and fleet-wide monitoring via a general survey methodology conducted under the Marine Recreational Fishing Statistics Survey.

The Accountability Measures used in the recreational sectors are the same type of Accountability Measures recommended by NMFS in the Proposed Rule, and the result has been ongoing overfishing. The season has shrunk from year-round in 1996 to just 60 days in 2008. In 2007 (final data are not available for 2008) the recreational sector exceeded its catch limit by 30 percent[9] and it increased its sources of discards. There is wide-spread distrust of the data and monitoring system, and the catch limit has recently been cut in half. Understandably, sport fishermen are frustrated because management hurts angling opportunities and related businesses on the water and along the Gulf coast.

In contrast, the commercial red snapper fishery began operating under LAPPs (an Individual Fishing Quota program) as its new Accountability Measures in 2007. Under LAPPs, real-time catch monitoring, data collection and enforcement track each vessel's catch and fishing activities. In the first year, the fishery harvested three percent under its catch limit, reduced the percentage of discarded fish by at least 71 percent,[10] the dockside price increased by 25 percent or more,[11] and fishermen report cutting harvesting costs and working under safer conditions.

It is surprising that the Proposed Rule does not identify LAPPs as an Accountability Measure preference. NMFS has already acknowledged their positive outcomes,[12] the Administration made a commitment to increase the number of LAPP fisheries,[13] and Congress specifically

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[7] Environmental Defense Fund, *Sustaining America's Fisheries and Fishing Communities: An Evaluation of Incentive-Based Management* (2007), *available at* www.sustainingfisheries.com.

[8] *Id.*

[9] National Marine Fisheries Service. *Southeast Fishery Bulletin: Early Closure of the Red Snapper Recreational Fishery in the Gulf of Mexico.* FB08-017. March 25, 2008.

[10] National Marine Fisheries Service - Southeast Region. 2007 Annual Red Snapper IFQ Program Report. 18 pp.

[11] *Id.*

[12] *See* Lee G. Anderson and Mark C. Holliday, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *The Design and Use of Limited Access Privilege Programs*, NOAA Technical Memorandum NMFS-F/SPO-86 (Nov. 2007) at 6-7; *see also* U.S. Ocean Action Plan: The Bush Administration's Response to the U.S. Commission on Ocean Policy (Dec. 17, 2004) at 18.

[13] *See* U.S. Ocean Action Plan: The Bush Administration's Response to the U.S. Commission on Ocean Policy (Dec. 17, 2004) at 18 ("[e]ncouraging market-based incentives to adjust harvest capacity in a fishery can help end the race

authorized their use in the MSA.[14] LAPPs are increasingly used in commercial fisheries and they are even being explored in recreational fishing.[15] By overlooking this tool as its top priority recommendation for Accountability Measures, NMFS is missing an opportunity to help managers effectively end overfishing and achieve the goals of the other National Standards.

For all of these reasons, EDF recommends that the NS1 explicitly require Councils[16] to evaluate LAPPs as a preferred Accountability Measure for commercial fisheries, or explain why a LAPP is not feasible and how the alternative will perform as well or better. NMFS has clear statutory authority to require such an evaluation.[17]

EDF recommends that the NS1 Guidelines be revised as follows. The plain text is that proposed by NMFS, the underlined text shows EDF's recommended additions and the stricken text shows EDF's suggested deletions. See a full redline version of the regulations with specific changes in Appendix B.

- ***Require Councils to evaluate LAPPs in commercial fisheries and all Accountability Measure impacts on other National Standards:***

  Proposed 50 C.F.R. § 600.310(c) *Summary of items to include in FMPs related to NS1.* For all stocks and stock complexes that are "in the fishery," the Councils should evaluate and describe the following items in the FMPs and amend the FMPs, if necessary, to align their management objectives and end overfishing:

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for fish, improve product quality, enhance safety at sea, and make fishing operations more efficient, ultimately improving the livelihood of those who depend on them.").

[14] 16 U.S.C. § 1853a.

[15] LAPPs are a new concept in recreational fishing, but may include options such as For-Hire IFQs and Angler Harvest Tags among others. For example, *see* Sutinen, J. and Johnston, R. *Angling Management Organizations: Integrating the Recreational Sector into Fishery Management.* Marine Policy 2003 27(471-487) and Johnston, R., Holland, D., Maharaj, V, and Campson, T.W. Fish Harvest Tags: An Alternative Management Approach for Recreational Fisheries in the U.S. Gulf of Mexico. Marine Policy 2007 doi:10.1016/jmarpol.2006.12.004. In addition, the Gulf of Mexico Fishery Management Council has tasked one of its advisory panels to explore LAPPs as a means to resolve the difficult problems facing its recreational red snapper fishery. For example, *see* Gulf Council August, 2008 Briefing Book, Tab B 14.

[16] The term "Council" as defined in 50 C.F.R. § 600.305(c)(11) includes both regional fishery management councils and the Secretary when preparing fishery management plans and amendments. It is used in the same way in this letter.

[17] NMFS routinely and properly invokes its discretion to require the Councils, when making management decisions, to take actions not explicitly required by the MSA. For example, NMFS introduces two concepts in the preamble to the Proposed Rule, "Overfishing Limits" and "Annual Catch Targets." NMFS states explicitly that these are concepts "which are not set forth in the MSA but which *NMFS believes would be helpful to implement the statutory requirements*." *See* 73 Fed. Reg. at 32533 (emphasis added). Numerous other sections of the National Standard Guidelines require adherence to the precautionary approach and consideration of ecosystem or other factors when establishing management measures, none of which are explicitly required by the MSA. *See, e.g.*, 50 C.F.R. § 600.350(d)(3)(i) (National Standard 9 Guidelines). Moreover, Congress added Section 303A to the MSA in 2006 expressly to authorize the Councils to adopt LAPPs. 16 U.S.C. § 1853a. The MSA also requires NMFS to establish advisory guidelines based on the National Standards to assist in development of fishery plans. 16 U.S.C. § 1851(b). These statutory provisions provide ample discretion to NMFS to require the Councils to consider LAPPs as a preferred Accountability Measure. Courts have long recognized that NMFS has broad discretion under the MSA to implement measures it finds necessary to improve management. *See, e.g.*, Connecticut v. Daley, 53 F. Supp. 2d 147, 157-158 (D. Conn. 1999). Requiring the Councils to consider LAPPs would be "helpful to implement the statutory requirements" of setting Accountability Measures and other requirements of the MSA.

(8) The potential for implementing a Limited Access Privilege Program to establish AMs in commercial fisheries, including whether such a LAPP would provide more effective AMs than other measures the Council either has in place or is considering with respect to meeting the objectives of National Standard 1 and other National Standards and, if applicable, an explanation for why the Council has decided not to implement a LAPP and how the selected alternative will perform as well or better.

§ 600.310(g)(8) *Accountability Measures based on LAPPs.* Limited Access Privilege Programs have demonstrated an ability to meet catch limits and other conservation goals while enhancing compliance, data collection, monitoring and enforcement and achieving the goals of the other National Standards. LAPPs are a preferred method for establishing AMs in commercial fisheries. For each commercial fishery, Councils should evaluate and describe the potential for implementing a LAPP to establish AMs, including an assessment of whether such a LAPP would provide more effective AMs than other measures the Council either has in place or is considering with respect to meeting the objectives of National Standard 1 and other National Standards.

- ***Expand the concept of Accountability Measures to include effective catch monitoring, data collection and analysis, and enforcement:***

§ 600.310(g)(7) *Data Collection and Catch Monitoring to Implement Accountability Measures.* The Councils should determine, by sector and for the fishery as a whole, whether existing methods for monitoring catches (including landings and discards) are sufficient to determine whether an ACL is being approached. The Councils should provide an appropriate trigger for AMs to prevent the ACL from being exceeded, or to correct and mitigate any overages during the next fishing year. Where catch monitoring, data collection and analysis methods, and enforcement mechanisms are unreliable, the Councils should propose better monitoring systems and account for this management uncertainty when establishing the ACT control rule (see paragraph (f)(6)(i) of this section).

§ 600.310(h)(1) In establishing Annual Catch Limit and Accountability Measures, FMPs should describe:
(iii) AMs and their relationship to ABC and ACT control rules, including how AMs are triggered, ~~and~~ what sources of data will be used and how (e.g., in season data, annual catch compared to the Annual Catch Limits, or multi-year averaging approach), the reliability of the resulting data sources and information tracking catch and preventing the ACL from being exceeded and, if not reliable, what additional AMs will be implemented to account for the increased uncertainty;

§ 600.310(i) Fisheries data. In their FMPs, Councils should describe general data collection and analysis methods, as well as any specific data collection and analysis methods used for all stocks, stock complexes, and ecosystem component species. FMPs should:

(4) Describe how data collection and analysis and catch monitoring methods employed across each sector of the fishery will ensure that AMs are triggered so as to prevent the ACL from being exceeded, or to correct and mitigate any overages if they occur.

2. **Require (not just allow) managers to establish separate Annual Catch Limits and Accountability Measures for each distinct sector of a fishery, and ensure that Accountability Measures s are equally rigorous for each.**

As written, the Proposed Rule allows, but does not require, sector-by-sector Annual Catch Limits and Accountability Measures.[18] The failure to require sector distinctions will perpetuate the status quo, as the NS1 Guidelines would allow one sector to overfish if another compensates for the overage. In turn, the consequence is a disincentive for people to comply with an Annual Catch Limit. Instead, NMFS must ensure that separate Annual Catch Limits and Accountability Measures are required for all distinct fishery sectors of a single species or species complex. These may include (but are not limited to) sector designations from social interests (e.g., commercial and recreational fisheries) or gear divisions (e.g., hook-and-line and trawling).

Again, the Gulf of Mexico red snapper fishery, with three distinct sectors, provides an instructive example. Red snapper are targeted by commercial and recreational fishermen, and caught as bycatch in the shrimp fishery. The commercial and recreational sectors have a total catch limit that is divided about evenly between them. The shrimp fishery's snapper catch is not defined in pounds and counted against the total catch limit, and instead managers attempt to control the bycatch indirectly by limiting trawling effort.

Under today's management system, the three sectors vary in their compliance with catch limits and in meeting conservation objectives. In 2007, the recreational sector shot over its limit by about 30 percent[19] and discarded a large number of fish. In the same year, the commercial sector operating under its new LAPP harvested three percent under its limit and reduced its regulatory discards. The shrimp fishery did not exceed its effort limit. Even though performance differs, regulators apply catch reductions and increases without regard for which sector is responsible. They simply split them between the commercial and recreational sectors, and can adjust the shrimp industry's effort limit.[20] Thus, a sector that complies with its catch limit may not benefit and, in fact, regulators may *de facto* allocate a portion of a sector's conservation savings to another sector to help offset its overages. Such management allows overfishing to continue, creates disincentives to comply with catch limits, and fosters intense conflicts between sectors and between fishermen and regulators.

For NS1 to end and prevent overfishing, sector responsibilities must also be clearly defined. These should ensure that Accountability Measures are equally rigorous for all sectors, and that each is individually responsible for complying with its Annual Catch Limit and meeting other management objectives. In addition, catch increases and decreases should be allocated according

[18] *See* 73 Fed. Reg. at 32535.
[19] *See* supra note 10.
[20] *See* Gulf of Mexico Fishery Management Council, *Final Amendment 27/14 to the Reef Fish and Shrimp Fishery Management Plans* (2007).

to sectors' contribution to rebuilding or overfishing. The NS1 Guidelines should require that initial allocations of fish between sectors, and reallocation between them, be contingent on a sector's compliance with Annual Catch Limits, based on equally rigorous accounting. If there are different levels of performance between sectors in a fishery, allocations should favor the sector that complies with Annual Catch Limits. If an initial split is being made, Councils should not allocate catches beyond historical average landings to any sector for which Annual Catch Limits and Accountability Measures are either not yet in place, or are less robust than another sector. Allocation to sectors that do not have effective Accountability Measures in place and cannot comply with Annual Catch Limits and other National Standards undermines conservation and the goal to end overfishing.

The same authorities that give NMFS discretion to require Councils to evaluate LAPPs as an Accountability Measure[21] also permit it to require sector management. In fact, Section 303(a)(14) of the MSA compels NMFS to establish sector management. That section requires management plans to allocate "any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing *sectors* in the fishery."[22] Sectors often operate with varying management tools and success. To comply with this statutory mandate, NMFS must establish Annual Catch Limits and Accountability Measures for each sector within a fishery.

EDF recommends that the NS1 Guidelines be revised as follows:

- ***Require Councils to designate separate Annual Catch Limits and Accountability Measures for all sectors:***

  § 600.310(f)(5) Setting the Annual Catch Limit

  (ii) *Sector ACLs.* A Council ~~may, but is not required to,~~ should establish sector-ACLs by dividing the ACL among the various sectors of the fishery ~~divide an Annual Catch Limit into sector-Annual Catch Limits~~. "Sector," for purposes of this ~~section~~ Part, means a distinct user group to which separate management strategies and separate catch quotas apply. Examples of sectors include the commercial sector, recreational sector, or various gear groups within a fishery. Sector-Accountability Measures must be developed for each sector-ACL, and the sum of sector ACLs must not exceed the stock or stock complex level ACLs. The system of ACLs and AMs designed must be effective and equitable and protect the stock or stock complex as a whole. ~~If~~ Where sector-ACLs and AMs are established, additional AMs at the stock or stock complex level would also be appropriate.

- ***Ensure that Accountability Measures are equally rigorous for all sectors and tie allocation and reallocation to compliance with Annual Catch Limits.***

  Insert a new section § 600.310(g)(5) for Sector-Accountability Measures, as set forth above in Section II(C), that includes a requirement that the Councils should not

[21] *See* supra note 17.
[22] 16 U.S.C. § 1853(a)(14) (emphasis added).

reallocate catch to a sector unless that sector complies with Annual Catch Limits and has implemented Accountability Measures that are equally rigorous or effective as those applicable to other sectors.

§ 600.310(g)(5) *Sector Accountability Measures.* Sector-AMs must be developed for each Sector-ACL. The Councils should ensure that AMs, as well as methods for data collection and analysis and catch monitoring to determine when AMs are triggered, are equally rigorous across all sectors of a fishery. Where AMs, data collection and analysis and catch monitoring are not equally rigorous across all sectors, the Councils should factor in the resulting uncertainty by reducing Sector-ACTs and Sector-ACLs for sectors that have not implemented measures that are as robust or effective as the other sectors in the fishery. The Councils should not reallocate catch to a sector unless that sector has implemented AMs that are equally rigorous or effective in adhering to the ACL as the AMs applicable to other sectors.[23]

3. **In developing Accountability Measures for recreational fisheries, managers should encourage development and implementation of LAPPs in for-hire sectors. In developing Accountability Measures for other recreational sectors, managers should develop effective performance-based mechanisms in consultation with recreational fishermen and other stakeholders.**

The economics, conservation, and fishing opportunities of recreational sectors can also improve with performance-based management approaches. As described previously, conventional management has been failing the recreational sector with shortened seasons and decreased bag limits, among other things. Concerned for their future, recreational fishermen are calling for change. For example, fishermen in the for-hire sector of the Gulf of Mexico red snapper fishery recently sent letters to the chair of the Gulf Council urging action to implement Accountability Measures and consideration of new approaches that would boost performance of the fishery (see Appendix C). The economic value of this sector is too important to ignore.

To meet the growing demand for new approaches, the Proposed Rule should encourage the development and implementation of performance-based Accountability Measures for recreational sectors. For for-hire sectors, LAPPs can provide a viable and secure business future, and such programs should be encouraged. For other recreational sectors, managers should develop effective performance-based mechanisms. Certainly recreational sectors face special challenges in moving from conventional to performance-based management. For example, NMFS is working to improve data collection and analysis systems, which EDF agrees is an important step, because such systems will improve the performance of new management approaches.[24] It is important to the ultimate success of performance-based systems to engage recreational fishermen and other stakeholders in designing systems that work.

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[23] Conforming changes are needed in other sections of the regulatory text. These changes are reflected in Appendix B.

[24] *See* Marine Recreational Fisheries of the United States; National Saltwater Angler Registry Program, 73 Fed. Reg. 33381 (June 12, 2008) (proposed rule to establish saltwater angler registry); 73 Fed. Reg. 46579 (Aug. 11, 2008) (extending comment period). NMFS has also established the Marine Recreational Information Program ("MRIP")

EDF recommends that the NS1 Guidelines be revised as follows:

- ***Encourage LAPP and other performance-based approaches to Accountability Measures in recreational sectors.***

  Insert a new section § 600.310(c)(9) that encourages Councils to develop and implement performance-based approaches, including LAPPs in for-hire sectors, as Accountability Measures for recreational sectors.

  § 600.310(c)(9) In implementing AMs, the Councils should encourage the development and implementation of LAPPs in for-hire recreational sectors, and development and implementation of effective performance-based management in other recreational sectors. In doing this, the Councils should consult with affected fishermen and other stakeholders.

4. Ensure that Annual Catch Limits and other catch limits and targets are set appropriately (both scientifically and politically) and are below the Overfishing Limit.

To be effective, catch limits and targets must consider several critical factors: accurate and transparent accounting of all fishing mortality, deductions of overages, scientific and management uncertainty, rapid rebuilding, and potential political influence.

Accurate and transparent accounting of all fishing mortality. EDF supports NMFS's definition of "catch" to include fish that are retained as well as mortality of fish that are discarded.[25] However, the NS1 Guidelines should clearly describe that "catch" includes estimates of dead discards and post-release mortality from catch-and-release recreational fishing as well as all other regulatory and economic discards from both recreational and commercial fishing.[26] We are concerned with the Proposed Rule's statement that catch targets may be specified for landings "so long as an estimate of bycatch is accounted for such that the total of landings and bycatch will not exceed the . . . Annual Catch Limit."[27] Today, discards are often factored into the stock assessment, but in many cases they are not described as part of the catch limit setting process. Instead, NMFS should require Councils to specify their estimates of all sources of fishing mortality in numbers of fish or in pounds and deduct the estimates from the Allowable Biological Catch when setting the Annual Catch Limit. A clear accounting for all fishing mortality is necessary for managers and

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to identify and address shortcomings of the existing Marine Recreational Fisheries Statistics Survey ("MRFSS"), as required by the 2006 amendments to the MSA. *See* 16 U.S.C. § 1881(g)(3)(A) (requiring NMFS to "establish a program to improve the quality and accuracy of information generated by the Marine Recreational Fishery Statistics Survey, with a goal of achieving acceptable accuracy and utility for each individual fishery" by January, 2009).

[25] *Id.*

[26] We note that fish released by recreational anglers that otherwise could have been retained may not fit the definition of "regulatory" or "economic" discards set forth in the MSA. *See* 16 U.S.C. §§ 1802(9), (38). Nevertheless, all sources of post-release mortality must be accounted for, whether they officially constitute "discards" or not.

[27] 73 Fed. Reg. at 32533.

stakeholders to make the best decision regarding the tradeoffs between wasteful discards and landings.

Deductions of overages. We are also concerned that statements in the Proposed Rule regarding Accountability Measures create uncertainty as to how – and whether – overages will really be accounted for. As currently written, the rule states that when Annual Catch Limits are exceeded, then adjustments would be effective "in the next fishing year, *or as soon as possible*, with explanation of why more timely adjustment is not possible."[28] For multi-year plans, it states that "a subsequent year's harvest *could be revised.*"[29] Finally, for stocks in a rebuilding plan, the next year's Annual Catch Limit would be reduced by the full amount of the overage "unless the best scientific evidence available shows that *a reduced overage adjustment is sufficient, or no adjustment is needed*."[30] Writing off overages is inconsistent with the precautionary approach, and would undermine the Accountability Measure requirements of MSA. NMFS has provided no guidance on circumstances that might warrant an adjustment beyond the next fishing year. Instead, NMFS should simply make clear that all overages must be accounted for in full for all managed fisheries (whether they are healthy, overfished, or undergoing overfishing) no later than when the Annual Catch Limit for the following fishing year is determined. To the extent actual numbers are not available in the year when the Annual Catch Limit is set, a reliable estimate should be used, subject to a "true-up" adjustment once the actual numbers are obtained.

Scientific and management uncertainty. We generally agree that the Proposed Rule's system of Overfishing Limits, Allowable Biological Catch, Annual Catch Limits and Annual Catch Targets may account for some scientific and management uncertainty. However, NMFS must fix the serious flaw that allows an Annual Catch Limit to be set equal to Allowable Biological Catch and Allowable Biological Catch to be set equal to the Overfishing Limit. This undermines NS1 because it makes a false assumption that there is no scientific or management uncertainty in setting these limits. The NS1 Guidelines should require the Annual Catch Limit to be set lower than Allowable Biological Catch and Allowable Biological Catch to be set lower than the Overfishing Limit in all cases without exception.

In addition, the NS1 revisions should provide additional guidance for setting Annual Catch Limits and other limits and targets for species that are especially vulnerable to overfishing, i.e., those that exhibit sequential hermaphroditism, aggregatory spawning, and habitat associations making fish-finding unusually easy. The Proposed Rule fails to incorporate "precaution" even though NMFS has emphasized its importance, suggesting that the degree of precaution required is related to a stock's susceptibility to overfishing, which, in turn, is based on that species' life history characteristics and uncertainty.[31] In practice, this approach is generally rejected in favor of maximizing yields, subjecting many fisheries to overfishing and underscoring the importance of factoring precaution into the setting of catch limits. In addition, NMFS describes a performance standard under which "chronic overfishing" is deemed to occur when an Annual Catch Limit is exceeded in more than one of the last four years, triggering a reevaluation of the

[28] 73 Fed. Reg. at 32535 (emphasis added).
[29] *Id.*
[30] *Id.*
[31] *See* NMFS, *Strategic Guidance for Implementing an Ecosystem-Based Approach to Fisheries Management.* (2003).

Accountability Measures.[32] This may be sufficient for productive stocks, but is inadequate for vulnerable ones. A year-class of a fish with a 30-year life span that recruits into the fishery at age 6-7 could exceed its Annual Catch Limit six or seven times during that life. Thus, NMFS should require, not just allow, Councils to select a higher performance standard for stocks especially vulnerable to overfishing. Moreover, the language in the proposed rule states that Allowable Biological Catch and Annual Catch Target control rules "should" be developed for each stock and stock complex "when possible." This language is not nearly strong enough. Allowable Biological Catch and Annual Catch Target control rules must be developed in all cases, incorporating adequate precaution, and with clear advance determinations included as to what levels of stock abundance induce cessation of fishing.

We support the concept of segmenting fishery ecosystems into stocks and stock complexes in the fishery, and those not in the fishery, but are concerned about the potential for abuse. We agree that relative vulnerability should be a key determinant of eligibility for lumping and that the presence of weaker, less-well-known stocks within a complex should require additional care.[33] We also agree that an FMP amendment should be required to create either stock complexes or designations of Ecosystem Component ("EC") species.[34] However, the definitions in the proposed rule give considerable latitude to Councils in deciding whether species (including currently managed species) should be included in an FMP as "non-target" or "EC" species. This flexibility in the species "mapping" process creates perverse incentives for Councils to dump vulnerable, rare and less well-known species into "stock complexes" or into "EC" status rather than to develop adequate information for management.[35] For example, the large groundfish and reef fish complexes include many sought-after species that are rare and poorly known, many of which act as "weak stocks." While the species in a complex are supposed to be similar in geographic, life history and vulnerability characteristics, the practice has been to lump them whether or not they are similar. The result is that weaker stocks end up being overfished. To solve this problem, EDF recommends implementation of measures to prevent new assortments of species from reducing the stringency of management actions for an individual species, absent real evidence of improved stock condition. NMFS should also require Councils to evaluate the relative adequacy of information for each stock in a fishery, and prioritize the gathering of information based on overall information needs and stock vulnerability to overfishing.

Rapid rebuilding. The NS1 Guidelines should clarify that the MSA requires rebuilding stocks as rapidly as possible. The Proposed Rule is consistent with current practice, but is inconsistent with the pre-2006 MSA requirement that rebuilding timeframes be "as short as possible,"[36] and the 2006 change that requires an immediate end to overfishing. It appears that NMFS's interpretation is that Councils can take as long to rebuild a fishery as they previously had both to end overfishing and rebuild, which renders the 2006 changes to the MSA obsolete. By striking the phrase "ending overfishing" from Section 304(e)(4) of the MSA, Congress intended that rebuilding plans would be shortened because they could no longer allow time for ending overfishing. NMFS's failure to adjust the NS1 Guidelines in response to this change is inconsistent with the statute and Congressional intent. NMFS should modify the NS1

[32] 73 Fed. Reg. at 32528.
[33] 73 Fed. Reg. at 32531.
[34] 73 Fed. Reg. at 32529.
[35] *See id.*
[36] 16 U.S.C. § 1854(e)(4).

Guidelines to specify that rebuilding timeframes can only be extended to 10 years and beyond in extraordinary circumstances, not as a matter of course.

Minimizing political influence. We support the renewed role of the SSCs as the arbiters of science, and the relationship proposed between the SSCs and other peer-review processes. This will add new responsibilities and extra care will be required in SSC selection and training, with a concomitant addition of ecological scientists.[37] Given the increased responsibility, NMFS should implement steps to assure the SSC members have necessary technical qualifications, and should institute training that makes clear both to councils and prospective members that SSCs are arbiters of science, not political decision-makers. NMFS should 1) establish formal criteria for SSC membership, including formal training and/or experience in fisheries and/or ecological science or economics; 2) create oversight mechanisms and responsibility within NMFS to ensure that members are both qualified and acting in the public interest rather than representing stakeholders; 3) provide adequate training programs so that new members are well-prepared to meet these challenges; and 4) provide a mechanism for SSC members to identify and challenge political interventions, including potentially the development of a new scientific appeal function, staffed by a board of objective, external expert scientists.

EDF recommends that the NS1 Guidelines be revised as follows:

- ***Require that all catch limits and targets transparently account for all fishing mortality:***

  § 600.310(f)(2)(i) *Catch* is the total quantity of fish, measured in weight or numbers of fish, taken in commercial, recreational, subsistence, tribal, and other fisheries. Catch includes fish that are retained for any purpose, as well as mortality of fish that are discarded or released. This means that estimates of bycatch mortality and all other sources of fishing-related mortality should be expressed in weight or numbers of fish and deducted from the ABC when setting the ACL.

  § 600.310(f)(3)(i) *Expression of ABC.* ABC should be expressed in terms of catch~~, but may be expressed in terms of landings as long as e~~. Estimates of bycatch and any other fishing mortality should be expressed in weight or numbers of fish, and deducted from the ~~not accounted for in the landings are incorporated into the determination of~~ Allowable Biological Catch when setting the ACL.

- ***Require that Annual Catch Limit overages be deducted in full no later than the following year whether the fishery is healthy, overfished, or undergoing overfishing.***

  § 600.310(g) *Accountability Measures.*

  (1) Introduction. AMs are management controls that prevent ACLs or sector-ACLs from being exceeded, ~~(~~inseason ~~Accountability Measures),~~ whenever possible, and correct

[37] In fact, it seems likely that the nation's population of trained stock assessment biologists, and of ecologists and economists with adequate familiarity with fisheries protocols, is likely to be strained by the need to develop and maintain working SSCs in all eight regional councils. We believe that a significant investment is needed in developing the next generation of SSC members to allow this system to work as it should.

or mitigate overages immediately if they occur. AMs should address and minimize both the frequency and magnitude of overages and correct the problems that caused the overage in as short a time as possible, but no later than during the fishing year following the year in which the overage occurred.

(2) Inseason AMs. Whenever possible, FMPs should include inseason monitoring and management measures to prevent catch from exceeding ACLs. Inseason AMs could include, but are not limited to, closure of a fishery; closure of specific areas; changes in gear; changes in trip size or bag limits; reductions in effort; or other appropriate management controls for the fishery. If final data or data components of catch are delayed, Councils should make appropriate use of preliminary data, such as landed catch, in implementing inseason AMs. ~~Where timely catch data are available for a stock,~~ FMPs should include inseason closure authority to close the fishery on or before the date when the ACL for a stock or stock complex is projected to be reached.

(3) AMs for when the ACL is exceeded. On an annual basis, the Council should determine as soon as possible after the fishing year if an ACL was exceeded. If an ACL was exceeded, AMs should be triggered and implemented ~~as soon as possible~~ immediately to correct the operational issue that caused the ACL overage, as well as any biological consequences to the stock or stock complex resulting from the overage when it is known. These AMs could include, among other things, modifications of inseason AMs or overage adjustments. ~~For stocks and stock complexes in rebuilding plans, t~~ The AMs should include overage adjustments that reduce the ACLs in the next fishing year by the full amount of the overages~~, unless the best scientific information available shows that a reduced overage adjustment, or no adjustment is needed to mitigate the effects of the overages~~. If catch exceeds the ACL more than once in the last four years, the system of ACLs, ACTs and AMs should be re-evaluated to improve its performance and effectiveness.

- ***Require Councils to set Annual Catch Limit below the OFL***

§ 600.310(f)(1) *Introduction.*

A control rule is a policy for establishing a limit . . . Paragraph (f) of this section describes a three-step approach for setting limits and targets so as to ensure a low risk of overfishing while achieving, on a continuing basis, Overfishing Limit: First, ABC is set below the OFL to account for scientific uncertainty in calculating the OFL; second, ACL is set below ~~at an amount not to exceed~~ the ABC; and third, ACT is set at an amount not to exceed the ACL to account for management uncertainty in controlling a fishery's actual catch.[38]

- ***Require additional guidance to prevent overfishing of vulnerable stocks.***

§ 600.310(e)(3)(iv) *Factors to consider in Overfishing Limit specification.*

[38] Numerous other conforming changes are needed throughout the regulatory text to ensure that Councils do not set the Annual Catch Limit as high as the Allowable Biological Catch or Allowable Biological Catch as high as the Overfishing Limit. These changes are reflected in Appendix B.

(C) Examples include life-history characteristics that increase risk of overfishing, impacts on ecosystem component species, weaker stocks, forage fish stocks, other fisheries, predator-prey or competitive interactions, marine mammals, threatened or endangered species, and birds. Species that are slow-growing, long-lived, late-maturing, with low productivity, that change sex, that aggregate to spawn in known locations vulnerable to fishing, or that have other characteristics that increase the risk of overfishing should be afforded special care in setting OFL below MSY. Species interactions . . .

§ 600.310(f) *Acceptable biological catch, annual catch limits and annual catch targets.*

(1) *Introduction.* A control rule . . . for managing uncertainty in controlling a fishery's actual catch. In addition, special care should be used in setting limits and targets and in designing control rules for species with life-history characteristics that place them at high risk of overfishing, including but not limited to slow growth, high longevity, late maturation, sex changing, or the presence of aggregatory spawning behaviors. For species with complex life histories acceptable risks should be limited to that calculated for the most vulnerable life history stage.

(4) *ABC Control Rule.* For stocks and stock complexes required to have an ABC, each Council must establish an ABC control rule based on scientific advice from its SSC. The ABC control rule must stipulate the stock level at which fishing will be prohibited. The process . . .

(6) *ACT Control Rule.* For stocks and stock complexes required to have an ACL, each Council must ~~should~~ establish ACT control rules for setting the ACTs. The ACT control rule must stipulate the stock level at which fishing will be prohibited. The ACT control rule should clearly articulate . . .

(i) *Determining management uncertainty.* Two sources . . . To determine the level of management uncertainty in controlling catch, analyses should consider the implications of exceeding catch limits in terms of likely recovery times, given life history characteristics of the species involved, as well as past management performance . . .

§ 600.310(g) *Accountability Measures.*

(3) AMs for when the ACL is exceeded. On an annual basis . . . If catch exceeds the ACL more than once in the last four years, the system of ACLs, ACTs and AMs must ~~should~~ be re-evaluated to improve its performance and effectiveness. Councils should set more stringent re-evaluation time frames for species with life history characteristics that make them especially vulnerable to overfishing, including slow growth, high longevity, late maturation, sex changing, or the presence of aggregatory spawning behaviors.

§ 600.310(d) *Classifying stocks in an FMP.*

(5) "Ecosystem component (EC) species" . . . "in the fishery." No species may be classified or re-classified EC to avoid reducing allowable fishing mortality on other species. No species may be reclassified EC unless there is adequate scientific evidence, affirmed by the SSC, that such reclassification will not threaten either stock condition or ecosystem functions.

(8) *Stock complex.* "Stock complex" means . . . salmonids species). No species may be added or removed from a stock complex in order to avoid reducing allowable fishing mortality on other species.

(9) *Indicator stocks.* An indicator stock . . . If the stocks within a stock complex have a wide range of vulnerability, they should be reorganized into different stock complexes that have similar vulnerabilities; otherwise the indictor stock should be chosen to represent the most vulnerable stock within the complex. In instances where an indicator stock is less vulnerable than other members of the complex, management measures must be conservative enough so that the more vulnerable members of the complex are not at risk from the fishery. More than one. . .

(10) *Anti-backsliding.* Reclassification cannot be used to reduce management stringency for species already undergoing management, unless that elevated fishing mortality is consistent with scientifically-determined SDC for that species.

§ 600.310(j) *Council actions to address overfishing and rebuilding for stocks and stock complexes in the fishery.*

(3) *Overfished fishery.*

(C) If T_{min} for the stock ~~or stock complex~~ is 10 years or less, then the maximum time for rebuilding (T_{max}) that stock to its B_{msy} is 10 years. Rebuilding timeframes can only be extended above T_{min} in cases where unusually severe impacts on fishing communities can be demonstrated, and where biological and ecological implications are minimal.

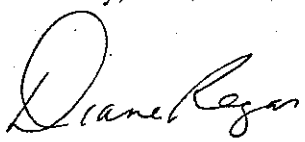
(D) If T_{min} for the stock ~~or stock complex~~ exceeds 10 years, then the maximum time allowable for rebuilding a stock ~~or stock complex~~ to its B_{MSY} is T_{min} plus the length of time associated with one generation time for that stock ~~or stock complex~~. Rebuilding timeframes can only be extended above T_{min} in cases where unusually severe impacts on fishing communities can be demonstrated, and where biological and ecological implications are minimal.

(F) Rebuilding times adopted for stock complexes must not be used to delay recovery of complex member species.

III. Conclusion

EDF appreciates the opportunity to comment on NMFS's Proposed Rule to revise the NS1 Guidelines. If the recommendations described in this letter are incorporated, the NS1 Guidelines will help end overfishing and lead to abundant fisheries that provide economic, recreational, and other benefits. We emphasize again that catch share programs are the only tool that consistently works to ensure that fishermen can comply with Annual Catch Limits and end overfishing. NS1 Guidelines that do not couple evaluation of catch shares with the requirements of the MSA will miss a critical opportunity and needlessly allow overfishing risks to continue. We urge NMFS to work with the Councils to implement effective Annual Catch Limits and Accountability Measures by 2010 for fisheries undergoing overfishing and by 2011 for all other fisheries, as required by law.

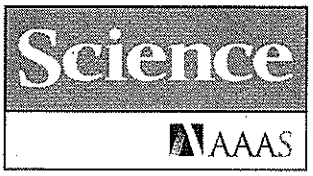
Sincerely,



Diane Regas
Managing Director, Oceans

Appendix A

Costello, C., et al. 2008. "Can Catch Shares Prevent Fisheries Collapse?" Science, 321 (5896), 1678-1681.



Can Catch Shares Prevent Fisheries Collapse?
Christopher Costello, *et al.*
Science **321**, 1678 (2008);
DOI: 10.1126/science.1159478

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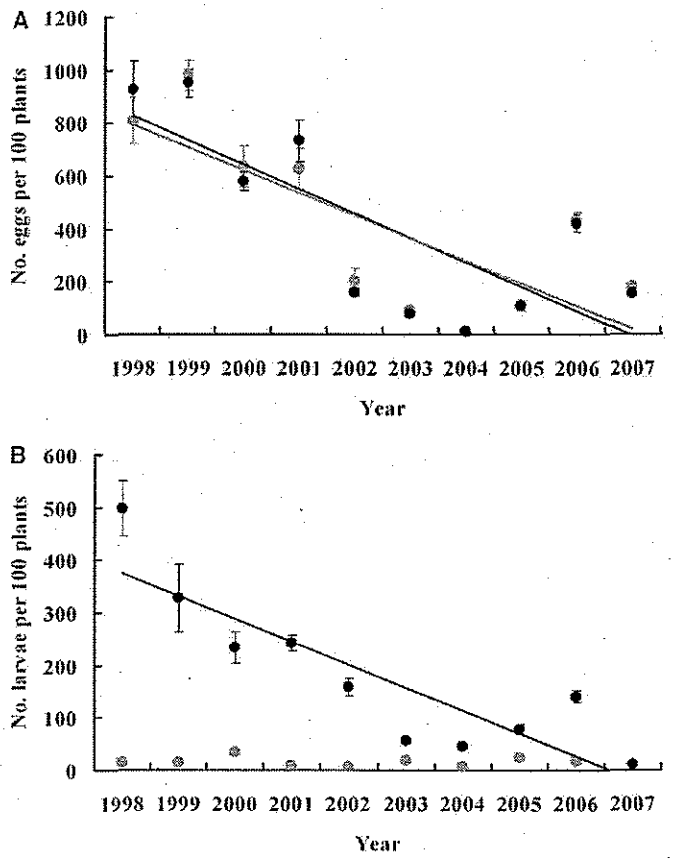

Fig. 3. Egg and larval densities of *H. armigera* on cotton at Langfang site, Hebei Province, China, from 1998 to 2007. (**A**) Relation between egg density on Bt cotton (red circles) and non-Bt cotton (black circles) and planting year of Bt cotton. Linear model on Bt cotton (black line), $y = 185{,}476.90 - 92.42x$, $F = 69.05$, df = 1,58, $P < 0.0001$, $R^2 = 0.54$. Linear model on non-Bt cotton (red line), $y = 171{,}365.94 - 85.37x$, $F = 62.59$, df = 1,58, $P < 0.0001$, $R^2 = 0.52$. (**B**) Relation between larval density on Bt cotton (red circles) and non-Bt cotton (black circles) and survey years. Linear model on non-Bt cotton (black line), $y = 87{,}107.86 - 43.41x$, $F = 97.56$, df = 1,58, $P < 0.0001$, $R^2 = 0.63$. Data are means ± SEM. There are six samples for each point in the graphs.

farmers. In China, a multiple cropping system consisting of soybeans, peanuts, corn, and vegetables is common. These crops also serve as hosts for *H. armigera*, and, because they do not express Bt toxin, they serve as refuges for nonresistant insects (*10*). Because cotton is not the only host crop, Bt cotton comprises about 10% of the major host crops in any province or throughout northern China. This accidental approach to refuge management appears to have, so far, warded off the evolution of resistance (*10*). Nevertheless, as a result of decreased spraying of broad-spectrum pesticides for controlling cotton bollworm in Bt cotton fields, mirids have recently become key pests of cotton in China (*18*, *19*). Therefore, despite its value, Bt cotton should be considered only one component in the overall management of insect pests in the diversified cropping systems common throughout China.

References and Notes

1. C. James, "Global status of commercialized biotech/GM Crops: 2007" (ISAAA Briefs No. 37, International Service for the Acquisition of Agri-biotech Applications, Ithaca, NY, 2007).
2. Y. Carrière *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **100**, 1519 (2003).
3. K. M. Wu, Y. Y. Guo, *Annu. Rev. Entomol.* **50**, 31 (2005).
4. J. Huang, S. Rozelle, C. Pray, Q. Wang, *Science* **295**, 674 (2002).
5. Materials and methods are available as supporting material on *Science* Online.
6. K. Wu, Y. Guo, S. Gao, *J. Econ. Entomol.* **95**, 832 (2002).
7. H. M. T. Hokkanen, *Annu. Rev. Entomol.* **36**, 119 (1991).
8. A. M. Shelton, F. R. Badenes-Perez, *Annu. Rev. Entomol.* **51**, 285 (2006).
9. B. E. Tabashnik, A. J. Gassmann, D. W. Crowder, Y.Carrière, *Nat. Biotechnol.* **26**, 199 (2008).
10. K. Wu, *J. Invertebr. Pathol.* **95**, 220 (2007).
11. F. Gould, *Annu. Rev. Entomol.* **43**, 701 (1998).
12. A. M. Shelton, J. Z. Zhao, R. T. Roush, *Annu. Rev. Entomol.* **47**, 845 (2002).
13. B. E. Tabashnik, T. J. Dennehy, Y. Carrière, *Proc. Natl. Acad. Sci. U.S.A.* **102**, 15389 (2005).
14. F. Gould *et al.*, *Proc. Natl. Acad. Sci. U.S.A.* **94**, 3519 (1997).
15. F. Gould, *Nat. Biotechnol.* **18**, 266 (2000).
16. Environmental Protection Agency, *Pesticide News Story: EPA Approves Natural Refuge for Insect Resistance Management in Bollgard II Cotton*; www.epa.gov/oppfead1/cb/csb_page/updates/2007/bollgard-cotton.htm.
17. Y. Carrière *et al.*, *Pest Manag. Sci.* **61**, 327 (2005).
18. K. Wu, W. Li, H. Feng, Y. Guo, *Crop Prot.* **21**, 997 (2002).
19. Y. H. Lu *et al.*, *Crop Prot.* **27**, 465 (2008).

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Supporting Online Material

www.sciencemag.org/cgi/content/full/321/5896/1676/DC1
Materials and Methods
Figs. S1 to S3
Table S1
References
Data Files S1 to S7

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Can Catch Shares Prevent Fisheries Collapse?

Christopher Costello,[1]* Steven D. Gaines,[2] John Lynham[3]†

Recent reports suggest that most of the world's commercial fisheries could collapse within decades. Although poor fisheries governance is often implicated, evaluation of solutions remains rare. Bioeconomic theory and case studies suggest that rights-based catch shares can provide individual incentives for sustainable harvest that is less prone to collapse. To test whether catch-share fishery reforms achieve these hypothetical benefits, we have compiled a global database of fisheries institutions and catch statistics in 11,135 fisheries from 1950 to 2003. Implementation of catch shares halts, and even reverses, the global trend toward widespread collapse. Institutional change has the potential for greatly altering the future of global fisheries.

Although the potentially harmful consequences of mismanaged fisheries were forecast over 50 years ago (*1*, *2*), evidence of global declines has only been seen quite recently. Reports show increasing human impacts (*3*) and global collapses in large predatory fishes (*4*) and other trophic levels (*5*) in all large marine ecosystems (LMEs) (*6*). It is now widely believed that these collapses are primarily the result of the mismanagement of fisheries.

One explanation for the collapse of fish stocks lies in economics: Perhaps it is economically optimal to capture fish stocks now and invest the large windfall revenues in alternative assets, rather than capturing a much smaller harvest on a regular basis. Although this remains a theoretical possibility for extremely slow-growing species

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(*7*), it remains rare in reality. A recent study reports that under reasonable economic parameterization, extinction is suboptimal (even with low growth rates) and that biomass under economically optimal harvest is larger than that under maximum sustainable yield (*8*).

If global fisheries contain large potential profits [perhaps a present value of $1 trillion (*9*)], yet the profits are only realized if the fisheries are managed sustainably, why are actively managed fisheries systematically overexploited? The answer lies in the misalignment of incentives. Even when management sets harvest quotas that could maximize profits, the incentives of the individual harvester are typically inconsistent with profit maximization for the fleet. Because individuals lack secure rights to part of the quota, they have a perverse motivation to "race to fish" to outcompete others. This race can lead to poor stewardship and lobbying for ever-larger harvest quotas, creating a spiral of reduced stocks, excessive harvests, and eventual collapse.

Examining specific cases, Beddington *et al.* (*10*), Hilborn *et al.* (*11*), Grafton *et al.* (*12*), and Griffith (*13*) argue that rights-based fisheries reforms offer promising solutions. Rather than only setting industry-wide quotas, fishermen are allocated individual rights. Referred to as catch shares or dedicated access privileges, these rights can be manifest as individual (and tradable) harvest quotas, cooperatives, or exclusive spatial harvest rights; the idea is to provide—to fishermen, communities, or cooperatives—a secure asset, which confers stewardship incentives. Most readily implemented within national jurisdictions (that is, inside 200 miles), some international agreements attempt to serve a similar function in international waters. Although both theory and empirical evidence suggest a robust link between catch shares and economic performance of a fishery (*14*, *15*), the link with ecological performance is more tenuous. Even so, Sanchirico and Wilen (*16*) argue that "It is widely believed and supported by anecdotal evidence that once fishers have a financial stake in the returns from sensible investment in sustainable practices, they are more easily convinced to make sacrifices required to rebuild and sustain fisheries at high levels of economic and biological productivity." A recent report provides examples consistent with this widely held belief (*17*). We tested the hypothetical causal link between the global assignment of catch shares and fisheries sustainability.

Whereas individual fishing rights have been implemented on small spatial scales in traditional cultures for millennia, the adoption rate in major fisheries has accelerated since the late 1970s. To test the efficacy of catch shares, we assembled a global database of 11,135 commercial fisheries and determined which fisheries had instituted catch shares from 1950 to 2003. We matched this institutional database to the same harvest database (*18*) used to assess fisheries collapse by Worm *et al.* (*6*). Our objective is to answer the question: Can catch shares prevent fisheries collapse?

In their widely cited contribution, Worm *et al.* (*6*) correlate the species richness of LMEs with fisheries collapse. They define a fishery as collapsed in year t if the harvest in year t is <10% of the maximum recorded harvest up to year t. Using this definition, ~27% of the world's fisheries were collapsed in 2003. Extrapolating this trend into the future, Worm *et al.* (*6*) find that 100% of the world's fisheries could be collapsed by 2048. Although this highly controversial projection (*19*) captured most of the attention from this article, a larger focus of the work was the role of ecosystem biodiversity in preventing collapse. Fisheries in more biodiverse regions were less likely to be collapsed at any given point in history. Unfortunately, however, this greater resilience to human exploitation does not change the ultimate conclusion. Biodiversity does not prevent collapse; it merely delays it.

In our analysis, we expanded beyond the characteristics of the ecosystem to consider the characteristics of the regulating fisheries institutions, simultaneously controlling for the ecosystem, genus, and other covariates. To assemble our catch-share database, we searched the published literature and government reports, interviewed experts on global fisheries, and vetted our final database with a diverse array of researchers. In total, we identified 121 fisheries managed using catch shares—defined as variations on individual transferable quotas (ITQs)—by 2003 (*20*). These work by allocating a dedicated share of the scientifically determined total catch to fishermen, communities, or cooperatives. This provides a stewardship incentive; as the fishery is better managed, the value of the shares increases. By analyzing the data at the fishery level [rather than the aggregate level, as in (*6*)], we facilitate inclusion of fisheries institutions as independent variables in our model specification.

We adopt the Worm *et al.* (*6*) definition of collapse. Although a better measure would be based on stock (*21*), no systematic database of global fish biomass exists. This collapse metric may overestimate the frequency of collapsed fisheries (*22*), which creates a conservative test for the benefits of catch shares. Sensitivity analyses that

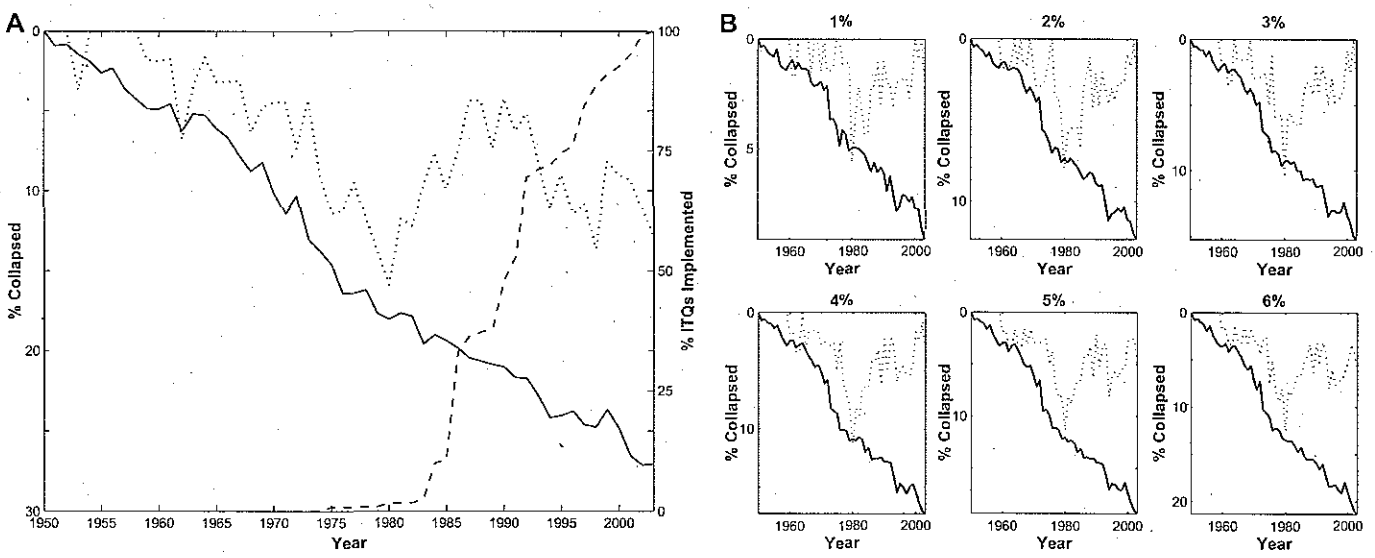

Fig. 1. (**A**) Percent of fisheries collapsed with (dotted line) and without (solid line) ITQ management using the Worm *et al.* (*6*) collapse threshold (10% of historical maximum). The number of ITQ fisheries increases through time (right y axis and dashed line), and the rate of implementation has been accelerating. (**B**) Percent of fisheries collapsed with (dotted line) and without (solid line) ITQ management using more conservative collapse thresholds: 1 to 6% of historical maximum catch.

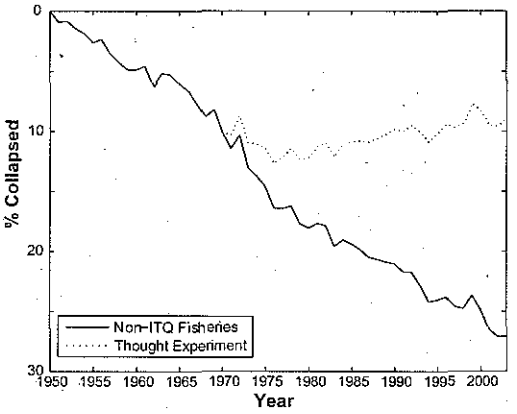

Fig. 2. Simulation of trend in fisheries collapse if all non-ITQ fisheries switched to ITQs in 1970 (dotted line), compared with the actual trend (solid line). The thought experiment assumes that the annual ITQ benefit counterbalances the global trend toward complete collapse, which is consistent with the observed trends in actual ITQs (Table 1). Fluctuations in the simulation arise from estimated interannual variability.

Table 1. Fishery-specific analyses of ITQ benefits. Each fishery is treated as a time series of collapse, with some fisheries converting to ITQ during the interval. Propensity score matching (*25*) controls for the effects of LME, genus, or species to further isolate biases that may arise from the particular places and fisheries where ITQs have been implemented. Columns 2 to 5 provide regression model results for four different propensity score models. Rows 2 and 3 provide the regression coefficients and SEs (in parentheses). Fisheries without ITQ management had an average annual percentage change of 0.54. For all comparisons, the annual benefit of ITQs roughly counters the current rate of decline in other fisheries (*23*). All estimated coefficients are statistically significant at the 1% level.

Parameter used to match fisheries	None	LME	Genus	Species
Percent ITQ difference (SE)	−7.06	−7.41	−6.79	−6.87
	(0.49)	(0.428)	(0.443)	(0.441)
Annual percent ITQ effect (SE)	−0.49	−0.37	−0.54	−0.51
	(0.136)	(0.137)	(0.136)	(0.139)

consider alternative thresholds for collapse and address other potential biases yield unchanged or stronger conclusions (*23*).

By 2003 the fraction of ITQ-managed fisheries that were collapsed (dotted line in Fig. 1A) was about half that of non-ITQ fisheries (solid line in Fig. 1A). Accelerated adoption of ITQs began in the late 1970s (dashed line and right *y* axis in Fig. 1A). In the preadoption period, would-be ITQ fisheries were on trajectories toward collapse, similar to non-ITQ fisheries. In the adoption period, the two curves diverge as ITQs are increasingly adopted (*24*). This disparity grows over time (*23*).

Demonstrating statistically a causal linkage between rights-based management and fisheries sustainability is complicated by three competing effects. First, the number of ITQ fisheries is growing, and new ITQ fisheries are drawn from a global pool with an ever-increasing fraction of collapsed fisheries. Random selection from this global pool could mask some benefits of rights-based management. Second, the conversion of fisheries to ITQs may involve a biased selection. For example, ITQs may be implemented disproportionately in fisheries that are already less collapsed, possibly giving a misleading perception of benefits from rights-based management. Finally, there may be temporal benefits of an ITQ (for instance, the longer an ITQ is in place in a given fishery, the less likely that fishery is to collapse). All of these mechanisms would lead to differences between ITQ and non-ITQ fisheries, but only the last mechanism implies a benefit from the management change.

An initial regression of the data in Fig. 1 suggests that implementing an ITQ reduces the probability of collapse by 13.7 percentage points (*23*). Because ITQs have been disproportionately implemented in a few global ecosystems such as Alaska, Iceland, New Zealand, and Australia (*25*), regional or taxonomic biases could generate misleading results. To account for potential selection bias, we used a variety of estimation strategies: (i) We restricted the sample to only those ecosystems or taxa that have experienced ITQ management. (ii) We used propensity score methods to match ITQ fisheries to appropriate control fisheries (*26*). (iii) We used fixed-effects estimation to identify the benefit of ITQs within each fishery.

The results are remarkably similar across all specifications and estimation techniques (*23*). The propensity score results are summarized in Table 1. Consistent with Fig. 1, ITQ fisheries perform far better than non-ITQ fisheries. Switching to an ITQ not only slows the decline toward widespread collapse, but it actually stops this decline. Each additional year of being in an ITQ (row 2 of Table 1) offsets the global trend (0.5% increase) of increasing collapse in non-ITQ fisheries (*23*). Other estimation techniques suggest even larger benefits. For example, fishery fixed-effects results suggest that ITQs not only halt the trend in global collapse, but they may actually reverse it (*23*).

Although bioeconomic theory suggests that assigning secure rights to fishermen may align incentives and lead to significantly enhanced biological and economic performance, evidence to date has been only case- or region-specific. By examining 11,135 global fisheries, we found a strong link: By 2003, the fraction of ITQ-managed fisheries that were collapsed was about half that of non-ITQ fisheries. This result probably underestimates ITQ benefits, because most ITQ fisheries are young.

The results of this analysis suggest that well-designed catch shares may prevent fishery collapse across diverse taxa and ecosystems. Although the global rate of catch-share adoption has increased since 1970, the fraction of fisheries managed with catch shares is still small. We can estimate their potential impact if we project rights-based management onto all of the world's fisheries since 1970 (Fig. 2). The percent collapsed is reduced to just 9% by 2003; this fraction remains steady thereafter. This figure is a marked reversal of the previous projections.

Despite the dramatic impact catch shares have had on fishery collapse, these results should not be taken as a carte blanche endorsement. First, we have restricted attention to one class of catch shares (ITQs). Second, only by appropriately matching institutional reform with ecological, economic, and social characteristics can maximal benefits be achieved. Nevertheless, these findings suggest that as catch shares are increasingly implemented globally, fish stocks, and the profits from harvesting them, have the potential to recover substantially.

References and Notes

1. H. S. Gordon, *J. Polit. Econ.* **62**, 124 (1954).
2. A. Scott, *J. Polit. Econ.* **63**, 116 (1955).
3. B. S. Halpern *et al.*, *Science* **319**, 948 (2008).
4. R. A. Myers, B. Worm, *Naturé* **423**, 280 (2003).
5. J. B. C. Jackson *et al.*, *Science* **293**, 629 (2001).
6. B. Worm *et al.*, *Science* **314**, 787 (2006).
7. C. W. Clark, *J. Polit. Econ.* **81**, 950 (1973).
8. R. Q. Grafton, T. Kompas, R. W. Hilborn, *Science* **318**, 1601 (2007).
9. Our calculations are based on those of Sanchirico and Wilen (*16*). Using a disount rate of 9%, the present value of global fisheries is ($90 billion)/(0.09) = $1 trillion.
10. J. R. Beddington, D. J. Agnew, C. W. Clark, *Science* **316**, 1713 (2007).
11. R. Hilborn, J. M. Orensanz, A. M. Parma, *Philos. Trans. R. Soc. London Ser. B* **360**, 47 (2005).
12. R. Q. Grafton *et al.*, *Can. J. Fish. Aquat. Sci.* **63**, 699 (2006).
13. D. Griffith, *Front. Ecol. Environ.* **6**, 191 (2008).
14. R. Newell, J. Sanchirico, S. Kerr, *J. Environ. Econ. Manage.* **49**, 437 (2005).
15. R. Q. Grafton, D. Squires, K. J. Fox, *J. Law Econ.* **43**, 679 (2000).
16. J. N. Sanchirico, J. E. Wilen, *Int. J. Global Environ. Issues* **7**, 106 (2007).

17. D. Festa, D. Regas, J. Boomhauer. *Issues Sci. Tech.* **Winter**, 75 (2008).
18. Database (2007 version) of global fisheries catches of the Sea Around Us Project (Fisheries Centre, University of British Columbia, Vancouver, Canada). This database is based on a consolidation of several major data sources such as the FAO capture fisheries and its regional bodies, the International Council for the Exploration of the Seas STATLANT database, and the Northwest Atlantic Fisheries Organization, as well as data provided from the Canadian, United States, and other governments.
19. F. Hölker *et al.*, *Science* **316**, 1285 (2007).
20. Other forms of property rights may induce similar incentives. For example, territorial user right fisheries and community concessions provide localized incentives to steward the stock. These institutions were not counted as catch shares because they typically occur on a much smaller spatial scale than the LME catch data.
21. K. de Mutsert, J. H. Cowan Jr., T. E. Essington, R. Hilborn, *Proc. Natl. Acad. Sci. U.S.A.* **105**, 2740 (2008).
22. M. J. Wilberg, T. J. Miller, *Science* **316**, 1285 (2007).
23. See supporting online material for details.
24. The divergence between ITQ and non-ITQ fisheries is even more pronounced for less conservative definitions of collapse; i.e. 1 to 6% of historical maximum catch (Fig. 1B).
25. The LMEs with at least one fishery managed using an ITQ by 2003 are the California Current, Gulf of Alaska, Humboldt Current, Iceland Shelf, New Zealand Shelf, Scotian Shelf, Southest Australian Shelf, Southeast U.S. Continental Shelf, Southwest Australian Shelf, and West-Central Australian Shelf.
26. P. R. Rosenbaum, D. B. Rubin, *Biometrika* **70**, 41 (1983).
27. We thank the Paul G. Allen Family Foundation for generous financial support; the Sea Around Us Project for making the catch data publicly available; C. Wong and T. Kidman for helping to compile the database; B. Hansen for helpful comments; and J. Prince, K. Bonzon, and J. Toth for assisting with verifying the catch-share database.

Supporting Online Material

www.sciencemag.org/cgi/content/full/321/5896/1678/DC1
Materials and Methods
SOM Text
Figs. S1 and S2
Tables S1 to S5
References

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Parasite Treatment Affects Maternal Investment in Sons

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Parasitism can be a major constraint on host condition and an important selective force. Theoretical and empirical evidence shows that maternal condition affects relative investment in sons and daughters; however, the effect of parasitism on sex ratio in vertebrates is seldom considered. We demonstrate experimentally that parasitism constrains the ability of mothers to rear sons in a long-lived seabird, the European shag *Phalacrocorax aristotelis*. The effect contributes to the decline in offspring survival as the breeding season progresses and hence has important population-level consequences for this, and potentially other, seasonal breeders.

One key ecological factor influencing the condition of parents, and therefore the potential fitness of dependent offspring, is parasitism (*1*). In sexually dimorphic species, offspring of the larger sex often require higher nutritional investment and are more vulnerable to changes in parental condition (*2*). Moreover, sex allocation theory predicts that parents in good condition should bias investment toward offspring of the sex that stands to gain more from extra resources provided at critical developmental stages (*3*). We provide experimental evidence that parasites can constrain the ability of mothers, in particular, to rear offspring of the more expensive sex. This contributes to differential mortality of sons and daughters as the breeding season progresses and could explain the seasonal decline in offspring survival that is commonly observed in this and many other seasonal breeders.

Populations of the European shag *Phalacrocorax aristotelis* frequently suffer from severe infections of gastro-intestinal parasites, in particular anisakid nematodes [*Contracaecum rudolphi* and *Anisakis simplex* (*4*)]. Although their effects are usually sublethal, these parasites compete with the host for nutrients and trigger costly immune responses (*5*) that may impair host breeding success. Shag chicks must be provisioned in the nest for ~50 days by both parents. Male-biased broods require more food than female-biased broods, and male nestlings grow faster, attain higher peak masses at fledging, and are about 20% larger than females as adults (*4*).

We experimentally manipulated parasitism levels in breeding adults just before chick hatching by treating both male and female parents with a broad-spectrum antiparasite drug (ivermectin), which removes gut parasites and prevents reinfection over a period of ~6 weeks and hence for most of the chick-rearing period. Throughout the laying period, nests were randomly allocated to either a treatment group, in which both parents were treated with ivermectin (n = 34 nests), or a control (untreated) group in which parents were exposed to natural levels of parasitism (n = 83 nests). Treated and control nests were matched for laying date, ensuring an equal spread of laying dates in each group spanning the natural range (~6 weeks). The survival of sons was higher when their parents had been treated (Fig. 1A) [generalized linear mixed model

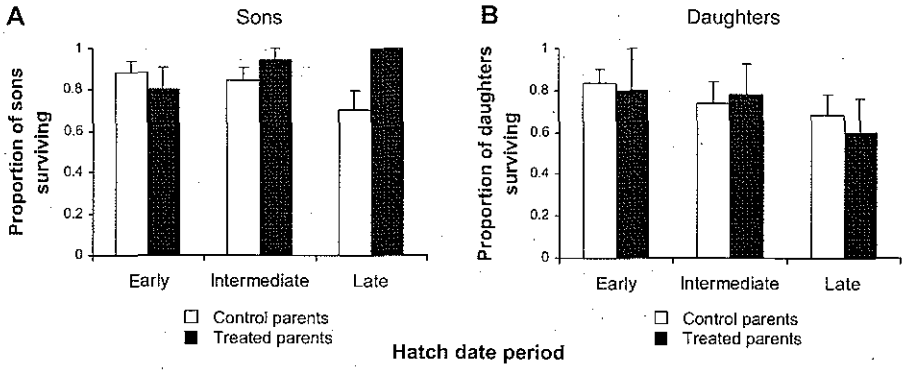

Fig. 1. Differential effect of ivermectin treatment on survival of sons (**A**) and daughters (**B**), and interaction with hatch date. Black bars represent chicks from treated parents, and white bars chicks from control parents. Hatch dates are grouped into early, intermediate and late periods, based on thirds of the distribution and corresponding roughly to 2-weekly intervals. The decline in the survival of sons is not apparent when their parents have been treated. Parasite treatment did not appear to affect the success of rearing daughters. Overall, parasitism in parents accounted for ~37% of the natural seasonal decline in chick survival. Data are means ± SEM. Effect sizes and statistics from logistic regression are given in the text.

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Appendix B

EDF's Recommended Changes to NMFS's Proposed Regulations

Environmental Defense Fund Recommended Changes to National Marine Fisheries Service's Proposed 50 C.F.R. § 600.310

Note: The plain text below is NMFS's proposed regulatory language. The underlined, bold text shows EDF's recommended additions, and the stricken text shows EDF's recommended deletions.

PART 600—Magnuson-Stevens Act Provisions

1. The authority citation for part 600 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq.

2. Section 600.310 is revised to read as follows:

§ 600.310 National Standard 1—Optimum Yield.

(a) *Standard 1.* Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery for the U.S. fishing industry.

(b) *General.* (1) The guidelines set forth in this section describe fishery management approaches to meet the objectives of National Standard 1 (NS1), and include guidance on:

(i) Specifying maximum sustainable yield (MSY) and OY;

(ii) Specifying status determination criteria (SDC) so that overfishing and overfished determinations can be made for stocks and stock complexes that are part of a fishery;

(iii) Preventing overfishing and achieving OY using a system of limits and targets, incorporation of scientific and management uncertainty in control rules, and adaptive management using annual catch limits (ACL) and measures to ensure accountability (AM); and

(iv) Rebuilding stocks and stock complexes.

(2) *Overview of Magnuson-Stevens Act concepts and provisions related to NS1*--(i) *MSY.* The Magnuson-Stevens Act establishes MSY as the basis for fishery management and requires

that: The fishing mortality rate does not jeopardize the capacity of a stock or stock complex to produce MSY; the abundance of an overfished stock or stock complex be rebuilt to a level that is capable of producing MSY; and OY not exceed MSY.

(ii) *OY.* The determination of OY is a decisional mechanism for resolving the Magnuson-Stevens Act's conservation and management objectives, achieving a fishery management plan's (FMP) objectives, and balancing the various interests that comprise the greatest overall benefits to the Nation. OY is based on MSY as reduced under paragraphs (e)(3)(iii) and (iv) of this section. The most important limitation on the specification of OY is that the choice of OY and the conservation and management measures proposed to achieve it must prevent overfishing.

(iii) *ACLs and AMs.* Any FMP which is prepared by any Council shall establish a mechanism for specifying ACLs in the FMP (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability (Magnuson-Stevens Act section 303(a)(15)). Subject to certain exceptions and circumstances described in paragraph (h) of this section, this requirement takes effect in fishing year 2010, for fisheries determined subject to overfishing, and in fishing year 2011 for all other fisheries (Magnuson-Stevens Act section 303 note). "Council" includes the Regional Fishery Management Councils and the Secretary of Commerce, as appropriate (see § 600.305(c)(11)).

(iv) Reference points. SDC, MSY, acceptable biological catch (ABC), ACL, and annual catch target (ACT), which are described further in paragraphs (e) and (f) of this section, are collectively referred to as "reference points."

(v) Scientific advice. The Magnuson-Stevens Act has requirements regarding scientific and statistical committees (SSC) of the Regional Fishery Management Councils, including but

not limited to, the following provisions:

(A) Each Regional Fishery Management Council shall establish an SSC as described in section 302(g)(1)(A) of the Magnuson-Stevens Act.

(B) Each SSC shall provide its Regional Fishery Management Council recommendations for ABC as well as other scientific advice, as described in Magnuson-Stevens Act section 302(g)(1)(B). The SSC may specify the type of information that should be included in the Stock Assessment and Fishery Evaluation (SAFE) report (see § 600.315).

(C) The Secretary and each Regional Fishery Management Council may establish a peer review process for that Regional Fishery Management Council for scientific information used to advise the Regional Fishery Management Council about the conservation and management of the fishery (see Magnuson-Stevens Act section 302(g)(1)(E)). If a peer review process is established, it should investigate the technical merits of stock assessments and other scientific information used by the SSC. The peer review process is not a substitute for the SSC and should work in conjunction with the SSC.

(D) Each Regional Fishery Management Council shall develop ACLs for each of its managed fisheries that may not exceed the fishing level recommendations of its SSC or peer review process (Magnuson-Stevens Act section 302(h)(6)).

(3) *Approach for setting limits and targets for consistency with NS1.* In general, when specifying limits and targets intended to avoid overfishing and achieve sustainable fisheries, Councils should take an approach that considers uncertainty in scientific information and management control of the fishery. These guidelines identify limit and target reference points which should be set lower as uncertainty increases such that there is a low risk that limits are exceeded as described in paragraphs (f)(4) and (f)(6) of this section.

(c) *Summary of items to include in FMPs related to NS1.* This section provides a summary of items that Councils should include in their FMPs and FMP amendments in order to address ACL, AM, and other aspects of the NS1 guidelines. As described in further detail in paragraphs (c)(1) through (7) of this section, Councils may review their FMPs to decide if all stocks are "in the fishery" or whether some fit the category of "ecosystem component species" and amend their FMPs as appropriate. If they do not establish ecosystem component species through an FMP amendment, then all stocks in an FMP are presumed to be "in the fishery." Councils should also describe fisheries data for the stocks, stock complexes, and ecosystem component species in their FMPs. For all stocks and stock complexes that are "in the fishery," the Councils should evaluate and describe the following items in their FMPs and amend the FMPs, if necessary, to align their management objectives to end or prevent overfishing:

(1) MSY and SDC (see paragraphs (e)(1) and (2) of this section).

(2) OY at the stock, stock complex, or fishery level and provide the OY specification analysis (see paragraph (e)(3) of this section).

(3) ABC control rule (see paragraph (f)(4) of this section).

(4) ACLs and mechanisms for setting ACLs and possible sector-specific ACLs in relationship to the ABC (see paragraphs (f)(5) and (h) of this section).

(5) ACT control rule (see paragraph (f)(6) of this section).

(6) AMs and AM mechanisms (see paragraphs (g) and (h)(1) of this section).

(7) Stocks and stock complexes that have statutory exceptions from ACLs (see paragraph (h)(2) of this section) or which fall under limited circumstances which require different approaches to meet the ACL requirements (see paragraph (h)(3) of this section).

(8) The potential for implementing a Limited Access Privilege Program to establish AMs in commercial fisheries, including whether such a LAPP would provide more effective AMs than other measures the Council either has in place or is considering with respect to meeting the objectives of National Standard 1 and other National Standards and, if applicable, an explanation for why the Council has decided not to implement a LAPP and how the selected alternative will perform as well or better.

(9) In implementing AMs, the Councils should encourage the development and implementation of LAPPs in for-hire recreational sectors, and development and implementation of effective performance-based management in other recreational sectors. In doing this, the Councils should consult with affected fishermen and other stakeholders.

(d) *Classifying stocks in an FMP*--(1) *Introduction.* Magnuson-Stevens Act section 303(a)(2) requires that an FMP contain, among other things, a description of the species of fish involved in the fishery. FMPs include target stocks and may also include non-target species or stocks. All stocks listed in an FMP or FMP amendment are considered to be "in the fishery" unless they are identified as ecosystem component (EC) species through an FMP amendment process.

(2) *Stocks in a fishery.* Stocks in a fishery include: (1) target stocks; (2) non-target stocks that are retained for sale or personal use; and (3) non-target stocks that are not retained for sale or personal use and that are either determined to be subject to overfishing, approaching overfished, or overfished, or could become so, according to the best available information, without conservation and management measures. Stocks in a fishery may be grouped into stock complexes, as appropriate. Requirements for reference points and management measures for these stocks are described throughout these guidelines.

(3) "Target stocks" are stocks that fishers seek to catch for sale or personal use, including "economic discards" as defined under Magnuson-Stevens Act section 3(9).

(4) "Non-target species" and "non-target stocks" are fish caught incidentally during the pursuit of target stocks in a fishery, including "regulatory discards" as defined under Magnuson-Stevens Act section 3(38). They may or may not be retained for sale or personal use. Non-target species may be included in a fishery and, if so, they should be identified at the stock level. Some non-target species may be identified in an FMP as ecosystem component (EC) species or stocks.

(5) "Ecosystem component (EC) species" are generally not retained for any purpose, although *de minimis* amounts might occasionally be retained. EC species may be identified at the species or stock level, and may be grouped into complexes. EC species may be included in an FMP or FMP amendment for any of the following reasons: for data collection purposes; for ecosystem considerations related to specification of OY for the associated fishery; as considerations in the development of conservation and management measures for the associated fishery; and/or to address other ecosystem issues. While EC species are not considered to be "in the fishery," a Council should consider measures for the fishery to minimize bycatch and bycatch mortality of EC species consistent with National Standard 9, and to protect their associated role in the ecosystem. EC species do not require specification of reference points but should be monitored on a regular basis, to the extent practicable, to determine changes in their status or their vulnerability to the fishery. If necessary, they should be reclassified as "in the fishery." **No species may be classified or re-classified EC to avoid reducing allowable fishing mortality on other species. No species may be reclassified EC unless there is adequate scientific evidence, affirmed by the SSC, that such reclassification will not threaten either stock condition or ecosystem functions.**

(6) *Reclassification.* A Council should monitor the catch resulting from a fishery on a regular basis to determine if the stocks and species are appropriately classified in the FMP. If the criteria previously used to classify a stock or species is no longer valid, the Council should reclassify it through an FMP amendment, which documents rationale for the decision.

(7) *Stocks or species identified in more than one FMP.* If a stock is identified in more than one fishery, Councils should choose which FMP will be the primary FMP in which management objectives, SDC, and other reference points for the stock are established. In most cases, the primary FMP for a stock will be the one in which the stock is identified as a target stock. Other FMPs in which the stock is identified as part of a fishery should be consistent with the primary FMP.

(8) *Stock complex.* "Stock complex" means a group of stocks that are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar. Stocks may be grouped into complexes for various reasons, including where stocks in a multispecies fishery cannot be targeted independent of one another; where there is insufficient data to measure their status relative to SDC; or when it is not feasible for fishermen to distinguish individual stocks among their catch. The vulnerability of stocks to the fishery should be evaluated when determining if a particular stock complex should be established or reorganized, or if a particular stock should be included in a complex. Stock complexes may be comprised of: one or more indicator stocks, each of which has SDC and ACLs, and several other stocks; several stocks without an indicator stock, with SDC and an ACL for the complex as a whole; or one of more indicator stocks, each of which has SDC and management objectives, with an ACL for the complex as a whole (this situation might be

applicable to some salmon species). **No species may be added or removed from a stock complex in order to avoid reducing allowable fishing mortality on other species.**

(9) *Indicator stocks*. An indicator stock is a stock that is used to help manage and evaluate stocks that are in a stock complex and do not have their own SDC. If an indicator stock is used to evaluate the status of a complex, it should be representative of the typical status of each stock within the complex, due to similarity in vulnerability. If the stocks within a stock complex have a wide range of vulnerability, they should be reorganized into different stock complexes that have similar vulnerabilities; otherwise the indicator stock should be chosen to represent the ~~more~~ **most** vulnerable stocks within the complex. In instances where an indicator stock is less vulnerable than other members of the complex, management measures **must be conservative enough** ~~need to be more conservative~~ so that the more vulnerable members of the complex are not at risk from the fishery. More than one indicator stock can be selected to provide more information about the status of the complex. Although the indicator stock(s) are used to evaluate the status of the complex, individual stocks within complexes should be examined periodically using available quantitative or qualitative information to evaluate whether a stock has become overfished or may be subject to overfishing.

(10) *Anti-backsliding*. Reclassification cannot be used to reduce management stringency for species already undergoing management, unless that elevated fishing mortality is consistent with scientifically-determined SDC for that species.

(e) *Features of MSY, SDC, and OY that should be identified in FMPs for all stocks and stock complexes in the fishery*--(1) *MSY*. Each FMP should include an estimate of MSY for the stocks and stock complexes in the fishery, as described in paragraph (d)(2) of this section).

(i) *Definitions*. (A) *MSY* is the largest long-term average catch or yield that can be taken

from a stock or stock complex under prevailing ecological, environmental conditions and fishery technological characteristics (e.g., gear selectivity), and the distribution of catch among fleets.

(B) *MSY fishing mortality rate (F_{msy})* is the fishing mortality rate that, if applied over the long term, would result in MSY.

(C) *MSY stock size (B_{msy})* means the long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate measure of the stock's reproductive potential that would be achieved by fishing at F_{msy}.

(ii) *MSY for stocks.* MSY should be estimated for each stock based on the best scientific information available (see § 600.315).

(iii) *MSY for stock complexes.* MSY should be estimated on a stock-by-stock basis whenever possible. However, where MSY cannot be estimated for each stock in a stock complex, then MSY may be estimated for one or more indicator stocks for the complex or for the complex as a whole. When indicator stocks are used, the stock complex's MSY could be listed as "unknown," while noting that the complex is managed on the basis of one or more indicator stocks that do have known, stock-specific MSYs or suitable proxies as described in paragraph (e)(1)(iv) of this section. When indicator stocks are not used, MSY or a suitable proxy should be calculated for the stock complex as a whole.

(iv) *Specifying MSY.* Because MSY is a long-term average, it need not be estimated annually, but it must be based on the best scientific information available (see § 600.315), and should be re-estimated as required by changes in long-term environmental or ecological conditions, fishery technological characteristics, or new scientific information. When data are insufficient to estimate MSY directly, Councils should adopt other measures of reproductive potential, based on the best scientific information available, that can serve as reasonable proxies

for MSY, F_{msy}, and B_{msy}, to the extent possible. As MSY values are estimates and will have some level of uncertainty associated with them, the degree of uncertainty in the estimates should be identified, when possible, through the stock assessment process and peer review (see § 600.335).

(2) *Status determination criteria*--(i) *Definitions*--(A) *Status determination criteria (SDC)* mean the quantifiable factors, MFMT, OFL, and MSST, or their proxies, that are used to determine if overfishing has occurred, or if the stock or stock complex is overfished. Magnuson-Stevens Act (section 3(34)) defines both "overfishing" and "overfished" to mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the MSY on a continuing basis. To avoid confusion, this section clarifies that "overfished" relates to biomass of a stock or stock complex, and "overfishing" pertains to a rate or level of removal of fish from a stock or stock complex.

(B) *Overfishing* (to overfish) occurs whenever a stock or stock complex is subjected to a level of fishing mortality or annual total catch that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis.

(C) *Maximum fishing mortality threshold (MFMT)* means the level of fishing mortality (F), on an annual basis, above which overfishing is occurring.

(D) *Overfishing limit (OFL)* means the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers or weight of fish. MSY is the long-term average of such catches.

(E) *Overfished.* A stock or stock complex is considered "overfished" when its biomass has declined below a level that jeopardizes the capacity of the stock or stock complex to produce MSY on a continuing basis.

(F) *Minimum stock size threshold (MSST)* means the level of biomass below which the stock or stock complex is considered to be overfished.

(G) *Approaching an overfished condition.* A stock or stock complex is approaching an overfished condition when it is projected that there is more than a 50 percent chance that the biomass of the stock or stock complex will decline below the MSST within two years.

(ii) *Specification of SDC and overfishing and overfished determinations.* SDC must be expressed in a way that enables the Council to monitor each stock or stock complex in the FMP and determine annually, if possible, whether overfishing is occurring and whether the stock or stock complex is overfished. In specifying SDC, a Council should provide an analysis of how the SDC were chosen and how they relate to reproductive potential. Each FMP must specify, to the extent possible, objective and measurable SDC as follows (see paragraphs (e)(2)(ii)(A) and (B) of this section):

(A) *SDC to determine overfishing status.* Each FMP should describe which of the following two methods will be used for each stock or stock complex to determine an overfishing status.

(*1*) *Fishing mortality rate exceeds MFMT.* Exceeding the MFMT for a period of 1 year or more constitutes overfishing. The MFMT or reasonable proxy may be expressed either as a single number (a fishing mortality rate or F value), or as a function of spawning biomass or other measure of reproductive potential. The MFMT must not exceed Fmsy.

(*2*) *Catch exceeds the OFL.* Should the annual catch exceed the annual OFL for 1 year or more, the stock or stock complex is considered subject to overfishing.

(B) *SDC to determine overfished status.* The MSST or reasonable proxy should be expressed in terms of spawning biomass or other measure of reproductive potential. To the

extent possible, the MSST should equal whichever of the following is greater: 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 this section. Should the estimated size of the stock or stock complex in a given year fall below this threshold, the stock or stock complex is considered overfished.

(iii) *Relationship of SDC to environmental change*. Some short-term environmental changes can alter the size of a stock or stock complex without affecting its long-term reproductive potential. Long-term environmental changes affect both the short-term size of the stock or stock complex and the long-term reproductive potential of the stock or stock complex.

(A) If environmental changes cause a stock or stock complex to fall below its MSST without affecting its long-term reproductive potential, fishing mortality must be constrained sufficiently to allow rebuilding within an acceptable time frame (also see paragraph (j)(3)(ii) of this section). SDC should not be respecified.

(B) If environmental changes affect the long-term reproductive potential of the stock or stock complex, one or more components of the SDC must be respecified. Once SDC have been respecified, fishing mortality may or may not have to be reduced, depending on the status of the stock or stock complex with respect to the new criteria.

(C) If manmade environmental changes are partially responsible for a stock or stock complex being in an overfished condition, in addition to controlling fishing mortality, Councils should recommend restoration of habitat and other ameliorative programs, to the extent possible (see also the guidelines issued pursuant to section 305(b) of the Magnuson-Stevens Act for Council actions concerning essential fish habitat).

(iv) *Secretarial approval of SDC.* Secretarial approval or disapproval of proposed SDC will be based on consideration of whether the proposal:

(A) Has sufficient scientific merit;

(B) Contains the elements described in paragraph (e)(2)(ii) of this section;

(C) Provides a basis for objective measurement of the status of the stock or stock complex against the criteria; and

(D) Is operationally feasible.

(3) *Optimum yield*--(i) *Definitions*--(A) *Optimum yield (OY).* Magnuson-Stevens Act section (3)(33) defines "optimum," with respect to the yield from a fishery, as the amount of fish that 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; that is prescribed on the basis of the MSY from the fishery, as reduced by any relevant economic, social, or ecological factor; and, in the case of an overfished fishery, that provides for rebuilding to a level consistent with producing the MSY in such fishery. OY may be established at the stock or stock complex level, or at the fishery level.

(B) In NS1, use of the phrase "achieving, on a continuing basis, the optimum yield from each fishery" means producing, from each stock, stock complex, or fishery: a long-term series of catches such that the average catch is equal to the OY, overfishing is prevented, the long term average biomass is near or above Bmsy, and overfished stocks and stock complexes are rebuilt consistent with timing and other requirements of section 304(e)(4) of the Magnuson-Stevens Act and paragraph (j) of this section.

(ii) *General.* OY is a long-term average amount of desired yield from a stock, stock complex, or fishery. The long-term objective is to achieve OY through annual achievement of

ACT, which is described in paragraph (f) of this section. An FMP must contain conservation and management measures to achieve OY, and provisions for information collection that are designed to determine the degree to which OY is achieved on a continuing basis—that is, to result in a long-term average catch equal to the long-term average OY, through an effective system of ACLs, ACTs, and AMs. These measures should allow for practical and effective implementation and enforcement of the management regime. The Secretary has an obligation to implement and enforce the FMP. If management measures prove unenforceable—or too restrictive, or not rigorous enough to prevent overfishing while achieving OY—they should be modified; an alternative is to reexamine the adequacy of the OY specification. Exceeding OY does not necessarily constitute overfishing. However, even if no overfishing resulted from exceeding OY, continual harvest at a level above OY would violate NS1, because OY was not achieved on a continuing basis. An FMP must contain an assessment and specification of OY, including a summary of information utilized in making such specification, consistent with requirements of section 303(a)(3) of the Magnuson-Stevens Act. A Council must identify those economic, social, ~~and~~ ecological**, and risk** factors relevant to management of a particular stock, stock complex, or fishery, then evaluate them to determine the OY. The choice of a particular OY must be carefully documented to show that the OY selected will produce the greatest benefit to the Nation and prevent overfishing. **OY must be set below MSY in order to account for management and scientific uncertainty in selecting OY, MSY and the OFL.**

(iii) *Determining the greatest benefit to the Nation.* In determining the greatest benefit to the Nation, the values that should be weighed and receive serious attention when considering the economic, social, or ecological factors used in reducing MSY to obtain OY are:

(A) The benefits of food production are derived from providing seafood to consumers;

maintaining an economically viable fishery together with its attendant contributions to the national, regional, and local economies; and utilizing the capacity of the Nation's fishery resources to meet nutritional needs.

(B) The benefits of recreational opportunities reflect the quality of both the recreational fishing experience and non-consumptive fishery uses such as ecotourism, fish watching, and recreational diving. Benefits also include the contribution of recreational fishing to the national, regional, and local economies and food supplies.

(C) The benefits of protection afforded to marine ecosystems are those resulting from maintaining viable populations (including those of unexploited species), maintaining adequate forage for all components of the ecosystem, maintaining evolutionary and ecological processes (e.g., disturbance regimes, hydrological processes, nutrient cycles), maintaining the evolutionary potential of species and ecosystems, and accommodating human use.

(iv) *Factors to consider in OY specification.* Because fisheries have limited capacities, any attempt to maximize the measures of benefits described in paragraph (e)(3)(iii) of this section will inevitably encounter practical constraints. OY cannot **equal or** exceed MSY in any circumstance and must take into account the need to prevent overfishing and rebuild overfished stocks and stock complexes**, as well as the inherent uncertainties in management**. OY ~~can~~ **shall** be reduced to a value less than MSY based on social, economic, and ecological factors. To the extent possible, the relevant social, economic, and ecological factors used to establish OY for a stock, stock complex, or fishery should be quantified and reviewed in historical, short-term, and long-term contexts. Even where quantification of these factors is not possible, the FMP still must address these factors in its OY specification.

(A) *Social factors.* Examples are enjoyment gained from recreational fishing, avoidance

of gear conflicts and resulting disputes, preservation of a way of life for fishermen and their families, and dependence of local communities on a fishery (e.g., involvement in fisheries and ability to adapt to change). Consideration may be given to fishery-related indicators (e.g., number of fishery permits, number of commercial fishing vessels, number of party and charter trips, landings, ex-vessel revenues etc.) and non-fishery related indicators (e.g., unemployment rates, percent of population below the poverty level, population density, etc.). Other factors that may be considered include the effects that past harvest levels have had on fishing communities, the cultural place of subsistence fishing, obligations under Indian treaties, proportions of affected minority and low-income groups, and worldwide nutritional needs.

(B) *Economic factors*. Examples are prudent consideration of the risk of overharvesting when a stock's size or reproductive potential is uncertain (see § 600.335(c)(2)(i)), satisfaction of consumer and recreational needs, and encouragement of domestic and export markets for U.S. harvested fish. Other factors that may be considered include the value of fisheries, the level of capitalization, the decrease in cost per unit of catch afforded by an increase in stock size, the attendant increase in catch per unit of effort, alternate employment opportunities, and economic contribution to fishing communities, coastal areas, affected states, and the nation.

(C) Examples include **life-history characteristics that increase risk of overfishing,** impacts on ecosystem component species, **weaker stocks,** forage fish stocks, other fisheries, predator-prey or competitive interactions, marine mammals, threatened or endangered species, and birds. **Species that are slow-growing, long-lived, late-maturing, with low productivity, that change sex, that aggregate to spawn in known locations vulnerable to fishing, or that have other characteristics that increase the risk of overfishing should be afforded special care in setting OFL below MSY.** Species interactions that have not been explicitly taken into account when

calculating MSY should be considered as relevant factors for setting OY below MSY. In addition, consideration should be given to managing forage stocks for higher biomass than B_{msy} to enhance and protect the marine ecosystem. Also important are ecological or environmental conditions that stress marine organisms, such as natural and manmade changes in wetlands or nursery grounds, and effects of pollutants on habitat and stocks.

(v) *Specification of OY.* The specification of OY must be consistent with preventing overfishing and **must** ~~should~~ be reduced from MSY to account for scientific uncertainty in calculating MSY, and economic, social, and ecological factors such as those described in paragraph (e)(3)(iv) of this section. If the estimates of MFMT and current biomass are known with a high level of certainty and management controls can accurately limit catch to the ACT then OY could be set **closer** ~~very close~~ to MSY. To the degree that such MSY estimates and management controls are lacking or unavailable, OY should be set farther from MSY. In order to achieve OY in the long term, catch targets (i.e., ACT) should be set below catch limits (i.e., ACLs) based on the degree of management control so that average catch (or average ACT) approximates OY (see paragraph (f)(6) of this section). If management measures cannot adequately control fishing mortality so that the specified OY can be achieved without overfishing, the Council should reevaluate the management measures and specification of OY so that the dual requirements of NS1 (preventing overfishing while achieving, on a continuing basis, OY) are met.

(A) The amount of fish that constitutes the OY should be expressed in terms of numbers or weight of fish. As a long-term average, OY cannot **equal or** exceed MSY.

(B) Either a range or a single value may be specified for OY. Specification of a numerical, fixed-value OY does not preclude use of ACTs that vary with stock size or

management precision. For example, an ACT control rule (described in paragraph (f)(6) of this section) might prescribe a smaller ACT if there is less management precision.

(C) All catch must be counted against OY, including that resulting from bycatch, scientific research, and all fishing activities.

(D) The OY specification should be translatable into an annual numerical estimate for the purposes of establishing any total allowable level of foreign fishing (TALFF) and analyzing impacts of the management regime.

(E) The determination of OY is based on MSY, directly or through proxy. However, even where sufficient scientific data as to the biological characteristics of the stock do not exist, or where the period of exploitation or investigation has not been long enough for adequate understanding of stock dynamics, or where frequent large-scale fluctuations in stock size diminish the meaningfulness of the MSY concept, OY must still be established based on the best scientific information available.

(F) An OY established at a fishery level may not **equal or** exceed the sum of the MSY values for each of the stocks or stock complexes within the fishery. If OY is specified at a fishery level, the sum of the ACTs for the stocks and stock complexes in the fishery should approximate OY.

(G) There should be a mechanism in the FMP for periodic reassessment of the OY specification, so that it is responsive to changing circumstances in the fishery.

(H) Part of the OY may be held as a reserve to allow for factors such as uncertainties in estimates of stock size and domestic annual harvest (DAH). If an OY reserve is established, an adequate mechanism should be included in the FMP to permit timely release of the reserve to domestic or foreign fishermen, if necessary.

(vi) *OY and foreign fishing*. Section 201(d) of the Magnuson-Stevens Act provides that fishing by foreign nations is limited to that portion of the OY that will not be harvested by vessels of the United States. The FMP must include an assessment to address the following, as required by section 303(a)(4) of the Magnuson-Stevens Act:

(A) *DAH*. Councils and/or the Secretary must consider the capacity of, and the extent to which, U.S. vessels will harvest the OY on an annual basis. Estimating the amount that U.S. fishing vessels will actually harvest is required to determine the surplus.

(B) *Domestic annual processing (DAP)*. Each FMP must assess the capacity of U.S. processors. It must also assess the amount of DAP, which is the sum of two estimates: The estimated amount of U.S. harvest that domestic processors will process, which may be based on historical performance or on surveys of the expressed intention of manufacturers to process, supported by evidence of contracts, plant expansion, or other relevant information; and the estimated amount of fish that will be harvested by domestic vessels, but not processed (e.g., marketed as fresh whole fish, used for private consumption, or used for bait).

(C) *Joint venture processing (JVP)*. When DAH exceeds DAP, the surplus is available for JVP.

(f) *Acceptable biological catch, annual catch limits, and annual catch targets*. The following features (see paragraphs (f)(1) through (f)(7) of this section) of acceptable biological catch, annual catch limits, and annual catch targets apply to stocks and stock complexes in the fishery (see paragraph (d)(2) of this section).

(1) *Introduction*. A control rule is a policy for establishing a limit or target fishing level that is based on the best available scientific information and is established by fishery managers in consultation with fisheries scientists. Control rules should be designed so that management

actions become more conservative as biomass estimates, or other proxies, for a stock or stock complex decline and as science and management uncertainty increases. Paragraph (f) of this section describes a three-step approach for setting limits and targets so as to ensure a low risk of overfishing while achieving, on a continuing basis, Overfishing Limit: First, ABC is set below the OFL to account for scientific uncertainty in calculating the OFL; second, ACL is set **below** ~~at an amount not to exceed~~ the ABC; and third, ACT is set at an amount not to exceed the ACL to account for management uncertainty in controlling a fishery's actual catch. **In addition, special care should be used in setting limits and targets and in designing control rules for species with life-history characteristics that place them at high risk of overfishing, including but not limited to slow growth, high longevity, late maturation, sex changing, or the presence of aggregatory spawning behaviors. For species with complex life histories acceptable risks should be limited to that calculated for the most vulnerable life history stage.**

(2) *Definitions*. (i) *Catch* is the total quantity of fish, measured in weight or numbers of fish, taken in commercial, recreational, subsistence, tribal, and other fisheries. Catch includes fish that are retained for any purpose, as well as mortality of fish that are discarded **or released. This means that estimates of bycatch mortality and all other sources of fishing-related mortality should be expressed in weight or numbers of fish and deducted from the ABC when setting the ACL**.

(ii) *Acceptable biological catch (ABC)* is a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL and should be specified based on the ABC control rule.

(iii) *ABC control rule* means a specified approach to setting the ABC for a stock or stock complex as a function of the scientific uncertainty in the estimate of OFL.

(iv) *Annual catch limit (ACL)* is the level of annual catch of a stock or stock complex that serves as the basis for invoking AMs. ACL cannot **equal or** exceed the ABC, but should be divided into sector-ACLs (see paragraph (f)(5) of this section).

(v) *Annual catch target (ACT)* is an amount of annual catch of a stock or stock complex that is the management target of the fishery. A stock or stock complex's ACT should usually be less than its ACL and results from the application of the ACT control rule. Where sector-ACLs have been established, each one should have a sector-ACT.

(vi) *ACT control rule* means a specified approach to setting the ACT for each stock or stock complex such that the risk of exceeding the ACL due to management uncertainty is at an acceptably low level.

(3) *Specification of ABC*. ABC may not **equal or** exceed OFL (see paragraph (e)(2)(i)(D) of this section) and is ~~recommended to be~~ reduced from OFL to account for scientific uncertainty in the estimate of OFL. Councils should develop a process for receiving scientific information and advice used to establish ABC. This process should: establish an ABC control rule, identify the body that will apply the ABC control rule (i.e., calculates the ABC), identify the review process that will verify the resulting ABC, and confirm that the SSC recommends the ABC to the Council. For Secretarial FMPs or FMP amendments, agency scientists or a peer review process would provide the scientific advice to establish ABC. For internationally-assessed stocks, an ABC as defined in these guidelines is not required.

(i) *Expression of ABC*. ABC should be expressed in terms of catch~~, but may be expressed in terms of landings as long as e~~. **Estimates of bycatch and any other fishing mortality should be expressed in weight or numbers of fish, and deducted from the ~~not accounted for in the landings are incorporated into the determination~~ of** ABC **when setting the ACL.**

(ii) *ABC for overfished stocks*. For overfished stocks and stock complexes, a rebuilding ABC must be set to reflect the annual catch that is consistent with the target fishing mortality rates in the rebuilding plan.

(4) *ABC control rule*. For stocks and stock complexes required to have an ABC, each Council **must** ~~should~~ establish an ABC control rule based on scientific advice from its SSC. **The ABC control rule must stipulate the stock level at which fishing will be prohibited.** The process of establishing an ABC control rule could also involve science advisors or the peer review process established under Magnuson-Stevens Act section 302(g)(1)(E). The ABC control rule should clearly articulate how far below the OFL, or OFL proxy, the ABC will be set based on the level of scientific knowledge about the stock or stock complex and the scientific uncertainty in the estimate of OFL. The ABC control rule should take into account uncertainty in factors such as stock assessment results, time lags in updating assessments, the degree of retrospective revision of assessment results, and projections. The control rule may be used in a tiered approach to address different levels of scientific uncertainty.

(5) *Setting the annual catch limit*--(i) *General*. ACL cannot **equal or** exceed the ABC and may be set annually or on a multiyear plan basis. A "multiyear plan" as referenced in section 303(a)(15) of the Magnuson-Stevens Act is a plan that establishes harvest specifications or harvest guidelines for each year of a time period greater than 1 year. A multiyear plan should include ACLs and ACTs for each year with appropriate AMs to prevent overfishing and maintain an appropriate rate of rebuilding if the stock or stock complex is in a rebuilding plan. The AMs specified for a multiyear plan should provide that, if an ACL is exceeded for a year, then a subsequent year's harvest specification (including ACLs and ACTs) could be revised.

(ii) *Sector ACLs.* A Council ~~may, but is not required to,~~ **should establish sector-ACLs by dividing the ACL among the various sectors of the fishery** ~~divide an Annual Catch Limit into sector Annual Catch Limits~~. ''Sector,'' for purposes of this ~~section~~ **Part**, means a distinct user group to which separate management strategies and separate catch quotas apply. Examples of sectors include the commercial sector, recreational sector, or various gear groups within a fishery. Sector-Accountability Measures must be developed for each sector-ACL, and the sum of sector ACLs must not exceed the stock or stock complex level ACLs. The system of ACLs and AMs designed must be effective and equitable and protect the stock or stock complex as a whole. ~~If~~ **Where** sector-ACLs and AMs are established, additional AMs at the stock or stock complex level would also be appropriate.

(iii) *ACLs for State-Federal Fisheries.* For stocks or stock complexes that have a large majority of harvest in state or territorial waters, FMPs and FMP amendments should include an ACL for the overall stock that may be further divided. For example, the overall ACL could be divided into a federal-ACL and state-ACL. However, NMFS recognizes that federal management would be limited to the portion of the fishery under federal authority (see paragraph (g)(5) of this section). When stocks are co-managed by federal, state, tribal, and/or territorial fishery managers, the goal should be to develop collaborative conservation and management strategies, and scientific capacity to support such strategies, to prevent overfishing of shared stocks and ensure their sustainability.

(6) *ACT control rule.* For stocks and stock complexes required to have an ACL, each Council **must** ~~should~~ establish ACT control rules for setting the ACTs. **The ACT control rule must stipulate the stock level at which fishing will be prohibited.** The ACT control rule should clearly articulate how far below the ACL the target will be established based on the

amount of management uncertainty associated with harvest of a stock or stock complex. For example, the ACT may need to be set further below the ACL in fisheries where inseason monitoring of catch data is unavailable or infeasible, or where AMs are established using a multi-year averaging approach (see paragraph (g)(4) of this section).

(i) *Determining management uncertainty.* Two sources of management uncertainty should be accounted for in establishing the ACT control rule: uncertainty in the ability of managers to constrain catch to the ACT and uncertainty in quantifying the true catch amounts (i.e., estimation errors). To determine the level of management uncertainty in controlling catch, analyses should consider the **implications of exceeding catch limits in terms of likely recovery times, given life history characteristics of the species involved, as well as** past management performance in the fishery and factors such as time lags in reported catch. Such analyses should be based on the best available scientific information from an SSC, agency scientists, or peer review process as appropriate.

(ii) *Establishing tiers and corresponding ACT control rules.* Tiers can be established based on levels of management uncertainty associated with the fishery, frequency and accuracy of catch monitoring data available, and risks of exceeding the limit. An ACT control rule could be established for each tier and have, as appropriate, different formulas and standards used to establish the ACT.

(7) *Relationships of OFL to MSY and ACT to OY.* The following (see paragraphs (f)(7)(i) and (ii) of this section) describes the relationships between terms used in ending and preventing overfishing and rebuilding overfished stocks and stock complexes.

(i) *Relationship of OFL to MSY.* OFL is the amount of catch for a particular year that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance, and

MSY is the long-term average of such catches. ABC **must** ~~is recommended to~~ be set below OFL to take into account the scientific uncertainty in the estimate of OFL.

(ii) *Relationship of ACT to OY.* Paragraphs (a) and (e)(3) of this section define and describe OY and the goal of preventing overfishing, while achieving on a continuing basis the OY from each stock, stock complex, or fishery. Management measures for a fishery should, on an annual basis, achieve the ACTs and prevent the ACLs from being exceeded. The long-term objective is to achieve OY through annual achievement of ACT.

(g) *Accountability measures.* The following features (see paragraphs (g)(1) through (~~5~~**8**) of this section) of accountability measures apply to those stocks and stock complexes in the fishery.

(1) Introduction. AMs are management controls that prevent ACLs or sector-ACLs from being exceeded, ~~(~~inseason ~~Accountability Measures),~~ **whenever** possible, and correct or mitigate overages **immediately** if they occur. AMs should address and minimize both the frequency and magnitude of overages and correct the problems that caused the overage in as short a time as possible**, but no later than during the fishing year following the year in which the overage occurred**.

(2) Inseason AMs. Whenever possible, FMPs should include inseason monitoring and management measures to prevent catch from exceeding ACLs. Inseason AMs could include, but are not limited to, closure of a fishery; closure of specific areas; changes in gear; changes in trip size or bag limits; reductions in effort; or other appropriate management controls for the fishery. If final data or data components of catch are delayed, Councils should make appropriate use of preliminary data, such as landed catch, in implementing inseason AMs. ~~Where timely catch data~~

~~are available for a stock,~~ FMPs should include inseason closure authority to close the fishery on or before the date when the ACL for a stock or stock complex is projected to be reached.

(3) AMs for when the ACL is exceeded. On an annual basis, the Council should determine as soon as possible after the fishing year if an ACL was exceeded. If an ACL was exceeded, AMs should be triggered and implemented ~~as soon as possible~~ **immediately** to correct the operational issue that caused the ACL overage, as well as any biological consequences to the stock or stock complex resulting from the overage when it is known. These AMs could include, among other things, modifications of inseason AMs or overage adjustments. ~~For stocks and stock complexes in rebuilding plans, t~~ The AMs should include overage adjustments that reduce the ACLs in the next fishing year by the full amount of the overages~~, unless the best scientific information available shows that a reduced overage adjustment, or no adjustment is needed to mitigate the effects of the overages~~. If catch exceeds the ACL more than once in the last four years, the system of ACLs, ACTs and AMs **must** ~~should~~ be re-evaluated to improve its performance and effectiveness. **Councils should set more stringent re-evaluation time frames for species with life history characteristics that make them especially vulnerable to overfishing, including slow growth, high longevity, late maturation, sex changing, or the presence of aggregatory spawning behaviors.**

(4) *AMs based on multi-year average data.* Some fisheries have highly variable annual catches and lack reliable inseason or annual data on which to base AMs. If there are insufficient data upon which to compare catch to ACL, either inseason or on an annual basis, AMs could be based on comparisons of average catch to average ACL over a three-year moving average period or, if supported by analysis, some other appropriate multi-year period. Evaluation of the moving average catch to the average ACL must be conducted annually. If the average catch exceeds the

average ACL more than once in the last four years, then the ACL, ACT and AM system should be re-evaluated. The initial ACL and management measures should incorporate information from previous years so that AMs based on average ACLs can be applied from the first year.

5) *Sector AMs.* Sector-AMs must be developed for each Sector-ACL. The Councils should ensure that AMs, as well as methods for data collection and analysis and catch monitoring to determine when AMs are triggered, are equally rigorous across all sectors of a fishery. Where AMs, data collection and analysis and catch monitoring are not equally rigorous across all sectors, the Councils should factor in the resulting uncertainty by reducing Sector-ACTs and Sector-ACLs for sectors that have not implemented measures that are as robust or effective as the other sectors in the fishery. The Councils should not reallocate catch to a sector unless that sector has implemented AMs that are equally rigorous or effective in adhering to the ACL as the AMs applicable to other sectors.

(6) *AMs for State-Federal Fisheries.* For stocks or stock complexes that have a large majority of harvest in state or territorial waters, AMs should be developed for the portion of the fishery under federal authority and could include closing the EEZ when the federal portion of the ACL is reached, or the overall stock's ACL is reached, or other measures.

(7) *Data Collection and Catch Monitoring to Implement AMs.* The Councils should determine, by sector and for the fishery as a whole, whether existing methods for monitoring catches (including landings and discards) are sufficient to determine whether an ACL is being approached. The Councils should provide an appropriate trigger for AMs to prevent the ACL from being exceeded, or to correct and mitigate any overages during the next fishing year. Where catch monitoring, data collection and analysis methods, and enforcement mechanisms are unreliable, the Councils should propose better monitoring

systems and account for this management uncertainty when establishing the ACT control rule (see paragraph (f)(6)(i) of this section).

(8) *AMs based on LAPPs.* Limited Access Privilege Programs have demonstrated an ability to meet catch limits and other conservation goals while enhancing compliance, data collection, monitoring and enforcement and achieving the goals of the other National Standards. LAPPs are a preferred method for establishing AMs in commercial fisheries. For each commercial fishery, Councils should evaluate and describe the potential for implementing a LAPP to establish AMs, including an assessment of whether such a LAPP would provide more effective AMs than other measures the Council either has in place or is considering with respect to meeting the objectives of National Standard 1 and other National Standards.

(h) *Establishing ACL and AM mechanisms in FMPs.* FMPs or FMP amendments should establish ACL and AM mechanisms for all stocks and stock complexes in the fishery, unless paragraph (h)(2) of this section is applicable. If a complex has multiple indicator stocks, each indicator stock must have its own ACL; an additional ACL for the stock complex as a whole is optional. In cases where fisheries harvest multiple indicator stocks of a single species that cannot be distinguished at the time of capture, separate ACLs for the indicator stocks are not required and the ACL can be established for the complex as a whole.

(1) In establishing ACL and AM mechanisms, FMPs should describe:

(i) Timeframes for setting ACLs (e.g., annually or multi-year periods);

(ii) Sector-ACLs, if any (including set-asides for research or bycatch);

(iii) AMs and their relationship to ABC and ACT control rules, including how AMs are triggered and what sources of data will be used **and how** (e.g., inseason data, annual catch

compared to the ACL, or multi-year averaging approach), **the reliability of the resulting data sources and information tracking catch and preventing the ACL from being exceeded and, if not reliable, what additional AMs will be implemented to account for the increased uncertainty**;

(iv) Sector-AMs, if there are sector-ACLs; and

(v) Fisheries data described in paragraph (i) of this section.

(2) *Exceptions from ACL and AM requirements*--(i) *Life cycle*. Section 303(a)(15) of the Magnuson-Stevens Act "shall not apply to a fishery for species that has a life cycle of approximately 1 year unless the Secretary has determined the fishery is subject to overfishing of that species" (as described in Magnuson-Stevens Act section 303 note). This exception applies to a stock for which the average length of time it takes for an individual to produce a reproductively active offspring is approximately 1 year and that the individual has only one breeding season in its life time. While exempt from the ACL and AM requirements, FMPs or FMP amendments for these stocks should have SDC, MSY, OY, ABC, and an ABC control rule.

(ii) *International fishery agreements*. Section 303(a)(15) of the Magnuson-Stevens Act applies "unless otherwise provided for under an international agreement in which the United States participates" (Magnuson-Stevens Act section 303 note). This exception applies to stocks or stock complexes subject to management under an international agreement, which is defined as "any bilateral or multilateral treaty, convention, or agreement which relates to fishing and to which the United States is a party" (see Magnuson-Stevens Act section 3(24)). These stocks would still need to have SDC and MSY.

(3) *Flexibility in application of NS1 guidelines*. There are limited circumstances that may not fit the standard approaches to specification of reference points and management measures set

forth in these guidelines. These include, among other things, conservation and management of ESA-listed species, harvests from aquaculture operations, and stocks with unusual life history characteristics (e.g. Pacific salmon, where the spawning potential for a stock is spread over a multi-year period). In these circumstances, Councils may propose alternative approaches for satisfying the NS1 requirements of the Magnuson-Stevens Act than those set forth in these guidelines. Councils should document their rationale for any alternative approaches for these limited circumstances in an FMP or FMP amendment, which will be reviewed for consistency with the Magnuson-Stevens Act.

(i) *Fisheries data.* In their FMPs, Councils should describe general data collection methods, as well as any specific data collection methods used for all stocks, stock complexes, and ecosystem component species. FMPs should:

(1) List sources of fishing mortality (both landed and discarded), including commercial and recreational catch and bycatch in other fisheries;

(2) Describe the data collection and estimation methods used to quantify total catch mortality in each fishery, including information on the management tools used (i.e., logbooks, vessel monitoring systems, observer programs, landings reports, fish tickets, processor reports, dealer reports, recreational angler surveys, or other methods); the frequency with which data are collected and updated; and the scope of sampling coverage for each fishery; and

(3) Describe the methods used to compile catch data from various catch data collection methods and how those data are used to determine the relationship between total catch at a given point in time and the ACL for stocks and stock complexes that are part of a fishery.

(4) Describe how data collection and analysis and catch monitoring methods employed across each sector of the fishery will ensure that AMs are triggered so as to

prevent the ACL from being exceeded, or to correct and mitigate any overages if they occur.

(j) *Council actions to address overfishing and rebuilding for stocks and stock complexes in the fishery*--(1) *Notification.* The Secretary will immediately notify a Council whenever it is determined that:

(i) Overfishing is occurring;

(ii) A stock or stock complex is overfished;

(iii) A stock or stock complex is approaching an overfished condition; or

(iv) Existing remedial action taken for the purpose of ending previously identified overfishing or rebuilding a previously identified overfished stock or stock complex has not resulted in adequate progress.

(2) *Timing of actions*--(i) *If a stock or stock complex is undergoing overfishing.* FMPs or FMP amendments should establish ACL and AM mechanisms in 2010, for stocks and stock complexes determined to be subject to overfishing, and in 2011, for all other stocks and stock complexes (see paragraph (b)(2)(iii) of this section). To address practical implementation aspects of the FMP and FMP amendment process, paragraphs (j)(2)(i)(A) through (C) of this section clarifies the expected timing of actions.

(A) In addition to establishing ACL and AM mechanisms, the ACLs and AMs themselves should be specified in FMPs, FMP amendments, implementing regulations, or annual specifications beginning in 2010 or 2011, as appropriate.

(B) For stocks and stock complexes still determined to be subject to overfishing at the end of 2008, ACL and AM mechanisms and the ACLs and AMs themselves should be effective in fishing year 2010.

(C) For stocks and stock complexes determined to be subject to overfishing during 2009, ACL and AM mechanisms and ACLs and AMs themselves should be effective in fishing year 2010, if possible, or in fishing year 2011, at the latest.

(ii) *If a stock or stock complex is overfished or approaching an overfished condition.* (A) For notifications that a stock or stock complex is overfished or approaching an overfished condition made before July 12, 2009, a Council must prepare an FMP, FMP amendment, or proposed regulations within one year of notification. If the stock or stock complex is overfished, the purpose of the action is to specify a time period for ending overfishing and rebuilding the stock or stock complex that will be as short as possible as described under section 304(e) of the Magnuson-Stevens Act. If the stock or stock complex is approaching an overfished condition, the purpose of the action is to prevent the biomass from declining below the MSST.

(B) For notifications that a stock or stock complex is overfished made after July 12, 2009, a Council must prepare an FMP, FMP amendment, or proposed regulations within two years of notification. Council actions should be submitted for Secretarial review within 15 months of notification to ensure sufficient time for the Secretary to implement the measures, if approved. If the stock or stock complex is overfished and overfishing is occurring, the rebuilding plan must end overfishing immediately and be consistent with ACL and AM requirements of the Magnsuon-Stevens Act.

(C) For notifications that a stock or stock complex is approaching an overfished condition made after July 12, 2009, a Council should take immediate action to reduce the likelihood that the stock or stock complex will become overfished. Otherwise, the stock or stock complex would likely be overfished by the time the two-year timeline to implement management measures expired.

(3) *Overfished fishery.* (i) Where a stock or stock complex is overfished, a Council must specify a time period for rebuilding the stock or stock complex based on factors specified in Magnuson-Stevens Act section 304(e)(4). This target time for rebuilding (T_{target}) shall be as short as possible, taking into account: the status and biology of any overfished stock, the needs of fishing communities, recommendations by international organizations in which the U.S. participates, and interaction of the stock within the marine ecosystem. In addition, the time period shall not exceed 10 years, except where biology of the stock, other environmental conditions, or management measures under an international agreement to which the U.S. participates dictate otherwise. SSCs (or agency scientists or peer review processes in the case of Secretarial actions) shall provide recommendations for achieving rebuilding targets (see Magnuson-Stevens Act section 302(g)(1)(B)). The above factors enter into the specification of T_{target} as follows:

(A) The "minimum time for rebuilding a stock" (T_{min}) means the amount of time the stock or stock complex is expected to take to rebuild to its MSY biomass level in the absence of any fishing mortality. In this context, the term "expected" means to have at least a 50-percent probability of attaining the B_{msy}.

(B) For scenarios under paragraph (j)(2)(ii)(A) of this section, the starting year for the T_{min} calculation is the first year that a rebuilding plan is implemented. For scenarios under paragraph (j)(2)(ii)(B) of this section, the starting year for the T_{min} calculation is 2 years after notification that a stock or stock complex is overfished or the first year that a rebuilding plan is implemented, whichever is sooner.

(C) If T_{min} for the stock ~~or stock complex~~ is 10 years or less, then the maximum time allowable for rebuilding (T_{max}) that stock to its B_{msy} is 10 years. **Rebuilding timeframes can only**

be extended above T_{min} in cases where unusually severe impacts on fishing communities can be demonstrated, and where biological and ecological implications are minimal.

(D) If T_{min} for the stock ~~or stock complex~~ exceeds 10 years, then the maximum time allowable for rebuilding a stock ~~or stock complex~~ to its B_{msy} is T_{min} plus the length of time associated with one generation time for that stock ~~or stock complex~~. "Generation time" is the average length of time between when an individual is born and the birth of its offspring. **Rebuilding timeframes can only be extended above T_{min} in cases where unusually severe impacts on fishing communities can be demonstrated, and where biological and ecological implications are minimal.**

(E) T_{target} shall not exceed T_{max}, should generally be less than T_{max}, and should be calculated based on the factors described in this paragraph (j)(3) with a priority given to rebuilding in as short a time as possible.

(F) Rebuilding times adopted for stock complexes must not be used to delay recovery of complex member species.

(ii) If a stock or stock complex reached the end of its rebuilding plan period and has not yet been determined to be rebuilt, then the rebuilding F should not be increased until the stock or stock complex has been demonstrated to be rebuilt. If the rebuilding plan was based on a T_{target} that was less than T_{max}, and the stock or stock complex is not rebuilt by T_{target}, rebuilding measures should be revised, if necessary, such that the stock or stock complex will be rebuilt by T_{max}. If the stock or stock complex has not rebuilt by T_{max}, and the rebuilding F is greater than 75 percent of MFMT, then the rebuilding F should be reduced to no more than 75 percent of MFMT until the stock or stock complex has been demonstrated to be rebuilt.

(iii) Council action addressing an overfished fishery must allocate both overfishing

restrictions and recovery benefits fairly and equitably among sectors of the fishery.

(iv) For fisheries managed under an international agreement, Council action addressing an overfished fishery must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States.

(4) *Emergency actions and interim measures*. The Secretary, on his/her own initiative or in response to a Council request, may implement interim measures to reduce overfishing or promulgate regulations to address an emergency (Magnuson-Stevens Act section 304(e)(6) or 305(c)). In considering a Council request for action, the Secretary would consider, among other things, the need for and urgency of the action and public interest considerations, such as benefits to the stock or stock complex and impacts on participants in the fishery.

(i) These measures may remain in effect for not more than 180 days, but may be extended for an additional 186 days if the public has had an opportunity to comment on the measures and, in the case of Council-recommended measures, the Council is actively preparing an FMP, FMP amendment, or proposed regulations to address the emergency or overfishing on a permanent basis.

(ii) Often, these measures need to be implemented without prior notice and an opportunity for public comment, as it would be impracticable to provide for such processes given the need to act quickly and also contrary to the public interest to delay action. However, emergency regulations and interim measures that do not qualify for waivers or exceptions under the Administrative Procedure Act would need to follow proposed notice and comment rulemaking procedures.

(k) *International overfishing*. If the Secretary determines that a fishery is overfished or approaching a condition of being overfished due to excessive international fishing pressure, and

for which there are no management measures (or no effective measures) to end overfishing under an international agreement to which the United States is a party, then the Secretary and/or the appropriate Council shall take certain actions as provided under Magnuson-Stevens Act section 304(i). The Secretary, in cooperation with the Secretary of State, should immediately take appropriate action at the international level to end the overfishing. In addition, within one year after the determination, the Secretary and/or appropriate Council shall:

(1) Develop recommendations for domestic regulations to address the relative impact of the U.S. fishing vessels on the stock. Council recommendations should be submitted to the Secretary.

(2) Develop and submit recommendations to the Secretary of State, and to the Congress, for international actions that will end overfishing in the fishery and rebuild the affected stocks, taking into account the relative impact of vessels of other nations and vessels of the United States on the relevant stock. Councils should, in consultation with the Secretary, develop recommendations that take into consideration relevant provisions of the Magnuson-Stevens Act and NS1 guidelines, including section 304(e) of the Magnuson-Stevens Act and paragraph (j)(3)(iv) of this section, and other applicable laws. For highly migratory species in the Pacific, recommendations from the Western Pacific, North Pacific, or Pacific Councils must be developed and submitted consistent with Magnuson-Stevens Reauthorization Act section 503(f), as appropriate.

(3) *Considerations for assessing "relative impact."* "Relative impact" under paragraphs (k)(1) and (2) of this section may include consideration of factors that include, but are not limited to: domestic and international management measures already in place, management history of a given nation, estimates of a nation's landings or catch (including bycatch) in a given fishery, and

estimates of a nation's mortality contributions in a given fishery. Information used to determine relative impact should be based upon the best available scientific information.

(l) *Relationship of National Standard 1 to other national standards*--(1) *National Standard 2 (see § 600.315).* Management measures and reference points to implement NS1 must be based on the best scientific information available. When data are insufficient to estimate reference points directly, Councils should develop reasonable proxies to the extent possible (also see paragraph (e)(1)(iv) of this section). In cases where scientific data are severely limited, effort should also be directed to identifying and gathering the needed data. SSCs should advise their Councils regarding the best scientific information available for fishery management decisions.

(2) *National Standard 3 (see § 600.320).* Reference points should generally be specified in terms of the level of stock aggregation for which the best scientific information is available (also see paragraph (e)(1)(iii) of this section). Also, scientific assessments should be based on the best information about the total range of the stock and potential biological structuring of the stock into biological sub-units, which may differ from the geographic units on which management is feasible.

(3) *National Standard 6 (see § 600.335).* Councils must build into the reference points and control rules appropriate consideration of risk, taking into account uncertainties in estimating harvest, stock conditions, life history parameters, or the effects of environmental factors.

(4) *National Standard 8 (see § 600.345).* Councils must take into account the importance of fishery resources to fishing communities when specifying OY and an ACT control rule. Also, see paragraph (e)(3)(iv)(A) of this section for more information on how factors that relate to fishing communities should be considered when reducing OY from MSY.

(5) *National Standard 9 (see § 600.350)*. Evaluation of stock status with respect to reference points must take into account mortality caused by bycatch. In addition, the estimation of catch should include the mortality of fish that are discarded.

(m) *Exceptions to requirements to prevent overfishing*. Exceptions to the requirement to prevent overfishing could apply under certain limited circumstances. Harvesting one stock at its optimum level may result in overfishing of another stock when the two stocks tend to be caught together (This can occur when the two stocks are part of the same fishery or if one is bycatch in the other's fishery). Before a Council may decide to allow this type of overfishing, an analysis must be performed and the analysis must contain a justification in terms of overall benefits, including a comparison of benefits under alternative management measures, and an analysis of the risk of any stock or stock complex falling below its MSST. The Council may decide to allow this type of overfishing if the analysis demonstrates that all of the following conditions are satisfied:

(1) Such action will result in long-term net benefits to the Nation;

(2) Mitigating measures have been considered and it has been demonstrated that a similar level of long-term net benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristic in a manner such that no overfishing would occur; and

(3) The resulting rate of fishing mortality will not cause any stock or stock complex to fall below its MSST more than 50 percent of the time in the long term, although it is recognized that persistent overfishing is expected to cause the affected stock to fall below its B_{msy} more than 50 percent of the time in the long term.

Appendix C

Letters from Gulf of Mexico Fishermen to Gulf of Mexico Fishery Management Council, Dated August 11, 2008

August 11, 2008

Dr. Tom McIlwain
Gulf of Mexico Fishery Management Council
3018 U.S. Highway 301 North
Suite 1000
Tampa, FL 33610-2266

RE: Interim Report of the Ad Hoc Recreational Red Snapper Advisory Panel

Dear Dr. McIlwain,

The federal recreational red snapper season ended last week, the shortest season on record. The early closure, compounded by the slowing economy, has served to undercut a once profitable for-hire business. There is little we can do to solve the economic woes of our nation, but we are fully engaged in trying to save our fisheries, our livelihoods and our communities.

Our industry continues to struggle under a decreasing TAC and rules and regulations which have only worsened over time. Local economies heavily dependent on our industry are now suffering. We know the problems facing our industry are complex and confusing but we all agree on one point: the current fishery management plan is not working.

Congress has finally stepped in and mandated new accountability measures to be implemented in all overfished species by 2010. This is both a significant deadline as well as an opportunity to make some needed improvements. Now is the time to begin a new direction and accept ideas that can protect our fisheries for generations to come. The consequences of inaction mean longer rebuilding timelines, less time on the water for those of us who love to fish, and lost economic potential for our region.

At this Council meeting you will hear a brief report on a few options considered by the Ad Hoc Recreational Advisory Panel for improving recreational management. In the end, the solution might be one of these ideas, a combination of these ideas or it might even be something the panel hasn't thought of yet. We need accountability and it is critical that we have better catch data. One place to start could be to begin working on verifiable electronic logbooks for the for-hire industry. We urge you, the members of the Gulf of Mexico Fishery Management Council, to take this opportunity to advance common-sense principles like better scientific data, accountability and flexibility to move from the status quo towards better recreational management soon. With so much at stake, how can we do otherwise?

Signature	Print Name	Signature	Print Name
	Robert Smith	Ron Zeitler	Ron Zeitler
	Whitney Morgan	Nancy Zeitler	Nancy Zeitler
	Jamie Yancey	Ted Baggett	Ted Baggett
	Troy Crain		

PLEASE SIGN BY SAT AUG 9
ALL CAPTAINS + MATES

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Signature	Print Name	Signature	Print Name
Jessica Baggett	Jessica Baggett		Franklin Colson
Jeffrey W. Culbreth	Jeffrey W. Culbreth	Matt Baggett	Matt Baggett
Lindley Staples	Lindley Staples	Diane Eliason	DIANE ELIASON
Harold Loeffler	Harold Loeffler	Bruce Kinlay	BRUCE KINLAY
Jonathan Cuthrell	Jonathan Cuthrell	Kenneth Boyd	Kenneth Boyd
Kerry Marshall	Kerry Marshall	Tommy Browning	Tommy Browning

SIGNATURE	Print Name	SIGNATURE	Print Name
	Kyle Lowe		
	Tyler Brennan		
	Brad Biggers		
Daniel Bryant			
	Gregory L. Marler		
	Joseph Eric Thrasher		
Dean Cox	Dean Cox		
	BILL WILLIAMS		
	Tom Banachowicz		
	Ernest Blair		
	Chris Garner		
	Alan Garris		
	Travis Gourley		
	Dave Young		
	James Westbrook		
J.P Cole	J.P. Cole		
	George Gray		
	Joe Hrisinowicz		
	Susie Westbrook		
	Bree Cheany		
	KATIE THRASHER		
	CAPT GARY JARVIS		
	CAPT Mike GRAFF		

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Signature	Print Name	Signature	Print Name
Kelly Williams	Kelly Williams		Neill Finkel
	JASON MIKEL		
Mike Parker	Mike Parker		

PLEASE SIGN BY SAT AM
CAPTAINS + MATES

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Signature	Print Name	Signature	Print Name
	Scott Robson		
Frances Montalvo	F. Montalvo	F. Montalvo	

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