

**Testimony of Chris Dorsett,
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before the U.S. House of Representatives,
Natural Resources Committee**

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Introduction

Over the past decade, significant progress has been made in ending overfishing and rebuilding overfished populations in the United States.¹ This progress, important from both ecological and economic standpoints, resulted from the rebuilding requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the work of fishery managers in implementing the law, and the efforts of fishery stakeholders. The MSA provides an adaptable framework that includes the essential elements for success found in a global analysis of rebuilding program performance while providing flexibility for incorporating social and economic needs. The rebuilding provisions of the MSA are showing signs of success in achieving the goal of returning fisheries to levels that support healthy and sustainable fish populations and fishing communities.

The recent report from the National Academy of Sciences, *Evaluating the Effectiveness of Fish Stock Rebuilding Plans in the United States* (NAS Report), came to a similar conclusion finding “demonstrated successes in identifying and rebuilding overfished stocks.”² For stocks that were placed under a rebuilding plan, fishing mortality has generally been reduced, and stock biomass has generally increased. The long-term net economic benefits of rebuilding have also proved generally positive.³ The report highlights the challenges and complexities of trying to evaluate science, and make decisions about catch limits and other management measures. In the face of those challenges, the report underscores the historic progress that has been achieved under the current law in ending overfishing and rebuilding fish populations.

Overview and Analysis of the Rebuilding Requirements of the MSA

While rebuilding was mentioned in the original 1976 Act, it was the 1996 Sustainable Fisheries Act (SFA) amendments, supported by a bipartisan group of Congressional members, that developed provisions to ensure rebuilding success and established specific mandates for rebuilding overfished populations. These changes were driven, in part, by the significant depletion of key groundfish species in New England. To address this issue, major revisions that now form the basis of the federal rebuilding program include:

- An explicit requirement to rebuild overfished species;⁴

¹ National Marine Fisheries Service, *2012 Report to Congress, Status of U.S. Fisheries* (May 2013).

² National Academy of Sciences, *Evaluating the Effectiveness of Fish Stock Rebuilding Plans in the United States*, (Sept. 2013) at 81 (hereinafter NAS Report).

³ NAS Report at 10.

⁴ 16 U.S.C. § 1853(a)(1), (10).

- Secretarial identification of overfished species and official notification to the Regional Fishery Management Councils (RFMCs);⁵
- A time limit for RFMCs to develop and implement a rebuilding plan once notified;⁶
- A requirement that populations are rebuilt in a short a time as possible but not to exceed ten years, with limited exceptions;⁷ and
- A requirement that conservation and management measures (including rebuilding) take into account the importance of fishery resources to fishing communities and, to the extent practicable, minimize adverse economic impacts;⁸

The law, as interpreted by the courts, includes the essential attributes for restoring overfished populations as identified by a recent assessment of global rebuilding programs. These include (in part):

1. Well defined objectives;
2. Finite time scales;
3. Rebuilding plan established in an open and transparent process;
4. Credible, consistent and transparent scientific monitoring of progress;
5. Simple and easily understood metrics of status and success;
6. Predefined rules for triggering corrective management action; and
7. Substantial, measurable reductions in fishing mortality at the onset of the plan.⁹

In recognizing the demonstrated success in identifying and rebuilding overfished stocks, the NAS Report concludes that:

The strong legal and prescriptive nature of rebuilding forces difficult decisions to be made, ensures a relatively high level of tractability, and can help prevent protracted debate over whether and how stocks should be rebuilt.¹⁰

While the NAS Report describes “inefficiencies” of this management framework, it is important to remember why these provisions were enacted and strengthened by Congress. Repeated delays and weak action are precisely what prompted Congress to institute the rebuilding requirements in 1996, and to tighten them in 2006. As noted by the NAS Report in citing a 1993 paper,

U.S. fisheries management was problematic because of “continued overfishing of some stocks; lack of coordination between councils and the NOAA/National Marine Fisheries Service in setting research agendas; conflicts among users; the vulnerability of the fishery management process to delays and political influence; lack of accountability;

⁵ *Id.* § 1854(e)(1), (2).

⁶ *Id.* § 1854(e)(3) (modified in the 2006 MSRA amendments).

⁷ *Id.* § 1854(e)(4).

⁸ *Id.* § 1851(a)(8).

⁹ Murawski, S.A. 2010. Rebuilding depleted fish stocks: the good, the bad, and, mostly, the ugly. *ICES Journal of Marine Science*, 67:1830-1840.

¹⁰ NAS Report at 185.

inconsistency in state and federal management measures; and adoption of unenforceable management measures.”¹¹

Since then, as the NAS Report and National Oceanic and Atmospheric Administration (NOAA) Status of the Stocks reports have found, the track record of rebuilding in the U.S. has been positive with record rebuilding of overfished populations over the past two years and overfishing at an all-time low.¹² Due to the MSA’s rebuilding mandate, rebuilding is more and more a problem of the past, as the annual catch limit (ACL) and rebuilding system continues to work to prevent overfishing and depletion.

To address these challenges and ensure the long-term health for our ocean, the prosperity of our nation’s fishing industries and associated businesses, and the opportunities for world-class recreational fishing, we offer a number of recommendations described in further detail below: First, build on the successful legal framework provided by the MSA by ensuring the proper application of ACLs and accountability provisions to avoid the need for rebuilding programs in the first place. Second, set criteria for when a population is considered overfished in a manner that avoids significantly depleted populations and lengthy rebuilding timelines. Third, use management procedure and management strategy evaluation (known as MSE) to improve management. Fourth, take an ecosystem approach to rebuilding. Finally, implement a monitoring, observation and research program for our nation’s large marine ecosystems to provide additional information for successful management.

Benefits of the MSA Rebuilding Requirements

There are significant economic, social and ecological reasons for fully restoring overfished populations. From an economic standpoint, while a full accounting of increased profitability for commercial and recreational fisheries does not exist, rebuilding is estimated to at least triple the net economic value of many U.S. fisheries.¹³ NMFS estimates that rebuilding U.S. stocks would increase the current ex-vessel value by an estimated \$2.2 billion (54%) annually, from \$4.1 billion to \$6.3 billion annually. Rebuilding would generate an additional \$31 billion in sales and support an additional 500,000 jobs.¹⁴ From an ecological standpoint, benefits of rebuilding include helping to restore ecosystem structure, function and resilience. These improvements ensure continued production of ecosystem goods and services beyond just fisheries benefits. As described below, the ecosystem benefits of rebuilding could be increased if a broader view of rebuilding is adopted.

¹¹ *Id.* at 24 (citing Parsons 1993).

¹² National Marine Fisheries Service, *2012 Report to Congress, Status of U.S. Fisheries* (May 2013).

¹³ Ussif Rashid Sumaila, *et al.* “Fish Economics: The Benefits of Rebuilding U.S. Ocean Fish Populations,” Fisheries Economics Research Unit, October 2005.

¹⁴ Testimony of Steven A. Murawski, Ph.D. Director, Scientific Programs and Chief Science Advisor, National Marine Fisheries Service, on Implementation of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act before the House Subcommittee on Insular Affairs, Oceans, and Wildlife, Washington, D.C. (October 27, 2009).

Unprecedented Progress in Restoring U.S. Fish Populations

The MSA rebuilding requirements are achieving the stated goals of recovery for the benefit of the environment and coastal economies. In recent years, unprecedented progress has been made in ending overfishing and rebuilding overfished species. According to the recent NAS Report, of the 85 stocks declared overfished since 1997, 42 are no longer classified as overfished: 31 have been designated as rebuilt, and 11 are rebuilding.¹⁵ Furthermore, a recent evaluation of all 44 stocks subject to rebuilding plans to comply with the 1996 Sustainable Fishery Act amendments and with sufficient information to assess progress under the plans found that 64% had been rebuilt or had made significant rebuilding progress (defined as achieving at least 50% of the rebuilding target and at least a 25% increase in abundance) since implementation of the rebuilding plan.¹⁶

Attachment 1 shows the decline in the percentage of managed stocks subject to overfishing and in an overfished condition from 1997-2011. Rebuilding success stories include Atlantic sea scallops in New England, bluefish in the Mid-Atlantic; lingcod in the Pacific and blue king crab in the North Pacific. The addition of science-based ACLs and accountability measures to the law in 2007¹⁷ strengthens the management framework to achieve not only continued success in rebuilding overfished species but also significant safeguards against future fishing-related depletion.

Avoiding the Perils of Depleted Fish Populations

The MSA rebuilding framework is essential to the health of our ocean and the economic and social well-being of our nation's coastal communities. Aside from the obvious loss of yield and accompanying socio-economic benefits that cannot be realized from a depleted population, maintaining fish populations at low abundance levels poses significant risks, in particular to fishery stability. Fishing generally alters the age and size structure of a population by removing the older, larger individuals from the population.¹⁸ Depleted populations are often made up predominantly of younger fish with population dynamics dominated by recruitment variability that is largely influenced by environmental factors. This leads to greater fluctuations in biomass and fishery yield, instability and unpredictability in the fishery.¹⁹ Increased variability combined with low population size is a factor in increased extinction risk.²⁰

¹⁵ NAS Report at 59.

¹⁶ Natural Resources Defense Council (NRDC), *Bringing Back the Fish: An Evaluation of U.S. Fisheries Rebuilding Under the Magnuson-Stevens Fishery Conservation and Management Act* (2013).

¹⁷ 16 U.S.C. § 1853(a)(15).

¹⁸ Berkeley, S.A., et al. 2004. Fisheries sustainability via protection of age structure and spatial distribution of fish populations. *Fisheries* 29:23–32.

¹⁹ Hsieh, C., et al. 2006. Fishing elevates variability in the abundance of exploited species. *Nature* 443:859-862; Shelton, A.O. and Mangel, M. 2011. Fluctuations of fish populations and the magnifying effects of fishing. *Proceedings of the National Academy of Sciences* 108:7075-7080; and Brunel, T and GerJan, J. 2013. Is age structure a relevant criterion for the health of fish stocks? *ICES Journal of Marine Science* 70:270-283. See also, NAS Report at 133.

²⁰ Johst, K and Wissel, C. 1997. Extinction risk in a temporally correlated fluctuating environment. *Theoretical Population Biology* 52: 91–100. See also, NAS Report at 133.

An additional peril of delayed rebuilding is that the likelihood of fishing-induced regime shifts increases when key populations are highly depleted. A regime shift in marine ecosystems occurs when ecological systems and the services they provide are transformed from one stable state to an alternative state. Examples of this can be found in several North Atlantic large marine ecosystems where trophic cascades due to fishing-induced changes in top predator abundance (most notably cod) have led to an increased abundance of lower trophic species.²¹ The best way to prevent such sudden and catastrophic ecosystem changes is to maintain ecosystem resilience by maintaining large, stable populations and maintaining biodiversity.²²

Ample Flexibility to Incorporate Social and Economic Considerations

A popular criticism of the MSA is that it provides little flexibility to managers for incorporating socio-economic concerns into rebuilding programs. A key part of this criticism is aimed at the selection of a ten year rebuilding limit (with limited exceptions) which is considered by some to be arbitrary. *U.S. Ocean Fish Recovery: Staying the Course* published in *Science* in 2005 found that the ten year limit is reasonable and beneficial. It noted that the drafters of the 1996 SFA amendments to the MSA balanced the advice of population dynamics experts that many depleted marine organisms were capable of rebuilding to target levels within about five years in the absence of fishing, socio-economic concerns and the desire for successful rebuilding and sustainable fisheries in deciding upon a ten year limit.²³ The article notes that “[t]his optimizing balance was deliberate and compassionate, not arbitrary.”²⁴

The other key part of the criticism is that this ten year rebuilding limit does not allow for adequate incorporate of socio-economic concerns. In reviewing rebuilding plans from 1997-2011, the NAS Report found that the ten year limit on rebuilding determined the target year for thirty-one of the seventy stocks for which rebuilding plans with a defined timeframe were implemented. Thus, the MSA and NS1 guidelines provide ample flexibility to incorporate socio-economic concerns.²⁵

In March 2013, Ocean Conservancy analyzed rebuilding timelines of the sixty-five stocks currently subject to rebuilding plans which were included in the *2011 Status of Stocks Report to Congress* “Fish Stocks in Rebuilding Plans” trend analysis in order to determine what level of flexibility is afforded to the regional fishery management councils (RFMCs) and National Marine Fisheries Service (NMFS).²⁶ Overall, our analysis (Attachment 2) shows that the RFMCs

²¹ See, for example, Frank, K.T., et al. 2005. Trophic cascades in a formerly cod-dominated ecosystem. *Science* 308(5728)1621-1623; and Österblom, H., et al. 2007. Human-induced trophic cascades and the ecological regime shifts in the Baltic Sea. *Ecosystems* 10:877-889.

²² Folke, C., et al. 2004. Regime shifts, resilience, and biodiversity in ecosystem management. *Annual Review of Ecology, Evolution, and Systematics* 35:557-581; Scheffer, M., et al. 2001 Catastrophic shifts in ecosystems. *Nature* 413:591-596.

²³ Safina et. al., *Science*, Vol 309, at 707 (July 29, 2005).

²⁴ *Id.*

²⁵ NAS Report at 81.

²⁶ NMFS, *Fish Stocks in Rebuilding Plans: A Trend Analysis* (2011), available at http://www.nmfs.noaa.gov/sfa/statusoffisheries/2011/RTC/2011_RTC_TrendAnalysis.pdf. (We analyzed all stocks reviewed by NMFS in the analysis except those 1) that have been rebuilt, 2) for which a formal rebuilding program had not been submitted under the MSA (Atlantic salmon), 3) for which a rebuilding plan was not required (South

and NMFS have interpreted and applied the MSA’s rebuilding requirements with ample flexibility in establishing target rebuilding dates upon which to base annual catch limits. In only one of the nineteen rebuilding plans in our analysis for which T_{MIN} information was available did the T_{MIN} estimate actually come close to the ten-year rebuilding limit (Pribilof Island blue king crab managed by the North Pacific Fishery Management Council (NPFMC)).²⁷ In five of the nine stocks to which the ten-year rule applied, RFMCs set target rebuilding timelines at the maximum legally permissible limit, even though shorter rebuilding timelines were possible.

In summary, the drafters of the ten year rebuilding requirement of the MSA carefully considered the tradeoffs associated with action forcing provisions to restore the health of U.S. fisheries and the need to consider important socio-economic concerns in rebuilding programs. Our analysis shows that the RFMCs and NMFS have utilized the flexibility of the law and NS1 guidelines in setting recovery dates for overfished species.

Future Considerations and Recommendations

While the overall rebuilding trend is positive, challenges remain. The NAS Report found that poor performance for some stocks could be attributed to the combined effects of delays in implementing rebuilding plans and difficulties implementing reduced target fishing mortalities.²⁸ In other cases, the failure of rebuilding plans to end overfishing has been due to difficulties to reduce overall fishing mortality when a species is caught as bycatch of a different fishery.²⁹ To address these challenges and to deliver on the sustainable fishery goals of the MSA, we recommend that any future changes to the law, national or regional policies either build upon or improve implementation of the current legal framework for successful rebuilding as described below.

The NAS Report makes a strong case that the best option is to avoid depleting populations in the first place and calls for taking corrective action sooner—when stocks are heading in the wrong direction—rather than waiting until they are officially classified as “overfished.” Once fish stocks are depleted there are limited options for minimizing the reductions in fishing necessary to rebuild the population.

The addition of requirements for setting science-based ACLs and accountability measures (AMs)³⁰ in the MSA in 2006 has profoundly impacted rebuilding success and the future need for

Atlantic pink shrimp), 4) that did not have reliable estimates of biomass and/or fishing mortality (all Caribbean and Western Pacific complexes and species identified as overfished), and 5) that are highly migratory species. We also did not include West Coast salmon rebuilding plans. For the remaining thirty-seven plans, we requested T_{MIN} (the rebuilding timeframe in the absence of all fishing), T_{MAX} (the maximum amount of time allowable for rebuilding under the protocol set forth in the national standard guidelines) and T_{TARGET} (the target date chosen for rebuilding) information from NMFS and the RFMCs in order to assess the amount of flexibility used in setting rebuilding targets.)

²⁷ As noted in the NAS Report at pg. 131, it appears that regimes in the Bering Sea and Gulf of Alaska have shifted to a state less conducive for crab productivity. As such, even in the absence of fishing mortality for over a decade, the population has not recovered.

²⁸ NAS Report at 69.

²⁹ *Id.* at 71.

³⁰ 16 U.S.C. § 1853(a)(15).

rebuilding plans in a positive way. With ACLs and AMs now in place for all managed species, NMFS recently declared that the United States has turned the corner on ending overfishing.³¹ A review of the past NOAA *Status of the Stocks* reports shows that indeed RFMCs with a history of science-based catch limits that are monitored closely against actual catch and bycatch have fewer species classified as subject to overfishing. These new management requirements, if implemented properly, should end the serial depletion of fisheries by preventing overfishing and by achieving established management targets, thus negating the need for rebuilding.

Importance of Proper Catch Accounting and Monitoring of Stock Recovery

One important aspect of success is ensuring that catch accounts for all types of mortality—both directed landing and bycatch mortality—given the significant role that bycatch mortality can play in overfishing. As interpreted by the NS1 Guidelines, ACLs and AMs must account for “the total quantity of fish . . . taken in commercial, recreational, subsistence, tribal, and other fisheries . . . as well as mortality of fish that are discarded.”³² The MSA provision requiring a standardized bycatch reporting methodology to assess the amount and type of bycatch occurring in the fishery³³ is also a critical component of long-term success. For those RFMCs lacking an adequate methodology, factoring management uncertainty into the catch-setting process becomes especially important.

Another important aspect of success is carefully tracking progress in preventing overfishing and recovery of overfished species. The review requirements of the law and NS1 Guidelines, which focused on assessing adequate progress and incorporating new information into rebuilding trajectories,³⁴ are important provisions that must be fully embraced in the regions to ensure rebuilding success. As noted by the NAS Report, the MSA requires review of the progress of rebuilding plans every two years but the frequency of updated, qualitative stock assessments varies widely both within and among regions. The report concludes that more frequent assessments might lead to more frequent but less extreme changes in rebuilding plans and closer adherence to fishery management providing greater long term stability for fishing communities.³⁵ Furthermore, more frequent stock assessments can help better refine estimates of long term biomass associated with management benchmarks like maximum sustainable yield to ensure recovery is achieved.

Recommendations: Better implementation of the MSA focused on revising processes for setting annual catch limits and accountability measures consistent with the “one in four rule” contained in the NS1 Guidelines as needed; ensuring that annual catch limits adequately address bycatch; establishing adequate standardized bycatch reporting methodologies; and ensuring that Secretary

³¹ NOAA Press Release, “U.S. ‘Turning a Corner’ in Ending Overfishing (March 8, 2011), available at http://www.noaanews.noaa.gov/stories2011/20110308_endingoverfishing.html.

³² 50 C.F.R. § 600.310(f)(2)(i) (defining “catch”) (emphasis added); *Oceana, Inc. v. Locke*, 831 F. Supp. 2d 95, 115-16 (“Since the ‘catch’ limited by [annual catch limits] includes both fish that are retained (landed) and bycatch that are discarded at sea, see 50 C.F.R. § 600.310(f)(2)(i), the [annual catch limits for the stocks at issue] may be exceeded by accumulation of bycatch alone.”).

³³ 16 U.S.C. § 1853(a)(11).

³⁴ *Id.* at § 1854(e)(7); 50 C.F.R. Part 600.310(j)(3)(ii).

³⁵ NAS Report at 5.

of Commerce review of rebuilding plans is conducted to assess progress, incorporate new information, and guide plan modifications.

Proper Setting of Criteria for When a Population is Overfished

Minimum Stock Size Threshold (MSST) is a key benchmark used by RFMCs to determine when a fish population is overfished and requires a rebuilding plan. The Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (Technical Guidance) offers a number of suggestions for setting MSST correctly. In order to avoid perceived conflicts with the MSA's ten-year rebuilding limit, MSST must be set in a manner that best ensures a short rebuilding timeline. This kind of thinking is already incorporated into the existing Technical Guidance in the recommendation that natural mortality be taken into account when setting MSST.³⁶ Following this recommendation means that species with low natural mortality rates, or that exhibit evidence of compensatory natural mortality (such as cod, haddock and Alaskan walleye Pollock),³⁷ which generally take longer to recover from an overfished status, will have MSSTs set closer to the biomass level at MSY (B_{MSY}) than species with higher resilience.

In cases where the acceptable biological catch (ABC) is set such that fishing mortality declines when biomass falls below B_{MSY} , it is somewhat less critical to properly define MSST, as those management procedures, in theory, are self-correcting. However, not every region employs such a control rule. We therefore support the finding of the NAS Report related to better use of harvest control rules to promptly but gradually reduce fishing mortality rates once a population falls below MSY based thresholds in order to prevent populations from becoming overfished and in need of a rebuilding plan.³⁸

Recommendation: Better implementation of the MSA via use of existing information like life history, catch and bycatch to set MSST at a level that will avoid lengthy rebuilding timelines. For species with low resilience or in cases where information is lacking, set MSST close to MSY to rebuild more quickly and buffer against uncertainty. Furthermore, more widespread use of harvest control rules that require prompt but gradual reductions in fishing mortality rates to avoid fish populations from becoming overfished and in need of rebuilding plans.

Rebuilding Directly to Biomass at Optimum Yield

Optimum yield (OY), as defined by the MSA, is the maximum sustainable yield (MSY) as reduced by economic, social, and ecological factors.³⁹ This means the biomass at optimum yield levels (B_{OY}) is greater than B_{MSY} to incorporate important social, ecological or economic considerations. These considerations include desired management targets (for example, a focus

³⁶ Restrepo, V., et al. 1998. Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Technical Memorandum NMFS-F/SPO-40.

³⁷ Keith, D.M. and Hutchings, J.A., 2012. Population dynamics of marine fishes at low abundance. *Canadian Journal of Fisheries and Aquatic Sciences* 69:1150-1163.

³⁸ NAS Report at 2 and 5.

³⁹ 16 U.S.C. § 1802(33)(B).

on larger fish as opposed to maximizing total pounds landed for recreational fisheries) and ecosystem health and resiliency (managing population levels above those at MSY to best fulfill roles in the ecosystem). There is currently an inconsistency in MSA objectives with regard to fish population levels, depending on whether or not stocks are in an overfished condition. For the management of stocks that are not overfished the goal is OY, which occurs at B_{OY} , and is greater than B_{MSY} .⁴⁰ However, the goal for overfished stocks is to rebuild to B_{MSY} .⁴¹ Thus, MSY is treated as both a limit and a target, depending on whether or not a stock is overfished. Given that the goal of NS1 is to achieve optimum yield on a continuing basis, the goal of a rebuilding plan should also be to rebuild directly to a population level supporting OY, as opposed to rebuilding to B_{MSY} and then having to take subsequent management action to achieve B_{OY} .

Recommendation: Amend the MSA to specify that the rebuilding biomass target is the biomass at optimum yield, where OY occurs at some level below MSY and consequently at a biomass level above B_{MSY} .

Use of Management Strategy Evaluation/Management Procedure Approach

We strongly agree with the recommendation of the NAS Report to advance the use of management strategy evaluation (MSE) to entertain a broader spectrum of ecosystem dynamics and possible outcomes than is typically considered in single-species rebuilding projections⁴². The “traditional” approach to managing fisheries consists of evaluating the status of the resource via the stock assessment process. Scientists’ advice to managers about current stock status and allowable future catches, including rebuilding trajectories, is usually based on a “best” model run, chosen to be the most likely representation of reality from a number of possible configurations of one or more model families. There are a number of problems with this approach that can lead to poor performance of the fishery management system and failed rebuilding plans. First is the variability in catch level advice that can result from one assessment to the next due to the addition of new data, change of modeling environment or change of model configuration. These types of assessment changes can also lead to significant changes in rebuilding targets which can throw off rebuilding progress. Second is an inability to properly evaluate long-term trade-offs among alternative rebuilding strategies, including proper consideration of risk, which directly impacts rebuilding success. Third is the political haggling that arises over setting management benchmarks such as ABC that provide the upper limit for ACLs. In the absence of a proper risk policy that determines acceptable risk of overfishing in light of all the proper trade-offs, RFMCs have the ability to reject their scientific advisers’ ABC recommendations on the basis that they would like a different risk level.⁴³

⁴⁰ National Standard One, 16 U.S.C. § 1851(a)(1) (“Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.”).

⁴¹ 16 U.S.C. § 1802(33)(C).

⁴² NAS Report at 138.

⁴³ An example for this can be found in the current Gulf of Mexico ABC Control Rule which gives the Council the ability to set risk on an *ad hoc* basis: “The indicated default risk of exceeding overfishing limit for Tier 2, or default acceptable biological catch buffer levels for Tier 3a and 3b, are to be used unless specified otherwise by the Council on a stock by stock basis.” GMFMC. 2011. Final Generic Annual Catch Limits/Accountability Measures

Management strategy evaluation (MSE) or the management procedure (MP) approach present alternative ways to manage a fishery.⁴⁴ MSE and MP are able to deal with the above issues inherent in the “traditional” approach and therefore have the potential to result in increased success of rebuilding plans. These methods employ catch control rules that specify how ABC is calculated from available data on an annual basis, but unlike the traditional approach, these catch control rules are thoroughly evaluated against alternative options via simulation testing before they are implemented. The simulations determine which of the alternative catch control rules perform best in terms of achieving management goals (such as rebuilding by T_{TARGET} with a certain probability) while avoiding undesirable outcomes (such as falling below a minimum biomass threshold or exceeding some pre-specified socio-economic limit reference point). Candidate control rules or rebuilding strategies are tested against factors like observation error, model misspecification, management uncertainty, and environmental variability. Where the MSE/MP approach has been applied successfully, there has been a more thorough evaluation of risk, less inter-annual catch variability, and less scientific and management debate about catch limits. MSE and MP also allow evaluation of simpler ABC-setting methods that are not necessarily model-based, which can save time and resources in the long-run. Although these methods may take time to develop initially, the benefits of implementing the resulting more robust management and rebuilding strategy generally outweigh the cost of the initial investment in the long run.

Recommendation: NMFS, RFMCs and Scientific and Statistical Committees (SSCs) should make better use of MSE and MP in making management decisions, including specification of biological reference points and evaluation of alternative rebuilding strategies against management goals in rebuilding plans.

Taking an Ecosystem Approach to Rebuilding

In a world of increasing environmental variability, we face greater uncertainty today about how fish populations and ecosystems respond to human activities, including rebuilding measures. In addition, fishing itself has broad ecosystem impacts that can compromise the health of natural populations, the fishery that depends on them, and the services ecosystems provide. Fishery models that rely on the single-species theory of fishing, and do not take into account ecosystem factors when trying to explain trends in population biomass and dynamics, may predict stock recovery rates that are much higher than subsequently observed in the fishery. The classic example of this phenomenon is Atlantic cod.⁴⁵ Similarly, rebuilding strategies that focus solely on attaining single-species fishing mortality and biomass goals fail to recognize the importance of rebuilding ecosystem structure, diversity, and processes which are crucial to maintaining or

Amendment for the Gulf of Mexico Fishery Management Council’s Red Drum, Reef Fish, Shrimp, Coral and Coral Reefs, Fishery Management Plans.

⁴⁴ Butterworth, D. 2007. Why a management procedure approach? Some positives and negatives. *ICES Journal of Marine Science* 64:613-617.

⁴⁵ Murawski, S.A., et al. 2001. Impacts of demographic variation in spawning characteristics on reference points for fishery management. *ICES Journal of Marine Science* 58:1002-1014 and Murawski, SA. 2010. Rebuilding depleted fish stocks: the good, the bad, and, mostly, the ugly. *ICES Journal of Marine Science* 67:1830-1840.

rebuilding resilience of ecosystems and the coastal communities that rely on revenue from fish stocks and ecosystem services.⁴⁶

An ecosystem based approach that accounts for the uncertainty of changing environmental conditions and the broader impacts of fishing will be critical to rebuilding success for U.S. fisheries. This approach will likely require the development of new rebuilding metrics and management reference points that go beyond the traditional biomass and fishing mortality thresholds and address other factors vital to proper fisheries management such as population demographics, ecosystem characteristics and services, and socio-economics. One reference point that should be further evaluated is fishery selectivity pattern, which determines population age and size structure on the single-stock scale and community properties such as the size-spectrum slope on an ecosystem level.⁴⁷

Recommendation: The MSA should be strengthened in a manner that supports an ecosystem based approach to management, including rebuilding overfished species. This includes improving the law by better incorporating ecosystem considerations into management through the development of fishery ecosystem plans and strengthening current implementation of the rebuilding requirements of the law to include aspects of ecosystem rebuilding and resiliency to changing environmental conditions such as restoring population demography, habitat, ecosystem structure and diversity, and coastal communities.

Establish monitoring, observation and research programs for our nation's large marine ecosystems

Given the significant stressors facing our nation's large marine ecosystems and the longstanding call to transition fisheries to an ecosystem-based management approach, the RFMCs and NMFS can greatly benefit from reliable and timely information on existing and changing environmental conditions in order to manage fisheries sustainably, including recovery under rebuilding plans. Investments in regional monitoring, observation and research programs for each of the nation's large marine ecosystems (LMEs) can help provide fishery managers and the public with information necessary to make better informed decisions. The resulting data can also help ensure that other uses of marine resources are compatible with fishing, fisheries management, and the community benefits that come from resilient ecosystems and robust fish populations.

Recommendation: Establish monitoring, observation and research programs for our nation's large marine ecosystems to provide additional information for management.

Response to the NAS Reports Treatment of the Mixed Stock Exception

⁴⁶ Pitcher, TJ and Pauly, D. 1998. Rebuilding ecosystems, not sustainability, as the proper goal of fisheries management. In: *Reinventing Fisheries Management* (ed T Pitcher, D Pauly, and P Hart). Chapman & Hall Fish and Fisheries Series. p 311-325.

⁴⁷ Brunel, T and GerJan, J. 2013. Is age structure a relevant criterion for the health of fish stocks? *ICES Journal of Marine Science* 70:270-283; and Garcia, SM, et al. 2012. Reconsidering the consequences of selective fisheries. *Science* 335:1045-1047.

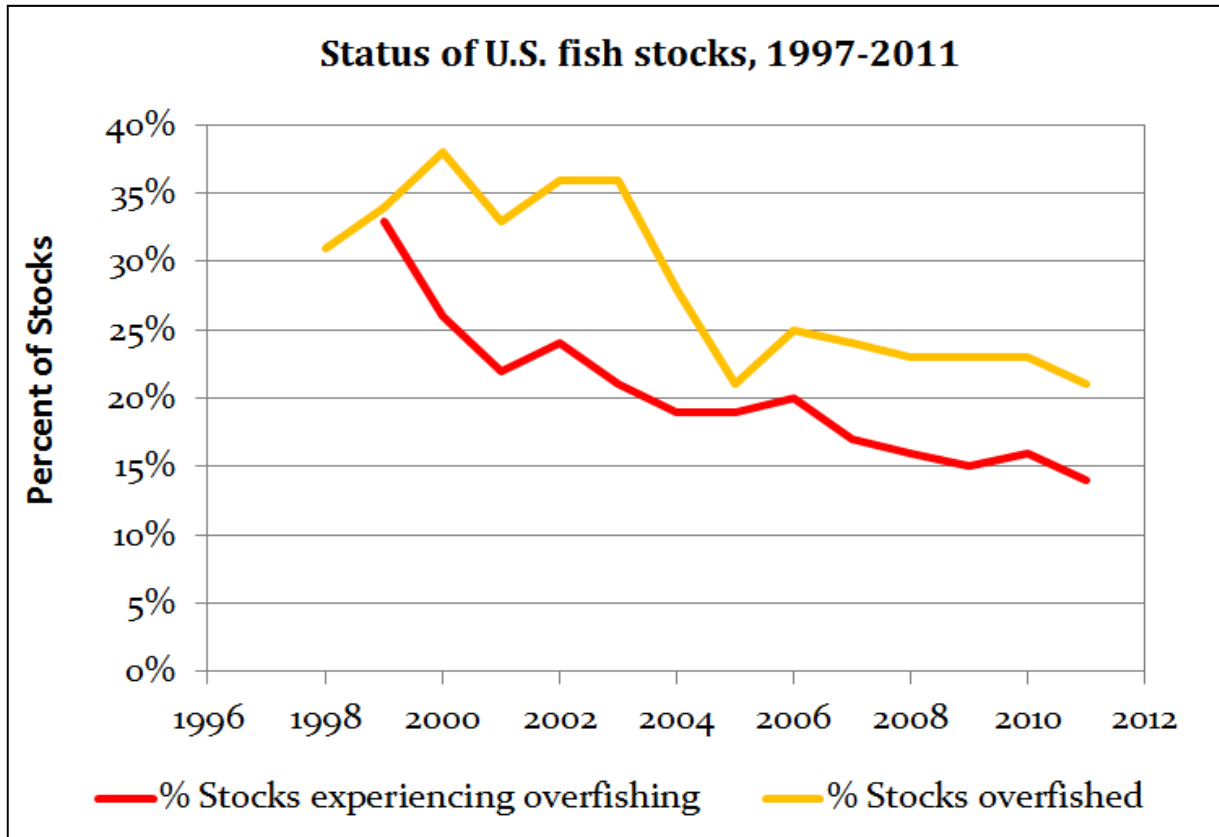
The NAS Report suggests that greater use of the “mixed stock exception” could reduce the impact of rebuilding on the catch of healthy fish stocks. It proposes that the operational feasibility of the mixed stock exception could be modified to expand the range of situations to which it can be applied, subject to assurances that the less productive species are not driven to unacceptably low levels. Unfortunately, while the Report seems to imply that a greater level of risk is appropriate, it provides no additional guidance as to what constitutes adequate “assurances” or “unacceptably low levels” beyond what is currently in the NS1 Guidelines. As the report acknowledges, stocks at depleted levels are at risk for increased variability and are more susceptible to environmental changes, which could negatively impact future rebuilding efforts.⁴⁸ Furthermore, the report fails explain how RMFCs should go about choosing one stock over another when conflicts inevitably arise. In this regard, the NAS Report falls short of addressing the problem with operationalizing the mixed stock exception to date: that it would allow overfishing to continue. Allowing overfishing on any stock violates both the spirit and the letter of the MSA by permitting overfishing on a stock within a stock complex in order to achieve optimum yield for another stock. We have made substantial progress toward ending overfishing and rebuilding U.S. fish stocks. Allowing overfishing on some stocks is shortsighted and could undo the long-term progress we are making. Finally, one species viewed as limiting the catch of healthier populations by one fishery or group of fishermen could be of significant value to another fishery.

Conclusion

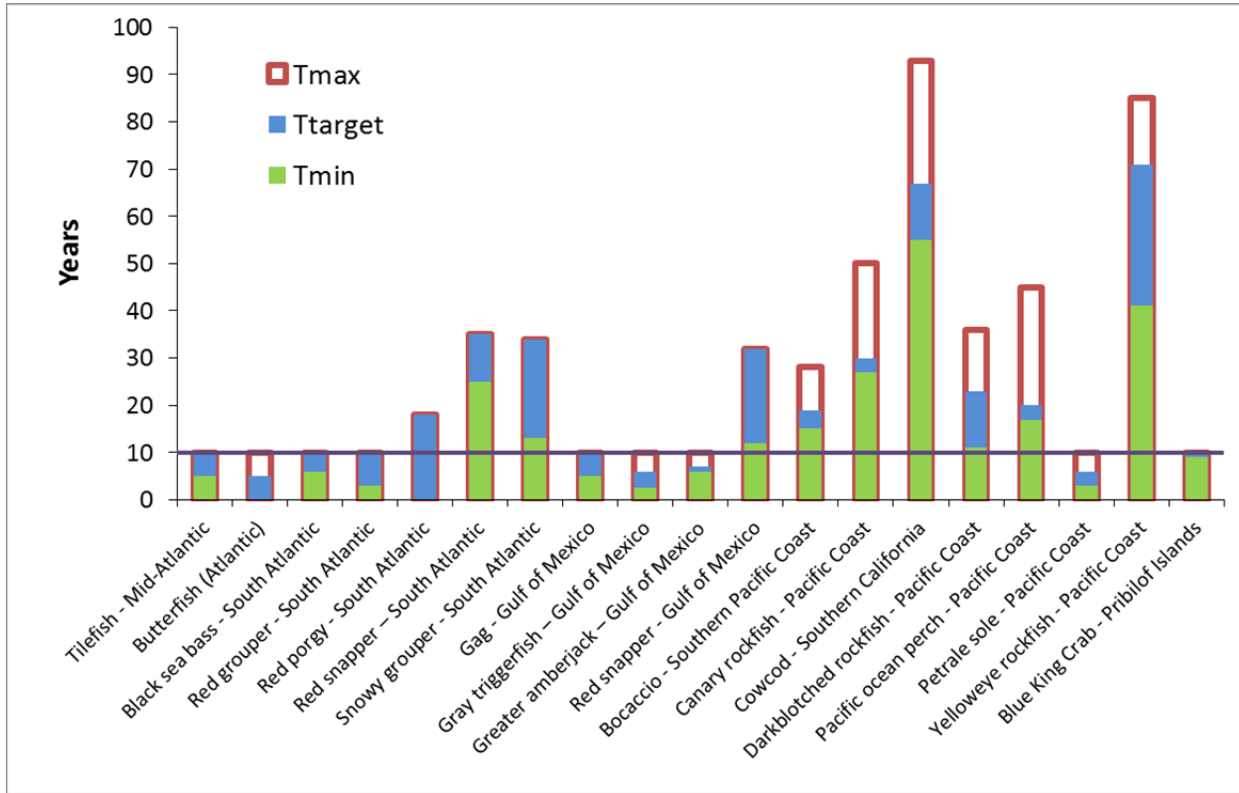
Over the past decade, significant progress has been made in ending overfishing and rebuilding overfished populations in the United States. While the NAS Report highlights the challenges and complexities of trying to evaluate science, and make decisions about catch limits and other management measures, it underscores the historic progress that has been achieved under the current law in ending overfishing and rebuilding fish populations. For stocks that were placed under a rebuilding plan, fishing mortality has generally been reduced, and stock biomass has generally increased. Moving forward, the NAS Report is the latest report to highlight the need to move to a management system that does not look at fish stocks in a vacuum, but takes into account the rest of the ecosystem in which they live and the impacts of changing environmental conditions. Building upon the successful rebuilding approaches of the MSA will ensure healthy oceans and fishing communities for present and future generations.

⁴⁸ NAS Report at 133.

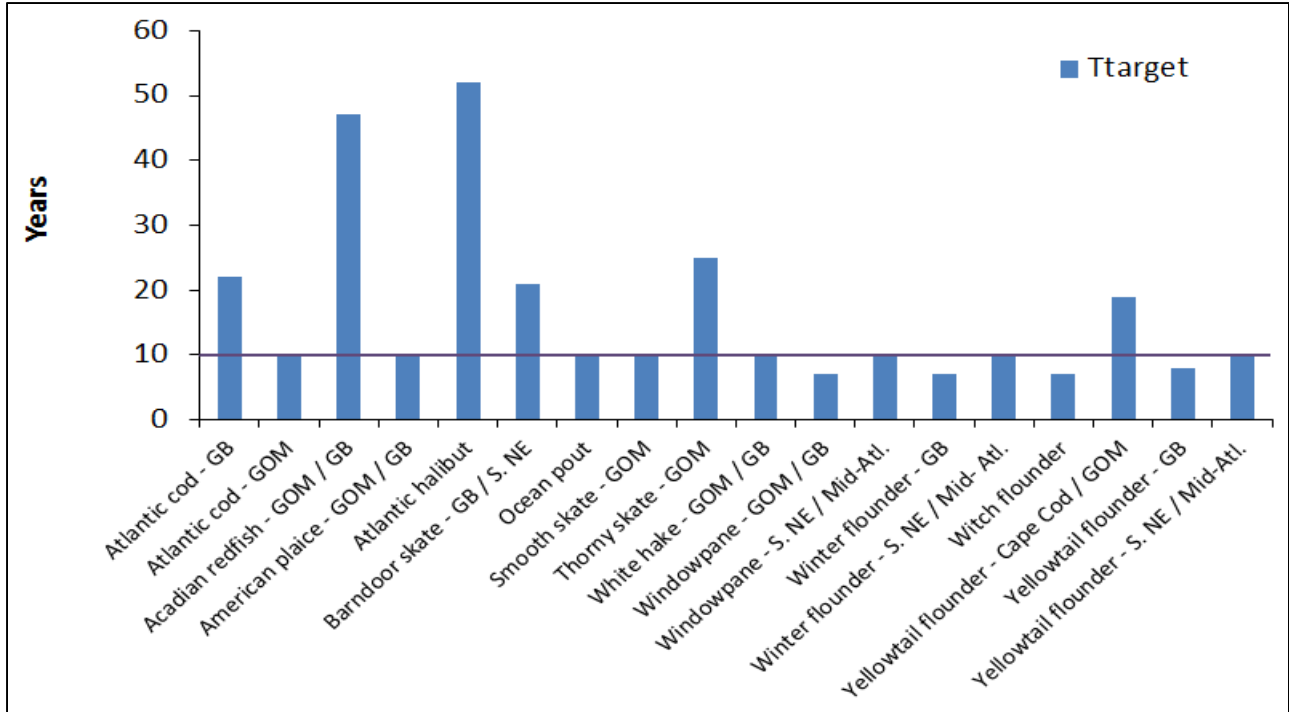
Attachment 1: Status of U.S. fish stocks, 1997-2011. Source: *2011 Report to Congress. Status of U.S. Fisheries. National Marine Fisheries Service. May 2012.*



Attachment 2: Rebuilding Timelines for Stocks Subject to a Rebuilding Plan in the 2012 Status of the Stocks Report



Minimum (Tmin), maximum (Tmax) and target (Ttarget) rebuilding times for stocks currently subject to a rebuilding plan, where values of Tmin and Tmax were available. The horizontal line marks the ten-year rebuilding deadline.



Target (T_{target}) rebuilding times for stocks subject to a rebuilding plan in New England where values of T_{max} (maximum) and T_{min} (minimum) rebuilding times were not available. The horizontal line marks the ten-year rebuilding deadline.