Hilborn presentation on Magnuson-Stevens Reauthorization

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Fisheries Management and Conservation Act

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Introduction

Good morning and I want to thank the members and staff for the opportunity to address this committee. My name is Ray Hilborn, I am a Professor of Fisheries and Aquatic Sciences at the University of Washington. I have been studying fisheries management for over 40 years, both in the U.S. and in a number of other countries and international commissions. This has resulted in 250 peer reviewed journal articles, and several books including most recently "Overfishing: what everyone needs to know" published by Oxford University Press.

I am not representing any group, although I do receive research funding from a wide range of foundations, NGOs, and commercial and recreational interest groups, the National Science Foundation and NOAA.

I am not here to argue for specific changes to the Magnuson-Stevens Act, rather to provide background on our growing knowledge of how fish populations behave, and how U.S. fisheries are performing.

What are our objectives?

The text of the Act begins with "To provide for the conservation and management of the fisheries, and for other purposes", but then becomes more specific by stating that rebuilding fish stocks, ensuring conservation and protecting essential habitat are all intentions of the act. Also, the Act makes it clear that one objective is to provide for "the development of fisheries which are underutilized or not utilized … to assure that our citizens benefit from the employment, food supply and revenue which could be generated thereby."

In short, the objective of the Act appears to be to provide for sustainable employment, food supply, recreational opportunity and revenue, and to achieve that, conservation of fish stocks and habitats is essential. The two specifically targeted actions are to rebuild overexploited stocks and develop fisheries on underutilized species. Yet, as I will show below, while we have reduced overfishing, one consequence has been far more underutilized fish stocks and we seem to have lost sight of the actual goals of employment, food supply, recreational opportunity and revenue.

In its annual report to Congress, NOAA reports on the status of our fisheries regarding the biological status and whether the stocks are assessed. The biological status is reported as both the number of stocks that are overfished (are at low enough abundance to reduce sustainable yield), and the number of stocks that are subject to overfishing (fished at a rate harder than would produce long term maximum sustainable yield). There is no systematic scorecard of the fisheries contribution to employment, food supply, recreational opportunity or revenue with reference to the potential contribution, or is there any evaluation of underutilization. While measuring these no doubt requires specific assumptions, there appears to be a tacit assumption among policy makers that if we prevent overfishing, we will produce something like maximum food production, employment, recreational opportunity and revenue, or at least that the greatest threat to these objectives is overfishing.

The Magnuson-Stevens Act has been quite effective at reducing overfishing so that the proportion of stocks estimated to be overfished, which the Act defines as fish stocks at lower abundance levels due to environmental factors, fishing pressure, or other factors, has declined from 38% in 2000 to 19% in 2012, and the proportion subject to overfishing declined from 33% in 1999 to 10% in 2012. The decline in the number of fish stocks subject to overfishing has largely been accomplished by major reductions in fishing pressure off the west coast, east coast and Gulf of Mexico. Alaskan fisheries were never subject to major overfishing and there has been no need to reduce fishing pressure there. Fishing pressure has declined dramatically from previous peaks; a 40% decline in the East Coast a 48% decline in the Southeast and Gulf of Mexico and a 75% decline on the West Coast. Across all U.S. fisheries where assessments are available, the exploitation rate is about 40% of what would produce maximum sustainable yield. U.S. fisheries management is now extremely conservative and while almost all attention seems to be focused on the few stocks where overfishing is occurring, we seem to be ignoring the fact that exploitation rates are now, on average, so low.

The status of stocks

The status of fish stocks can be summarized by plots that compare the biomass of the stock to the level that would produce maximum sustainable yield (called BMSY) on the X axis, and the fishing pressure compared to the level that would produce maximum sustainable yield (called FMSY) on the Y axis. Figure 1 is such a plot for US west coast stocks status as reported in NMFS stock assessments.

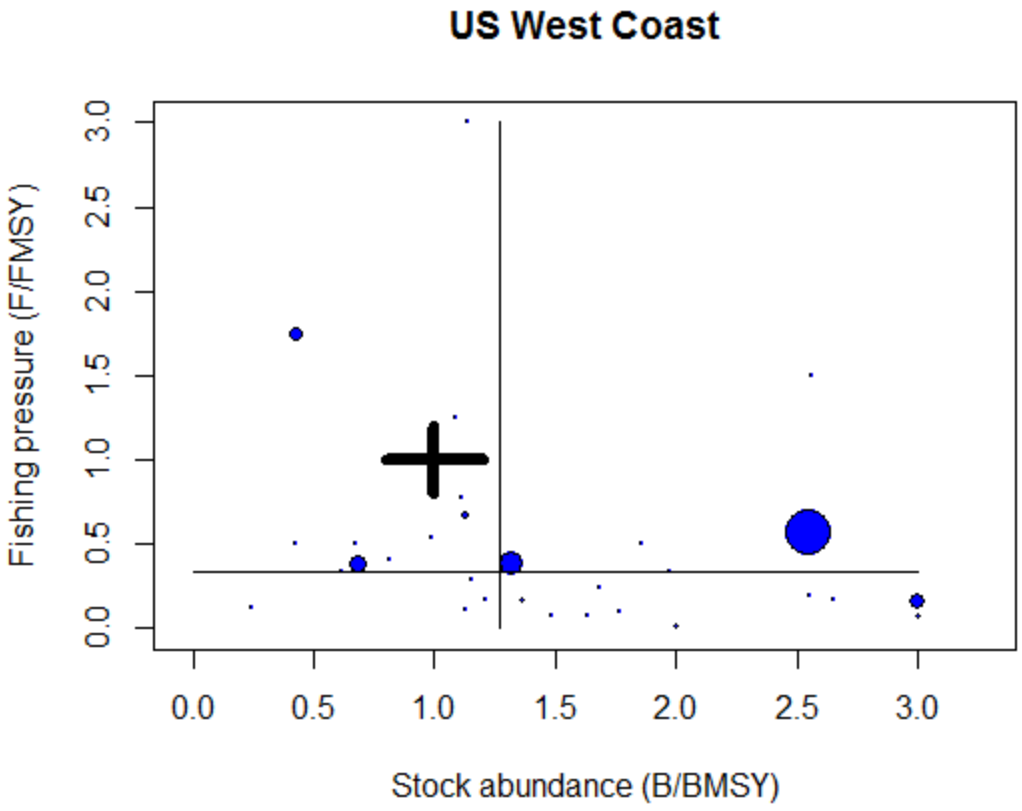

Figure 1. Stock status of US west coast stocks from most recent NOAA assessments.

Each point on the graph represents one fish stock and the size of the point is proportional to the potential maximum sustainable yield for the stock if the stock was fully rebuilt. The thick cross-hairs represent the traditional target of maximum sustainable yield. In the U.S. terminology any F greater than 1.0 on the Y axis would be classified as "overfishing" and any biomass less than 0.5 on the X axis would be classified as "overfished." The thin black lines are the median values of the x and y axes, showing that, on average U.S. west coast stocks are exploited at about 40% of the level that would produce maximum sustainable yield and biomass is, on average, about 130% of the biomass that would produce maximum sustainable yield. If our management objective is to produce maximum sustainable yield we are missing the target by quite a bit, hitting well below and to the right of the target.

If we combine all U.S. fisheries in a single plot we see a generally similar pattern in Figure 2, with blue representing the West Coast, green Alaska, yellow the Gulf of Mexico and S.E. Atlantic, and red the mid-Atlantic and New England. We see the most overfished stocks in the northeast.

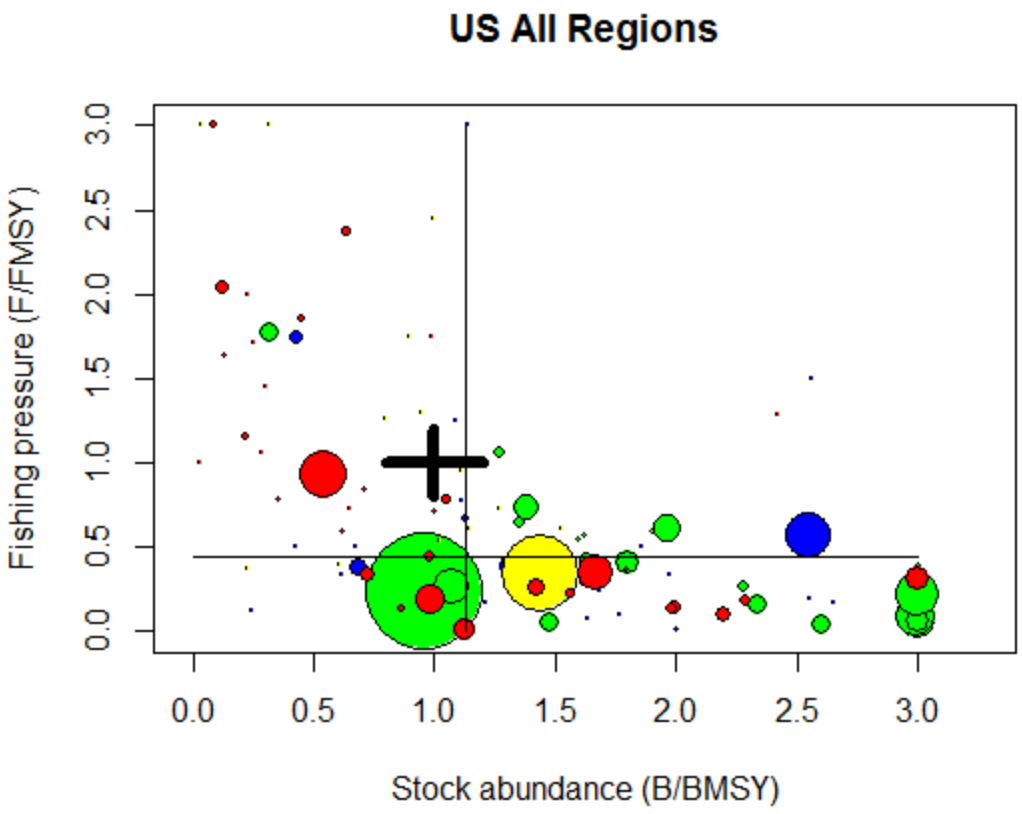

Figure 2. Status of all US stocks.

On average, the biomass of U.S. fish stocks is above the level that would produce maximum sustainable yield and fishing pressure is much lower than would produce maximum sustainable yield. Also, the overfished stocks are generally small stocks, while the large stocks are typically fished very lightly.

Behavior of fish stocks

The modern theory of fisheries management developed in the early 20th century and by the 1950s the basic principles had been well established around the general theory that holding a stock at or near a specific biomass, often called BMSY or the biomass that produces maximum sustainable yield, was optimal. This theory and approach was written into national regulations around the world, including the original Magnuson Act, and international agreements like the Law of the Sea.

In this theory, the average sustainable yield depends upon the biomass of the stock, and sustainable yield is maximized at an intermediate stock level, usually 35-50% of what it would be in the absence of fishing. Environmental variability is acknowledged as a form of year to year noise, good years and bad years come randomly.

This view of the world has dominated our management strategies, including setting target biomass and harvest rates, and in the stock rebuilding requirements. The theory asserts that if stock biomass controls productivity, then reducing fishing pressure on stocks at low abundance allows biomass to rebuild, and stock productivity will increase as the biomass increases.

In the last two decades, the evidence has become strong that this view of the world is incorrect, and most fish stocks experience sustained periods of good times and bad times. This is often called productivity regime shifts. In a paper published in 2013 a group of us showed that for 230 fish stocks where we had long term data, 69% showed such regime shifts, and only 18% of fish stocks appeared to conform to the simple theory that biomass determines productivity. The remaining 13% of stocks showed no relationship between biomass and productivity or temporal regime shifts. We found that increases in productivity were slightly more common than declines.

If regime shifts, which are natural environmental fluctuations, are driving productivity, then reducing fishing pressure will increase the abundance of the stock, but productivity (and subsequent sustainable yield) will not increase until the regime changes. Rebuilding to former biomass may indeed be impossible unless productivity changes, regardless of reductions in fishing.

Figures 3 and 4 illustrate the relationship between fish stock abundance and productivity for cod in Iceland (figure 3), and the temporal pattern in productivity (Figure 4). It appears that there was a major drop in productivity for this cod stock in the mid 1980s (as there was for most cod in the Western Atlantic), and for the present Iceland must simply live with a less productive cod stock.

Accepting that regime shifts are common does not mean we do not need to regulate fisheries. We must always be careful not to harvest more than the production, and when regime shifts move systems from high to low productivity, the yield must decline.

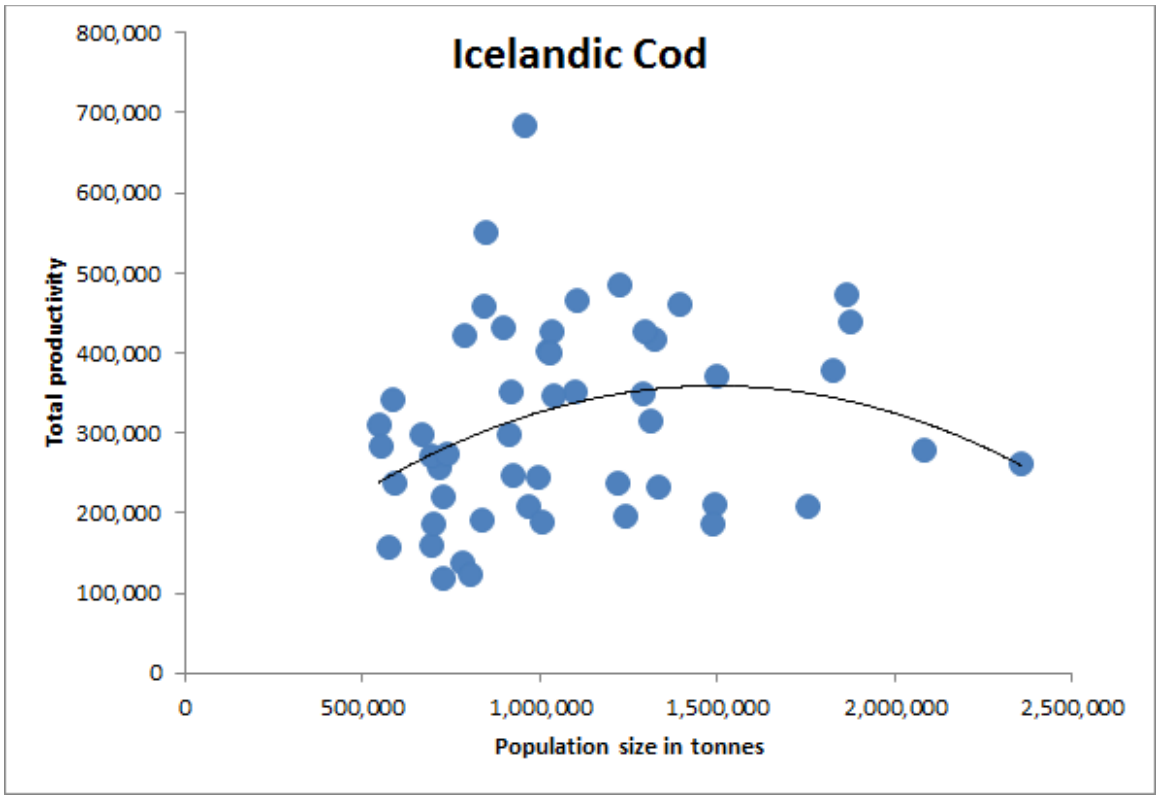

Figure 3. The relationship between stock size and productivity for Atlantic cod in Iceland.

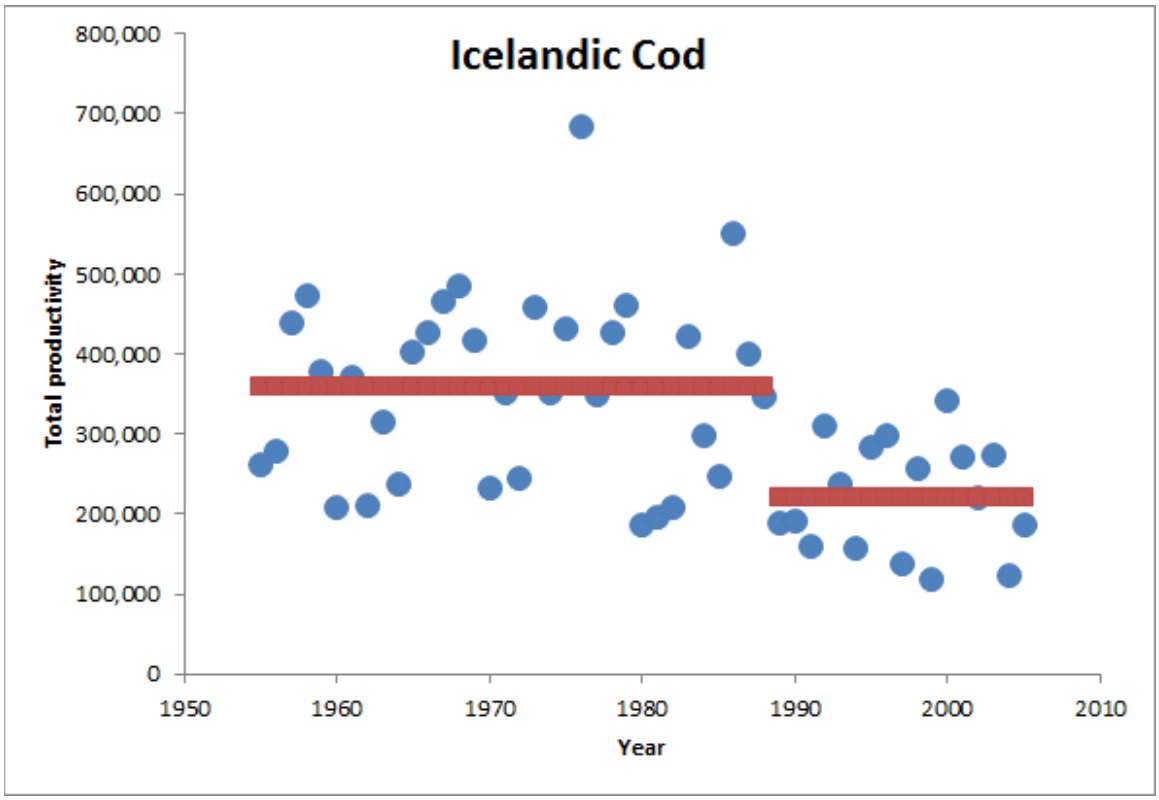

Figure 4. The temporal pattern in productivity of the Icelandic cod stock. There appears to have been a major decrease in productivity in the mid-1980s.

Lost Yield, Jobs, Recreational Opportunity and Revenue

U.S. fisheries management has been successful at largely stopping overfishing and reducing the number of overfished stocks --- but since stopping overfishing is a means to an end, not an end itself, we must ask how is the U.S. doing at producing food, jobs, recreational opportunity and revenue?

We can calculate the lost food production by comparing the long term yield under current fishing pressure with the long term yield under the fishing pressure that would produce maximum sustainable yield. We lose food production (and potential jobs, recreational opportunity and revenue) in two ways, by fishing too hard or fishing too little, and the Magnuson-Stevens Act makes specific reference to both of these in its objectives. U.S. stocks for which we have assessments have a potential sustainable yield of a little over 7 million tons per year. Under current fishing pressure the stocks that are subject to overfishing (22% of stocks) would lose, on average, 44% of their potential yield, but because these are generally small stocks it only constitutes 1-3% of the potential yield of U.S. fisheries combined. Thus overfishing has almost no impact on the long term yield of U.S. fish stocks. In contrast, 77% of stocks are "underfished," that is, fished at rates less than would produce maximum sustainable yield. These stocks on average lose 55% of their potential yield, and because these are the larger fish stocks in

the U.S. we are losing 30-48% of U.S. potential yield by underfishing. Further, 95% of this lost yield comes from stocks that are at or above the level that produces maximum sustainable yield. So we are losing almost all of our yield from underfishing abundant productive stocks.

We lose 1-3% of US potential yield by fishing too hard, 30-48% of potential yield by fishing too little

The major threat to sustainable jobs, food, recreational opportunity and revenue from U.S. marine fisheries is no longer overfishing, but underfishing. However, many groups, particularly some e-NGOs, are still actively pushing for less fishing pressure by giving a high priority to maintaining fish stocks at high abundance. Perhaps it is time for Congress to explicitly state the extent to which we wish to forego food, jobs, recreational opportunity and revenue in order to have more fish in the ocean either because of their intrinsic value, or as food for marine birds and mammals.

Why is fishing pressure so low? This is a question we are actively investigating but there are a number of explanations. In some cases this is due to lack of markets, but increasingly the low fishing pressure results from the layers of precautionary regulation that have been imposed to prevent overfishing.

We do know that if our national objective were to maximize the profitability of fisheries, our management targets would be less fishing pressure than that which produces maximum sustainable yield, and if we could calculate lost profit under current US fishing pressure, the loss from economic overfishing would likely be higher, and the loss from economic underfishing would be lower.

So perhaps Regional Fisheries Management Councils have explicitly reduced fishing pressure to increase profitability. Some stocks are underexploited because of lack of markets. Others are underexploited because they are subject to rebuilding plans. Many stocks are caught up in mixed stock fisheries, where healthy stocks (Georges Bank haddock) cannot be fully exploited because they are caught in conjunction with rebuilding stocks (Georges Bank cod). Finally, much of the under-exploitation comes from the layers of precaution built into the system. The fact that any stock which is fished at rates above FMSY is called "subject to overfishing" means that we are intrinsically aiming to fall below FMSY. The consequence of that is we are losing a significant fraction of our potential yield, jobs, recreational opportunity and revenue.

Some would argue that the current low fishing pressure is necessary to rebuild overfished stocks and once all stocks are rebuilt fishing pressure can rise again. Under the current management system this will never happen because some stocks are always going to be depleted due to natural fluctuations and climate change, and, as we add annual catch limits for more minor species in a mixed stock fishery, the problem will only get worse.

In summary, U.S. fisheries policy is currently very conservative, and if our objectives are jobs, food, recreational opportunity and revenue then we should focus national legislation and management guidelines on fully exploiting the underutilized species and place less emphasis on assuring that nothing is overfished.

Layers of independent legislation

Federal fisheries are subject to a wide range of legislation including the Magnuson-Stevens Act, the Marine Mammal Protection Act, the Endangered Species Act and the National Environmental Policy Act. Each of these imposes independent requirements that result in a set of uncoordinated regulations whose net outcome may result in a combination of lower economic benefits to the nation, and poorer conservation benefits than a coordinated management system. There is no doubt that there are trade-offs between utilization and preservation, but the current set of regulatory mandates is putting us in a position that is far from the best set of trade-offs. I address some specific recommendations in the section below on ecosystem based management.

The 10 year rebuilding requirement

One of the most influential layers of regulation is the 10-year rebuilding requirement. This has the result of often ratcheting catches down as the 10 year time comes closer even though the stock size may be increasing. So long as it is not rebuilding on a timetable that will hit the 10-year mark, catches must be further reduced to try to make the timeline. Thus we can find decreasing allowable catches even though fish stock abundance is increasing.

The 10-year timeline was largely predicated on two assumptions, (1) that the greatest threat to benefits from the nation's fisheries is overfishing, and (2) that there are tipping points and stocks that are overfished are in danger of not being able to recover if pushed too low. Our research has shown both of these assumptions to be false. As I showed earlier there is little loss of benefits to U.S. from overfishing, and our research also shows no evidence for tipping points. If fishing pressure is reduced stocks will recover, and the 10-year timeline will definitely speed the recovery, but it is not necessary for recovery to occur.

Annual catch limits for all species

A looming crisis is coming with requirements to set annual catch limits on all stocks. At present the management system does assessments and provides management plans for the great majority of stocks that contribute to the benefits to U.S. society, but there are many stocks that are caught in U.S. fisheries to some degree that are not a significant contribution to these benefits. We simply do not have the money and resources to collect scientific data, perform stock assessments, and manage all of these stocks. Current requirements to greatly expand the number of stocks that are assessed is resulting in highly conservative "low information" approaches that will combine with other measures such as the 10-year rebuilding requirement to make the management

system even more precautionary than it is now and further reduce benefits to the nation from fisheries. I suggest that we focus federal management on the fish stocks that are important to the nation's food, jobs and income and not subject the hundreds of small stocks to the same process, relying on other legislation such as the Endangered Species Act to protect them.

Integrating with ecosystem based management

In my view, ecosystem based management has two major categories of actions. First is rather straightforward elimination or major reduction of by-catch, reducing fishing pressure to sustainable levels, and protection of sensitive habitats. The councils have done a good job of solving these problems. The second element is the underlying trade-off between utilization and preservation. This trade-off exists and different groups within society have different preferences on where along the range of possible trade-offs we should be. A current topic for such debate is in reduction of fisheries for forage fish. Preservation oriented NGO's would like to see fishing for forage fish significantly reduced or eliminated in order to provide more food for other species.

Science can provide estimates of the trade-offs between utilization and conservation, but it cannot provide policy guidance on what level of trade-off we should accept. Policy makers such as Congress or the Fishery Management Councils need to provide this guidance, and at present Congress has provided it only with respect to some species through the ESA and MMPA.

The importance of predictability for recreational and commercial fisheries

Recreational and commercial fishing are both economic activities that provide jobs, income and profit to the nation, but also satisfaction and enjoyment to individuals engaged in these activities. As in most economic activities stability is desirable, sudden changes in regulations disrupts commercial supply and demand, and is highly disruptive for recreational fishing when seasons are abruptly closed and fishing opportunities are highly variable from year to year. Given natural variability and uncertainty in our management system, constancy of commercial and recreational opportunity is not possible.

Any harvest strategy effectively assigns some of the intrinsic variability to the harvest, and some of it to the stock abundance. As it happens the typical harvest strategy used to achieve biomass based reference points effectively assigns most of the variability to harvest, and attempts to reduce variability in biomass. Other policies, specifically using exploitation rate reference points, would shift more of the variability from harvest to stock biomass. Such policies typically provide for more social and economic benefit while not threatening conservation and sustainability goals.

Conclusions

U.S. citizens should be proud of our record of fisheries management, it is unrivaled for rebuilding of fish stocks, transparency of management, and quality of the science that goes into it. NOAA should be congratulated on the job it has done. However, there has been a loss of focus on what we are trying to achieve, and sustainable jobs, recreational opportunity, and income seem to have been lost in the focus on overfishing as the threat to fisheries benefits. The reauthorization of the Magnuson-Stevens act is a time where the management system can be fine-tuned to maintain our current healthy fish stocks, but dramatically increase the benefits the citizens of the U.S. receive from those stocks.