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"***Re-authorization of the Magnuson-Stevens Fishery Conservation and Management Act: Fisheries Science"***

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Chairman Sullivan, Ranking Member Peters, and distinguished members of the Committee, thank you for inviting me to appear before you to discuss fisheries science and its potential to inform better fishery management practices.

My name is Michael Jones. I am a professor in the Department of Fisheries and Wildlife at Michigan State University. I received my B.Sc. and Ph.D. degrees from the University of British Columbia in Canada. I have worked in the private sector as an environmental consultant, in the public sector as a government scientist, and since 1997 as an academic. I come to fisheries "honestly" – my father worked in the fisheries industry in British Columbia, admittedly as an accountant, but my exposure through him to this world set the course of my academic career. My research focuses on fish population dynamics and ecology, resource management and simulation modeling.

Over the years, I have become more and more interested in how uncertainty and risk affect resource management decision-making. I have also seen how Structured Decision Making methods can lead to better management outcomes, especially when they involve stakeholder engagement. I have worked closely with fishery management agencies, particularly in the Great Lakes region and in Alaska, to apply my research findings and scientific expertise to current and emerging management issues.

I am a founding director of the Quantitative Fisheries Center (QFC) at MSU. Our Center works with agency partners and stakeholders to foster better management of fisheries, primarily in the Great Lakes Region. The QFC marries analytics with management and decision-making. We use our expertise to put statistical methods and models to work with stakeholders, to achieve real fishery benefits in real time.

We work to ensure that wise, fair decisions are made, based on the best science, and in partnership with many, sometimes disparate, stakeholder groups.

Although our work has focused on the Great Lakes, we tackle scientific issues that are just as important for other regions of the United States, where the Magnuson-Stevens Act applies, including:

- determination of sustainable and equitable harvest policies for exploited species;
- mitigation of the negative effects of invasive species;
- accommodation of the influence of ecosystem change on food webs that include economically valuable fish stocks.

The Magnuson-Stevens Fishery Management and Conservation Act has made vital contributions to substantially improve the state of our country's federally-managed fisheries. While I hardly need to remind this committee of this fact, we have seen since the early 2000s:

- 39 overfished stocks rebuilt.
- A 98 percent increase in fish stock sustainability.
- A Fish Stock Sustainability Index (FSSI), which gauges key stocks according to their overfishing status and biomass levels, has increased every year since the index was implemented.[1]

This is in stark contrast to reports of fishery performance in many other — although not all other — regions of the world.

The Marine Fish Conservation Network reports that as of 2013, two-thirds of overfished stocks placed in rebuilding plans due to the Magnuson-Stevens Act have been rebuilt or have made significant progress since 1996. They estimate that rebuilding **all** U.S. fish populations would lead to a $31 billion increase in annual sales and support for half a million new U.S. jobs.[2]

Via the Magnuson-Stevens Act, our country oversees 4.4 million square miles of ocean – an area larger than that of our entire country. These oceans and seas range from the Caribbean to the Bering Sea, and no two are the same. They include a huge variety of species that are the objects of exploitation: ranging from small, pelagic, short-lived fish like menhaden to large, extremely long-lived benthic fish like Pacific coast rockfishes, not to mention numerous important shellfish species.

Ecological science tells us that these species should not all be managed in the same way. There is merit – and evidence to support this – considering scientifically defensible flexibility in things like rebuilding plan expectations, for example related to species life histories. A 'one-size fits all' approach to fisheries management does not work well, and risks managing some fisheries overly conservatively while others suffer from regulations that are too liberal. Determing how to adapt management strategies to match the characteristics of diverse fisheries has been a focus of my work for the past 30 years.

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[1] NOAA Fisheries Magnuson-Stevens Fishery and Conservation Act http://www.nmfs.noaa.gov/sfa/laws_policies/msa/

[2] Marine Fish Conservation Network http://conservefish.org/healthy-oceans/magnuson-stevens-act-upholding-a-legacy-of-success/

All fisheries are managed in the face of great uncertainty, both about current status and about future conditions; good policy and decision-making frameworks should explicitly recognize this uncertainty and frame action in the context of risks.

One implication of this is that there is not a “bright line” between stocks that are assessed as overfished versus those that are not. Better decisions would result from some Accommodation for the uncertainty about status, taking account of a range of possible assessments from, for example, slightly/possibly overfished to certainly/greatly overfished, would go a long ways toward informing better decisions.

Around the world, fishery management is increasingly being informed by approaches widely referred to as Management Strategy Evaluations (MSEs), which use computer simulation methods to evaluate how alternative fishery management strategies are likely to perform relative to pre-defined sets of management goals, and that explicitly recognize the uncertainty I just mentioned. While sometimes technically challenging, particularly for data-poor fisheries, there is no excuse for failing to use this type of approach, especially for economically important fisheries. Increasingly, the National Marine Fisheries Service has begun to adopt this approach.

We have had positive experiences with the application of MSE methods to two key fishery management issues in the Great Lakes.

The first MSE application is sea lamprey control. Sea lamprey were one of the first aquatic invaders that entered the Great Lakes as a consequence of increased shipping and other commerce in the region in the early 20th century. When the sea lamprey entered into the upper Great Lakes, they decimated native fish populations.

Sea lampreys have a very unique life cycle. Lampreys cause their damage to Great Lake fisheries during the adult parasitic phase of life, which lasts 12-18 months. During the spring, lamprey die, but not before they spawn in Michigan rivers to continue their destructive legacy. After the eggs hatch, they go through a non-parasitic larval stage that lasts for three to six years. When the larval stage is complete, they begin the adult parasitic phase where they enter the Great Lakes and feed on the fish population. However, during the larval stage sea lampreys are vulnerable to chemical control, and this has been the primary means by which this destructive invader has been controlled.[3]

Over the last decade we have used MSE methods to guide “million dollar” critical decisions about allocation of resources between assessment (that is, determining where we should apply control) and control (that is, how much habitat should we chemically treat) of this pest, and to evaluate trade-offs among competing management options. This science has been vital to the considerable success of the control program run by the bi-national Great Lakes Fishery Commission.

[3] Jones, M.L., B. Irwin, G.J.A. Hansen, H.A. Dawson, A.J. Treble, W. Liu, W. Dai, and J.R. Bence. 2009. An operating model for Great Lakes sea lamprey integrated pest management. Open Fish Science Journal 2: 59-73.

While sea lamprey control is a success story in the Great Lakes, the lessons learned from this program can reach far beyond the Great Lakes. Learning how to better manage invasive species ranks among the most important ecosystem-level issues we face today, and this is equally true for our marine ecosystems.

The second MSE application involves the most valuable freshwater commercial fishery in the world – the Lake Erie walleye and yellow perch fisheries. Not unlike red snapper in the Gulf of Mexico, and any number of other US coastal marine fish stocks, Lake Erie walleye and perch are highly valued by recreational and commercial fishers alike.[4]

Since the late 1970s walleye and perch fishers, and the managers that determine who gets to catch what, have repeatedly fought over allocation of these prized fish stocks. By 2009 trust among stakeholders, and between many stakeholders and decision makers, was at an all-time low. In Ontario especially, managers and commercial fishery stakeholders were spending a lot of unproductive time in court.

In the summer of 2010, the Lake Erie fishery managers decided to change course. They invited the Quantitative Fisheries Center to lead a Structured Decision Making effort to help create a more transparent, science-based process – a process that would help define harvest policies that were scientifically sound and balanced the competing objectives of different stakeholders.

At the core of our effort was the development of an MSE model, using a process that involved active engagement of fishery stakeholders and managers, to both improve stock assessment methods and examine harvest policy options. Largely as a result of the transparency and openness of our process, this work has led to adoption of harvest policies that are viewed by all stakeholders as suitable for these fisheries.

My experience with using a stakeholder-engaged MSE process, both in Lake Erie and more recently in western Alaska for subsistence salmon fisheries, has convinced me that progress towards better management of fisheries, where a diversity of stakeholders have potentially conflicting objectives, depends on an open, transparent process where stakeholders feel empowered to influence management decisions, and are able to gain insight into the objectives of other stakeholders.

Experience with the management of fisheries in the Great Lakes over the past few decades also has taught me the importance of careful consideration of how ecosystem change can affect the future of fisheries in ways that are not always evident from looking at the past.

As I mentioned earlier, invasive species, including the sea lamprey but also zebra and quagga mussels, and possibly Asian carp in the future, can profoundly alter the dynamics of our native species that are economically and culturally important.

[4] Jones, M.L., M.J. Catalano, L.K. Peterson, and A.M. Berger. 2016. Stakeholder-centered development of a harvest control rule for Lake Erie walleye *Sander vitreus.* pp. 163-183 in “Management Science in Fisheries”, C.T.T. Edwards and D.J. Dankel, editors. Routledge, Oxford and New York.

In addition, land-based activities such as agricultural practices and stormwater management can have large impacts on nutrient dynamics that drive so-called bottom up effects on the food web.

More than 50 years of experience with human-driven ecosystem change in the Great Lakes offers examples that can be applied to fishery management in marine coastal regions of the U.S. These can also help us to develop robust management strategies that are resilient to the uncertainties created by unanticipated changes to the ecosystem.

One of the great benefits to U.S. fisheries science and management that has come from the Magnuson-Stevens Act has been its impact on the development and deployment of cutting edge scientific technologies to inform us about fish stocks and their ecosystems. I would be remiss if I were not to mention at this hearing that this is a benefit that we who carry out science in the Great Lakes truly envy. Senator Peters and others recently introduced a bill known as the Great Lakes Fishery Research Authorization Act that seeks to provide comparable support for science for Great Lakes fisheries as we presently enjoy for marine systems thanks to the MSA. I urge you to consider the merits of this bill for the betterment of fishery management in the United States' "north coast."

The Magnuson-Stevens Act undoubtedly allows us to claim our country has the world's best managed fisheries, but our work cannot stop. I am honored to have the opportunity to speak to you about the role of science in our investment in the future of America's fisheries, and I look forward to addressing your questions.