Statement to the
US Commission on Ocean Policy

Developing Scientific Information for Fishery Management

William W. Fox, Jr., Ph.D.
Director, Office of Science & Technology
National Marine Fisheries Service
National Oceanic & Atmospheric Administration
US Department of Commerce

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Introduction

Information on the ocean, its resources and human endeavors that use them, derived by the scientific method provides the foundation for successful fisheries management. While accurate, precise and complete scientific information will not of itself guarantee successful fishery management, it is an essential ingredient and is recognized as such in our national fisheries law, the Magnuson-Stevens Fishery Conservation and Management Act of 1976 as amended (MSA).

Ideally, scientific information provides transparency to the fishery management process. It potentially lays out the current state of affairs relative to some reference points, provides the directions that may be taken and means to get there, predicts the impacts of all the alternatives and gives comfort to those affected that the chosen measures will have a beneficial outcome. In practice, however, scientific information has often fallen short of its potential.

A senior colleague of mine detested the term “good science” because it implied that there is something such as “bad science”. Science is the application of a specific method that produces knowledge, he maintained, and the alternative is simply bad procedure employed out of ignorance, mistake or misconduct, hence not science. There is also the misstatement of scientific conclusions and that is not science either. Traditionally, the scientific method concludes with the publication of the hypothesis, investigative methods, observations and conclusions in a refereed journal. That is science in the purest sense and scientists are those individuals who were trained in and practice science. But the MSA is driven by scientific information not science. There is a distinction.

While produced by scientists, scientific information can be derived from a work in progress of many sorts, i.e. not yet formally published, or even conjecture, i.e. an educated guess. The MSA requires that fishery management measures be based on the best scientific information available. Therefore, Congress understood that there are grades of scientific information and not just science or non-science in the traditional sense.

By specifying that fishery management measures must be based on the best scientific information available, Congress did the critical good deed of removing the greatest impediment to fishery management, procrastination (i.e. “let’s do a study”), and substituted in its place the use of imperfect information albeit scientific. Just to put this into context, it is important to realize that Congress further charged the Secretary of Commerce with the duty to prevent overfishing in the face of this imperfect information in the first national standard of the MSA. And finally, through a 1996 amendment Congress prohibited the use of some management tools that would address the rationalization of capital investments in fishing. Add in the effects of fishing on endangered species and essential fish habitat and the net result can become a well-fueled turmoil-making machine. Scientific information and how it is developed can contribute to starving it.

Science Quality

How is the best scientific information available determined? In part, it has been strictly a judgment call by the scientists who advise the eight fishery management councils whether individually or collectively as the statutory Scientific and Statistical Committee or some other established body such as the West Coast STock Assessment Review (STAR) Panel or East Coast Stock Assessment Review Committee (SARC). Also in part it has been the result of a formal determination by the Secretary of Commerce during the approval process for fishery management plans, amendments, and regulations.

While rarely has this determination been a significant issue in legal proceedings against the Secretary, concern among some members of Congress resulted in a workshop conducted by the Consortium for Oceanographic Research and Education (CORE) to address the means for more objectively making a determination. The suggested criteria from the workshop are:

1. Relevant
2. Passed Independent Scientific Review
3. Provided in a Timely Manner
4. Periodically Re-evaluated
5. Delivery Process Open and Broad-Based

In addition, the Secretary of Commerce published similar criteria in the Federal Register for weighing the scientific information made available on the effects of tuna purse seining on depleted Eastern Tropical Pacific Ocean dolphin populations. They are:

1. Relevant
2. Timely
3. Independently Peer-Reviewed
4. Independently Verifiable

They key feature is that the criteria serve to weigh or rank the scientific information rather than to include or exclude it. The development and publishing of such criteria as

guidelines would assist in the transparency of the fishery management process. As a regulation or law, however, they may serve no additional purpose other than simply to expand the available points of attack for litigation.

The National Marine Fisheries Service (NOAA Fisheries) is developing a Science Quality Assurance Program as its resources permit. The program consists of 1) independent reviews of critical scientific information, 2) a certified set of analytical tools, 3) independent reviews of potentially controversial scientific issues, and 4) an accreditation process for its science enterprise and scientific training.

Center for Independent Experts--NOAA Fisheries has fully tested a pilot Center for Independent Experts (CIE) and currently is considering offers to a request for proposals to establish it permanently. The CIE, while funded through public funds, blindly assigns experts selected by the CIE to tasks established by NOAA Fisheries. The experts must meet stringent conflict of interest standards, work for the CIE and file their report to the CIE. The kinds of tasks accomplished by the CIE experts include conducting independent reviews and participating as independents in group scientific endeavors. The pilot study was conducted in conjunction with the University of Miami's Rosenstiel School of Marine and Atmospheric Science.

Stock Assessment Toolbox--NOAA Fisheries has partially developed a system of certified analytical tools with a common graphical user interface to assist in stock assessments, our so-called stock assessment "toolbox". The reasons for its development include having certified code for use in litigation, improving the efficiency of standard analyses and providing a standard means for training and certifying scientists in the field of stock assessment. Our toolbox was begun in partnership with the International Council for the Exploration of the Seas (ICES), the principal European body for providing scientific advice for fishery management and other ocean matters. As such it incorporates most of the standard analyses used by our scientists on our east Coast and by European scientists. We are currently incorporating analytical procedures that are used by our scientists primarily on the West Coast.

National Research Council Reviews--The most useful scientific information is that which is complete and broadly viewed as unbiased. To this end NOAA Fisheries established a formal program of reviews of the scientific bases behind controversial issues with the boards of the National Research Council (NRC). Most notable is the Ocean Studies Board, which has a subcommittee on fisheries whose logistics NOAA Fisheries financially supports but NOAA Fisheries also has supported studies by the Board of Environmental Science and Toxicology and the Polar Board. Two recent examples of issue studies are: "Marine Protected Areas" and the "Effects of Trawling on Benthic Habitat." Both are publicly available. Such studies provide complete and unbiased benchmarks for scientific advice offered by NOAA Fisheries as well as sound recommendations for research needed to improve it.

In addition, the Ocean Studies Board has been asked to review NOAA Fisheries' stock assessment capabilities and our program for attracting scientists into this field as well as

social science. These studies provide sound advice for developing our critical infrastructure and research directions as well as supporting the requirements to undertake them. As a result, NOAA Fisheries has a formal Stock Assessment Improvement Plan, Data Acquisition Plan, Fishery Information System plan and Social Science plan.

Accreditation of NOAA Fisheries Science Centers—NOAA Fisheries is developing an accreditation program for its five fishery science centers and the collection of laboratories of which they are comprised. NOAA Fisheries recently adopted draft standards for the accreditation program and the fishery science centers are drafting implementation plans for approval later this year. The standards were developed by the NOAA Fisheries Science Board with the aid of a poll of the entire scientific, technical and administrative complements of the five NOAA Fisheries fishery science centers. The draft accreditation plan contemplates a five-year implementation period followed by external visiting committee assessments similar to that which is done in most academic scientific institutions.

The Necessary Tools

Understanding the dynamics of large-scale ocean ecosystems sufficiently to offer effective scientific advice on how the manage the human activities that affect them is necessarily a large, complex and expensive undertaking. However, such an undertaking can have great rewards in pointing to necessary modifications to human activities with billions of dollars of returns per annum on a long-term basis. For example, our latest report to the Nation on the status of Our Living Oceans points out that the long-term potential yield is over 8 million metric tons while the recent average yield is less than 5 million metric tons. Since we have overcapacity in many of our fisheries, the potential economic benefits from our fisheries are greater than the difference between potential and recent yields, not to mention the social and political benefits of starving fishery management's turmoil-making machine. We can manage better. A good research and broad, long-term monitoring program on ocean ecology and social science are essential to achieving it.

So what can science do to help? Reduce risk. I believe there are at least three principal areas that can help.

Increase our Investment in Social Science--First, a larger investment in social science can provide a better understanding of the economic and social effects of fishery management and of the dynamics behind overcapacity, laying out potential mechanisms for resolving it along with the fiscal and social costs and benefits in doing so. We frequently get caught up in litigation because of alleged failures to prepare adequate impact analyses. At present, NOAA Fisheries has a very small social science research program. It also lacks the kind of data collection program needed to support social science research and technical analyses. But NOAA Fisheries has a requirements plan and Congress has begun to fund it.

Improve Stock Assessments--We have the technical capability today to determine the current status of almost any important fish stock, not all simultaneously of course, but the number and frequency of current stock assessments is largely a financial issue. We can certainly gain some significant precision and accuracy through research on improved methodology and the full introduction of acoustical technology but additional major gains will come from long-term, at least interdecadal, forecasting. In some cases where we can measure incoming year classes we can do a fairly good job of forecasting ahead for several years but in most cases our forecasts are simple projections based on the current stock age structure and a wide variety of assumptions, presenting a very fuzzy picture of the future. Taking actions to prevent overfishing frequently involves high short term-costs but the fuzzy future presents a very high risk in the eyes of those asked to do so.

We know that to recover an overfished stock all we need to do is to drastically cut fishing mortality. We also have a fairly good picture of the long-term average end point of doing so. However, the interannual, much less the interdecadal, recovery trajectory in its timing, magnitude and variability is again very fuzzy. The risks associated with such uncertainty leads to an endless battle over which action and degree of it to take despite a near consensus on the current overfished status and the need to exit it.

There has been a substantial investment in understanding the ocean's role in climatic periodicity and in long-term climate change. While our understanding is far from perfect, it is at present sufficient to begin research that relates such ocean variability to that of fish stocks in order to improve the ability of our stock assessment models to forecast ahead. To this end, NOAA is building four new state-of-the-art fishery science vessels, NOAA Fisheries is participating in joint academic-government process-oriented research programs like GLOBEC and FATE and in planning for an ocean observing system that has an appropriate biotic component. We are presently participating in a pilot effort to demonstrate an integrated ocean observing system in the Gulf of Maine.

Invest In Technology—We can be a lot more efficient in many ways that we go about doing our business if we simply made some significant investments in technology. Data that we collect by hand off logbooks and other records can be done simply and cheaply by electronic technology. Satellite technology and sensors aboard fishing vessels can collect and transmit much of the data we collect today using observers. There is no reason that we should be handling as much paper as we do today. Our scientific capability is being crushed by the demands of FOIA requests and litigation because of the time it takes to search and assemble records. The introduction of electronic systems and acoustical and optical technology in our fish stock sampling protocols could easily improve the efficiency and effectiveness of our at-sea fishery surveys many times over.

Partnerships

The scientific information supporting fisheries management policy emanates from a wide variety of sources. While the Secretary of Commerce is charged by the MSA with conducting a program of fishery research and therefore has a substantial program, much of the research, data collection and monitoring is conducted outside of NOAA Fisheries

by states, universities and private companies. NOAA Fisheries strongly supports the development of partnerships in research, data collection and monitoring.

NOAA is a major source of funding for the external development of scientific information for fishery management, either directly or through major grant programs like Sea Grant. The states also receive significant federal funding for marine fisheries though the Wallop-Breaux program administered by the Department of Interior. More recently the National Science Foundation has funded research related to fishery management like the GLOBEC program.

NOAA Fisheries science programs are greatly enhanced through direct academic partnerships. During the most recent year that we made a detailed count, Fiscal Year 2001, the agency collaborated with over 100 academic institutions. Many scientists in our fisheries science centers are adjunct or affiliate professors at universities, where they teach courses and serve on graduate committees. NOAA Fisheries has formal joint research programs at: the University of Massachusetts, University of Rhode Island, Rutgers University, College of William and Mary (VIMS/Hampton University), Florida State University, Oregon State University, University of Washington, University of Miami, University of California at San Diego (Scripps), Santa Cruz and Davis, University of Hawaii and University of Alaska.

NOAA Fisheries is also involved in cooperative agreements with 24 Minority Serving Institutions (MSI). NOAA's MSI Educational Partnership Program initiative is designed to support the development of quality education to students at minority serving institutions while meeting the prescribed goals of NOAA and the nation. The Living Marine Resources Cooperative Science Center, University of Maryland Eastern Shore was created through this program. A second MSI, Jackson State University has partnered with NMFS to develop a short course in fisheries stock assessment.

However, we must do more with universities. There are too few students being trained in the fields of science that are nearly unique to the mission of NOAA Fisheries, stock assessment and fishery economic assessment. This is in part the result of a general problem in the US but it is a particular problem for NOAA Fisheries since many supporting academic programs folded during the 1980s and need to be rebuilt. The issues, plans and suggestions are outlined in the NRC report “Recruiting Fishery Scientists.”

While NOAA Fisheries since the time when it was the Bureau of Commercial Fisheries and the US Commission on Fish and Fisheries has always worked hand in hand with the fishing industry to produce scientific information, there is a strong policy push and funding from Congress to do more. We welcome this thrust and are developing increased programs in every region of the country.

This excerpt for the recent testimony of Dr. Rebecca Lent, NOAA Fisheries’ Deputy Assistant Administrator for regulatory Programs expresses our commitment:

> "We have learned that the variations across fisheries make it difficult to apply standardized approaches across all regions and fisheries. We also have learned that improving data gathering capability requires some or all of the following elements:
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> 1. consistent outreach to industry and other interested constituents;
> 2. careful development of valid technical and scientific protocols; and
> 3. the testing and refinement of these lessons in well-designed pilot studies.
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> "Funding specifically identified for cooperative research within the National Marine Fisheries Service first appeared when Congress allocated money for the Northeast in FY1999 as part of Disaster Relief money to assist in efforts to involve fishing communities in both the planning and conduct of research…. Beginning in FY2001, NMFS also received specially designated funding for a National Cooperative Research Program. The program is being developed to continue to expand and refine cooperative and collaborative research programs with NMFS constituents to improve data collection and analysis, fishing methods and gear technology, while building improved working relations with fishing communities. The FY 2002 appropriation provides $16.7 million specifically for cooperative research programs, of which $2.75 is for the National Cooperative Research Program to continue these activities. This significant commitment of funding by the Congress further highlights the importance of this research."

To ensure the success of this expanding venture in science with industry, NOAA Fisheries has funded a study by the NRC to provide us with recommendations on how best to proceed.

Summary

In summary, scientific information for fishery management should possess the four "r's" as penned by Dr. Michael Sissenwine, i.e. it must be relevant, right, respected and responsive. There is no single formula for achieving these characteristics and no single institution that should be provided the responsibility for doing so. Government (state and federal) and the private sector (universities and industry) each have their strengths for developing scientific information. NOAA Fisheries thinks the best approach is a collaborative approach. That coupled with careful attention to communication provides the best interface for science and policy in fisheries management.