MARINE MAMMAL COMMISSION
4340 East-West Highway, Room 700
Bethesda, MD 20814-4447

17 December 2008

Mr. William Michaels
Office of Science and Technology
National Marine Fisheries Service
1315 East-West Highway, F/ST4
Silver Spring MD 20910

Re: 0648-AW62

Dear Mr. Michaels:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Marine Fisheries Service's request for comments regarding use of the best available science in carrying out the provisions of the Magnuson-Stevens Fishery Conservation and Management Act and, particularly, National Standard 2 of that Act (73 Fed. Reg. 54132). The Commission provides the following recommendations and comments.

## RECOMMENDATIONS

The Marine Mammal Commission recommends that the National Marine Fisheries Service—

- continue to base all of its management activities, including those related to fisheries, on the best available science;
- require that all aspects of fishery science used to manage fisheries, whether by fishery management councils or agency managers, be expressed or described with accompanying measures of confidence in the conveyed information;
- expand its fishery science efforts to incorporate a more adaptive or experimental approach to better characterize the potentially significant but largely undescribed effects of commercial fishing on marine ecosystems;
- take all necessary measures to ensure a clear distinction between the processes of setting catch limits and allocating catch among fishery participants;
- define the best available science to include comprehensive descriptions of the possible positive and negative outcomes of management decisions, the probability that those results will occur, and the consequences if they do occur;
- develop and impose precautionary information standards for fishery management decisions to ensure that the best available science is, in fact, adequate for its intended purpose;
- place on the industry the burden of supporting the research needed to manage a fishery in an appropriately conservative manner when the best available information is not sufficient to support management needs;
- establish explicit, detailed standards for SAFE reports to ensure they describe all pertinent information required for management of the subject fishery and related ecosystem, including specific catch limits, allowable gear types and selectivity, temporal and spatial fishing limits,

all sources of uncertainty and the potential consequences of decisions that do not account for that uncertainty, and measures of past management performance to provide an empirical basis for judging the adequacy and use of the best available science in managing the pertinent fishery; and

- work with the fishery management councils to develop an independent process for appointing scientists to scientific and statistical committees to ensure that those committees are objective in their analysis and reporting of the best scientific information available.

## RATIONALE

The Commission offers the following rationale for its recommendations.

### Defining Science

Science is a human endeavor that seeks to provide a demonstrable basis for understanding the world (or universe) around us. Virtually all elements of the scientific process are aimed at demonstrating that basis, from the documentation of observations in descriptive science to the complex design of studies aimed at discriminating between various hypotheses. To that end, the practice of science imposes certain mores, such as clear delineation of hypotheses and description of methods and materials, objective analyses, repeatable results, documentation to ensure transparency, and peer review to identify logical flaws or alternative explanations. Under ideal conditions, the scientific process corrects itself by catching errors in reasoning, design, analysis, and interpretation. It does so by seeking truth in a manner that is independent of the beholder. By all means, the Marine Mammal Commission recommends that the National Marine Fisheries Service continue to base all of its management activities, including those related to fisheries, on the best available science.

### Reducing Uncertainty

The aim of fishery science is to reduce the uncertainty inherent in fishery management. Characterizing fish stocks and the effects of fishing on them and the surrounding ecosystem is fraught with uncertainty concerning stock structure, stock distribution and movements over time and space, abundance or biomass, vital rates, stock/recruitment relationships, ecological interactions, and fisheries catch statistics. These are important determinants of fishery effects on fished stocks and their ecosystems. The uncertainty associated with them may be additive or, if they interact, synergistic, and may propagate through the combined research/management process and lead to overfishing of the target species or unacceptable adverse ecosystem effects (i.e., ecosystem overfishing). Management decisions based on such information can err by under-protecting or over-protecting fishery resources or the ecosystem. The probability that fishery management councils or fishery managers will make such errors—in either direction—is determined in part by the type and degree of uncertainty involved. To ensure that councils and managers take that uncertainty into account in their decision-making, the Marine Mammal Commission recommends that the National Marine Fisheries Service require that all aspects of fishery science used to manage fisheries, whether

by fishery management councils or agency managers, be expressed or described with accompanying measures of confidence in the conveyed information.

The ecosystem effects of fishing are perhaps the most uncertain aspect of fisheries science. That uncertainty is reflected in the vague description of optimum sustainable yield (OSY), the aim of National Standard 1 of the Magnuson-Stevens Act. The Act defines OSY as the maximum sustainable yield as reduced by any relevant social, economic, or ecological factor. In effect, the use of OSY is an attempt to incorporate ecosystem and other considerations, but in most respects fisheries scientists and managers have not yet determined how to make the transition from maximum sustainable yield, a single-species concept, to OSY. Doing so will require a paradigm shift in fisheries research and management. In particular, more attention must be directed toward investigation of fishery effects on other aspects of marine ecosystems. Doing so will require a more adaptive, experimental (i.e., manipulative) approach to the investigation of fishery effects. For that reason, the Marine Mammal Commission recommends that the National Marine Fisheries Service expand its fishery science efforts to incorporate a more adaptive or experimental approach to better characterize the potentially significant but largely undescribed effects of commercial fishing on marine ecosystems. The frequently touted goal of ecosystem-based management cannot be realized until fishery science expands accordingly.

**Determining Allowable Catch versus Allocating the Catch**

The most important fishery management decisions affecting conservation of the target stock and associated ecosystem pertain to the allowable catch biomass, age and sex structure (e.g., types of catch selectivity), and temporal and spatial distribution (i.e., to avoid localized depletion). Most members of the various fishery management councils do not have backgrounds in fisheries science and are invested in commercial fisheries. They are therefore subject to conflicts of interest, and any decisions or recommendations they make should be confined to those within bounds established through independent, objective scientific processes. Their expertise involves the socioeconomic aspects of fisheries management, which pertains primarily to the allocation of the catch among fishery participants, be they individuals, gear sectors, or communities. Maintaining the integrity of the process for setting catch limits is essential to the long-term health of the target stock, ecosystem, and—for that matter—the fishery itself. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service take all necessary measures to ensure a clear distinction between the processes of setting catch limits, which should be done based on scientific information, and allocating catch among fishery participants, which introduces socioeconomic considerations.

**Risk/Benefit Analysis and the Adequacy of the Best Available Science**

Risk/benefit analysis is an essential component of fishery management because fishery science is imperfect and fishing may result in undesirable effects. Both risks and benefits are best defined in terms of the probability of potential negative or positive effects, respectively, and the consequences if those effects occur. To make informed decisions regarding such effects, managers must consider not only the best available science but also the adequacy of that science for guiding the decision process. By analogy, making difficult medical decisions requires not only information

on the best treatments available but also on the likelihood of their success or failure and the consequences of both. Fishery managers require the same types of comprehensive information if they are to make informed decisions. For that reason, the Marine Mammal Commission recommends that the National Marine Fisheries Service define the best available science to include comprehensive description of the possible positive and negative outcomes of management decisions, the probability that those results will occur, and the consequences if they do occur.

Furthermore, in many cases the best available scientific information may not be adequate to make informed decisions about the likelihood of significant adverse effects (which may or may not be detectable). To act responsibly, management should set information requirements or standards that provide a suitable buffer against incorrect decisions that may lead to unacceptable adverse effects. The buffer can be reduced as available information improves. Doing so is a matter of imposing reasonable precaution and provides an incentive to collect better scientific information if more aggressive fishery practices are desired. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service develop and impose precautionary information standards for fisheries management decisions to ensure that the best available science is, in fact, adequate for its intended purpose.

When the best available science is not sufficient to support fisheries management and decision-making, and the resources available to the National Marine Fisheries Service are insufficient to support the necessary research, the two principal options are to proceed with the fishery in the absence of adequate data or find alternative sources of support. The Commission frequently has commented and recommended that, under such circumstances, the industry should bear the burden of supporting the research needed to manage the fishery in an appropriate conservative manner, as it is the industry that stands to benefit from the fishery. The Marine Mammal Commission reiterates that recommendation here.

**Stock Assessment and Fishery Evaluation (SAFE) Reports**

SAFE reports are the primary means for documenting the status of fished stocks, the fished ecosystems, and the involved fisheries. As such, they are or should be the primary sources of scientific information for fishery management councils and fishery managers. To ensure that SAFE reports are objective and comprehensive, they should be prepared by scientists who are knowledgeable about the topics of interests (e.g., stocks, ecosystems, fishing industry), free of fishery conflicts of interest, and peer-reviewed by independent experts. They should include, in readily accessible (i.e., understandable) form, all of the pertinent information needed for fishery management as well as measures of uncertainty associated with all conveyed information. They should set explicit bounds on catch levels based on specific and explicit information standards and risk/benefit analysis. Importantly, they also should provide a historical record of management actions and catch to provide an empirical basis for judging the past performance of fishery management and make any necessary, compensatory adjustments. Because of the central role they play in supporting fishery management with the best available science, the Marine Mammal Commission recommends that the National Marine Fisheries Service establish explicit, detailed standards for SAFE reports to ensure they describe all pertinent information required for

management of the subject fishery and related ecosystem, including specific catch limits, allowable gear types and selectivity, temporal and spatial fishing limits, all sources of uncertainty and the potential consequences of decisions that do not account for that uncertainty, and measures of past management performance to provide an empirical basis for judging the adequacy and use of the best available science in managing the pertinent fishery.

**Science and Statistical Committees and Peer Review**

Magnuson-Stevens Act provisions (§ 302(g)(1)(A)) require each council "to establish, maintain, and appoint the members of a scientific and statistical committee to assists it in the development, collection, evaluation, and peer review of such statistical, biological, economic, social, and other scientific information as is relevant to such Council's development and amendment of any fishery management plan." Furthermore, section 302(g)(1)(B) of the Act states that "[e]ach scientific and statistical committee shall provide its Council ongoing scientific advice for fishery management decisions, including recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield, and achieving rebuilding targets, and reports on stock status and health, bycatch, habitat status, social and economic impacts of management measures, and sustainability of fishing practices." Finally, under section 302(g)(1)(E), "[t]he Secretary and each Council may establish a peer review process for that Council for scientific information used to advise the Council about the conservation and management of the fishery."

Scientific and statistical committees are essential because council members generally do not have the background in fishery science needed for fully informed decision-making. The committees inform the council using either their own expertise or convening additional experts to provide peer review or otherwise support council decision-making. We know of no constraint on the expertise that may be tapped for this purpose. However, we do question whether the mechanism for appointing the members of these committees may introduce bias, which could mean that the council members are not necessarily given the benefit of the best scientific information available. Each council appoints the scientists for its scientific and statistical committee. Doing so may introduce bias because council members, who tend to be aligned with or part of the fishing industry, may be more likely to select scientists whose opinions are more consistent with their own world views. Any bias in the selection of scientists may undermine the objectivity and independence of the committees and their advice. If the scientific and statistical committees are appointed and operate in an unbiased, independent manner, then we do not see a need for further peer review unless the committees lack the expertise needed. Under current conditions, the basic fishery analyses are conducted by the agency's fishery scientists, the methods and results are reviewed by planning teams, and the end products are again reviewed by the scientific and statistical committee. However, if the scientific and statistical committees are subject to bias by selection procedures, then the entire council process is potentially compromised. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service work with the fishery management councils to develop an independent process for appointing scientists to scientific and statistical committees to ensure that those committees are objective in their analysis and reporting of the best scientific information available.

Finally, councils should not be allowed to ignore or overrule certain types of scientific advice from their scientific and statistical committees. By doing so on matters pertaining to catch, councils have repeatedly increased the level of risk to the fished stock and affected ecosystem, all too often leading to chronic overfishing or overfished stocks and unacceptable ecosystem effects. For that reason, the Marine Mammal Commission reiterates its recommendation that the Service take all necessary measures to ensure a clear distinction between the processes of setting catch limits and allocating catch among fishery participants, and limit council discretion accordingly.

Please contact me if you have questions about the Commission's recommendations or rationale.

Sincerely,

Timothy J. Ragen, Ph.D.
Executive Director