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January 15, 2020

Neil A. Jacobs, Ph.D.
Assistant Secretary of Commerce for
Environmental Observation and Prediction
Performing the duties of Under Secretary of Commerce
for Oceans and Atmosphere
National Oceanic and Atmospheric Administration
Herbert C. Hoover Building, Room 6811
14th Street & Constitution Avenue, NW
Washington, DC 20230

Dear Dr. Jacobs:

On behalf of the NOAA Science Advisory Board (SAB), I am pleased to transmit to you a report from the SAB *Improving Fish Stock Assessments, A Report on Emerging Stock Assessment Technologies.* The SAB approved this report at its December 16-17, 2019 meeting. The purpose of the report was to examine technologies to increase the efficiency and accuracy of stock assessments, the potential saving of ship and personnel time in stock assessment cruises, and to explore the potential roles of future methods that are under development.

The report includes conclusions and suggestions made by the Ecosystem Sciences and Management Working Group (ESMWG) of the SAB. As a component of the 2018-2019 SAB Work Plan, in late 2018 the SAB asked the ESMWG to produce a report on Work Plan Topic 9: "Evaluate fisheries monitoring technologies to improve stock assessments. This evaluation should consider how to optimally balance electronic monitoring, eDNA, and other technologies."

As background to this ESMWG report, NOAA released a Stock Assessment Improvement Plan (SAIP) in 2018. This document emphasized that "[t]o provide the best information possible and meet the demands for increased quality and quantity of stock assessments, we must continually improve stock assessments with new developments in science and technology." While the SAIP described many overall activities and actions taken by the Agency to meet those goals, SAB Topic 9 focused primarily on the three different tools used in this report. This ESMWG effort also builds on another recent report of the working group.

In 2016, the ESMWG produced a report on the broader issue of new technologies that could be utilized by NOAA across many different areas of research and monitoring (ESMWG, 2016). While that report covered remote systems and some molecular methods, this current report addresses more specific issues related to new technologies for fisheries stock assessment, as detailed in SAB Work Plan Topic 9.

To produce the attached report presented in December, the ESMWG Committee and co-chairs met with NOAA topic experts, liaisons, scientific advisors and NOAA officials via in-person meetings and multiple phone calls through late 2018 and all of 2019. In addition, ESMWG

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members reviewed documents related to the three case study technologies, NOAA stock assessments, and other relevant documents (e.g., documents describing general new technology readiness levels as classified by NOAA). Updates on the development of the committee work were provided by the ESMWG co-chairs to the SAB at their regular meetings in spring and summer of 2019. The draft report was revised during the 2 fall ESMWG committee meeting in October and then prepared for the December SAB meeting.

The report provides a number of key findings, among them:

- All of the technologies have tremendous potential for enhancing current stock assessment methods. Some are more applicable to particular fisheries than others, but the potential for new directions and strategic utilization is high.
- They should be considered *synergistic with ongoing stock assessment methods and processes*, and cannot serve as stand-alone replacements or provide immediate solutions to time, effort, funding and ship-use constraints.
- Data created by some of these new techniques produce information that is substantially different from current data inputs to stock assessment and may have distinct biases that will need to be evaluated before they can be used. These and other new methods will require dedicated studies comparing their results to NOAA's current best practices to ensure a high degree of integrity, reliability and credibility in stock assessments for fisheries management.
- These techniques can expand the options, efficiency and accuracy of some existing NOAA research tools and may eventually enable new questions to be addressed.
- The technologies require specialized personnel training to maximize their use.
- These methods will likely provide information that goes beyond stock assessment and into areas of environmental assessment, ecosystem-based fisheries management, natural history and core biological information about the target species.
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- The technologies require specialized personnel training to maximize their use.
- These methods will likely provide information that goes beyond stock assessment and into areas of environmental assessment, ecosystem-based fisheries management, natural history and core biological information about the target species.

The report recommends that NOAA invest in laboratory and field testing of these methods and should consider Public-Private-Partnerships (P3) to develop support for these methods in areas where the agency does not have primary responsibility. The report also recommends that NOAA explore the potential for workforce development, cooperative institutes, postdoctoral programs and training classes to provide current and prospective NOAA scientists training for these methods. Finally, the report notes that NOAA should consider how artificial intelligence, cloud computing and other approaches can be applied to process the large volumes of data that will be generated, and should consider implications for data access and ownership.

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The report concludes that, to make use of emerging technologies, NOAA will need to investigate how these and other new methods could be useful to validate, expand and provide new possibilities for improving, and possible reducing the costs and effort, of stock assessment analyses. However, given the levels of readiness of the techniques themselves and the ability of stock assessment models to accept new types of data, many technologies do not appear ready to replace current approaches on a wide scale. In the near-term, they could be useful for broad Ecosystem Based Fisheries Management (EFBM) efforts and might be especially useful in data-poor fisheries. All use will require trained personnel. The techniques clearly hold potential for new scientific developments beyond stock assessments and could open up new research directions for NOAA.

The SAB encourages NOAA to provide feedback, as you deem appropriate, at the first opportunity. Please let me know if you have any questions, comments or concerns.

Sincerely,

P. Lynn Scarlett
Chief External Affairs Officer
The Nature Conservancy

Attachment:

SAB Report *Improving Fish Stock Assessment:, A Report on Emerging Stock Assessment Technologies*

CC: Tim Gallaudet
Kevin Wheeler
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