



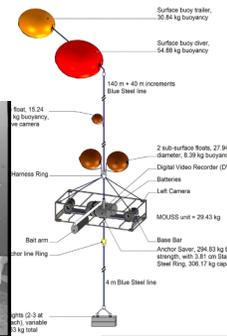
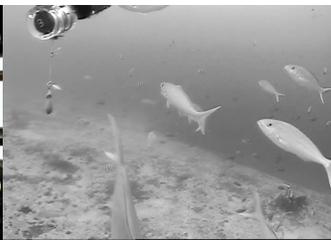
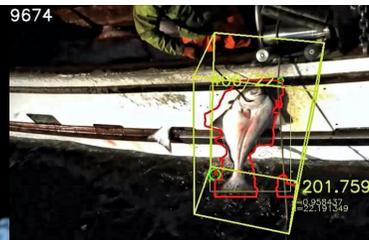
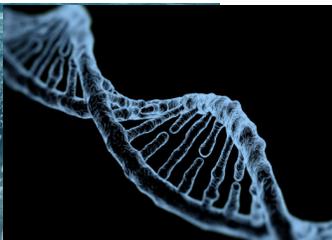
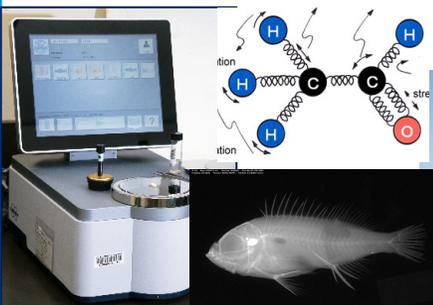
National Oceanic and Atmospheric Administration's Response to:

IMPROVING FISH STOCK ASSESSMENTS A REPORT ON EMERGING STOCK ASSESSMENT TECHNOLOGIES

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Presentation to the NOAA Science Advisory Board

March 15, 2021



Introduction

As a component of the *Two Year NOAA Science Advisory Board (SAB) Work Plan*¹, in late 2018 the SAB asked the Ecosystem Sciences and Management Working Group (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...”*

This task was a response to a request by NOAA to the SAB to consider

- 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.

¹ https://sab.noaa.gov/sites/SAB/Meetings/2018%20Documents/Nov_Meeting/SABWorkPlan2018-19_Revised_10.29.2018.pdf

Recommendation 1

Although new technologies may lead to efficiencies in the medium to long-term time frames, they should not be viewed primarily as cost-saving approaches, but rather as a means to improve stock assessments and ecological monitoring moving forward.

- NOAA agrees. As these technologies transition to operational, they will contribute to filling data gaps, reduce uncertainty in science advice, and potentially enable more stock and ecosystem assessments.
- In the near term, NOAA will invest in new technologies in a variety of ways, such as platform procurement, calibrations, development of analytical techniques, staff training, and needed infrastructure and expertise to use and maintain these systems.
- Many of these technologies are not replacing, but rather augmenting current programs, allowing NOAA to better achieve assessment and monitoring objectives.



Recommendation 2

Before using the data from new technologies, NOAA will need to examine whether and how the new technologies can be linked to current stock assessment models and supporting analyses, and to what degree any new techniques enhance stock assessments...

- NOAA agrees. The ultimate goal of any data investment strategy needs careful consideration of how the data will be used in stock assessments and other analyses supporting fishery management.
- Certain technologies (e.g., FT-NIRS) provide the same type of data as traditional methods ... these data might be uses with minimal need for assessment model calibration and testing. For others (e.g., eDNA) research is needed to understand capabilities, validate and apply.
- NOAA is investing in the development of a modular stock assessment software platform, the *Fisheries Integrated Modeling System* (FIMS; a unified approach to fisheries modeling across a range of data availability scenarios).

Recommendation 3

New technologies can be advanced by holding workshops with diverse experts to develop ideas for how to apply these new technologies to stock assessment. Workshops could explore ... insights to benefit NOAA's fishery management and overall science mission.

- NOAA concurs and strongly supports this approach. The external community has great expertise and innovation. Two examples follow.
- In the early 2010's NOAA organized (with the National Academy of Sciences), explored the potential for optical data from fishery surveys and fishery observer programs. That system is functional today.
- More recently, NOAA funded an external project to conduct a new red snapper survey in the GoMex. This project employed various advanced and conventional technologies that started with scoping workshops involving NOAA Fisheries to assure inclusion in red snapper stock assessments.

Recommendation 4

Side-by-side comparisons between new technologies and ongoing stock assessment analyses will be needed ... To account for environmental variability, multiple years ... will be required ensuring no disruption of integrity and credibility of stock assessments.

- NOAA concurs. Stock assessments build on sustained time series. In recent years, NOAA has begun side-by-side data collection of traditional acoustic-trawl surveys, UxS systems, and eDNA.
- In addition to technology (side-by-sides), rapid changes in environment affecting, require side-by-side approaches in the single- versus multi-species stock assessments, and evolving EBFM approaches.
- NOAA concurs that continued planning is paramount to ensure quantitative incorporation of new types of data as well as changes in the environment and supporting ecosystems. [Please also see the response to *Recommendation #2 on FIMS.*]



Recommendation 5

NOAA will need to invest in lab and field testing of these methods, as appropriate ... NOAA should consider Public-Private-Partnerships (P3) to develop support ... where the agency does not have primary responsibility or does not have sufficient resources.

- NOAA agrees. Oftentimes, it is difficult to conduct such studies with the same staff, ships and resources that are needed to maintain the existing time series.
- Our work on advanced technologies has always focused on adaption of new technologies to our needs while relying principally on the external community for basic research and development.
- In some cases we have used Small Business Innovation Research (SBIR) grants to reach out to the external community for development on specific topics.



Recommendation 6

NOAA should explore the potential for workforce development, cooperative institutes, postdoctoral programs and training classes to provide current and prospective NOAA scientists training for these methods.

- NOAA agrees with the need to develop internal and external future workforce with experience in advanced technologies.
- NOAA is exploring new internal programs (*Leveraging Abilities, Needs, Talents, Energies & Resources Network, LANTERN*) and advanced tech bootcamps to rapidly develop its existing workforce.
- NOAA also continues to develop existing cooperative education programs (e.g., the LMRCSC) to sponsor undergrad and grad students in specialized fields of study alongside development of NOAA staff to improve existing talent and recruit new talent in these technologies.



Recommendation 7

New technologies will generate large amounts of data. NOAA should consider how AI, cloud computing ... can be applied to process the large volumes of data generated. NOAA will also need to consider provisions for data ownership and access...

- We concur. Building our scientific understanding and making management decisions, requires adequately acquiring, processing, and archiving large data volumes.
- NOAA's S&T Focus Areas will expand NOAA's capability to use emerging technologies and revolutionize the agency's high-volume observations. The *NOAA Big Data Program* provides cloud storage and sharing capacity.
- As part of their *Fisheries Information Management Modernization* efforts, NOAA Fisheries will bring together data owners, managers, and users to evaluate current and future high-volume data acquisition, processing, and management requirements.



Thank you



NOAA is grateful for the valuable input and recommendations of the SAB and the ESMWG. We support and concur with the report's recommendations, and look forward to continued collaboration with the SAB and the ESMWG.

