Topic 9
Emerging Technologies for Fisheries Stock Assessments

NOAA Science Advisory Board
April 24, 2019

Ecosystem Sciences Management Working Group

Dr. Michael Castellini, University of Alaska
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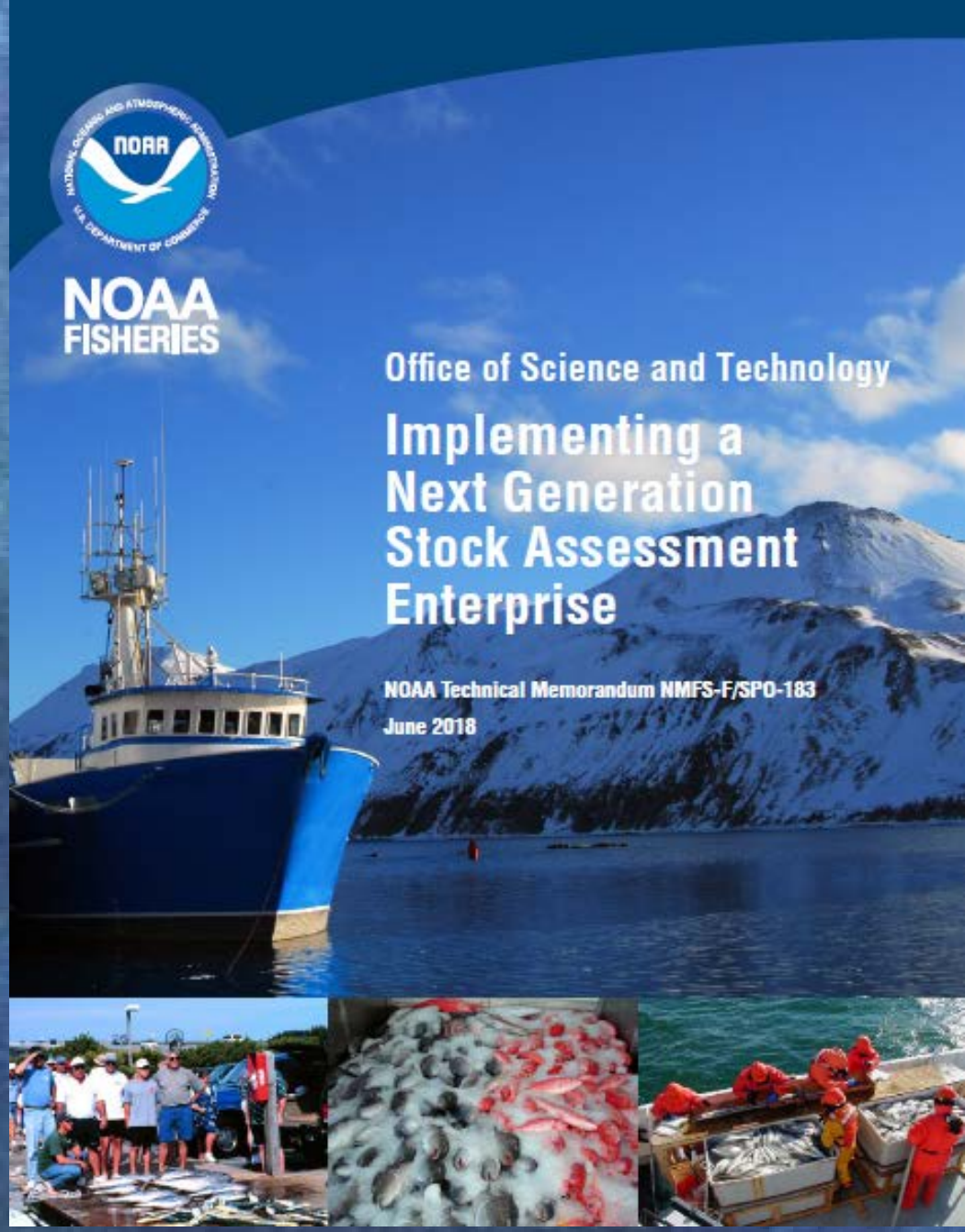
Co- chairs

2018 Stock Assessment Improvement Plan (SAIP)

- To 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.

- Including:
  - expansion of the data collection and data delivery systems, and
  - utilization of new statistical and mathematical modeling techniques and software.



SAB 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 well as incorporate the results of the UxS and machine learning topics (Topics 3 and 4)."

- **Topic 3:** Enhance Strategic Investment and Use of Unmanned and Autonomous Systems
- **Topic 4:** Review Improving Data Collection, Management, Dissemination and Decision Support, and Leveraging New Approaches such as those encompassed in the domain of Artificial Intelligence (AI) and Data Science

ESMWG Tasks and Processes for 2019-2020

First ESMWG project through new SAB WorkPlan

1. Assigned Task 9 July 2018
   - Met with NMFS, liaisons and NOAA field office to refine topics, timeline and process. December 2018

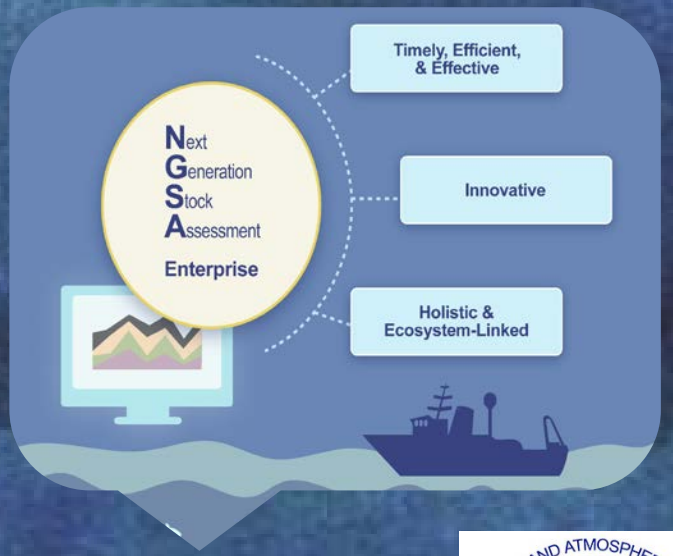
2. Conference calls and meetings with liaisons and NMFS
   - Focus topics from broader list. March 2019
   - May 2019 ESMWG in-person meeting to outline project components, work with specialists, assign tasks
   - Present draft outline and topics to SAB July 2019
   - Summer 2019 first draft of 10-12 page report
   - Fall 2019 ESMWG meeting to finalize
   - End of 2019 submit to SAB.

Objective: Review new technologies that can improve stock assessment in fisheries.

1. Not yet “plug and play”. Dedicated research to compare with SOP methods.

2. Not likely to yield immediate fiscal or effort reductions

3. Methods can be organized by readiness:
   - Near term and ready to field verify
     - Modern otolith assessment methods for fish age and life history.
   - Medium term at field testing stages
     - Remote observing systems, e.g saildrones.
   - Longer term development
     - eDNA, Omics Roadmap



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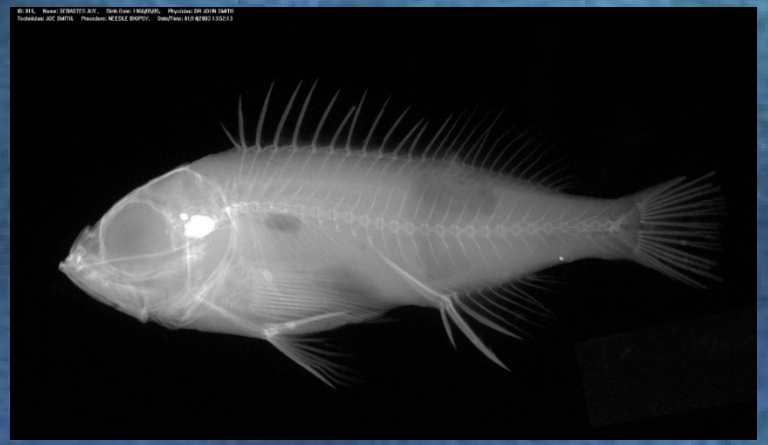
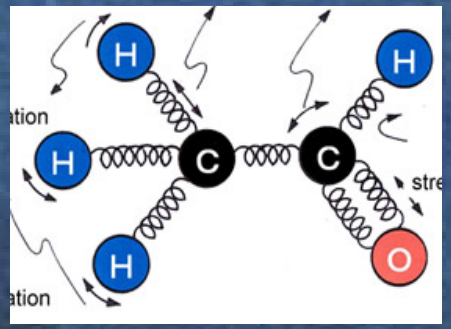
Near term readiness to test and deploy

Modern methods in fish otolith chemistry for aging



Near IR FFT analysis of composition to age

- **In fish otoliths, which contain protein, more vibrational energy produced from C-H, N-H and O-H bonds equates to older fish**
- FT-NIRS provides rapid age estimation with good precision, and greater than **800% efficiency compared to traditional methods**.



Medium horizon: Calibration, testing and initial trials

Remote observing systems (e.g. saildrones) for assessment of ocean conditions and population distributions.

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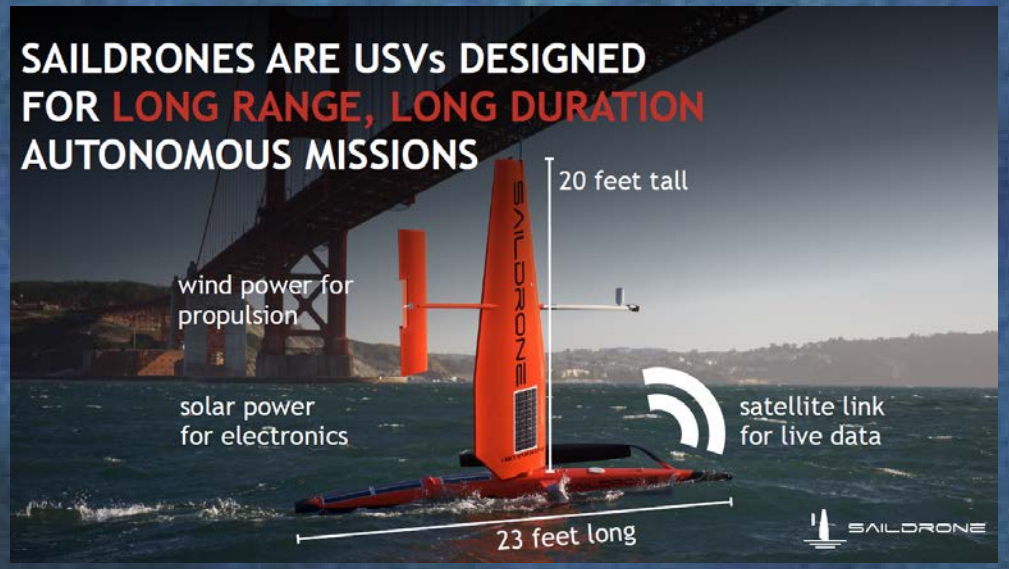

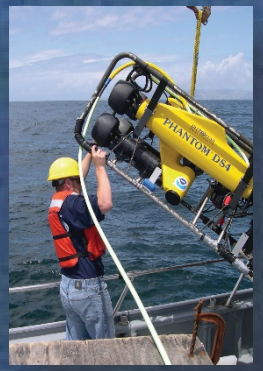

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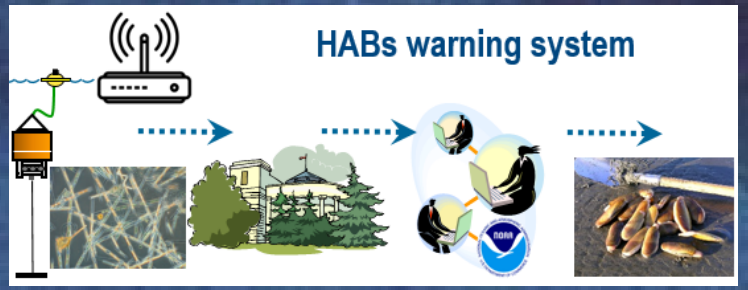
Longer term development: Conceptual models, laboratory studies, university research, focus meetings.

e DNA, Omics and molecular methods for species identification, presence, distribution, life history

eDNA featured in NOAA 'Omics Roadmap



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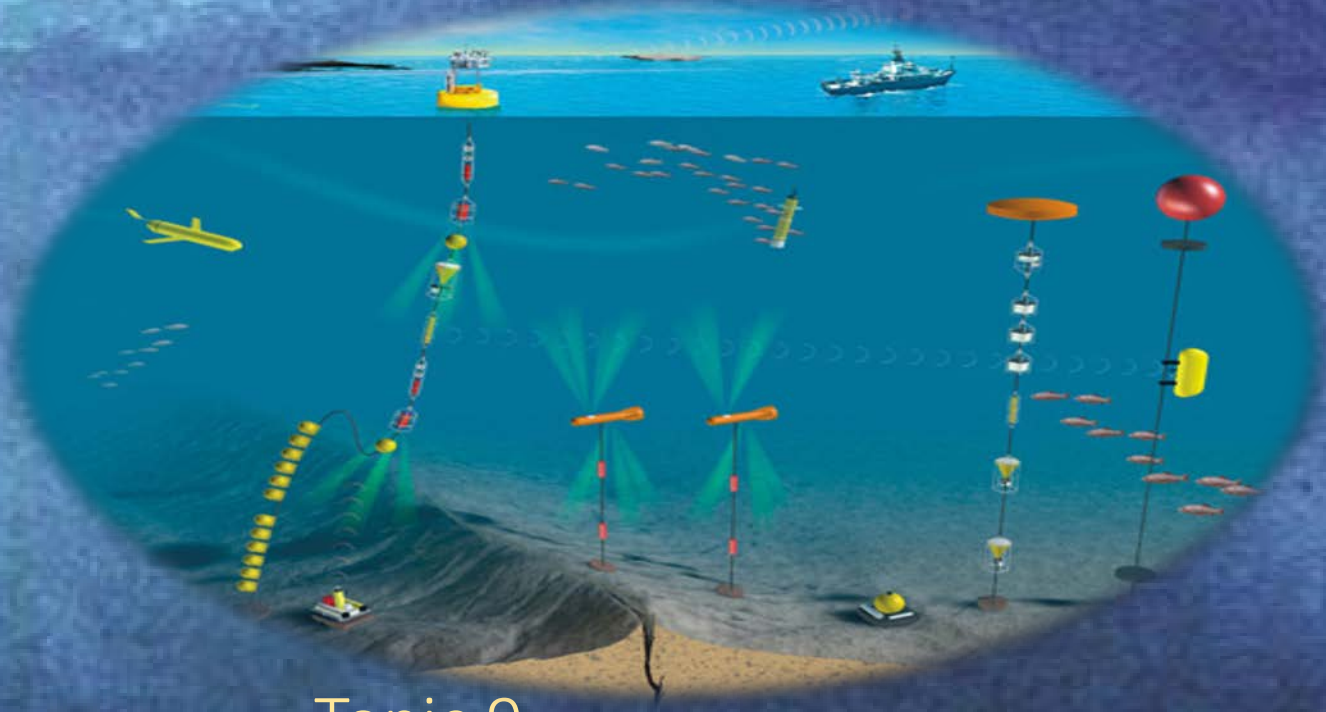

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