WELCOME
HAB Observing Group Webinar #1
September 1, 2021

For technical issues contact mchory@oceanleadership.org
Introduction and Agenda

Agenda

I. Introduction and Agenda
   Overview – Dr. Clarissa Anderson and Dr. Quay Dortch

II. Welcome – Dr. Steve Thur and Carl Gouldman

III. Presentation: HAB Observing Network and Implementation – Dr. Greg Doucette
     o Q&A

IV. HAB Observing Group – Dr. Clarissa Anderson and Dr. Quay Dortch
    o Q&A

V. Future HAB OG Webinar Topics and Dates

Dr. Clarissa Anderson
Executive Director, Southern California Coastal Ocean Observing System

Dr. Quay Dortch
Senior HAB Scientist
Consultant to CSS for NOAA
Welcome

Dr. Steve Thur
Director, NOAA National Centers for Coastal Ocean Science

Carl Gouldman
Director, NOAA U.S. Integrated Ocean Observing System
Implementation Strategy for a National Harmful Algal Bloom Observing Network (NHABON)

Gregory Doucette
NOAA/National Centers for Coastal Ocean Science

on behalf of
The HAB Observing Group Steering Committee

HAB Observing Group Webinar Series
1 September 2021
HABs pose distinct environmental, economic, and societal challenges.

- Impacts include harm to fisheries, shellfish harvesting & beach closures, drinking water contamination, and general public health endangerment, including illness and death.

Known HAB organisms are emerging & causing problems in new regions:

- *Alexandrium* and *Pseudo-nitzschia* in the Alaskan Arctic
- *Dinophysis* in TX, WA, NY, ME, MA, …..
- *Pseudo-nitzschia* in Gulf of Maine and Gulf of Mexico
- CyanoHABs are emerging across the Nation and its coasts (freshwater-marine continuum)
- Fish & shellfish killing species are now being reported in many locations

### Coastal & Great Lakes HAB Impacts

<table>
<thead>
<tr>
<th>Name</th>
<th>Human &amp; Animal Poisoning</th>
<th>Fish Kills</th>
<th>Water Discoloration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amnesic Shellfish Poisoning (ASP)</td>
<td>Yes*</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ciguatera Fish Poisoning (CFP)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Diarrhetic Shellfish Poisoning (DSP)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Neurotoxic Shellfish Poisoning (NSP)</td>
<td>Yes*</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Paralytic Shellfish Poisoning (PSP)</td>
<td>Yes*</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Brown Tide</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CyanoHABs</td>
<td>Yes*</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Golden Alga</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Karlodinium</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sargassum (beaching)</td>
<td>No</td>
<td>?</td>
<td>High Biomass Hypoxia</td>
</tr>
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</table>

*Human or animal deaths*
HAB-related challenges are multi-faceted and vary by region… thus, strategic decisions on approaches to monitoring and predicting HABs are best made at the regional level…NOT ‘one-size-fits-all’!
Recognizing the need to integrate sustained HAB observing capabilities on a national level and deliver products operationally…

NCCOS and IOOS convened a cross-NOAA workshop to develop a NHABON Framework

Framework document published in December 2020 with input from NOAA & IOOS Association

The next steps to achieve a sustainable NHABON were identified as:

- develop an implementation plan
- determine a governance strategy
- identify and obtain diverse stakeholder support
- coordinate obs with regional partners via IOOS RAs
- integrate with the annual federal budget process
National HAB Observing Network

Primary Contributors

Josie Quintrell, IOOS Association
Stephanie Murphy, Consortium for Ocean Leadership
Dr. Clarissa Anderson, Scripps Institution of Oceanography/SCCOOS
Dr. Donald Anderson, Woods Hole Oceanographic Institution
Dr. Holly Bowers, Moss Landing Marine Lab./National HAB Comm. Co-chair
Dr. Timothy Davis, Bowling Green State Univ./National HAB Comm. Co-chair
Dr. Quay Dortch, Consolidated Safety Services, Inc.
Dr. Gregory Doucette, NOAA
Dr. Lonnie Gonsalves, NOAA
Dr. Barb Kirkpatrick, Texas A&M University/GCOOS
Dr. Jan Newton, University of Washington/NANOOS
Dr. Richard Stumpf, NOAA
Dr. Tiffany C. Vance, NOAA
Foundations of a HAB Observing Network

- Provides sustained observations for HAB detection, early warning, and forecasting
- Supports state, tribal, and national missions to understand, predict, mitigate, and manage HABs
- Provides ability to detect known & emerging species
- Flexible and scalable

- Builds on:
  - NOAA’s prior & continuing investments in research, technology, forecasting
  - NOAA Framework for a National HAB Observing Network
  - NOAA/IOOS’ support of regional ocean & coastal observing systems
- Tailored to regional needs
NHABON: Vision & Mission

VISION

A sustained, national network for regional HAB observing

MISSION

The NHABON delivers sustained observations

- for HAB detection, early warning, and forecasting
- to better understand, predict, mitigate, and manage HABs
- to reduce HAB impacts on society, economies, and the environment
Focus of the National HAB Observing Network

HAB Observations support early warnings and forecasts that are key to keeping communities safe.
Innovations in HAB Observing Technologies

- **Environmental Sample Processor (ESP)**
  - A robotic “laboratory in a can”
  - Detects cells & toxins of specific HABs in near-real time & transmits data
  - Can be deployed on moorings, docks, autonomous underwater vehicles

- **Imaging Flow Cytobot (IFCB)**
  - Submersible microscope captures high-resolution images of algal cells
  - Machine learning algorithms ID & count HAB species
  - Imagery & alerts transmitted via cell phone or internet
  - Can be deployed on moorings, docks, autonomous surface vehicles

- **HABscope**
  - Low cost off-the-shelf microscope, 3D printed adapter, and iPod. $500/ea
  - Community scientists take video of water samples
  - Image analysis software developed by GCOOS and NOAA ‘counts’ *Karenia brevis* cells for use in respiratory forecast (habforecast.gcoos.org)
Emerging Technologies – A Continuing Process

Hyperspectral Imagery – Aircraft, UAS

FlowCam (large particle imaging)
Fluid Imaging Technologies

LightDeck (MBio) Rapid Toxin Field Tests
LightDeck Diagnostics
# Proposed Investment Plan

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>5-year Total</th>
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<tbody>
<tr>
<td>New Acquisition</td>
<td>$3,308,000</td>
<td>$3,012,000</td>
<td>$2,612,000</td>
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<td></td>
<td>$8,932,000</td>
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<tr>
<td>Existing Operations</td>
<td>$1,772,835</td>
<td>$2,281,905</td>
<td>$3,115,060</td>
<td>$3,321,815</td>
<td>$3,321,815</td>
<td>$13,813,430</td>
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<tr>
<td>and Maintenance</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Replacement</td>
<td></td>
<td></td>
<td></td>
<td>$1,500,000</td>
<td>$1,500,000</td>
<td>$3,000,000</td>
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<td>HABDAC</td>
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<td>Coordinator</td>
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<td>$100,000</td>
<td>$100,000</td>
<td>$400,000</td>
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<tr>
<td>Total</td>
<td>$5,880,835</td>
<td>$6,193,905</td>
<td>$6,627,060</td>
<td>$5,721,815</td>
<td>$5,721,815</td>
<td>$30,145,430</td>
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</tbody>
</table>

**Table 1.** Proposed Investment Plan to build up a National HAB Observing Network over time and in accordance with evolving needs (inflation and indirect costs, which vary widely, are not included).
Congressional Interest in HABs

- Broad, bipartisan Congressional concern about HABs and support for HAB research and response initiatives

- Congress has targeted appropriations to enhance investment in HAB research across federal agencies and to support regional HAB observing network Pilot Projects

- NOAA IOOS and the National Centers for Coastal Ocean Science (NCCOS) coordinated on review and selection of Pilot Projects, guided by NHABON Framework

- Pilot Projects are intended to serve as a foundation and demonstration of the emerging NHABON:
  - California, Pacific NW, Alaska, Great Lakes, Gulf of Mexico, Northeast, and Southeast
Regional NHABON Pilot Projects

These Pilot Projects showcase the regional diversity of HABs, the need for O&M support, and the observing strategies being adopted to support monitoring and forecasting:

- **California** - IFCB operational support
- **Pacific Northwest** - supporting observations for the PNW HAB Bulletin
- **Alaska** - Coordinator for statewide HAB sampling, obs, and comms
- **Great Lakes** - ESP operational support linked to developing toxin forecast in the Lake Erie HAB Bulletin; improve telemetry
- **Gulf of Mexico** - HABscope operations and expansion supporting improved bloom and respiratory forecasts
- **Northeast** – purchase SeaTrac ASV and C-T & F sonde; upgrade/ optimize ASV-capable IFCB for deployment on SeaTrac
- **Southeast** – obs data to modelers for HAB forecast product support
NHABON: Moving Forward...

- Success of Pilot Projects will be essential to secure continued Congressional investment in NHABON
- IOOS Regional Associations will serve a pivotal and growing role in coordinating NHABON activities
- Enhancing and expanding HAB observing partnerships within and between regions will be key to future success!
Questions?
HAB Observing Group Purpose

ESTABLISH

an informal community-based coalition

TO

enhance scientific collaboration & information/resource sharing for

HAB observing system operators, data users and stakeholders,
technology manufacturers, academia, and government agencies

Steering Committee: Co-Chairs: Quay Dortch, Clarissa Anderson Membership:
Mike Brosnahan, Tim Davis, Greg Doucette, Barb Kirkpatrick, Josie Quintrell, Marc Suddleson, Tiffany Vance
Regionally
NOAA IOOS provides some sustained funding to RAs
Many other sources of funding for both sustained operations and research to RAs & partners
Funding and information flow in multiple directions
HAB Observing Group: Moving Forward...

- **Coordinated, strategic growth**: growth directed and fostered by communication between members

- **Inclusive**: open to cross-sector membership (e.g., federal & state agencies, IOOS regions, tribes, NGOs, academia, industry)

- **Adaptable**: membership will decide how best to steer & shape

- **Informative**: forum to broadly share information & ‘lessons learned’ (e.g., technologies, data, products)

- **Active**: play an active role in the HAB observing community (e.g., facilitate transition of obs. technol. from research to ops)

- **Linked**: promote connectivity & synergy with national & international HAB observing efforts
Ultimately, the strength and success of the HAB Observing Group will depend on the contributions of its members.
Questions?
Preferences for Webinar Topics

• Please vote on your preference for future webinar topics: https://www.surveymonkey.com/r/HABwebinars

• Webinar schedule will be posted on the NHABON webpage, with topics determined by survey results: http://www.ioosassociation.org/nationalhabobserving
Future Webinar Schedule

- Webinar #2: Dec 1, 2021 at 3:00 pm EST
- Webinar #3: Mar 2, 2021 at 3:00 pm EST
- Possible Ocean Sciences Town Hall
- Webinar #4: May 4, 2022 at 3:00 pm EST
THANK YOU ALL
FOR ATTENDING!

For more information, visit: http://www.ioosassociation.org/nationalhabobserving

Please contact josie@ioosassociation.org and mchory@oceanleadership.org for any questions

Contact Mindy Richlen, mrichlen@whoi.edu to join the US-HAB listserv