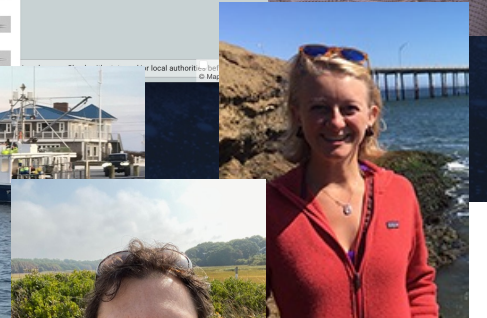
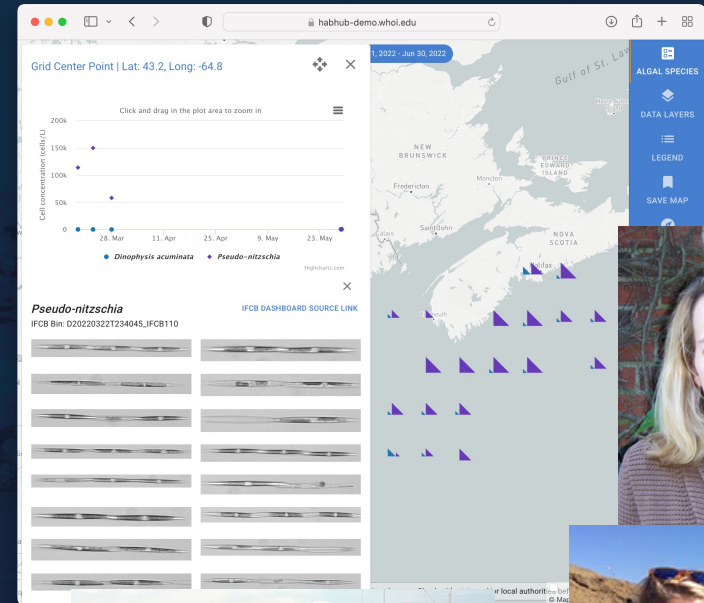


HAB hub webserver for data visualization and sharing

Mike Brosnahan, Ethan Andrews, Claire Anacreon, Kali Horn, and Mindy Richlen

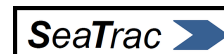
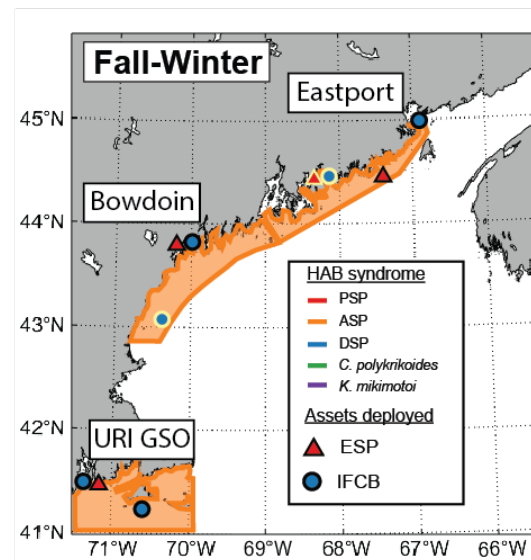
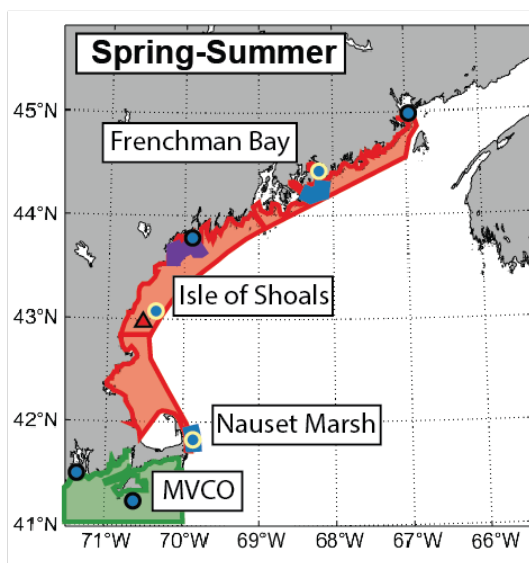
GlobalHAB symposium on automated in situ observations of phytoplankton

25 August, 2022



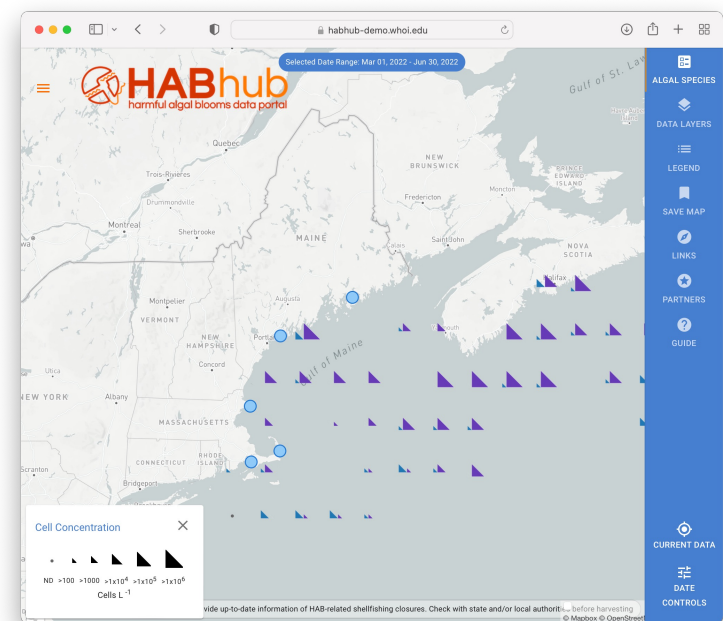
HABON-NE Harmful Algal Bloom Observing Network-New England

An adaptive, region-scale HAB sensor network for bloom surveillance and real-time data sharing



Goals for development

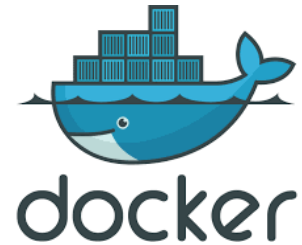
- **Best possible situational awareness: automated data ingestion, standardized plots and products**
- **Serve diverse audiences (general public/K-12 education, fishermen/aquaculturists, resource managers, scientists)**
- **Open sourcing for broad adoption by HAB monitoring groups**
- **Facilitate data reuse and sharing with attribution**
 - Provide direct access to data sources (provenance)
 - Linked SOP documentation (IFCB, ESP, etc.)



| HABhub architecture

Containerized/GitHub distribution model

- Tested on Windows, Mac and Linux
- <https://github.com/WHOIGit/whoi-hab-hub.git>



Django/PostgreSQL back end

- 'Layer' model
- **Completed:** IFCB, PSP shellfish toxicity, Biotoxin closure notices
- **Planned or in development:** ESP, shellfish toxicity model, ecological forecast outputs



Facebook ReactJS front end

- Map centered UI
- All map elements inspectable, 'click down' interface
- Links to primary data, machine dashboards



Initial data layers

- Shellfish toxicity observations
 - MA 1972 - 2019
 - ME 1980 - 2019
 - NH 1991 - 2019
- IFCB sensor observations
- Shellfish closures
 - MA 2011 to 2019
 - NH 2017 to 2020
 - ME 2019
- *ESP sensor observations*
- *Other phytoplankton monitoring data*
- *Shellfish toxicity predictions from sensor data*
- *Advective transport model products*

New Hampshire Closure: Entry of Information from NH Coastal Table
Add closure notice

Title:

Effective date: Today | 📅
Note: You are 5 hours behind server time.

Data source: → Source of closure data –
New Hampshire Department of Environmental Services

Shellfish areas:

Available shellfish areas:

- Atlantic Ocean Nearshore
- Atlantic Ocean Offshore
- Atlantic Ocean-ME
- Bellamy River
- Bellamy River North
- Bellamy River South
- Bellamy River South ClementPt

Chosen shellfish areas:
Atlantic Ocean (nearshore)

Choose all | Remove all

Species:
Ocean quahogs
Oysters
Razor clams
Sea scallops, adductor
Sea scallops, whole
Softshell clam, adductor

Hold down "Control", or "Command" on a Mac, to select more than one.

Areas closed for harvest

State specific web forms optimized by Claire Anacreon and Ethan Andrews

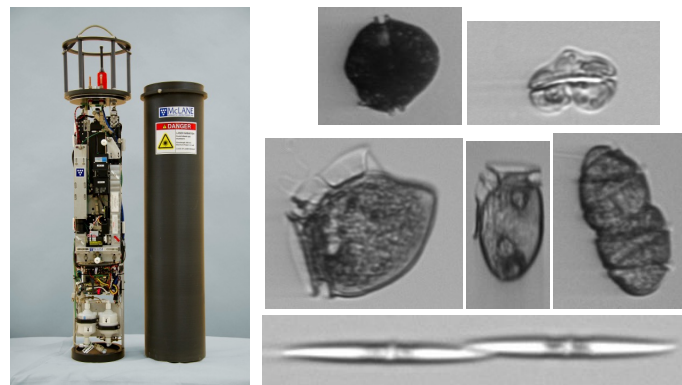


Claire Anacreon (above) and Kali Horn (right)

Initial visualization development

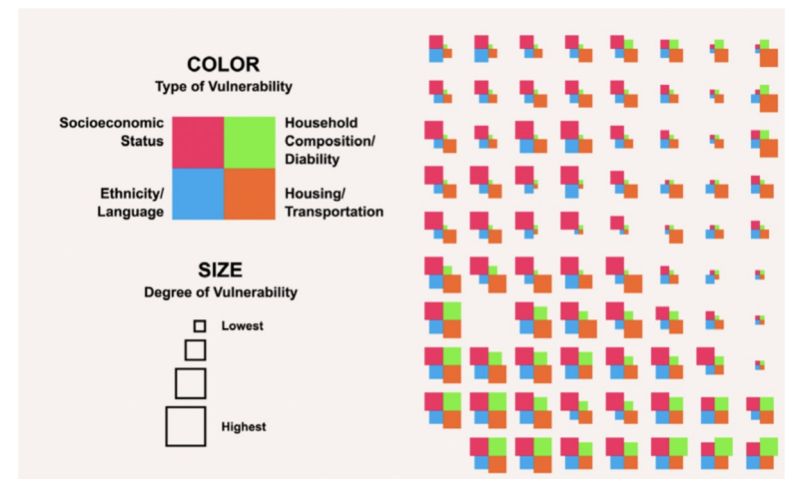
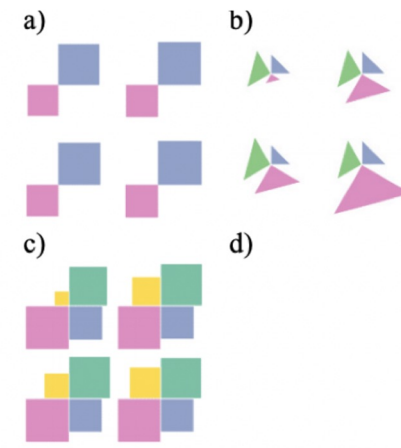
Challenges:

- How to show multiple species/toxins simultaneously? Consider different measurement sources (sensors, methods, etc.)
- Provide direct hooks to inspect primary sources of data, export of data and visualizations by end users
- Facilitate retrospective comparisons – how are current conditions similar or different than the past?



Visualizations

- **Data depiction - glyphs**
 - Multivariate data representation using different glyph sizes/color
 - Visualize multiple attributes; taxa/cell concentrations, toxins/toxin concentrations
- **Interactive visualizations:**
 - Data and forecast model products in maps and time series plots
 - Interpret/translate raw sensor outputs with links to instrument dashboards

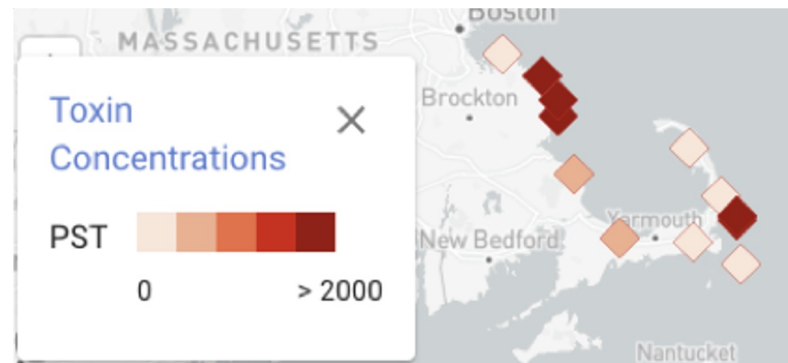
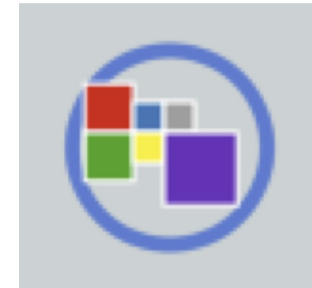
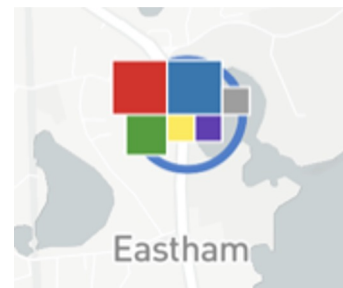
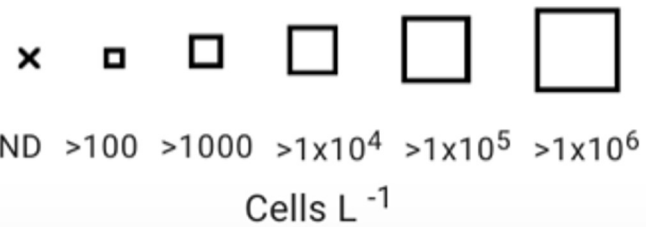


Visualizations

HAB Species/Syndrome

- ✓ Alexandrium catenella / PSP ■
- ✓ Dinophysis acuminata / DSP ■
- ✓ Dinophysis norvegica / DSP ■
- ✓ Karenia / Fish Kills ■
- ✓ Margalefidinium polykrikoides / Fish Kills ■
- ✓ Pseudo nitzschia / ASP ■

Cell Abundance



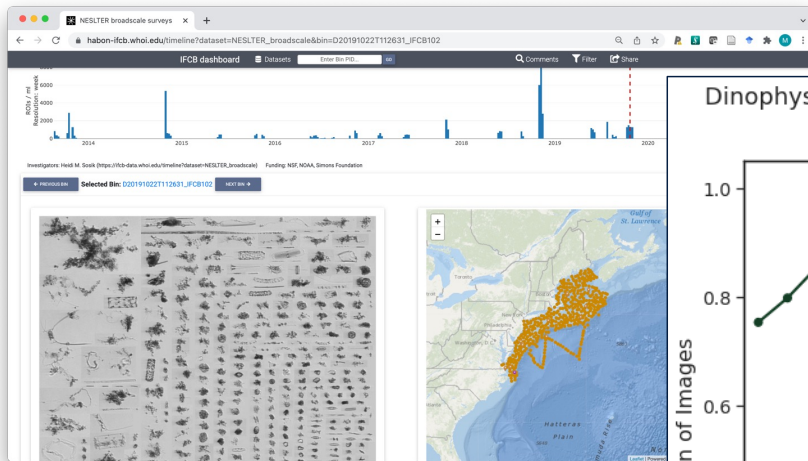
| Other recent development

- User accessibility features
 - Color selection tool
 - New visitor guide
- Ability to customize maps by moving legends, other floating windows
- Save map feature for specific regions, HAB organism/syndrome interests

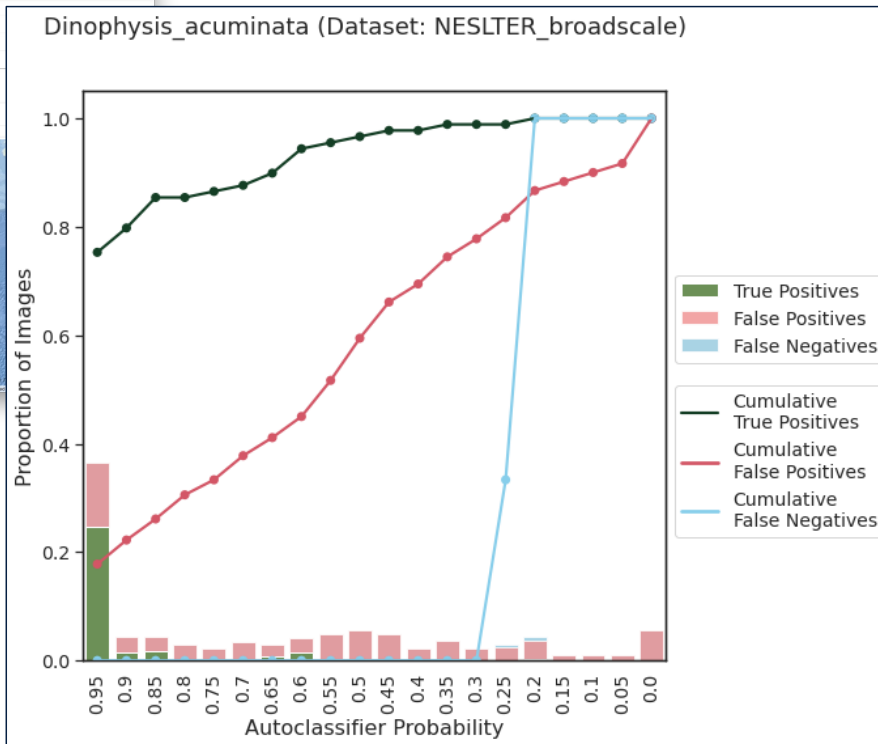
| Other development

Demo

Improving IFCB products



How are winning scores distributed among correct (TP) and wrong (FP) classifications?

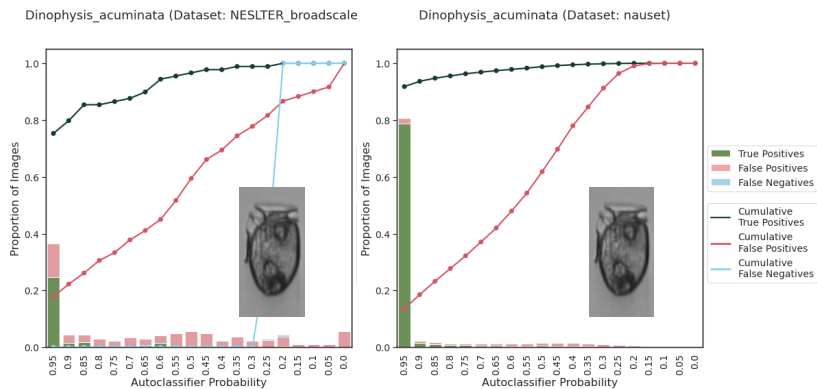


Serena Sung-Clarke



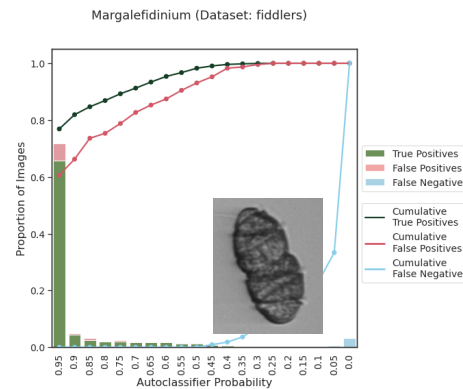
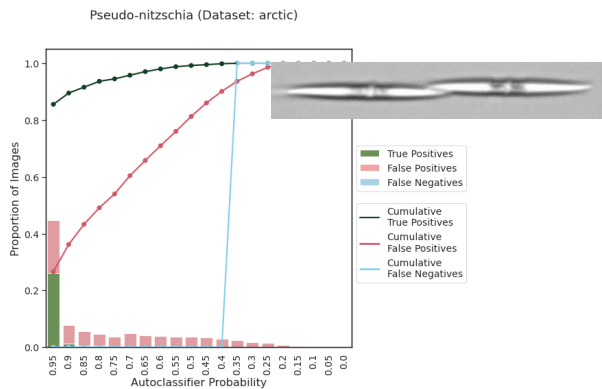
Mrun Pathare

Improving IFCB products



>95% prob threshold produces 'cleaner' classifier product than simple winning prob

Details vary by species and time/location



Human annotation of images remains the gold standard

Need a mechanism to push these directly into HAB hub

| Next steps

- **We welcome feedback!**
- End user group UI testing
- ESP data ingestion, sharing
- Visualizing forecast/model outputs
- Ingestion of annotator data into IFCB products
- Inclusion of source metadata in exports

<https://habhub.whoi.edu/>

<https://habhub-demo.whoi.edu/>

