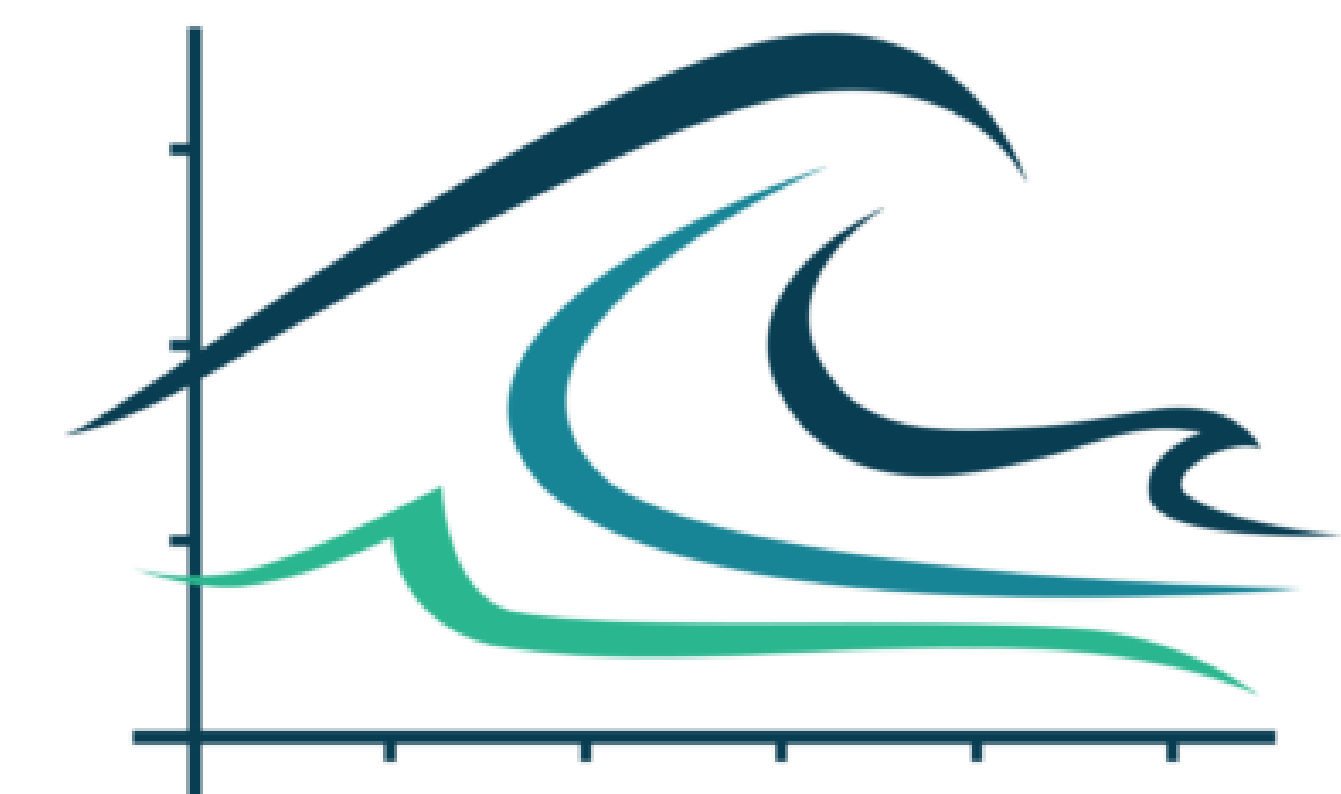


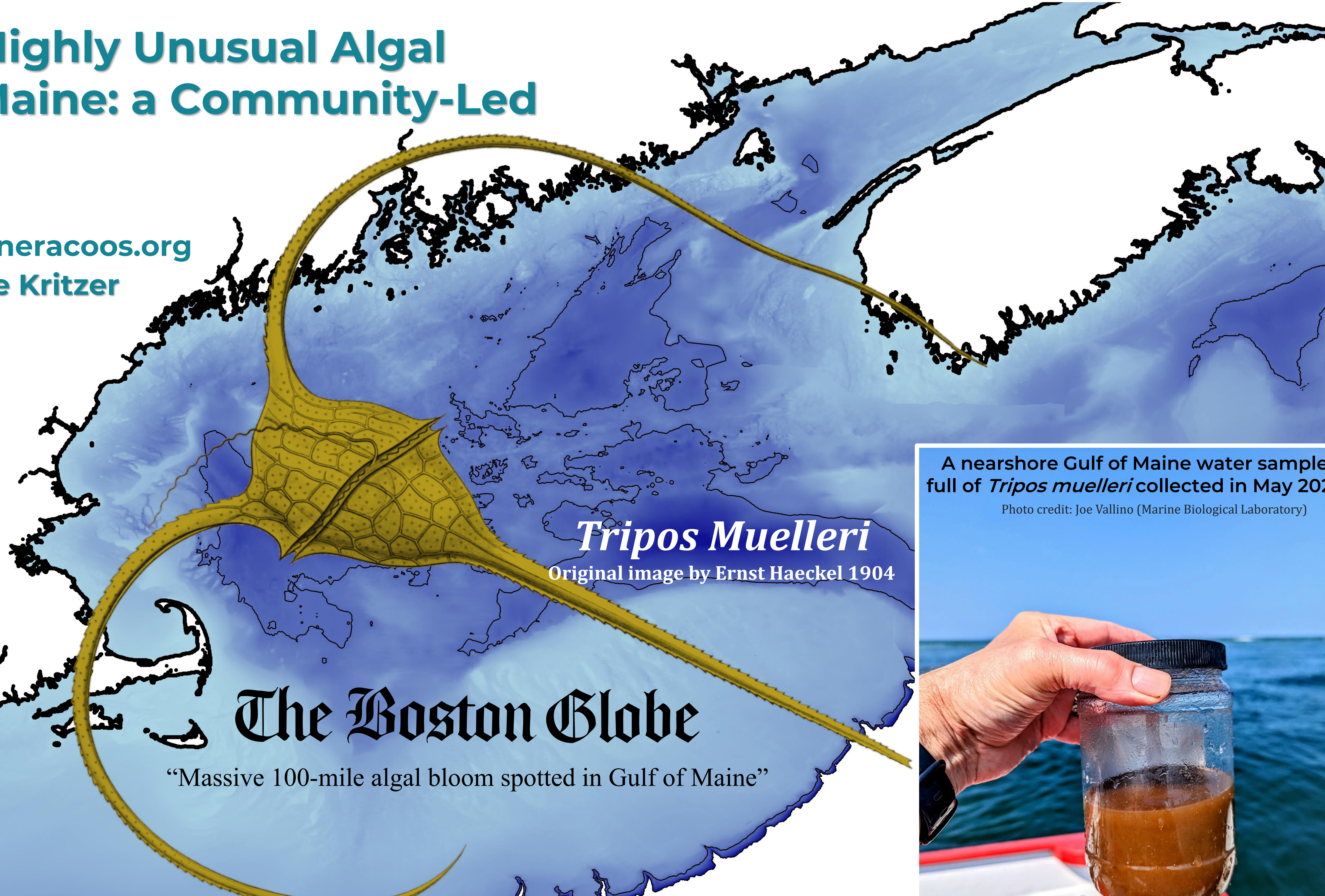
Monitoring the 2023 Highly Unusual Algal Bloom in the Gulf of Maine: a Community-Led Rapid Response

Cameron Thompson, Cameron@neracoos.org
Austin Pugh, Jackie Motyka, Jake Kritzer

NERACOOS



NORTHEASTERN REGIONAL ASSOCIATION
OF COASTAL OCEAN OBSERVING SYSTEMS



Tripos Muelleri
Original image by Ernst Haeckel 1904

The Boston Globe

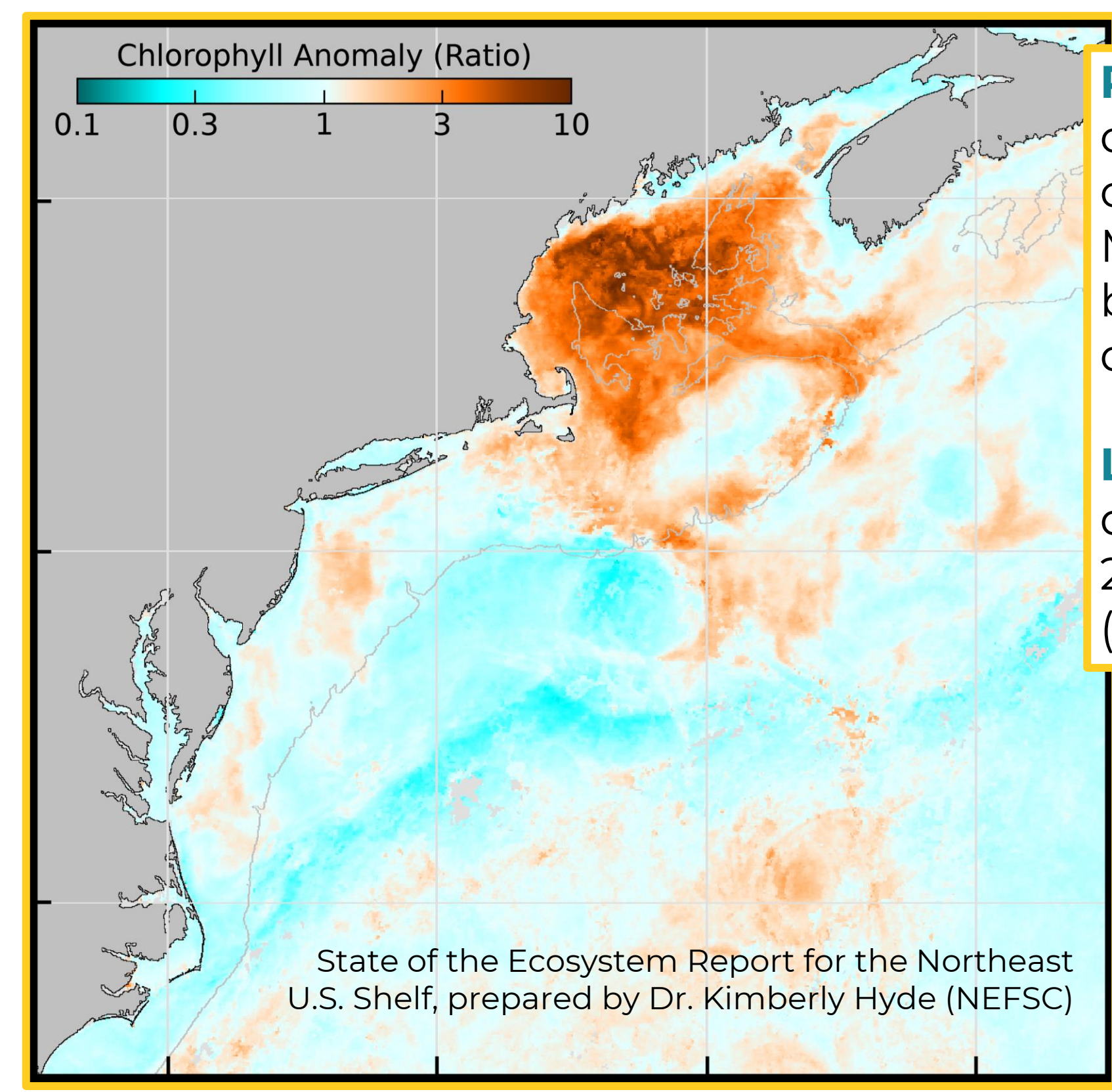
“Massive 100-mile algal bloom spotted in Gulf of Maine”

A nearshore Gulf of Maine water sample full of *Tripos muelleri* collected in May 2023
Photo credit: Joe Vallino (Marine Biological Laboratory)



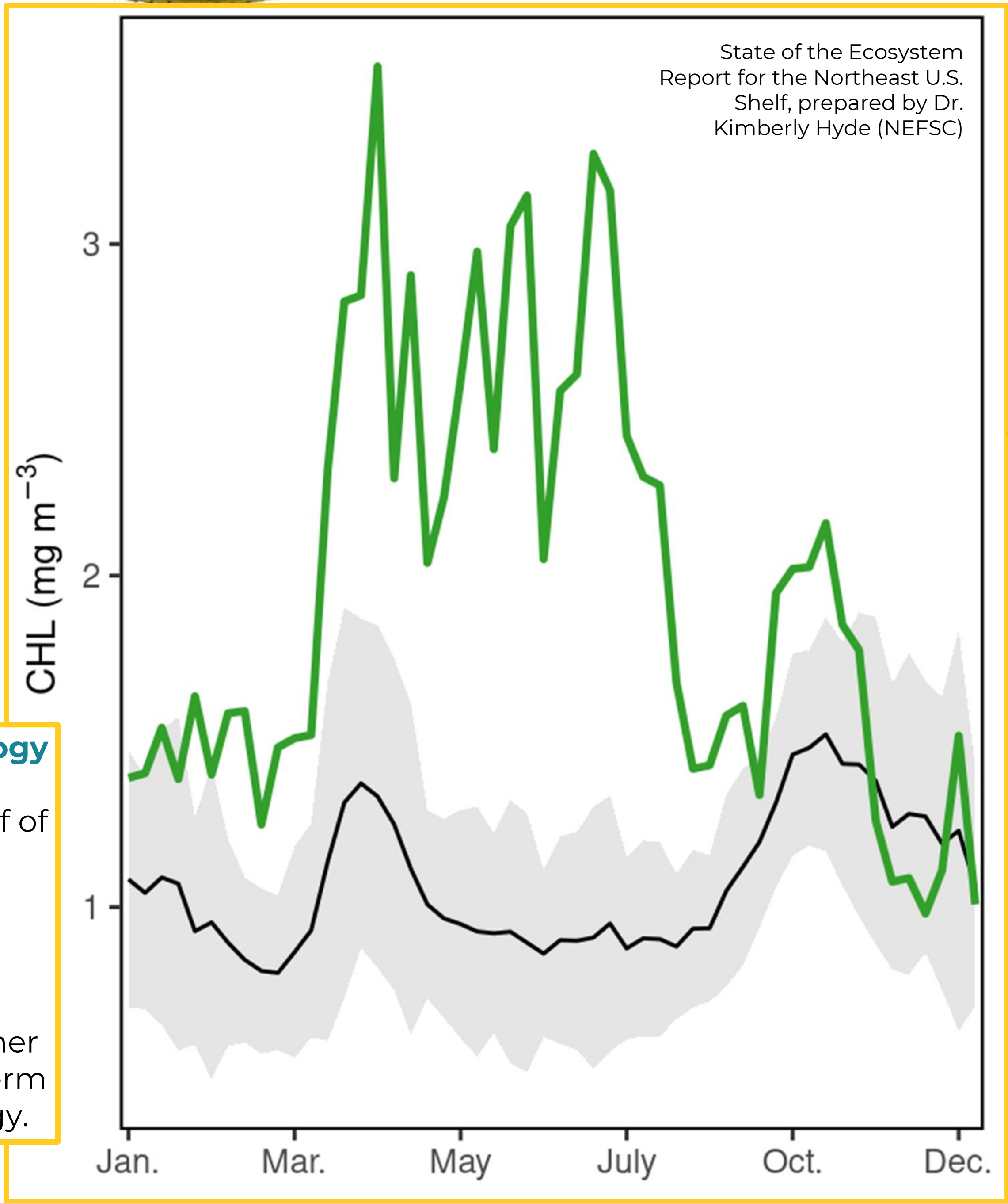
A highly unusual algal bloom of the dinoflagellate *Tripos muelleri* dominated the western Gulf of Maine from April to August of 2023 (figures right and below). Independent citizen, fisheries and scientific observers in the region noted the unusually dark brown color of the water, record high cell counts and Chlorophyll A, record low pCO₂, and water samples or nets saturated with algae (as shown in photo to right side).

A network of collaborators throughout the region attempted to monitor the bloom to track its extent and progression, as well as its impacts on fisheries and the ecosystem. By August 2023, the *Tripos* bloom had moved offshore and cell counts had started declining, signaling its end. Although lower than usual dissolved oxygen levels were detected at this time there was no indication of a large hypoxic zone developing. Water column mixing due to fall storms and advection of dead *Tripos* away from the region may have helped prevent widespread hypoxia but the ultimate fate of the bloom remains undetermined.

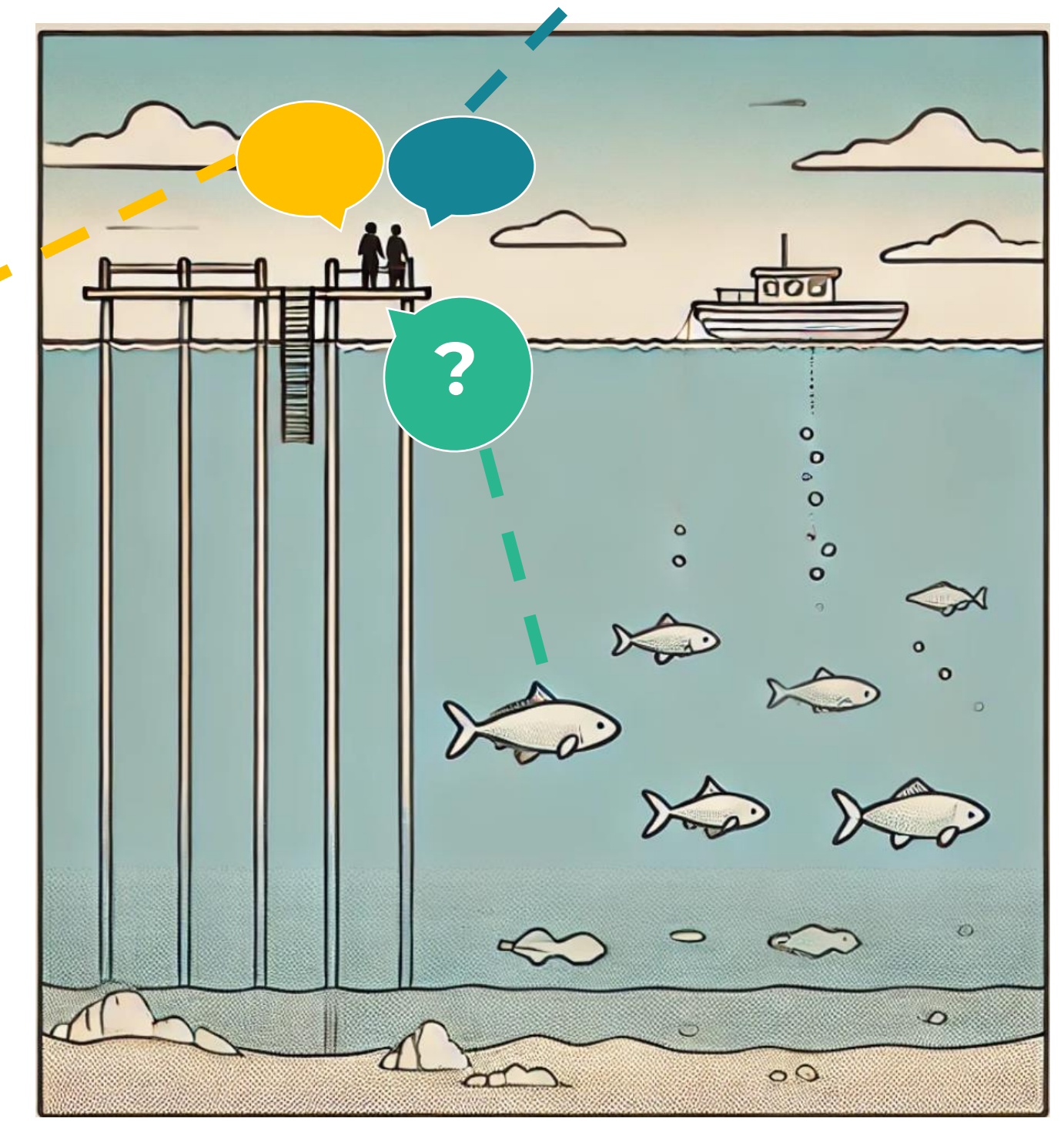


Right. Annual Climatology of satellite derived Chl a concentration in the Gulf of Maine region shown in black/gray with 2023 displayed in green.

Left. Anomaly Map displaying ratio of summer 2023 Chl a to the long-term (1998 to 2023) climatology.



State of the Ecosystem Report for the Northeast U.S. Shelf, prepared by Dr. Kimberly Hyde (NEFSC)



The Dock

Following workshop recommendations NERACOOS is currently developing a platform, called The Dock to help organize communications, the sharing of information, and increase engagement across a diverse set of stakeholders.

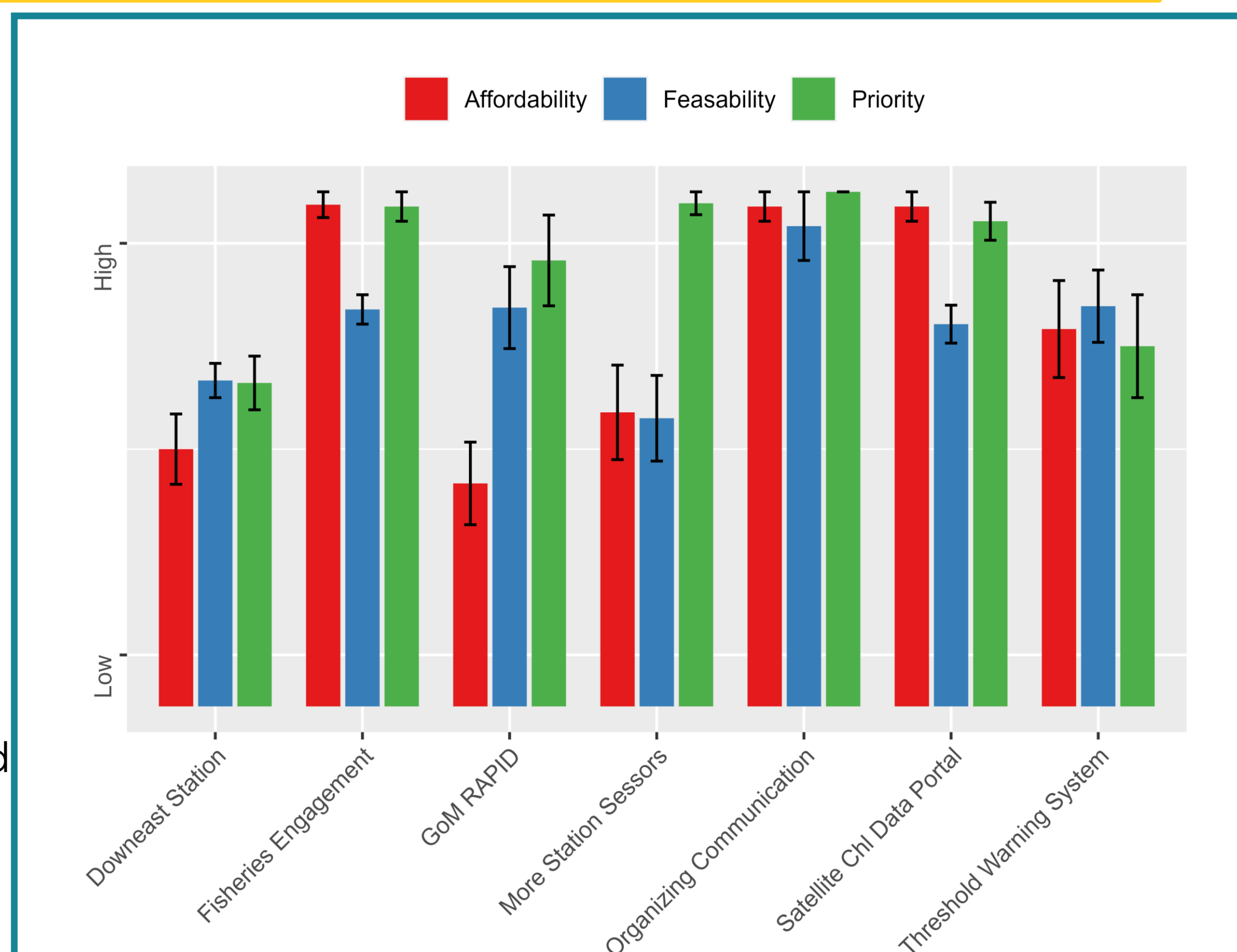
Responding to the Event NERACOOS stepped in to help coordinate the monitoring effort of the informal observer network. In collaboration with the University of New Hampshire (UNH), a press release was also issued, sparking a media response with popular articles that informed the public about the event and potential ecosystem impacts. Meanwhile, NERACOOS and others sought funding for additional monitoring surveys, but there were limited mechanisms for rapid response. Following the end of the *Tripos* bloom and its recognized significance, NERACOOS and UNH conducted a seminar and workshop to understand the event and evaluate the response of the ocean observing system.

A Retrospective Workshop was organized to provide a platform for sharing perspectives, to instigate collaborations for further investigations, and to address the following questions:

- What worked well for responding to this event?
- Do we have the data and tools needed to monitor anomalous bloom events and to identify the likely drivers and impacts of such events?
- Do we have the adaptive capacity to rapidly respond to events like this?
- What should be our next steps to address these issues?

The 37 stakeholders and experts who attended the workshop engaged in various plenary and breakout group discussions. The perspectives shared can be summarized by the ideas and initiatives outlined during the final report-out session. Here, participants were invited to evaluate the outcomes of the discussion and assess each idea's affordability, feasibility, and priority (figure to right).

Acknowledgements: We extend our appreciation to all those who shared their observations and participated in the workshop, the organization of which would not be possible without our UNH collaborators, including Chris Hunt, Kia Ziervogel, Liz Harvey, Sally Nelson, and Erik Chapman (SeaGrant).



Workshop participants evaluate proposed ideas and initiatives

- Downeast Maine Time Series Station** Proposed to address observational gaps
- Expanded Fisheries Engagement** Aims to deepen fishermen involvement through enhanced cooperative research and systematic capture of their observations.
- GoM RAPID** Suggested establishing a regional fund to support rapid monitoring
- More Stations Sensors** Focused on adding diverse sensors to existing stations to track ecosystem changes, with an emphasis on Dissolved Oxygen and Chlorophyll.
- Organizing Communication** Proposes improving communication following the example of NOAA's Ocean Acidification Information Exchange.
- Satellite Chlorophyll Data Portal** Recommended creating a web portal for easier access to satellite chlorophyll data, with potential expansion to other measures.
- Threshold Warning System** Suggested a system to automatically alert the community about unusual data readings.

Workshop Lessons

The workshop highlighted the need for enhanced monitoring to better understand and anticipate extreme events. Nevertheless, the coastal ocean observing network did a fair job of monitoring the highly unusual *Tripos* bloom, and the research community is actively working towards better understanding it. Those successes can largely be attributed to strong networks and the collaborative disposition of the community which may serve as mechanisms for climate resilience. Under future climate change scenarios extreme events will become more common and necessitate rapid responses. Greater observational infrastructure will help in monitoring and responding to such events, as will facilitating collaboration efforts and supporting structured communication.

[Read the Workshop Report Here](#)

