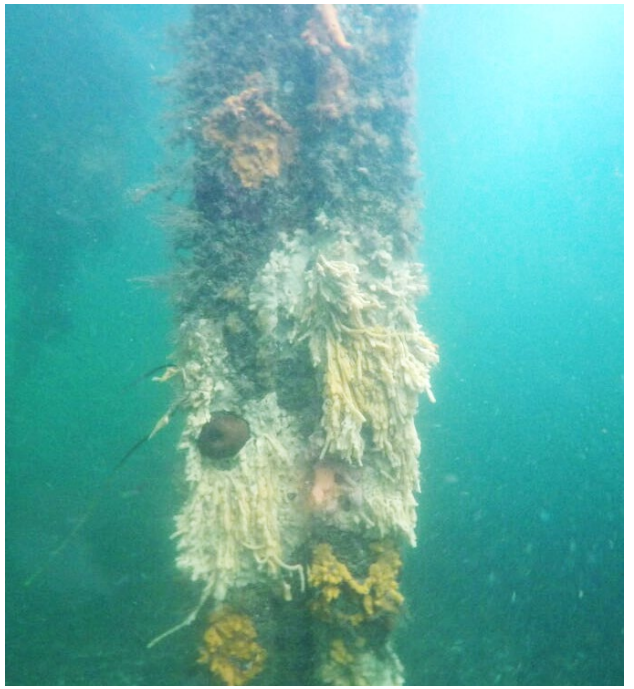
Photo: Alex Shure. Fouling community at the Public Pier in Beverly, MA on the 2023 RAS.

CZM's Marine Invasive Species Program

MA Water Resources Committee Meeting
November 14, 2024

Lexie Neffinger
Coastal Habitat and Water Quality Specialist
Massachusetts Office of Coastal Zone Management

Marine Fouling Communities



Floating docks, pilings, and other coastal structures

Marine Fouling Communities

Fishing gear and aquaculture farms

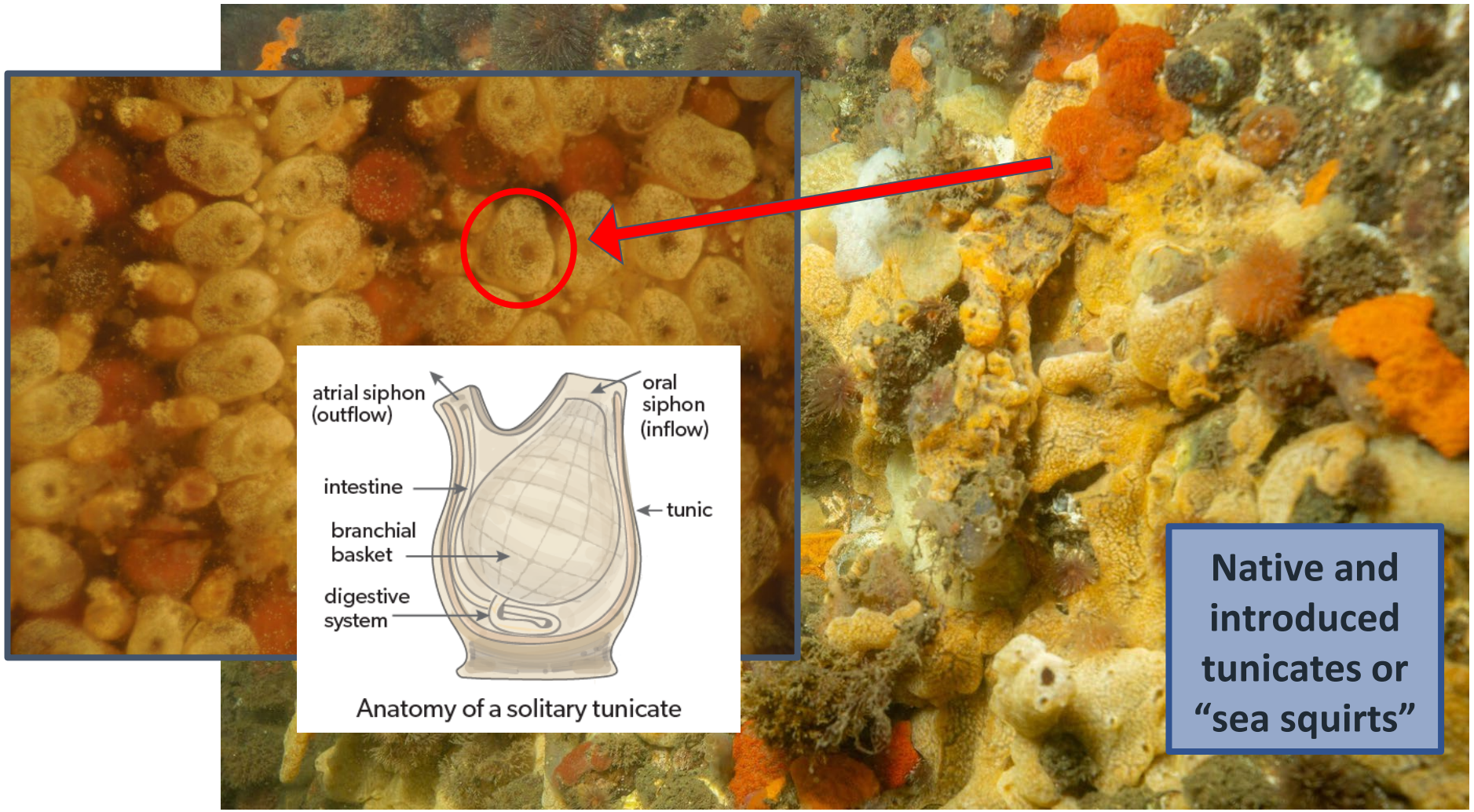
Marine Fouling Communities

Other miscellaneous submerged substrate

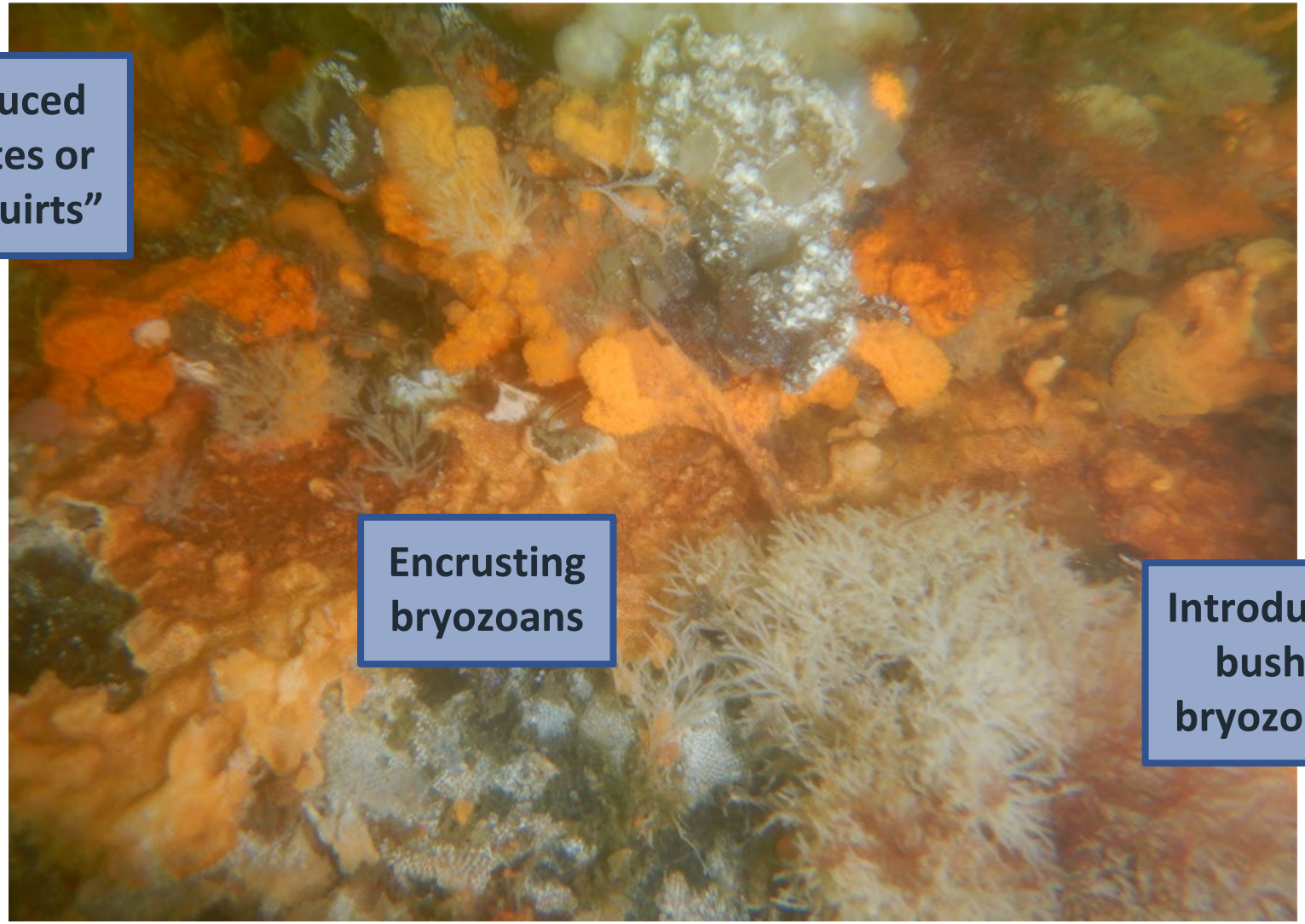
Marine Fouling Communities

Marine Fouling Communities

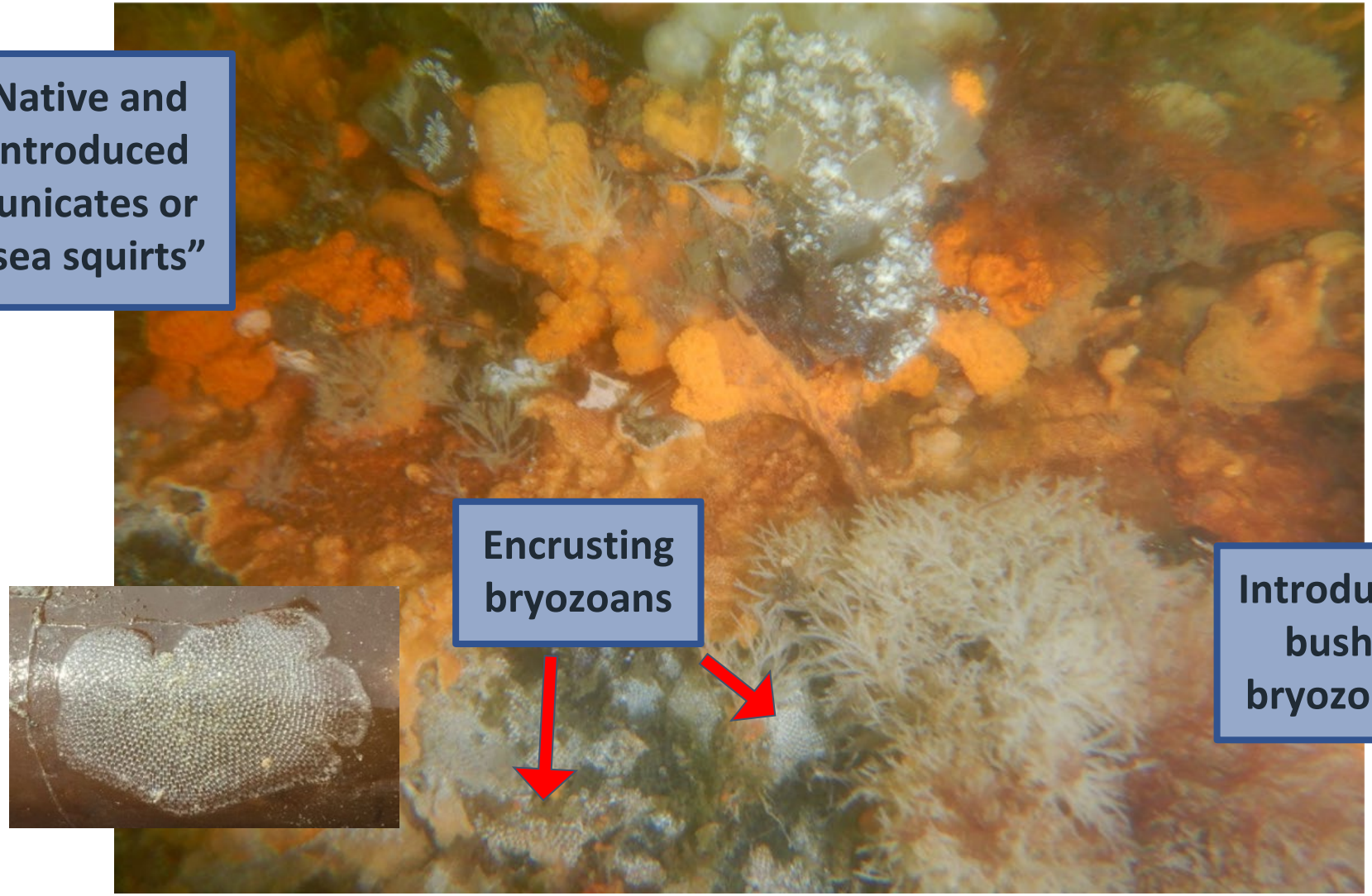
Marine Fouling Communities



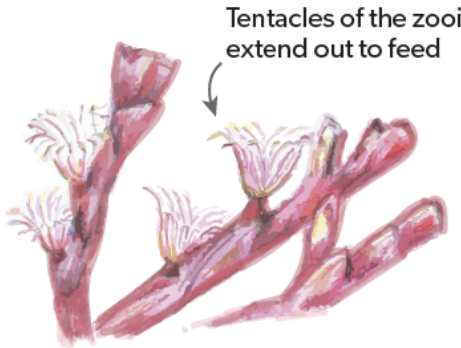
Marine Fouling Communities



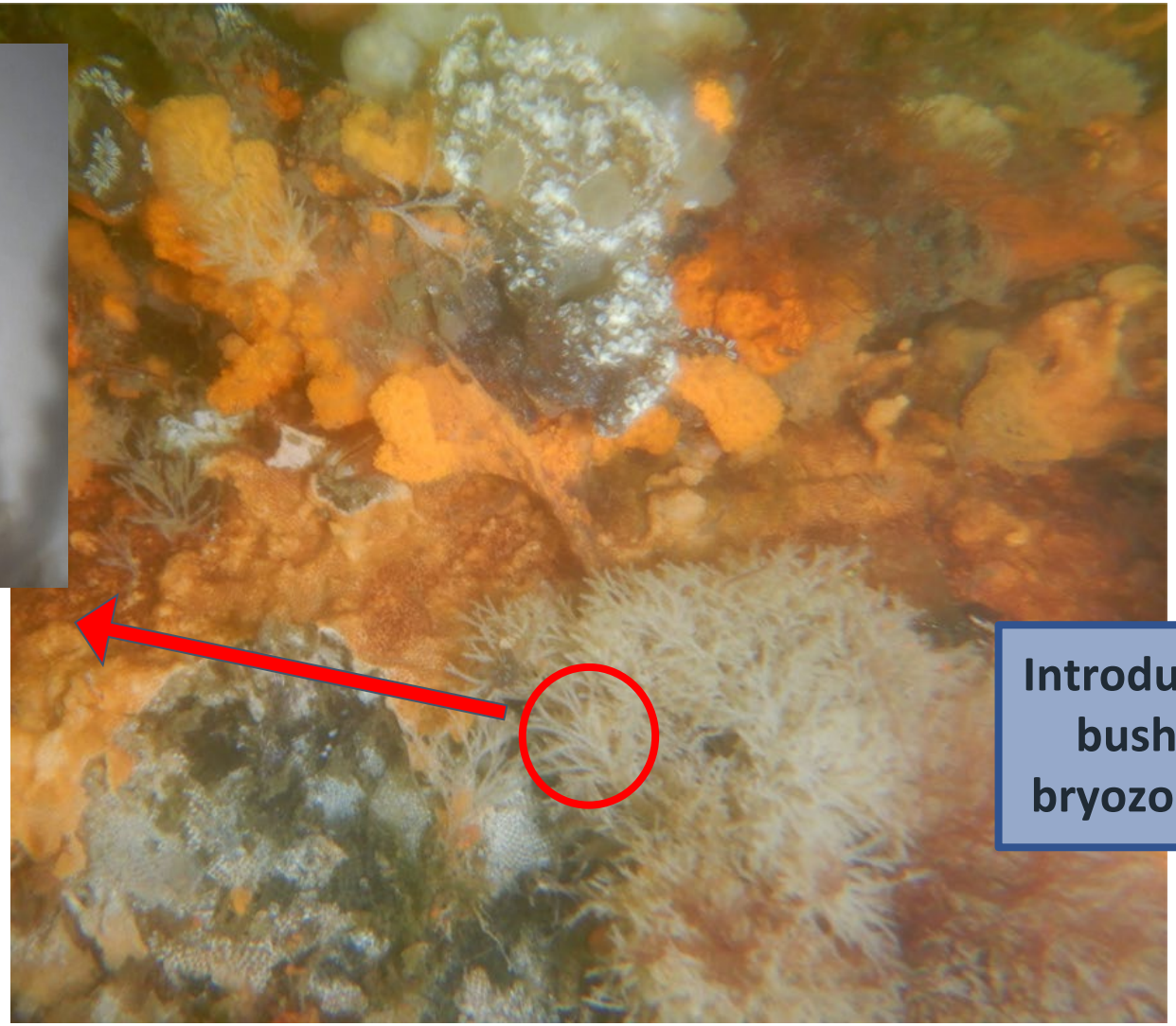
Marine Fouling Communities



Marine Fouling Communities

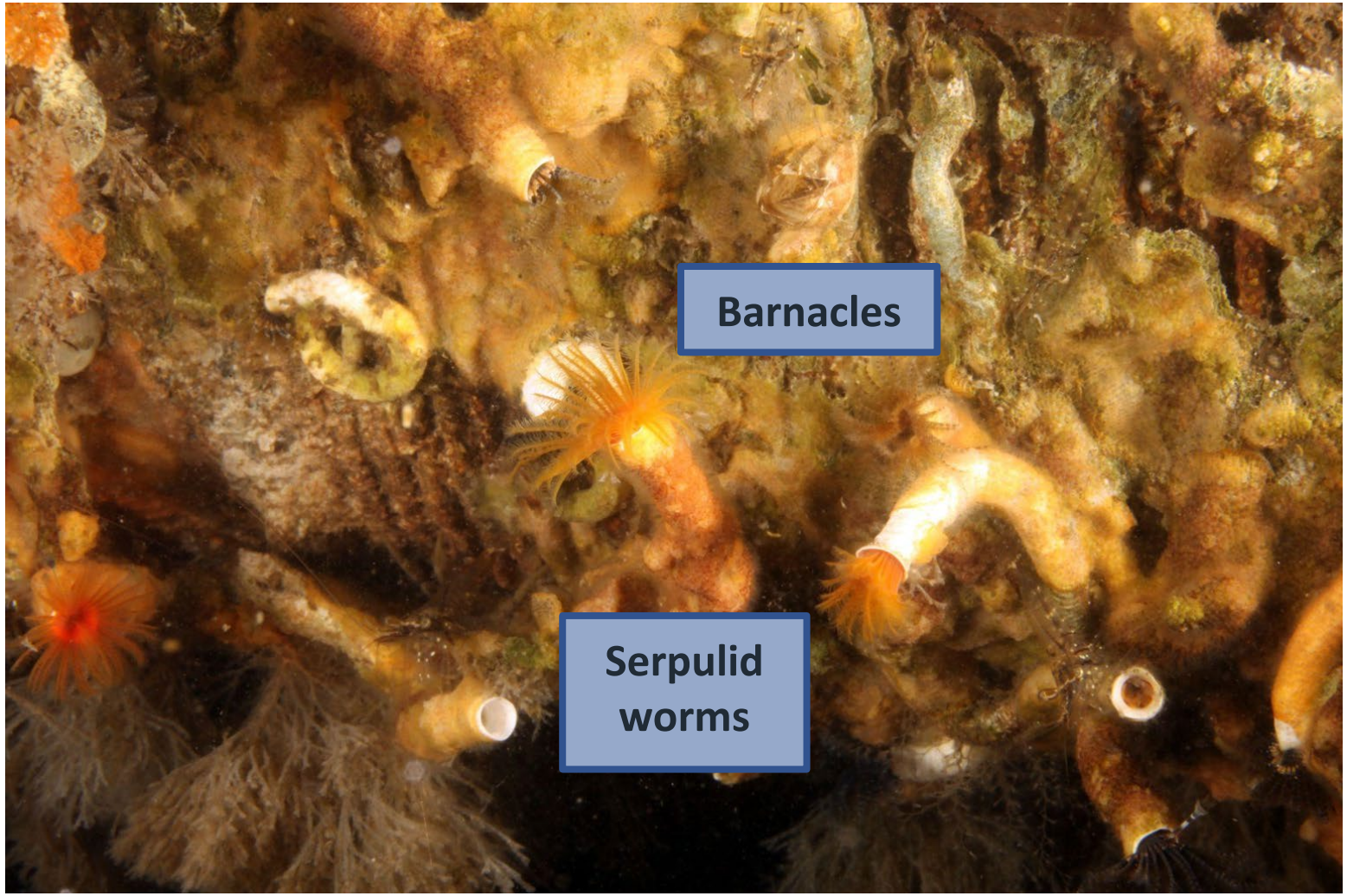


Close up view of zooids arranged in branching form



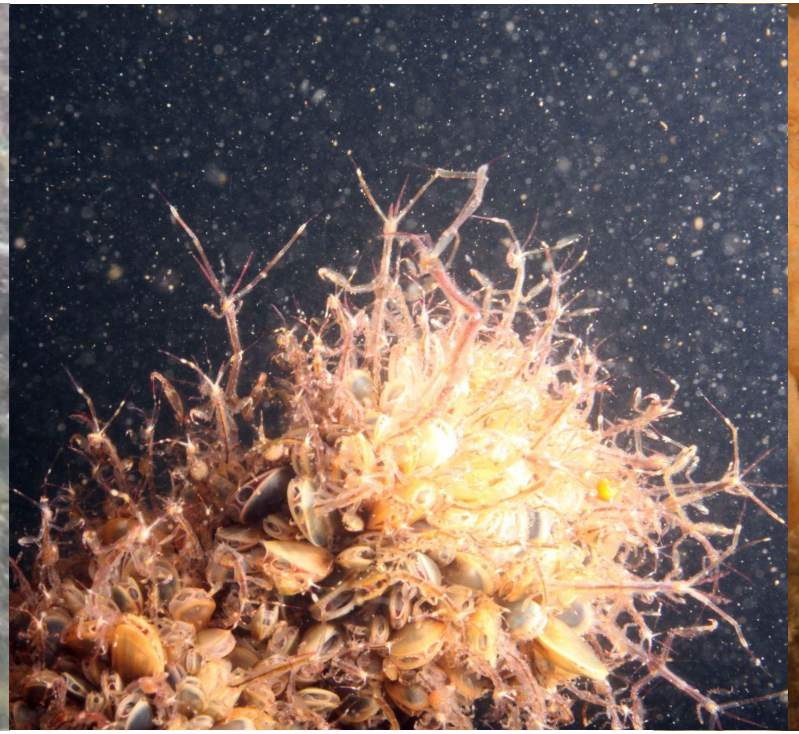
Introduced bushy bryozoans

Marine Fouling Communities



Marine Fouling Communities

Marine Fouling Communities



Motile fauna in association with the fouling community

Marine Fouling Communities

Space is a **limited resource!**

And so is food – most fouling organisms are **filter feeders.**

Biological Invasions

What are biological invasions?

How are they transported?

What are their impacts?

How do we monitor them?

Biological Invasions

What are biological invasions?

How are they transported?

What are their impacts?

How do we monitor them?

Biological Invasions

Introduced species are those which have been transported by human activities into a region where they were previously absent and have self-sustaining reproducing populations.

Biological Invasions

What are biological invasions?

How are they transported?

What are their impacts?

How do we monitor them?

Biological Invasions

Introduced species are those which have been transported by human activities into a region where they were previously absent and have self-sustaining reproducing populations.

Range expansions are the movement of native or previously introduced species into regions where they were previously absent and have self-sustaining reproducing populations.

- adapted from Carlton & Schwindt, 2024

Biological Invasions

What are biological invasions?

How are they transported?

What are their impacts?

How do we monitor them?

Ballast discharge

Photo: International Maritime Organization

Ship fouling

Photo: Minchin & Sides (2006)

Marine debris

Photo: Ocean Voyages Institute

...and more.

Biological Invasions

What are biological invasions?

How are they transported?

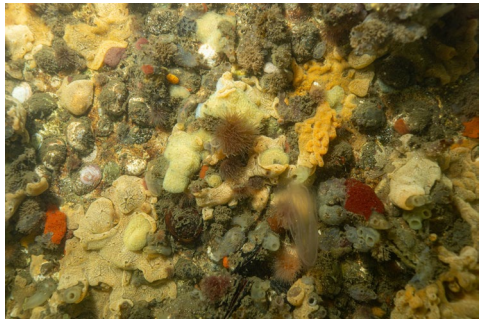
What are their impacts?

How do we monitor them?

Ecological Impacts

Botrylloides violaceus colony on a crab in Alaska, Photo: Linda McCann/SERC

Carcinus maenas on eelgrass, Photo: Howarth et al. (2021)



Introduced tunicates, bryozoans, and other species crowding native mussels Photo: Alex Shure

Economic Impacts

Biological Invasions

What are biological invasions?

How are they transported?

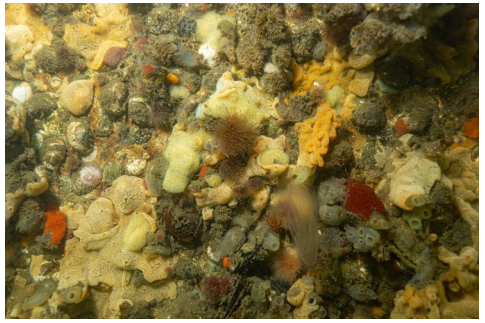
What are their impacts?

How do we monitor them?

Ecological Impacts

Botrylloides violaceus colony on a crab in Alaska, Photo: Linda McCann/SERC

Carcinus maenas on eelgrass, Photo: Howarth et al. (2021)



Introduced tunicates, bryozoans, and other species crowding native mussels Photo: Alex Shure

Economic Impacts

Didemnum vexillum fouling mussel cages in British Columbia, Photo: Gordon King

Hundreds of pounds of tunicates pulled up during a scallop dredge, Photo: Carl Huntsberg at Maine DMR

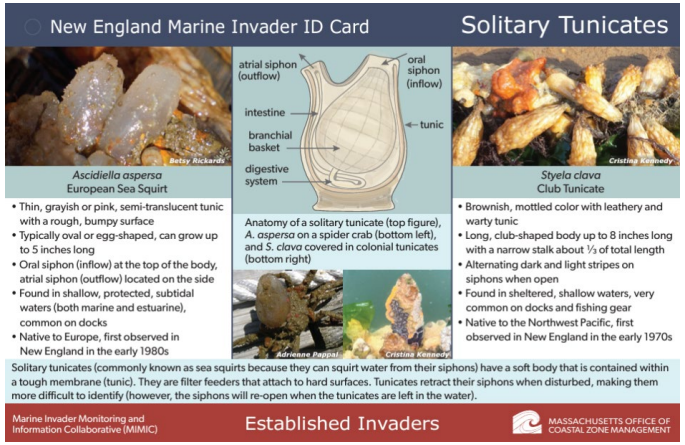
Biological Invasions

What are biological invasions?

How are they transported?

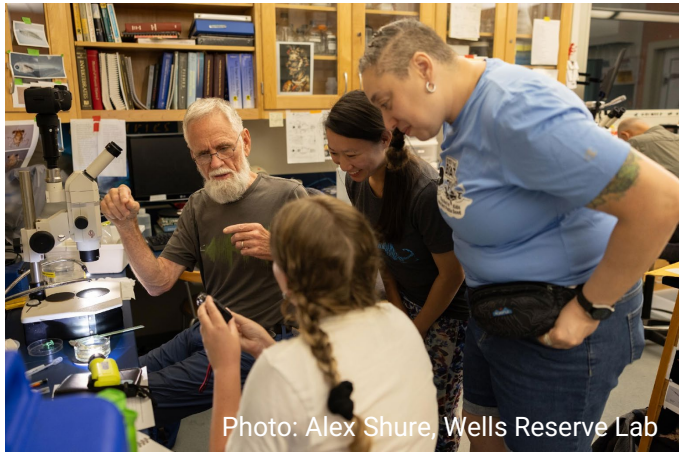
What are their impacts?

How do we monitor them?



Marine Invader Monitoring and Information Collaborative Est. 2006

Participatory science program
Monitor for 18 common invaders



Rapid Assessment Survey Est. 2000

Scientific expert survey team
Identify all organisms encountered

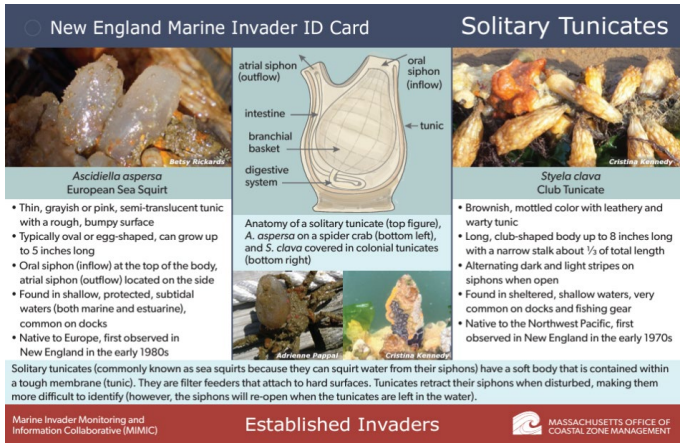
Biological Invasions

What are biological invasions?

How are they transported?

What are their impacts?

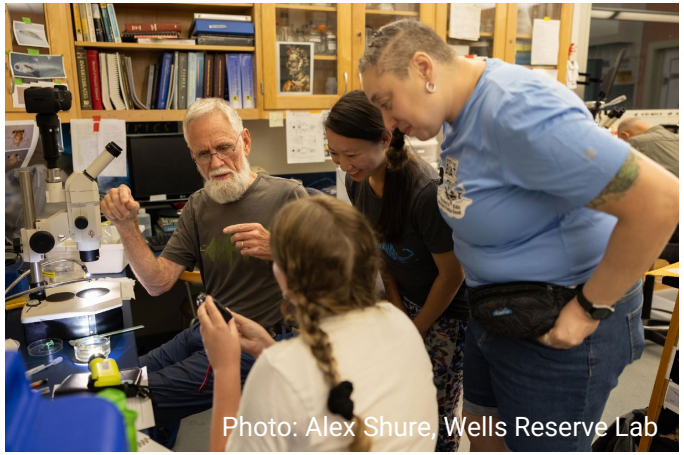
How do we monitor them?



Frequency
Range
Accessibility

Marine Invader Monitoring and Information Collaborative
Est. 2006

Participatory science program
Monitor for 18 common invaders



Rapid Assessment Survey
Est. 2000

Scientific expert survey team
Identify all organisms encountered

Detection
Richness
Precision

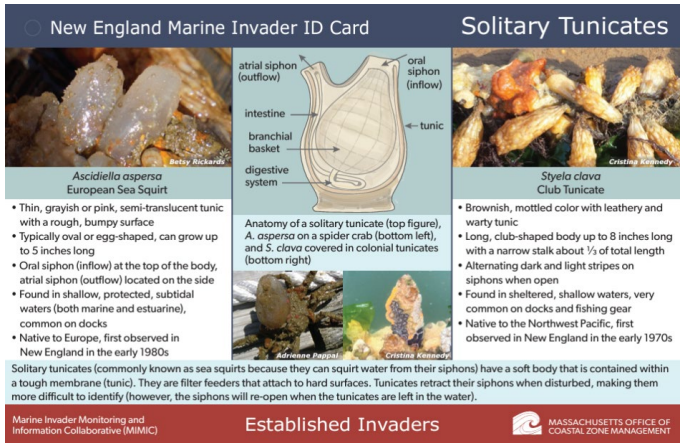
Biological Invasions

What are biological invasions?

How are they transported?

What are their impacts?

How do we monitor them?



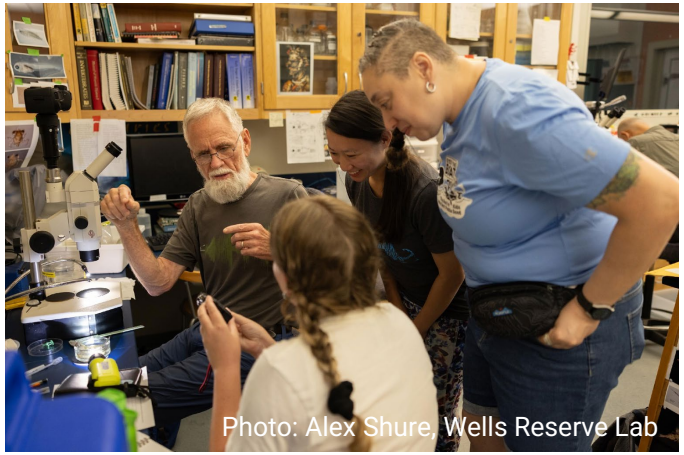


Photo: Alex Shure, Wells Reserve Lab

Frequency
Range
Accessibility

Marine Invader Monitoring and Information Collaborative Est. 2006

Participatory science program

Monitor for 18 common invaders

Rapid Assessment Survey Est. 2000

Scientific expert survey team

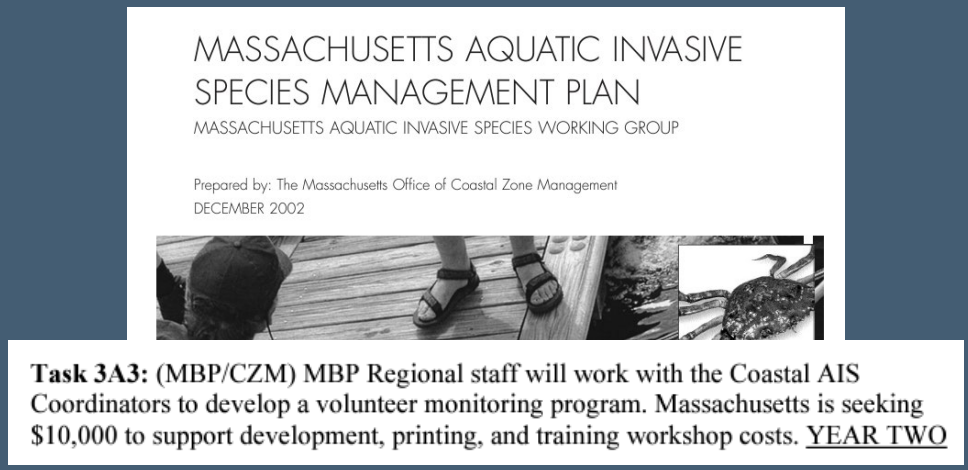
Identify all organisms encountered

Detection
Richness
Precision

What is MIMIC?

History

2002


MASSACHUSETTS AQUATIC INVASIVE SPECIES MANAGEMENT PLAN

MASSACHUSETTS AQUATIC INVASIVE SPECIES WORKING GROUP

Prepared by: The Massachusetts Office of Coastal Zone Management
DECEMBER 2002

Task 3A3: (MBP/CZM) MBP Regional staff will work with the Coastal AIS Coordinators to develop a volunteer monitoring program. Massachusetts is seeking $10,000 to support development, printing, and training workshop costs. YEAR TWO

2006

Marine Invader Monitoring and Information Collaborative Established

- CZM provides training and resources to MIMIC Coordinators
- Salem Sound Coastwatch is contracted to create first set of ID cards
- CZM trains 6 monitoring groups
- 2007 – Full time MIS coordinator at CZM, program evolves and expands

What is MIMIC?

Program structure

CZM: Program Coordination

- Trains coordinators
- Disseminates equipment and materials
- QCs observations
- Collects, synthesizes, and distributes all data

MIMIC Coordinators

- Train volunteer networks
- Coordinate monitoring events
- Collect and submit regional data

MIMIC Volunteers

- Work with MIMIC Coordinator to monitor sites
- Learn about their local coastal ecosystems

What is MIMIC?

Methods

1. Arrive at site / safety check
2. Record environmental data
3. Conduct 1 hour search for MIMIC species
4. Complete MIMIC data sheet
5. Leave no trace

MIMIC Species

Conditions: Can be identified in the field by non-expert, trained volunteers

Colonial and Solitary T unicates



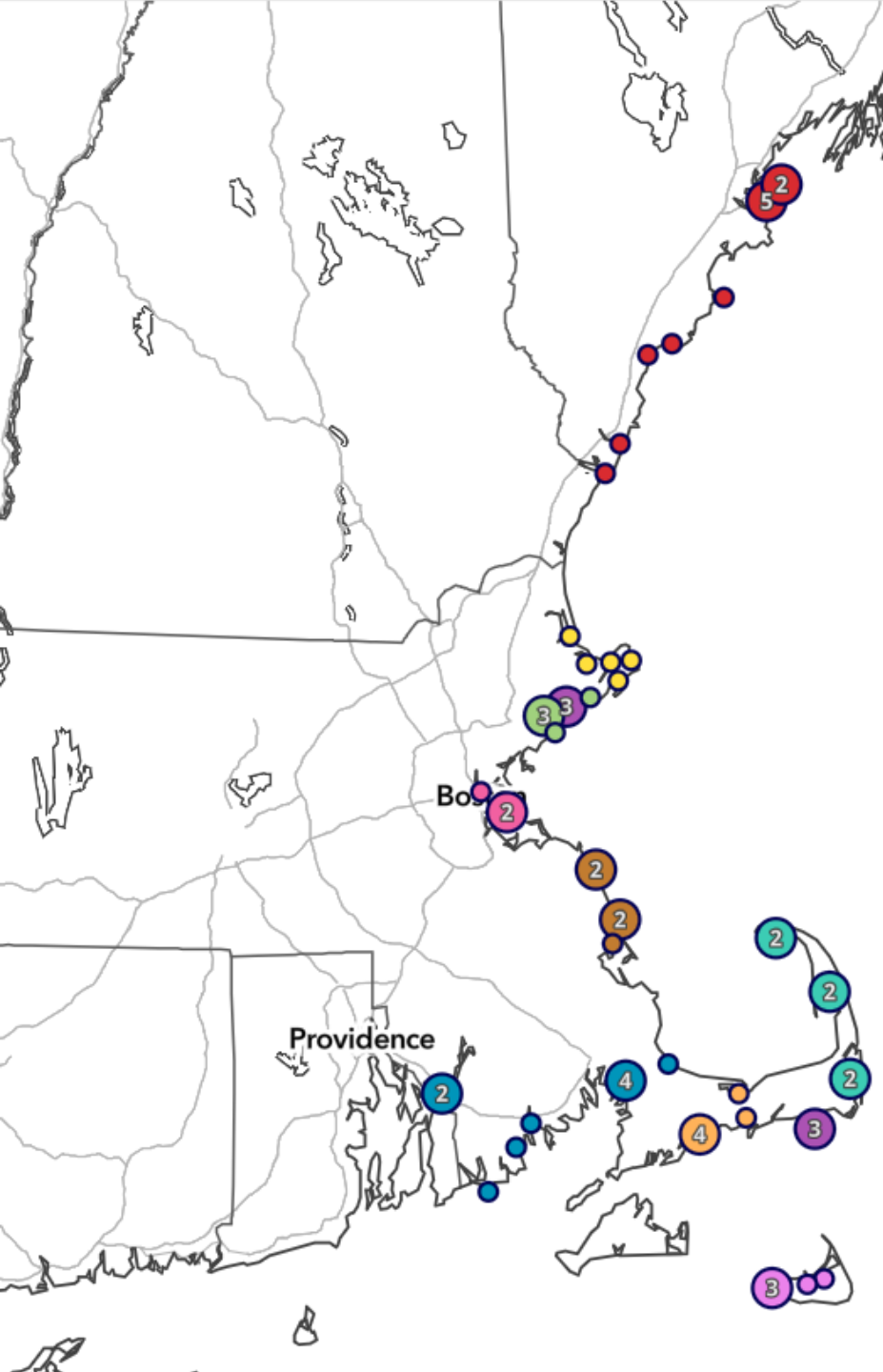

Crustaceans


Bryozoans



Seaweeds

Other



2023 MIMIC Season

64 total sites monitored (60 historic sites, 4 new)

- *160+ sites monitored since 2006*

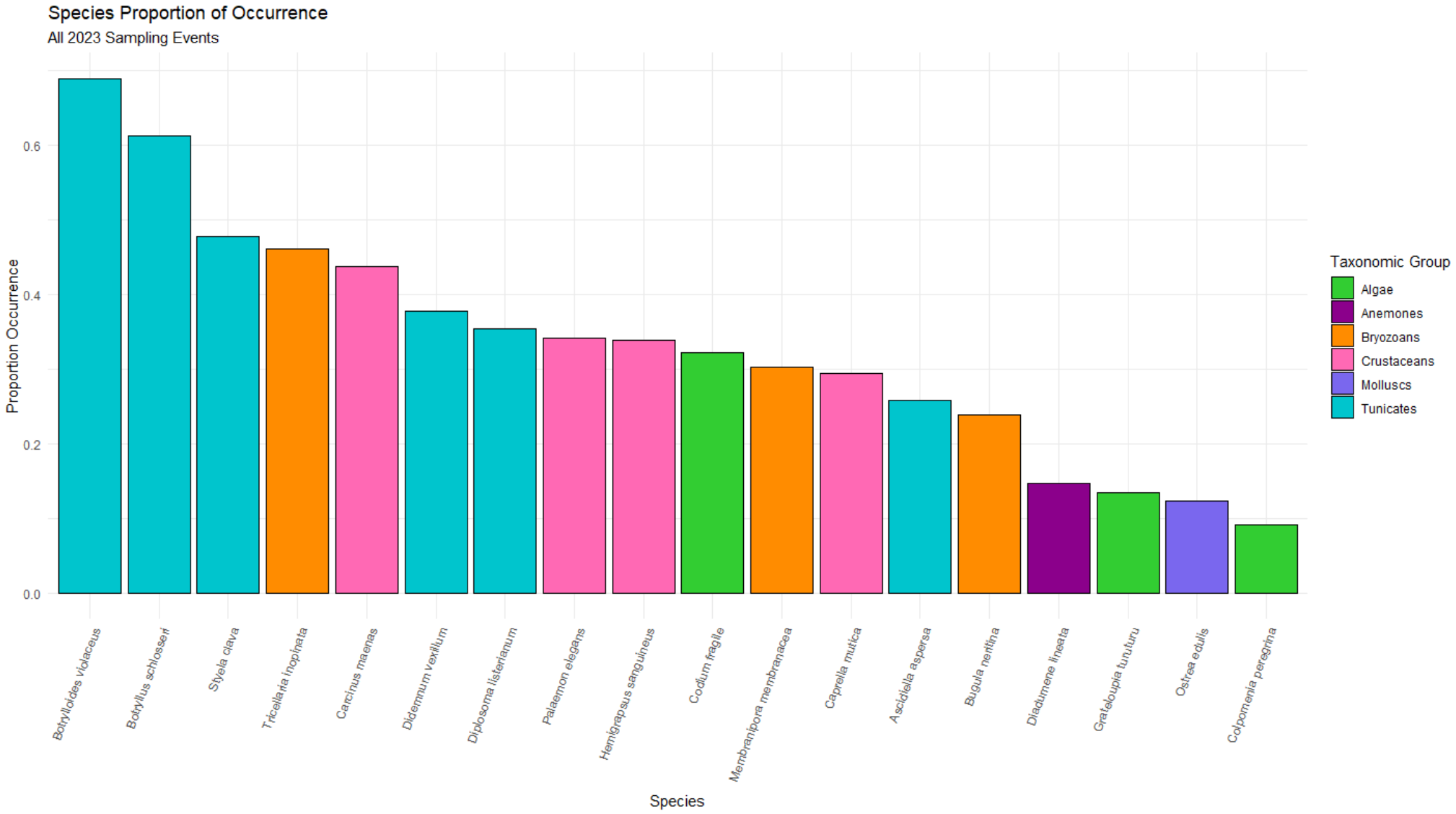
Marinas, tidepools, cobble shores, & dive sites

10 monitoring groups in Maine and Massachusetts

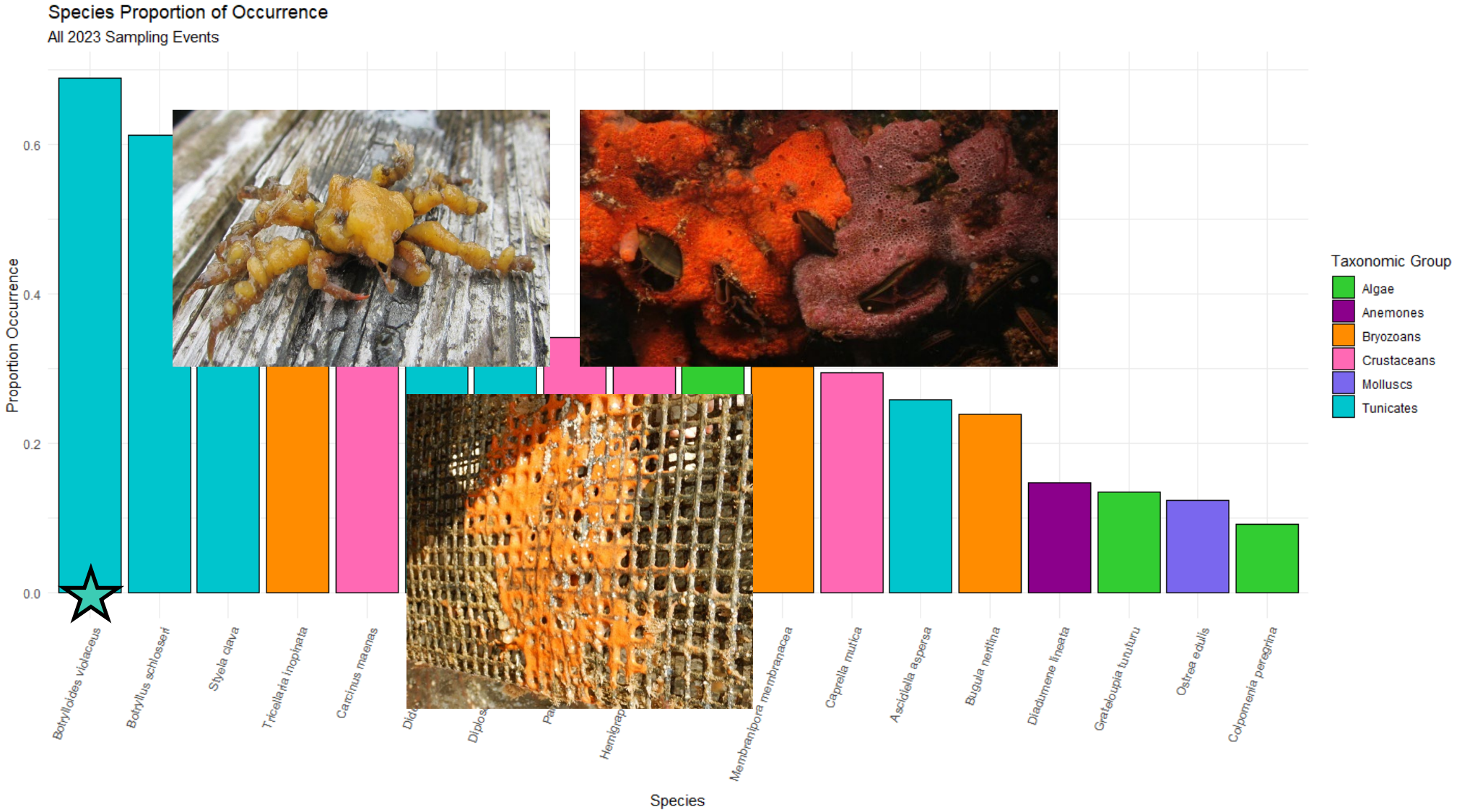
- *30+ groups engaged since 2006*

- Wells NERR
- Mass Maritime Academy
- Center for Coastal studies
- MA Division of Marine Fisheries
- Barnstable Clean Water Action
- Merrimack Valley Planning Commission
- UMB Nantucket Field Station
- North and South Rivers Watershed Association
- Salem Sound Coastwatch
- NPS Boston Harbor Islands

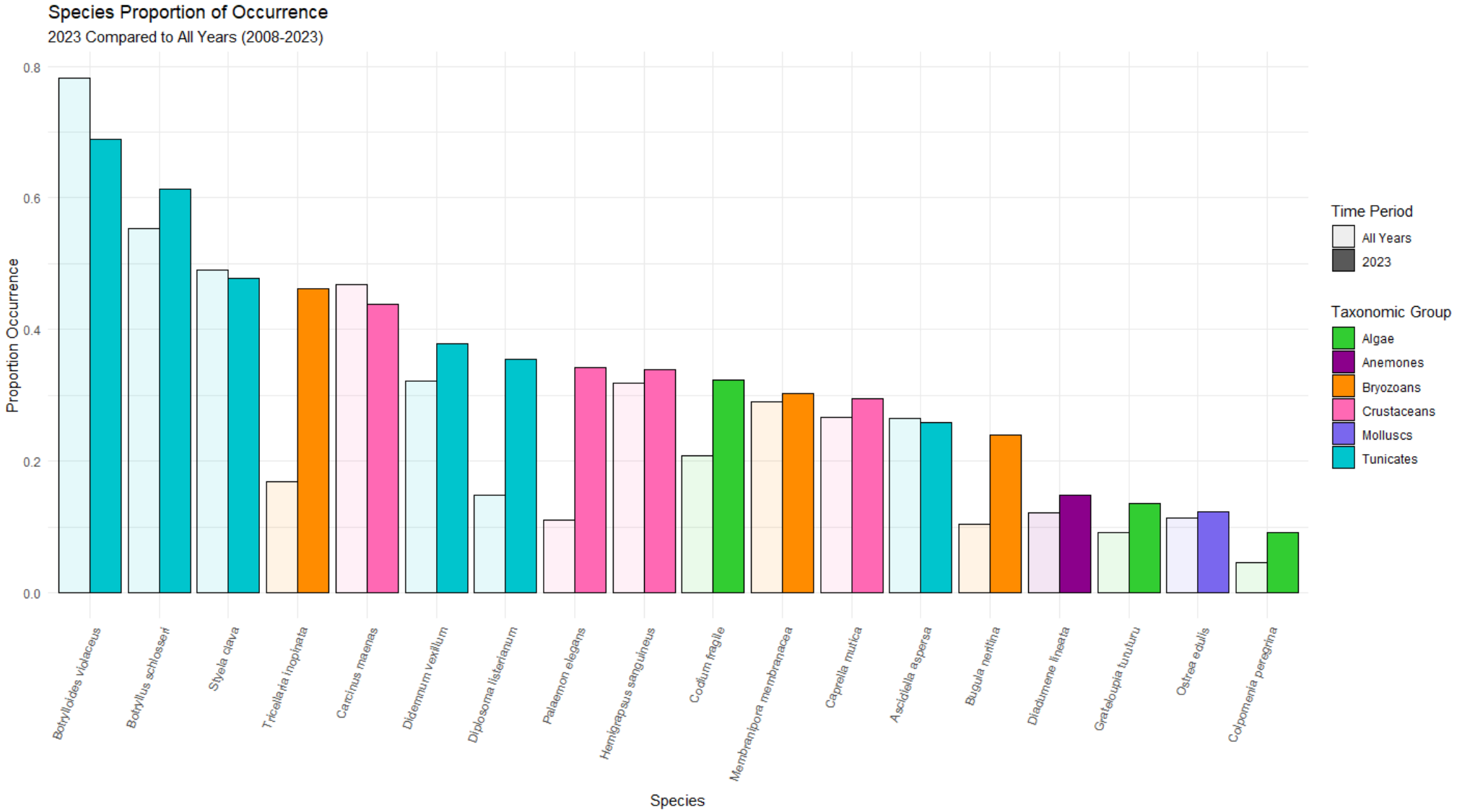
2023 Data Overview



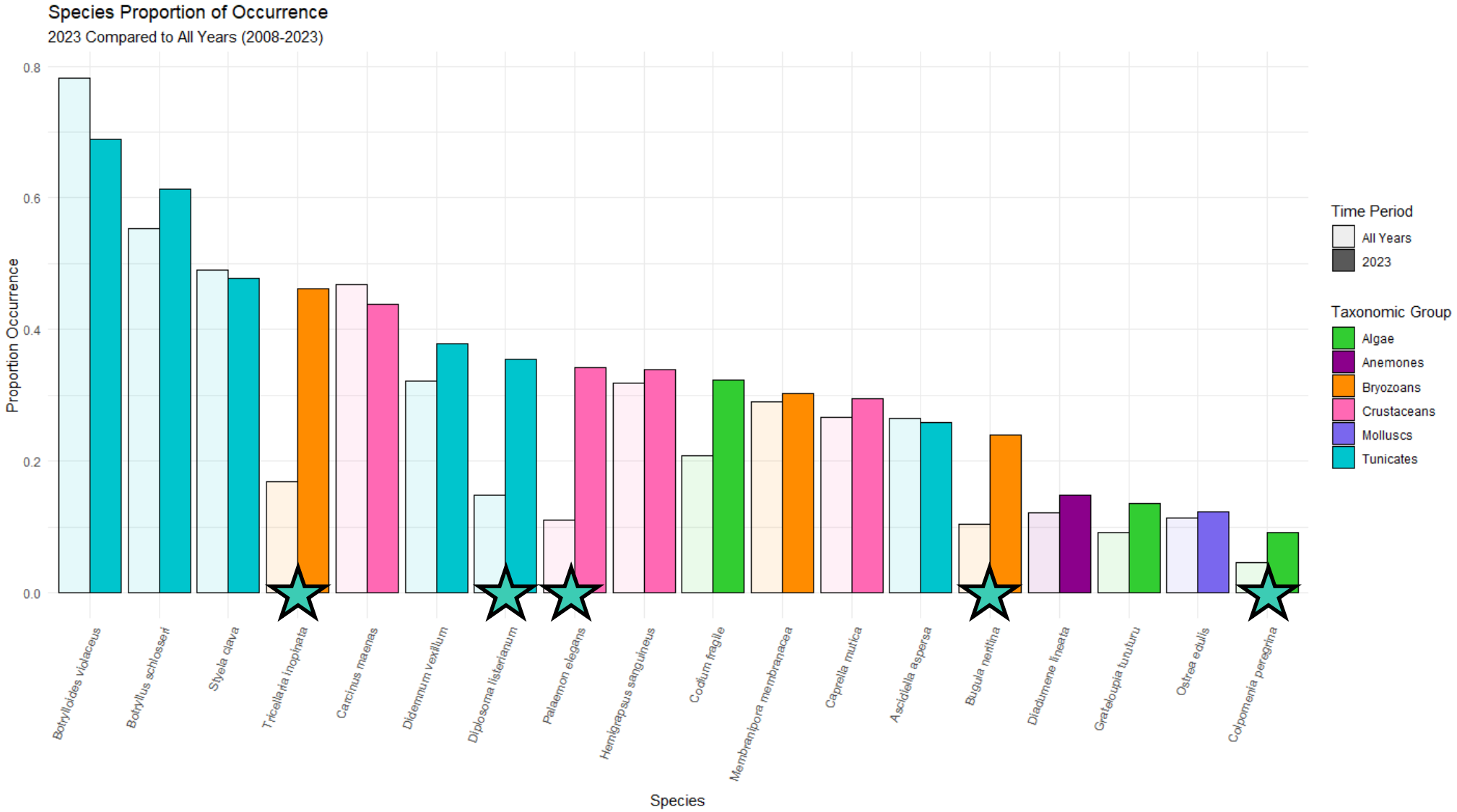
2023 Data Overview



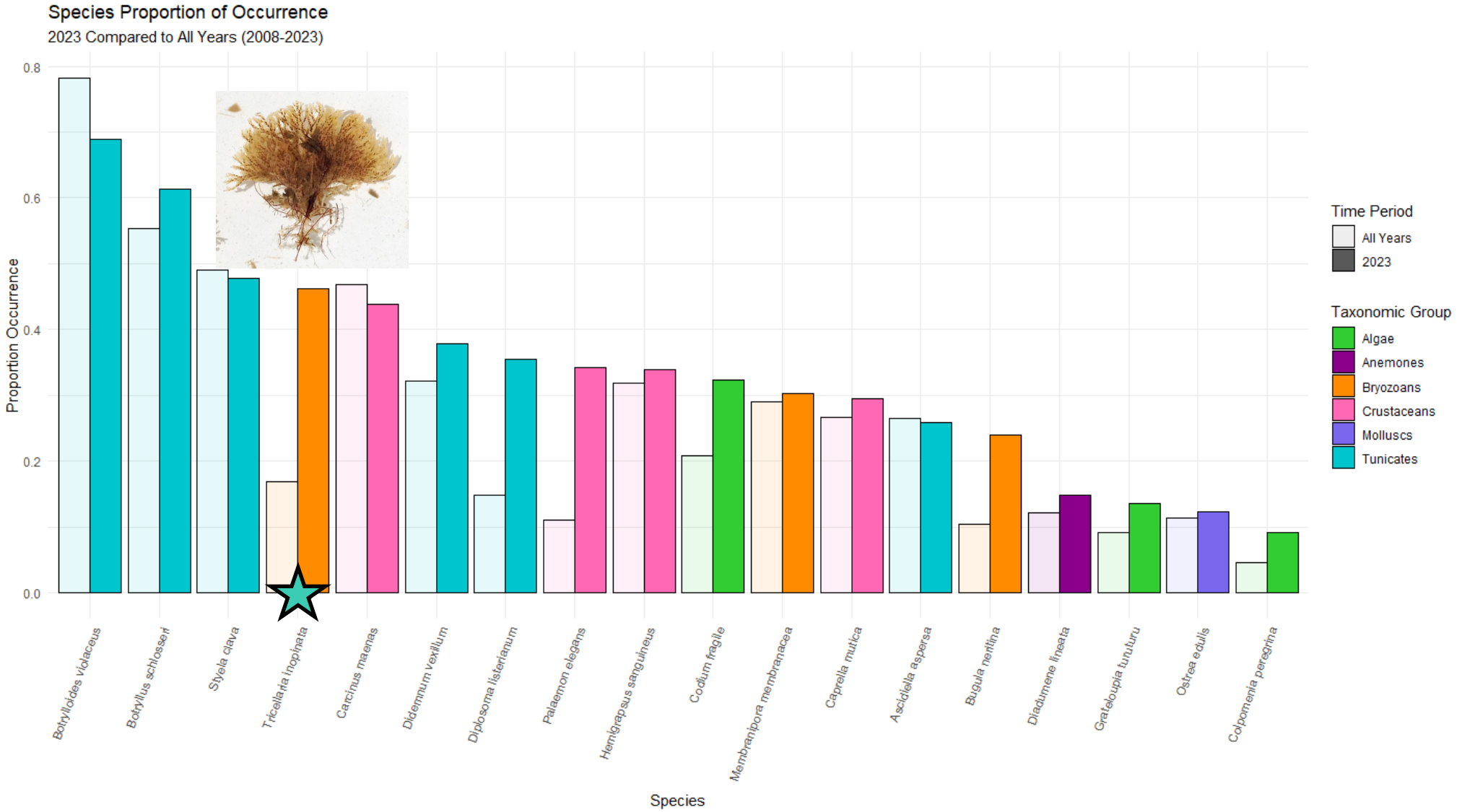
2023 Data Overview



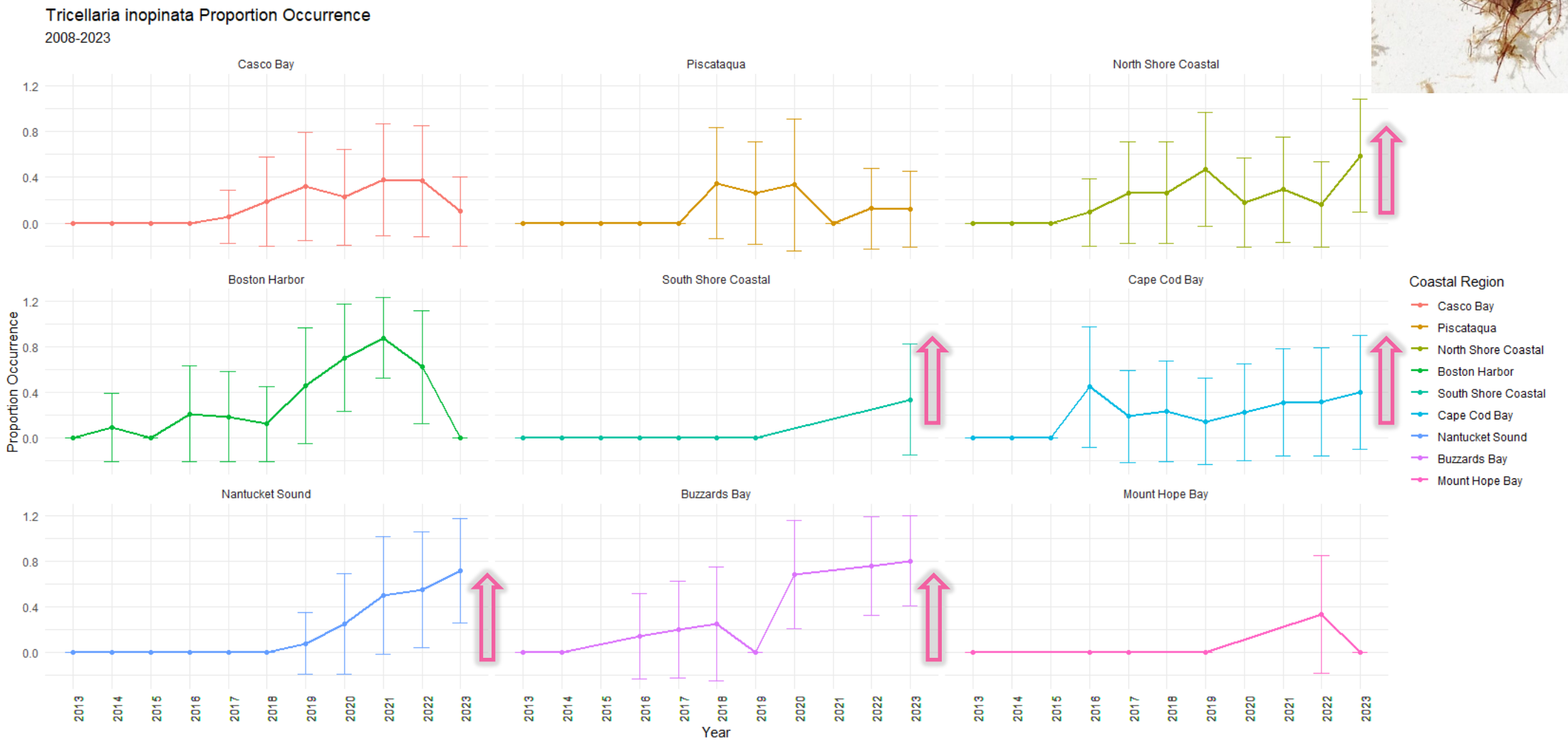
2023 Data Overview



2023 Data Overview



2023 Data Overview



2024 MIMIC Updates

Participation doubled from 2023 season

- 20 groups in 2024 vs. 10 groups in 2023

Geographic reach increase

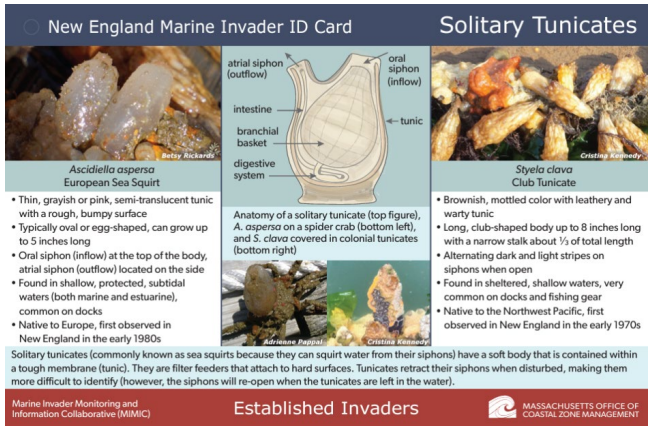
- Monitoring expanded north into Canada (Huntsman Marine Lab)
- South to Rhode Island– program re-established from 2011 (URI)

Photo: Shiela Blair, Hull High School students

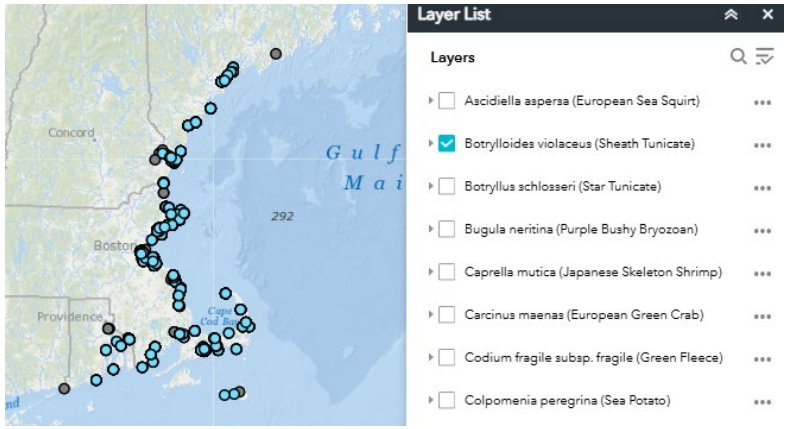
Photo: CZM, EPA dive team training

MIMIC Data & Resources

https://www.mass.gov/info-details/marine-invader-monitoring-and-information-collaborative-mimic

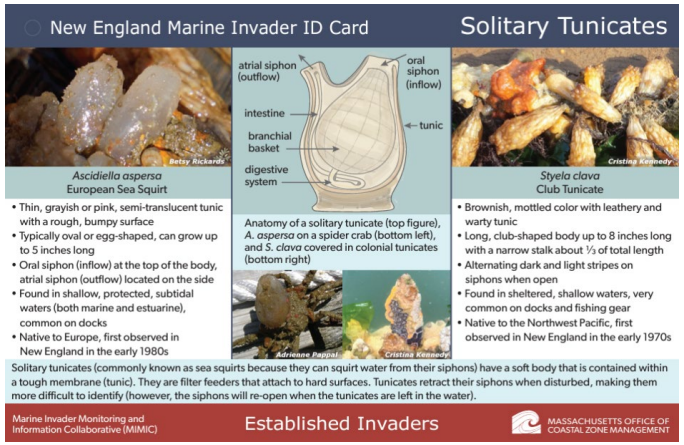


ID cards for all 18 species & MIMIC datasheets



StoryMap of MIMIC data (being updated this winter)

Guidance document for coordinators and volunteers (update incoming)



Frequency
Range
Accessibility

Marine Invader Monitoring and Information Collaborative
Est. 2006

Participatory science program

Monitor for 18 common invaders

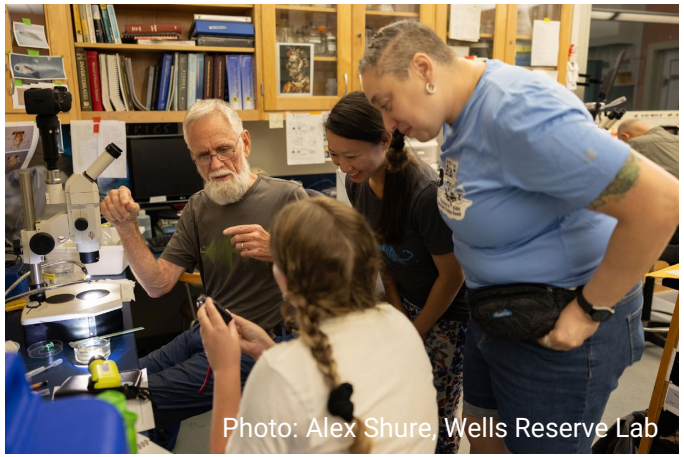


Photo: Alex Shure, Wells Reserve Lab

Rapid Assessment Survey
Est. 2000

Scientific expert survey team

Identify all organisms encountered

Detection
Richness
Precision

What is the RAS?

History

2000

MIT Sea Grant organizes the first New England Rapid Assessment survey.

2002


MASSACHUSETTS AQUATIC INVASIVE SPECIES MANAGEMENT PLAN

MASSACHUSETTS AQUATIC INVASIVE SPECIES WORKING GROUP

Prepared by: The Massachusetts Office of Coastal Zone Management
DECEMBER 2002

Task 3A1: (MIT Sea Grant/MPB/CZM) MIT Sea Grant, CZM, and MBP will work to identify funds to conduct rapid assessments surveys of ports and harbors every five years at an estimated cost of $30,000 per assessment. YEARS THREE-FIVE

2003 - Present

New England Rapid Assessment Surveys

- CZM coordinates northern New England RAS, MIT Sea Grant coordinates southern NE RAS (RI to NY)
- 9 surveys have been completed since 2000
- Academic, government, non-profit, and museum partners across 30+ institutions have participated

Photo: Alex Shure, Beverly Pier

New England RAS

Every 3-5 years

Team of 20-30: Taxonomists, students, and regional experts

Identify **all** invertebrate and algae species encountered

Establish comprehensive, long-term dataset of fouling communities, including new invasions and range expansions

RAS Methods

One Hour Search

Laboratory identifications of live samples

Published RAS Report

2023 Northern New England RAS

Photo: Alex Shure, Wells Reserve

2023 RAS funders

NEANS
NORTHEAST AQUATIC NUISANCE SPECIES PANEL

Buzzards Bay
National Estuary Program

Department of Conservation and Recreation
dcr Massachusetts

Massachusetts Office of Coastal Zone Management
CZM

Casco Bay Estuary Partnership

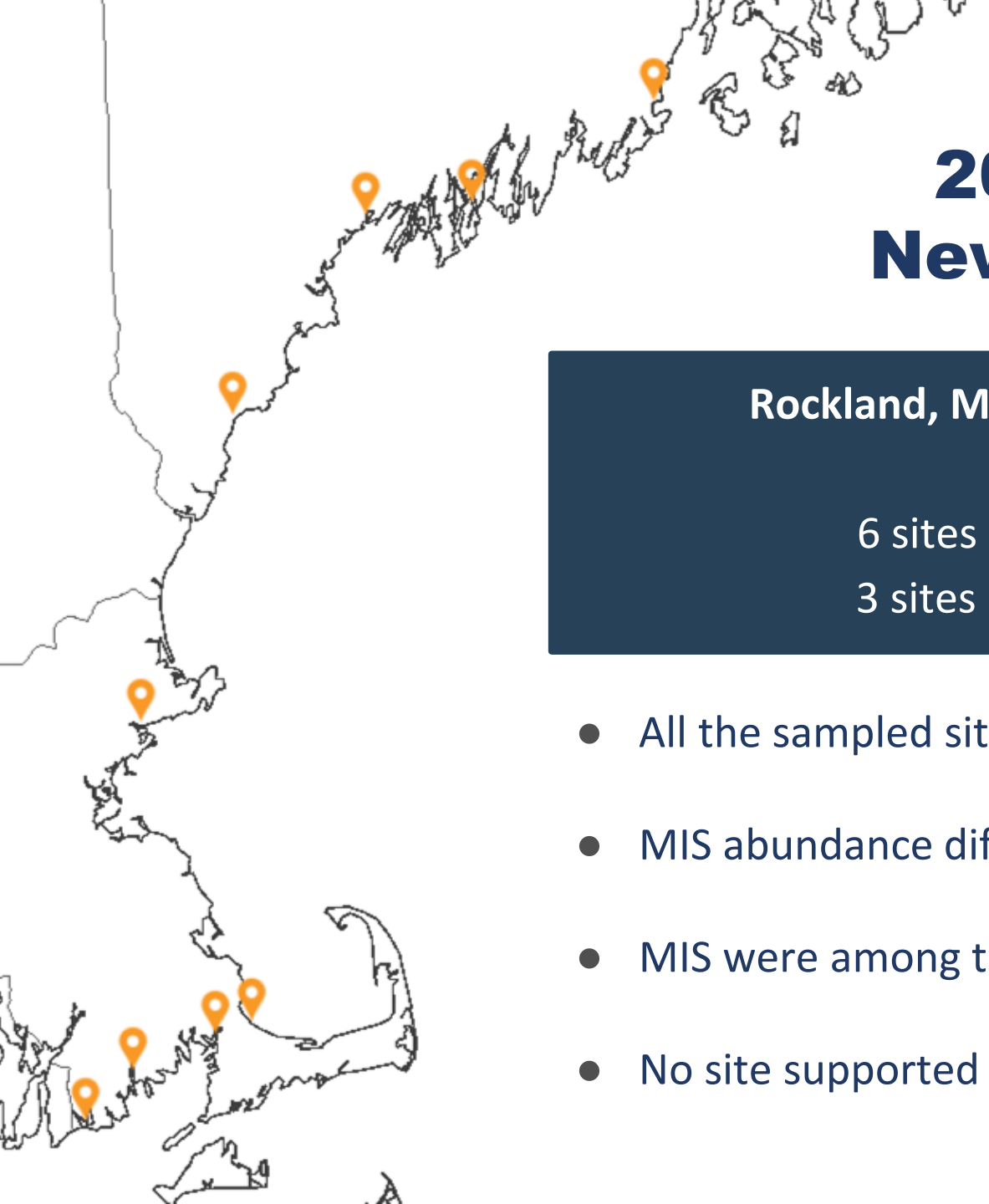
Massachusetts Bays National Estuary Partnership

wellsreserve at laudholm

Massachusetts Maritime Academy
EST 1891


Photo: Alex Shure, Wells Reserve Lab

...and host labs!

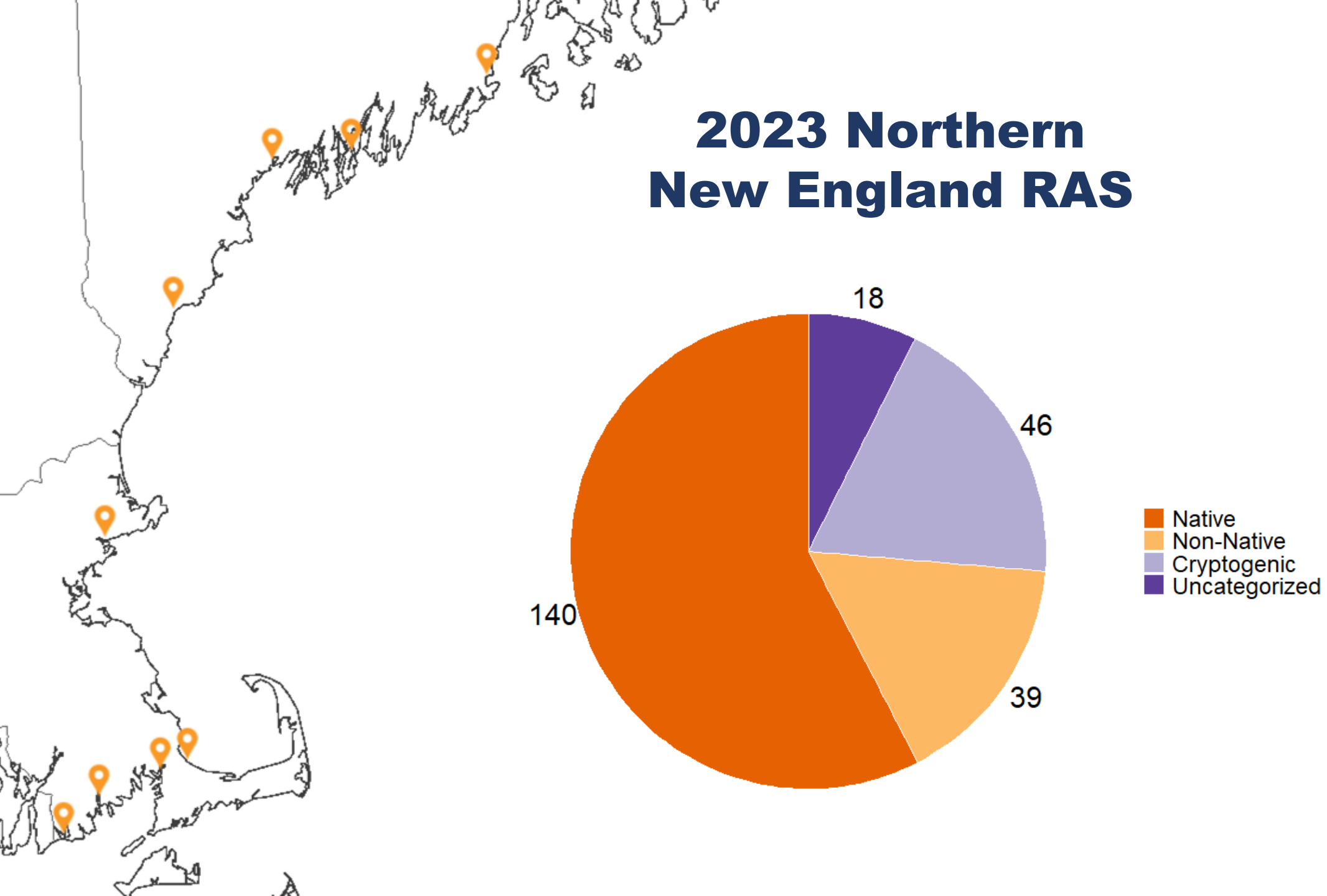


2023 Northern New England RAS

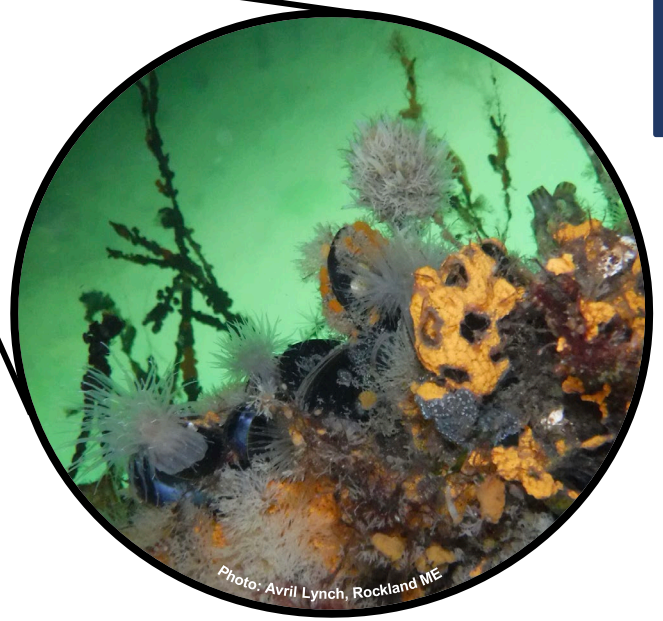
Rockland, Maine to Westport, Massachusetts,
August 7 - 11, 2023
6 sites north of Cape Cod (15-18 °C)
3 sites south of Cape Cod (22-24 °C)

- All the sampled sites had unique fouling community.
- MIS abundance differs between sites and between regions.
- MIS were among the aspect-dominant taxa at 8 of 9 sites.
- No site supported only native species.

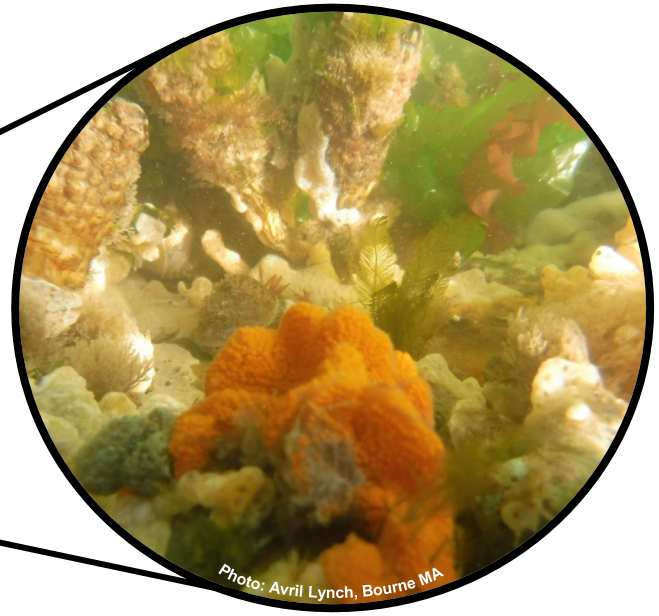
2023 Northern New England RAS



Community Patterns
North & South of Cape Cod

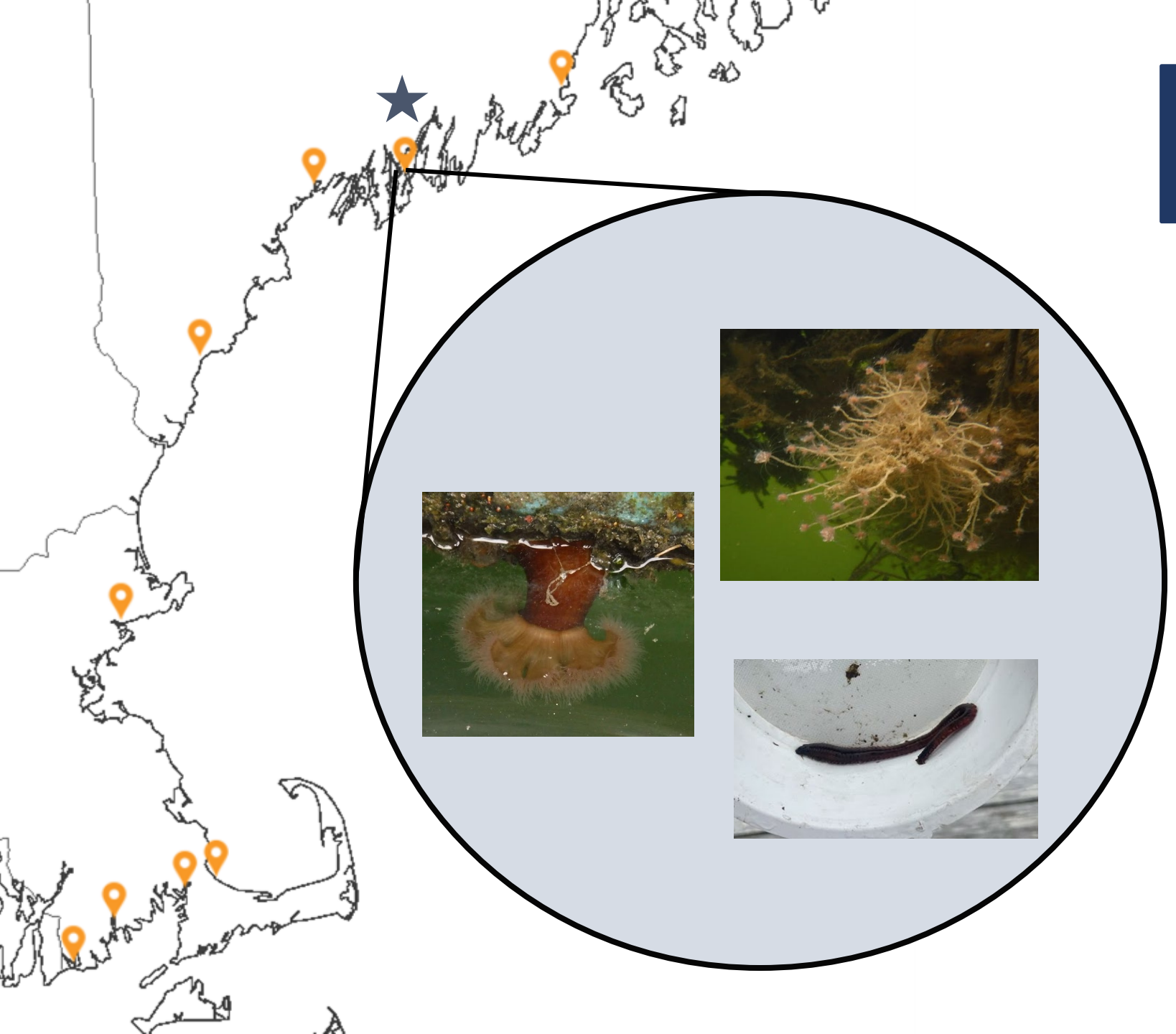


North: adult mussels are the base of fouling communities
+ hydroids, bryozoans, anemones, ascidians, caprellids, kelp, other algae, and more.



South: mussels are present, but base dominated by ascidians and bryozoans.

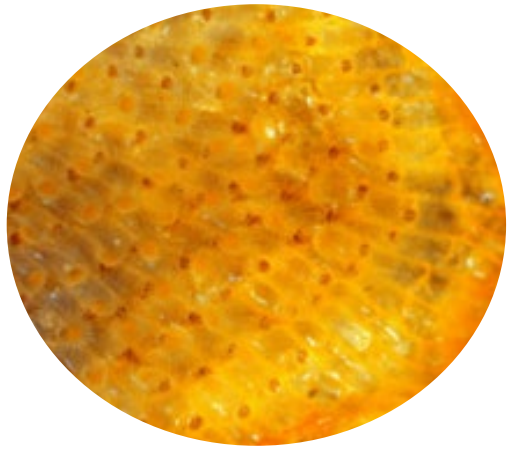
Community Patterns
Environmental / Water Quality



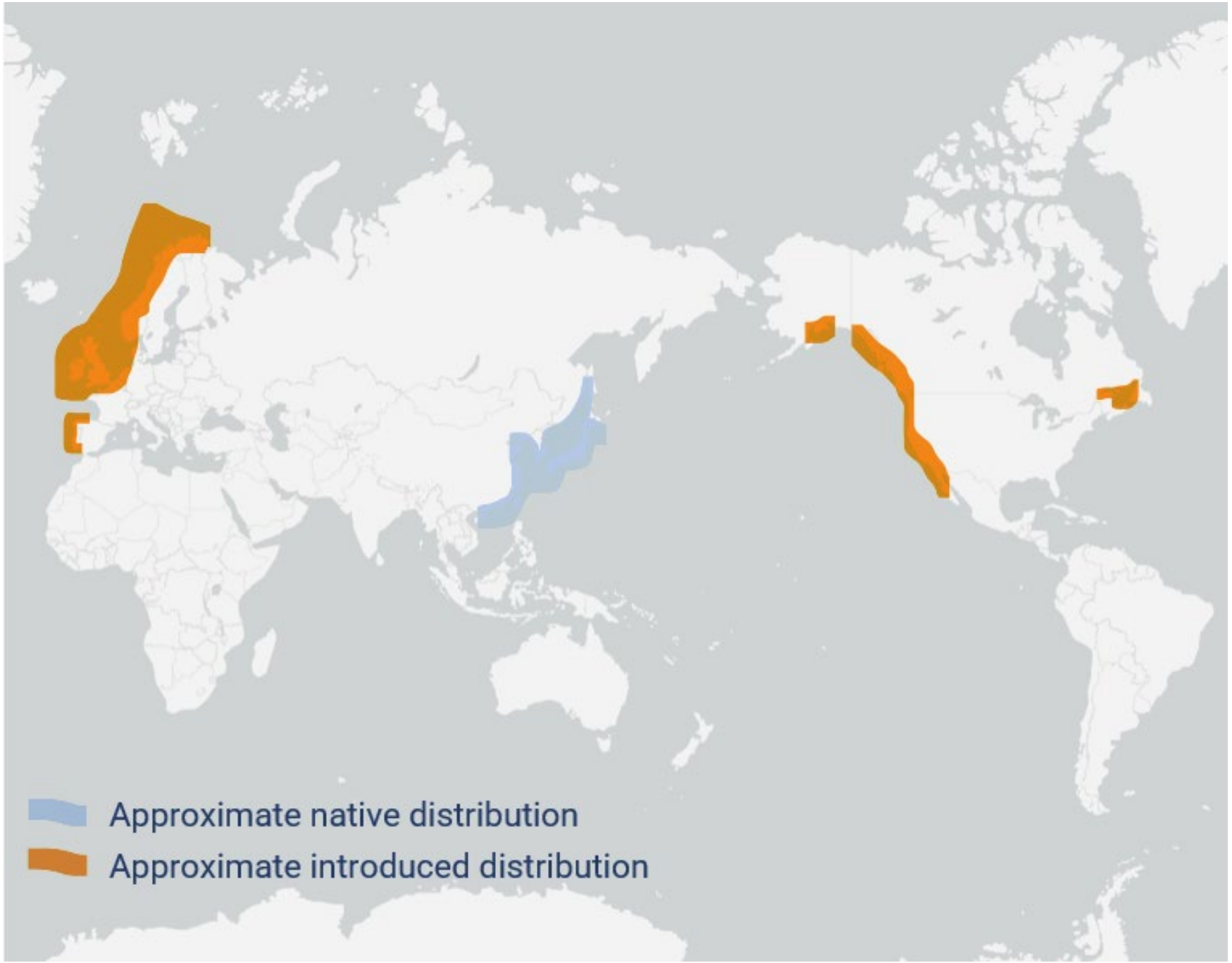
The fouling community in **Georgetown ME** had the lowest salinity and was the coldest site.

It was the only site with native aspect dominant taxa - supporting native hydroids, sea anemones, bivalves, and worms.

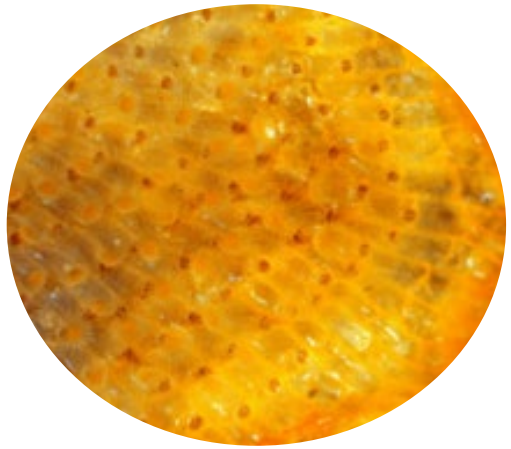
New Invader



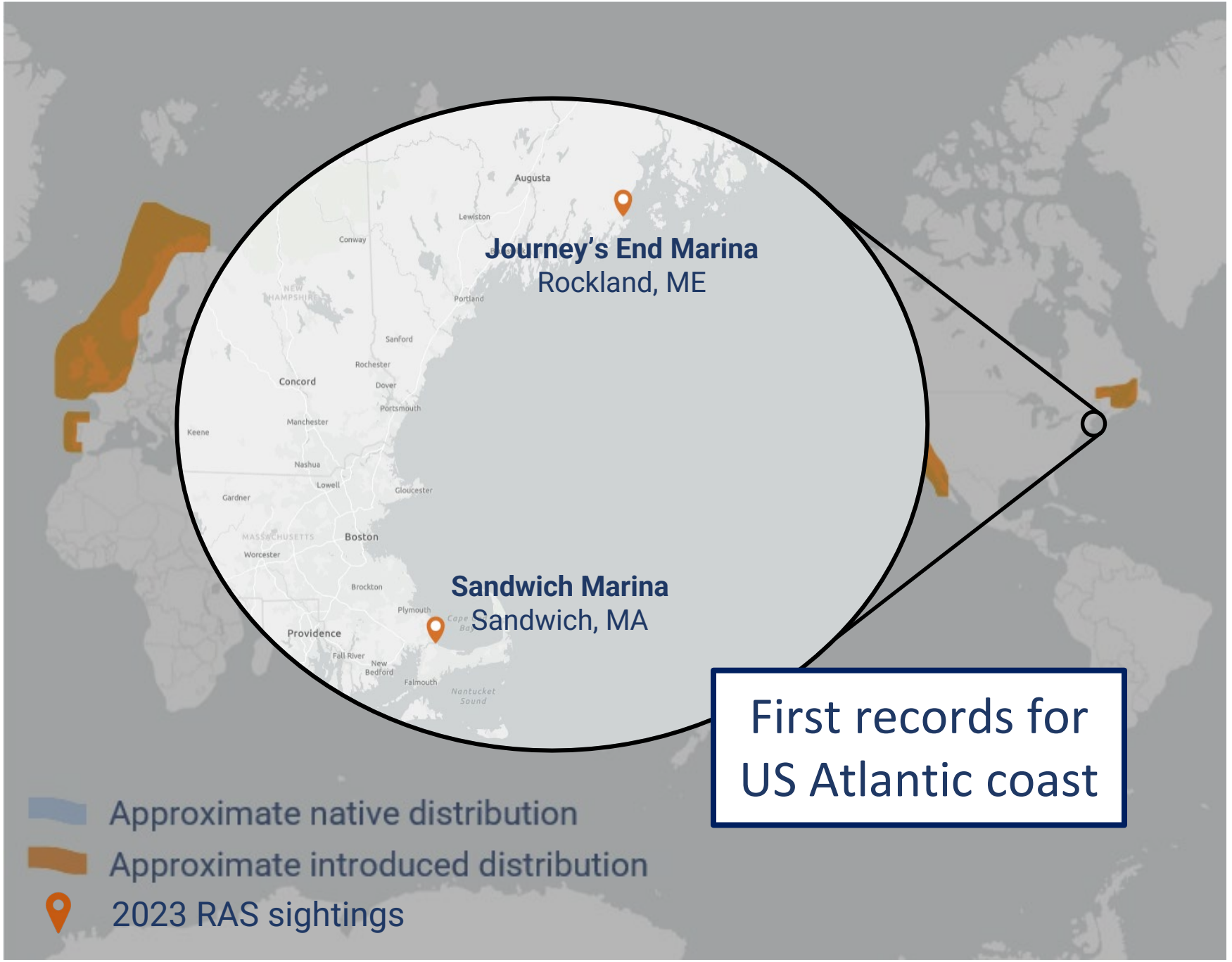
Bryozoan
Schizoporella japonica



New Invader



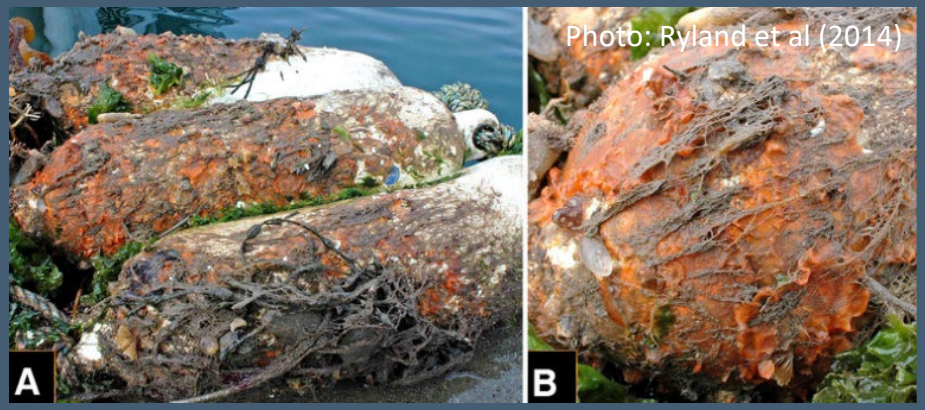
Bryozoan
Schizoporella japonica



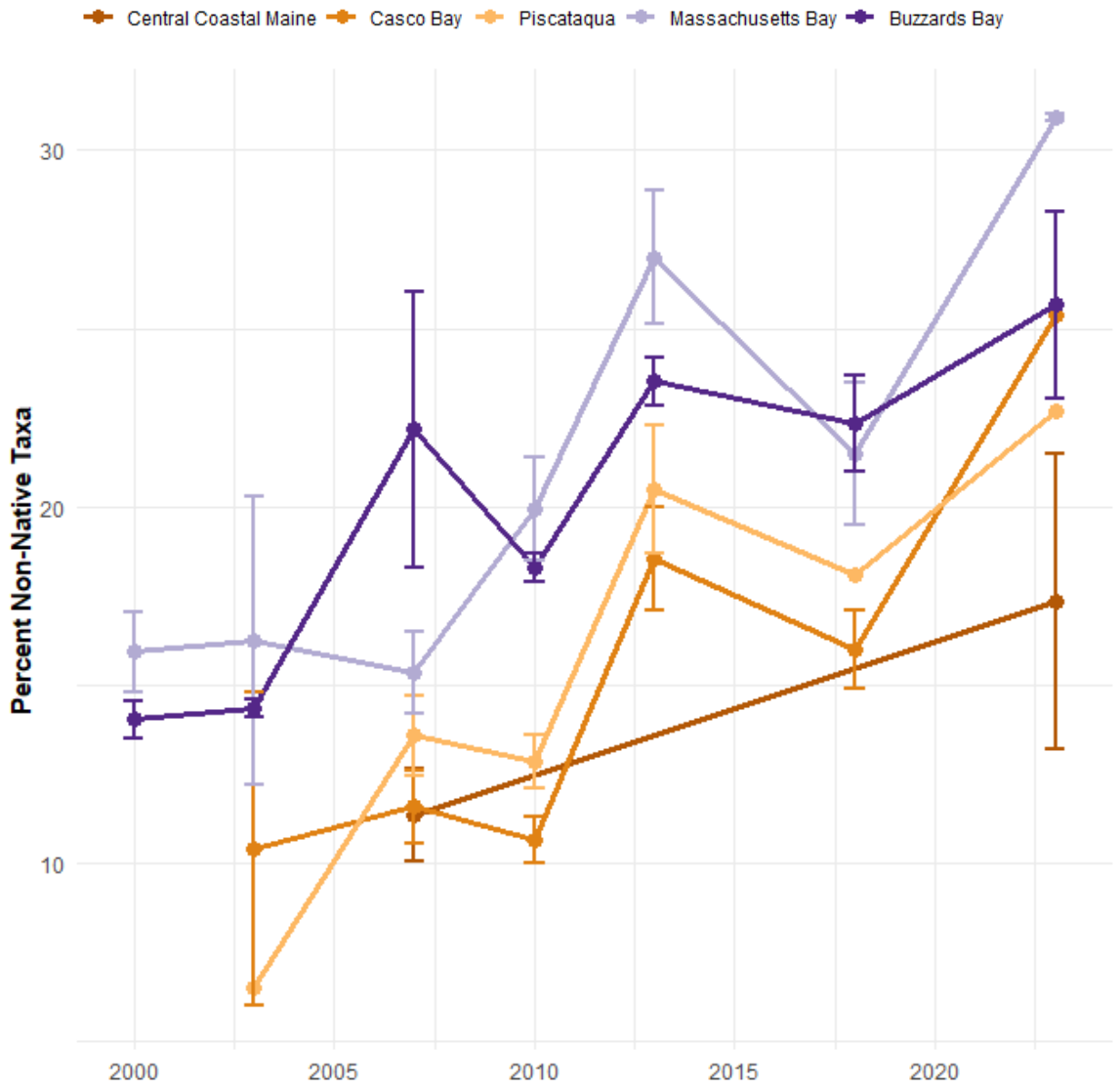
Potential Impacts of Introduced Encrusting Bryozoans

Impacts to native species

Fouling gear and coastal structures



New England RAS: Temporal Trends



Program Impacts

RAS

- Comprehensive, long-term dataset of fouling communities
- Identify new species introductions
- Track range expansions of introduced species over time
- Reclassify species invasion status through time
- Inform MIMIC species list

MIMIC

- Track established species distribution and abundance more frequently across a larger geographic range
- Increase awareness of MIS issues in coastal communities
- Connect communities to the coast through participatory science

QUESTIONS?