



Monitoring introduced marine fouling species in the Gulf of Maine

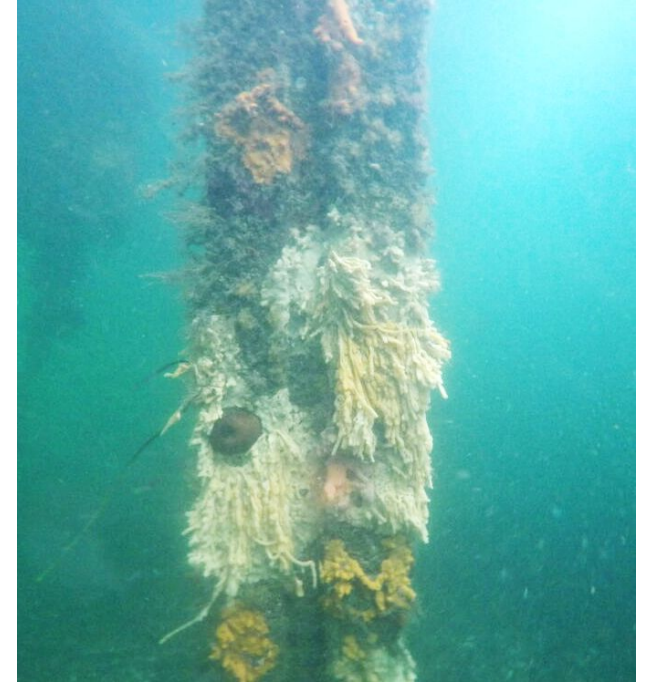


**Gulf of Maine Symposium
April 8, 2025**

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

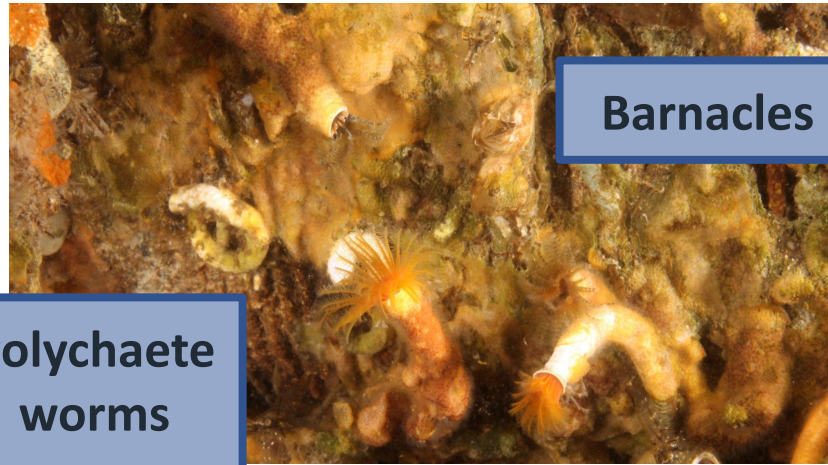
Photo: Alex Shure. Fouling community at the
Public Pier in Beverly, MA on the 2023 RAS.

Marine Fouling Communities



Floating docks, pilings, and other coastal structures

Marine Fouling Communities

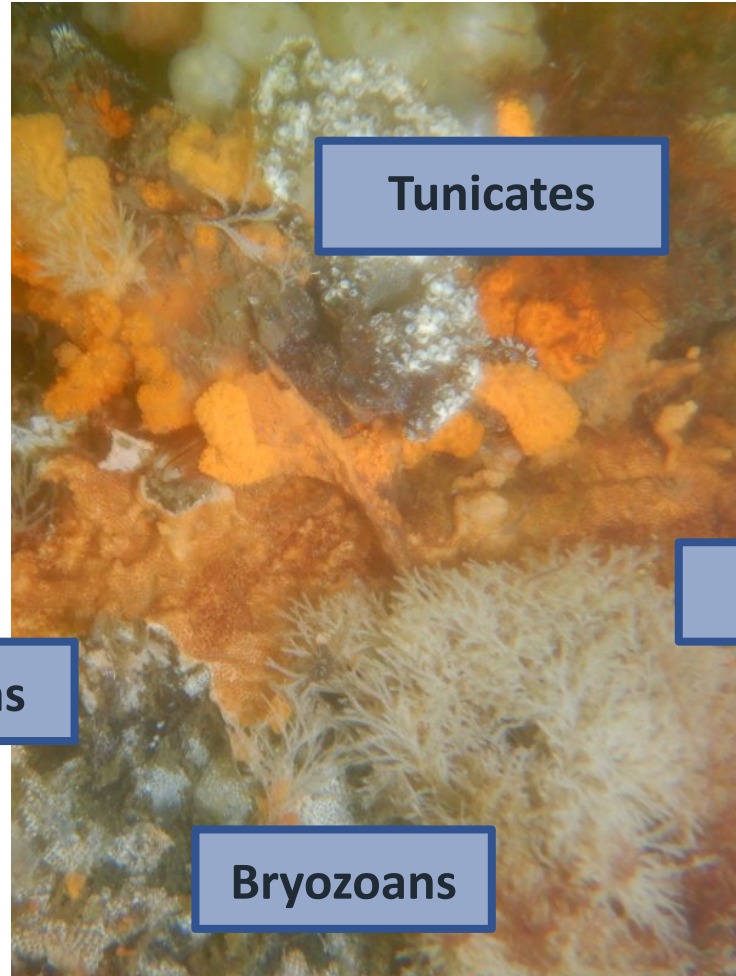


Barnacles

Polychaete
worms

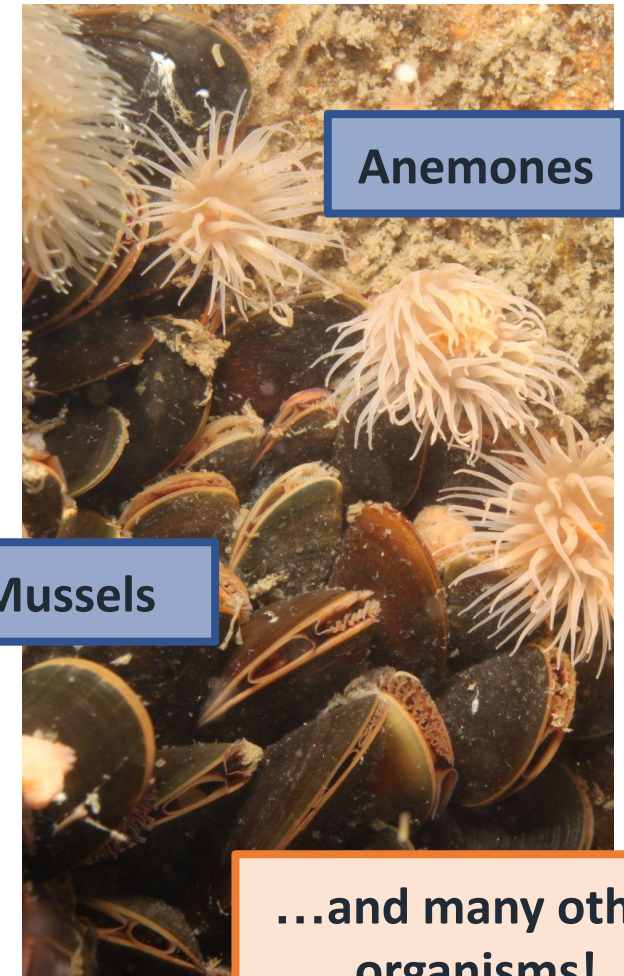


Crustaceans



Tunicates

Bryozoans



Anemones

Mussels

...and many other
organisms!

Marine Bioinvasions: Impacts



Photo: Dr. James Carlton, Beverly, MA

Marine Bioinvasions: Impacts

Competition for food and space



Direct impacts to native species and habitats



Photo: Howarth et al. 2021

Impacts to coastal economies



CZM's Marine Invasive Species Program

Rapid Assessment Survey (RAS) Est. 2000

Scientific expert survey team
Identify all organisms encountered

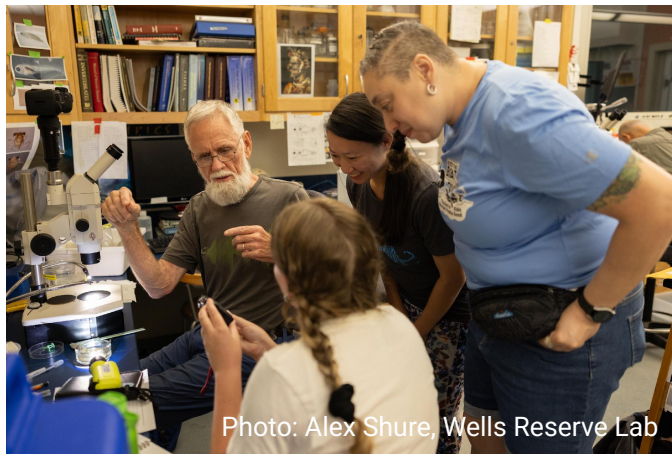


Photo: Alex Shure, Wells Reserve Lab

Marine Invader Monitoring and Information Collaborative (MIMIC) Est. 2006

Participatory science program
Monitor for 18 common invaders

New England Marine Invader ID Card	Solitary Tunicates
 <i>Ascidella aspersa</i> European Sea Squirt	 <i>Styela clava</i> Club Tunicate
• Thin, grayish or pink, semi-translucent tunic with a rough, bumpy surface • Typically oval or egg-shaped, can grow up to 5 inches long • Oral siphon (inflow) at the top of the body, atrial siphon (outflow) located on the side • Found in shallow, protected, subtidal waters (both marine and estuarine), common on docks • Native to Europe, first observed in New England in the early 1980s	• Brownish, mottled color with leathery and warty tunic • Long, club-shaped body up to 8 inches long with a narrow stalk about 1/3 of total length • Alternating dark and light stripes on siphons when open • Found in sheltered, shallow waters, very common on docks and fishing gear • Native to the Northwest Pacific, first observed in New England in the early 1970s
Anatomy of a solitary tunicate (top figure), <i>A. aspersa</i> on a spider crab (bottom left), and <i>S. clava</i> covered in colonial tunicates (bottom right)   	
Solitary tunicates (commonly known as sea squirts because they can squirt water from their siphons) have a soft body that is contained within a tough membrane (tunic). They are filter feeders that attach to hard surfaces. Tunicates retract their siphons when disturbed, making them more difficult to identify (however, the siphons will re-open when the tunicates are left in the water).	
Marine Invader Monitoring and Information Collaborative (MIMIC)	Established Invaders
	

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Detection
Richness
Precision

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Frequency
Range
Accessibility

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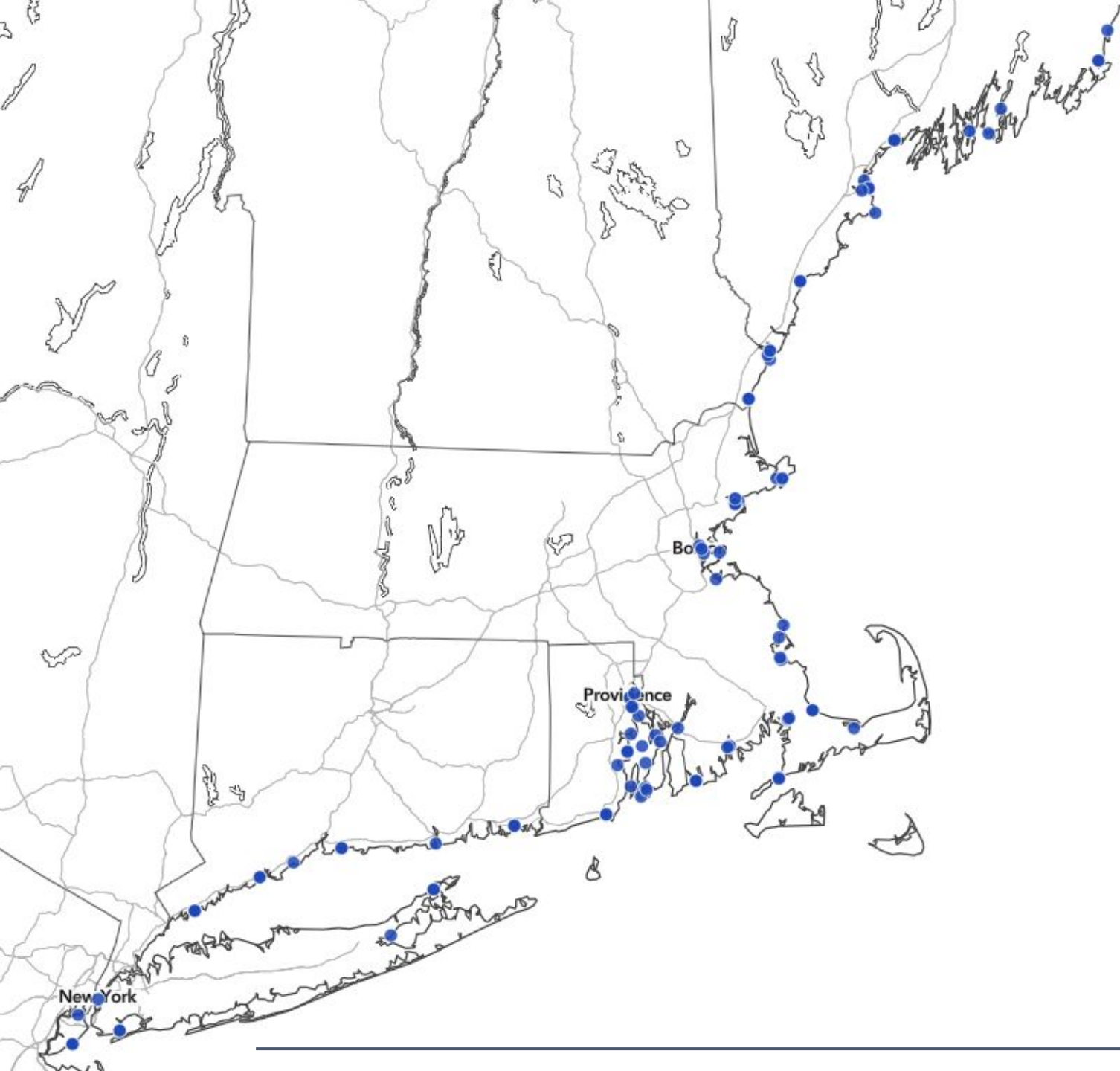
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Marine Invader Monitoring and Information Collaborative (MIMIC)

MASSACHUSETTS OFFICE OF COASTAL ZONE MANAGEMENT

Frequency
Range
Accessibility



RAS Overview

STATS

Survey Years: 2000, 2003, 2007, 2010, 2013, 2018, 2019, 2023, 2024

Geographic Range: New York to Maine

Number of Sites: 72 (33 within the Gulf of Maine)

RAS: Selected Gulf of Maine Findings

2000



Caprella mutica

(Caprellid amphipod from
NW Pacific)

Sites **from RI to MA**, no
previous records from
New England

2010



Palaemon elegans

(Shrimp from NE
Atlantic)

Salem, MA – first North
American record

2013

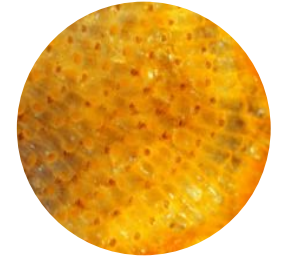


Melita palmata

(Gammarid amphipod
from NE Atlantic)

Boston, MA – one
individual from Rowes
Wharf marina;
establishment unknown

2023

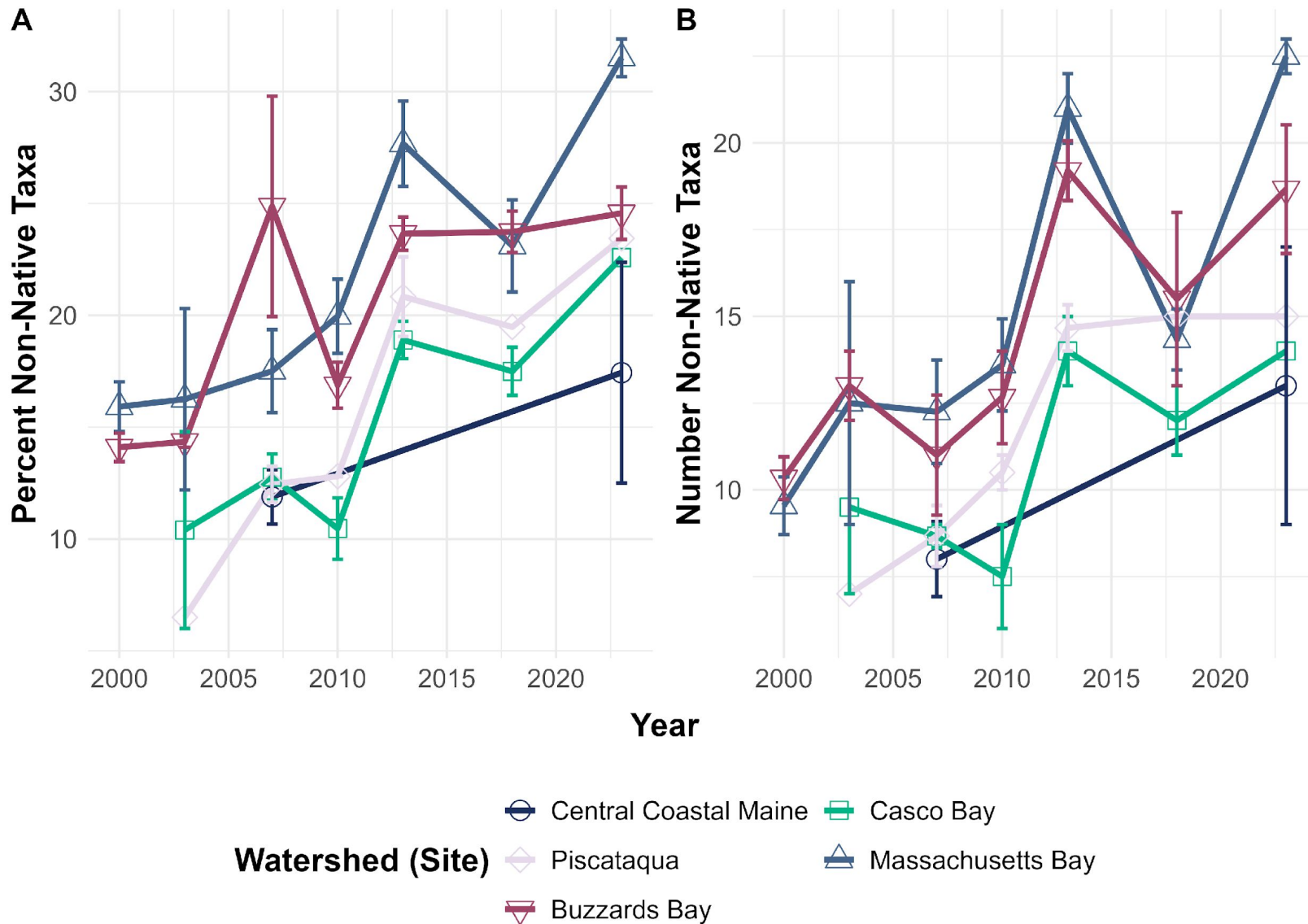


Schizoporella japonica

(Bryozoan from NW
Pacific)

**Sandwich, MA &
Rockland, ME** – first
records from Gulf of
Maine

RAS: Temporal Trends



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Marine Invader Monitoring and Information Collaborative (MIMIC)	

Frequency
Range
Accessibility

MIMIC Overview

STATS

Geographic Range:
Rhode Island to New Brunswick

All time (2008 – 2024)

- 181 sites
- 32 monitoring groups
- 1000+ individual participants

2024 Monitoring Season

- 89 sites
- 20 monitoring groups
- 300+ individual participants



MIMIC Species

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

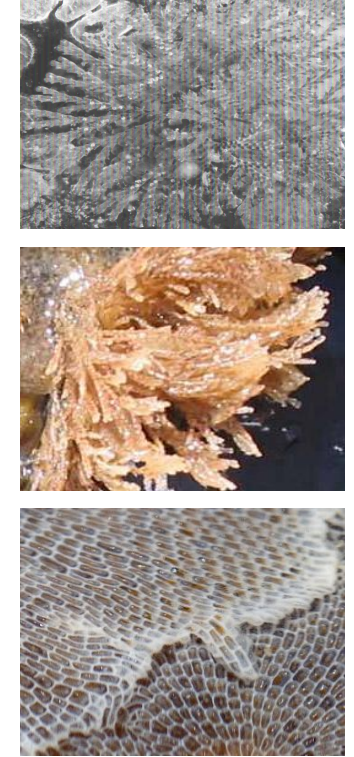
Colonial and Solitary Tunicates



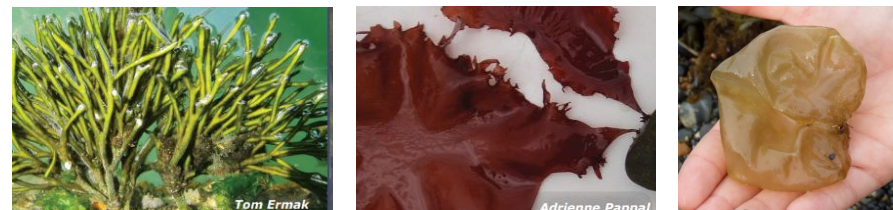
Crustaceans



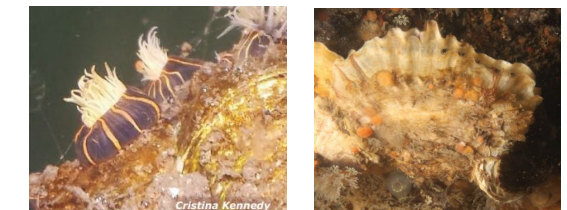
Bryozoans



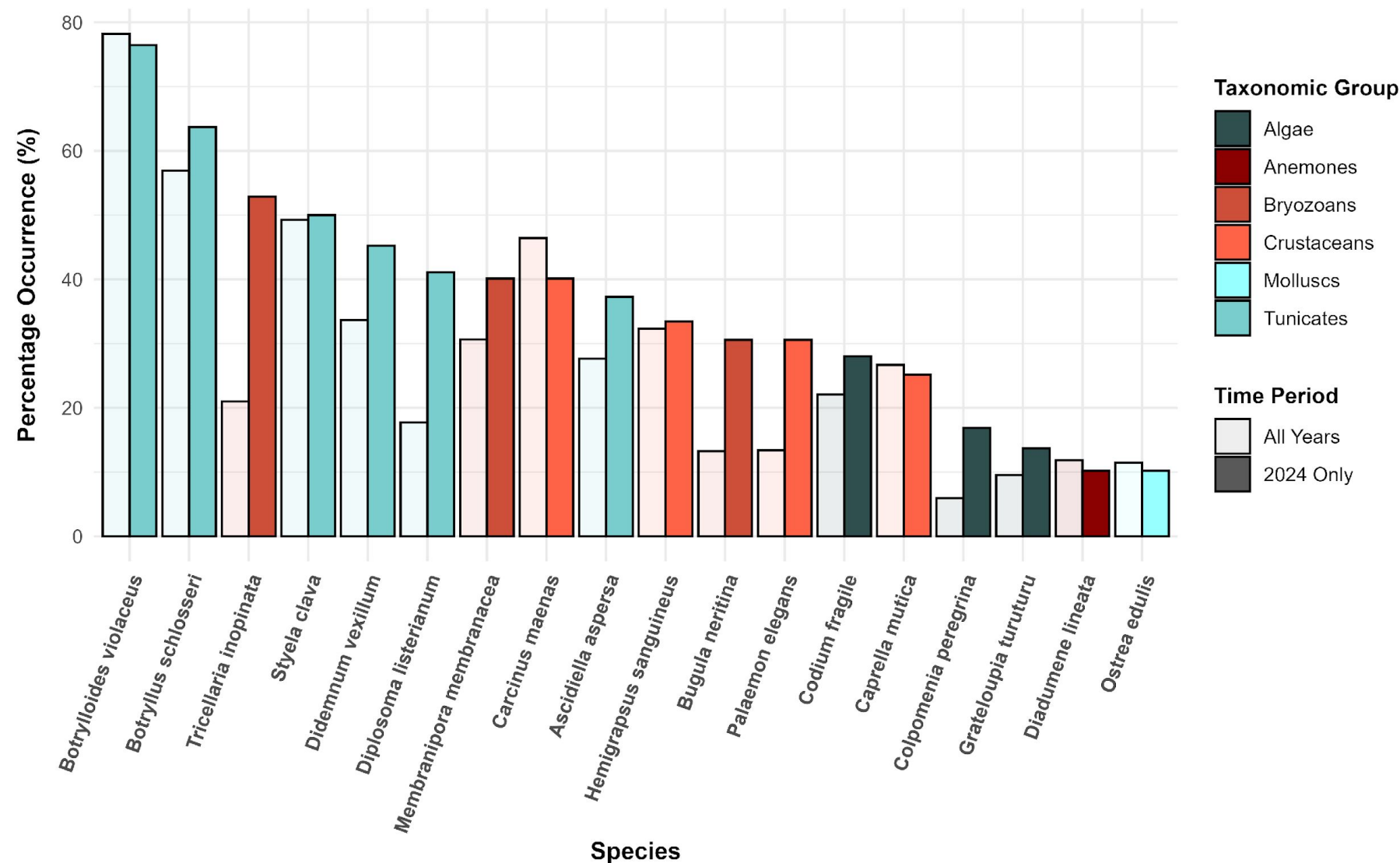
Seaweeds



Other



MIMIC Species Occurrence



MIMIC Temporal Trends



RAS & MIMIC

2010 RAS



Palaemon elegans is identified at Hawthorne Cove Marina in Salem, MA



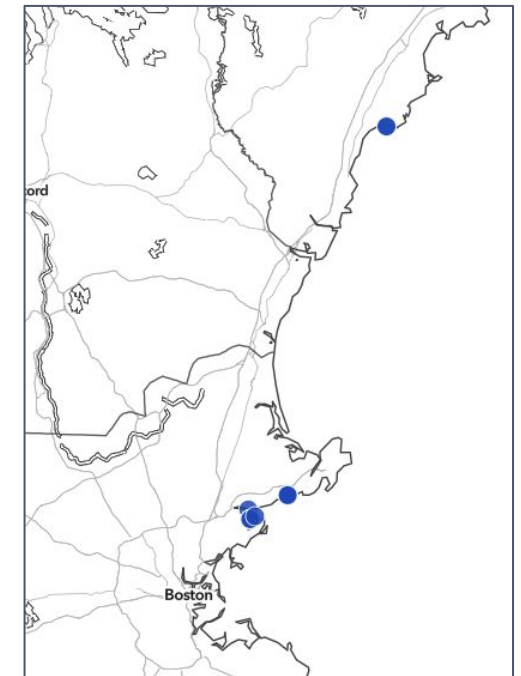
2010 – 2011

New England Marine Invasive Species Amphipods and Shrimp

 <i>Caprella mutica</i> Japanese Skeleton Shrimp Gretchen Carlson	 <i>Palaemon elegans</i> European Rock Shrimp Adrienne Pappal
• Mottled red body with a ridge of small spines along back • Males can be over 2 inches long, first two body segments are smooth and very long, giving the appearance of a long bent neck • Females are smaller with a brood pouch with red spots • Native to the north Pacific coasts of Asia, now common throughout New England, especially on docks and pilings  Photo: J. H. Hines	• Mostly translucent body with dark red-brown bands, neon blue claws, and orange/blue bands on legs • Can be up to 2.5 inches long • Distinct, shovel-shaped rostrum has 7 to 9 teeth across the top • Occurs near docks, in tide pools, and in salt marsh creeks • Found from Connecticut to Maine, range is expanding  Photo: J. H. Hines
Skeleton shrimp are a large family of caprellid amphipods with a long body, large front claws, long antennae, and hind legs that cling to surfaces (see photo above of <i>C. mutica</i> clinging to a colonial tunicate). Caprellids are often highly animated and can be seen "waving" back and forth in large groups. First observed in New England in 2010, <i>P. elegans</i> belongs to the grass shrimp family, which includes both native and non-native species. The body includes a long pair of antennae, a serrated rostrum, and five pairs of legs. The first two pairs of legs have small, slender claws.	
Marine Invasive Monitoring and Information Collaborative (MIMIC) Established Invaders MASSACHUSETTS OFFICE OF COASTAL ZONE MANAGEMENT	



2011 MIMIC Season



Palaemon elegans is found at 5 sites, as far north as Kennebunk, ME

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



THANK YOU!

And thank you to the many, *many* MIMIC and RAS co-organizers, collaborators, participants, and funders!

