Marine Invasive Species Report

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June 2025

Overview

Biological invasions have emerged as one of the leading environmental threats to our coastal and marine habitats. Marine invasives are species that have been moved beyond their natural geographic range, either deliberately or unintentionally, by human activities. These introduced species often reproduce in large numbers and outcompete native species for food and space. With no natural controls to keep their numbers in check, these invaders can have damaging effects on our local waters.

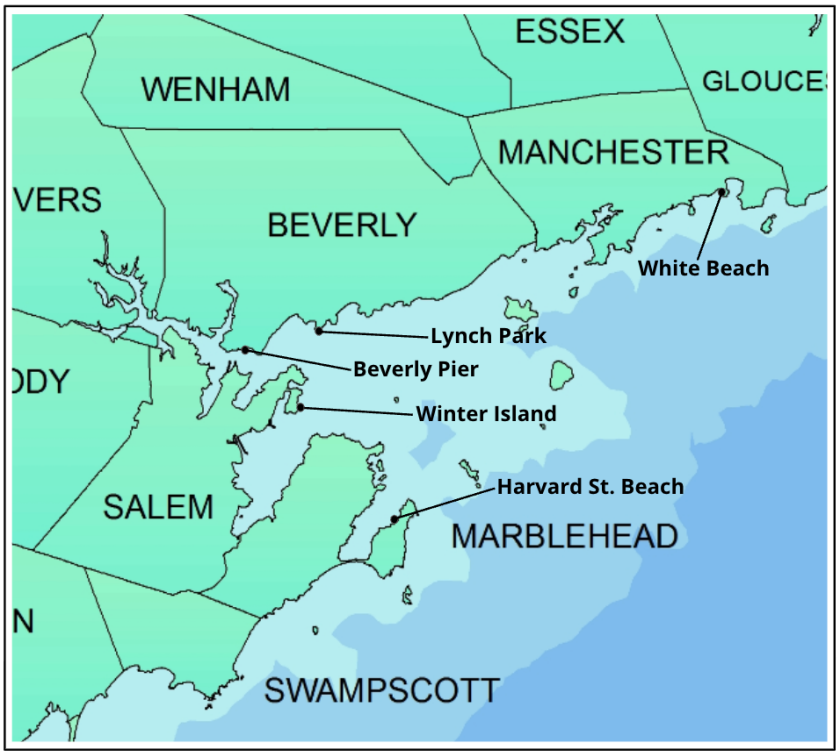
Salem Sound Coastwatch has monitored marine invasive species at docks, in tidepools, and along the rocky shore every summer for the past 20+ years with the help of community science volunteers. We are on the lookout for a variety of invasive crustaceans, tunicates, and seaweeds, among others!

As a founding member of the Marine Invader Monitoring and Information Collaborative (MIMIC), we share the data our volunteers collect with the MA Office of Coastal Zone Management, who tracks of the abundance of marine invaders along the North Atlantic coast.

A selection of the 18 marine invasive species identified in the MIMIC survey protocols.

Monitoring Locations

Since 2008, Salem Sound Coastwatch has been monitoring marine invasive species once per month in June, July, and August, at five locations within Salem Sound. These locations represent a variety of habitats including cobble beaches at Harvard Street Beach (Marblehead), Lynch Park (Beverly), and White Beach (Manchester); under docks at the Public Pier (Beverly); and in tidepools at Winter Island (Salem). During each monitoring survey, staff and volunteers look for 18 designated marine invasive species and record their presence and abundance.



Locations of the five monitoring sites in Salem Sound.

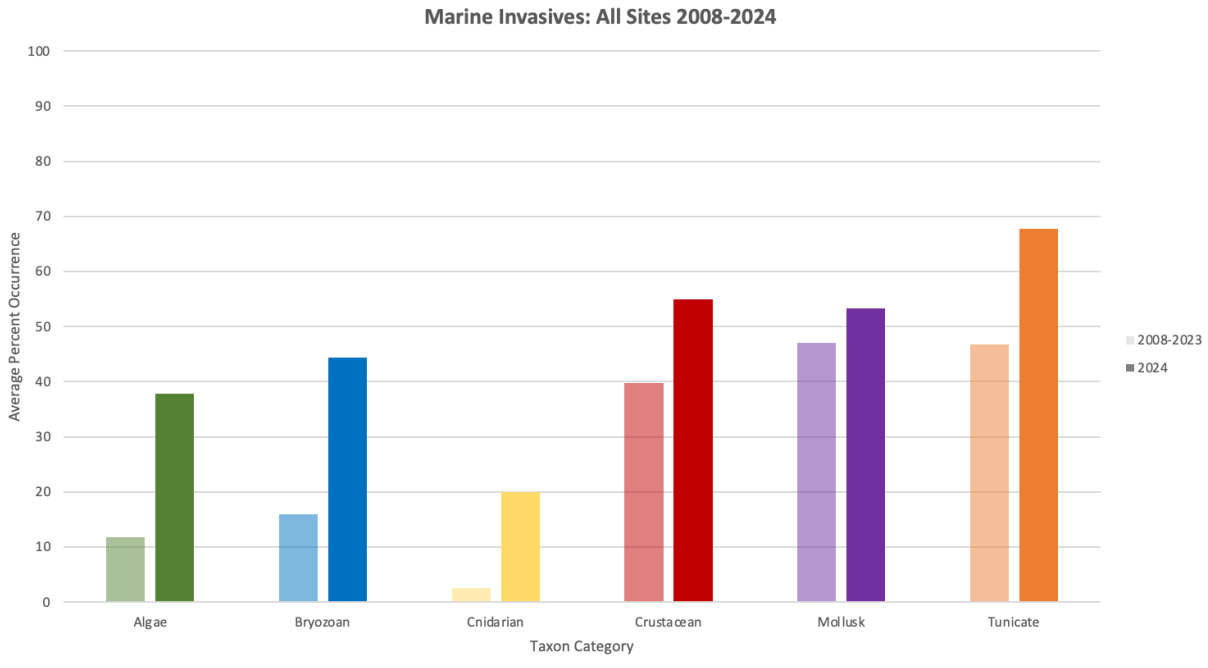
Results

All Sites

All 18 marine invasive species have been categorized based on their taxonomic group:

- "Algae" represents three species: Red Algae (*Grateloupia*), Green Fleece (*Codium*), and Sea Potato (*Colpomenia*).
- "Bryozoan" represents three species: Lacy Crust (*Membranipora*), Unexpected Bryozoan (*Tricellaria*), and Purple Bushy Bryozoan (*Bugula*).
- "Cnidaria" represents one species: Orange-striped Anemone (*Diadumene*).
- "Crustacean" represents four species: European Green Crab (*Carcinus*), Asian Shore Crab (*Hemigrapsus*), Japanese Skeleton Shrimp (*Caprella*), and European Rock Shrimp (*Palaemon*).
- "Mollusk" represents one species: European Oyster (*Ostrea*).
- "Tunicate" represents six species: European Sea Squirt (*Ascidiella*), Club Tunicate (*Styela*), Sheath Tunicate (*Botrylloides*), Golden Star Tunicate (*Botryllus*), Mystery Tunicate (*Didemnum*), and Diplosoma Tunicate (*Diplosoma*).

The bar graph below displays the six categories of marine invasive species and how frequently they were observed during monitoring surveys. Translucent/light bars represent the average percent occurrence from 2008-2023, while solid/dark bars represent the average from the 2024 monitoring year. Since monitoring began in 2008, all taxonomic groups of invasive species have increased in the frequency they were observed at all sites.



Average percent occurrence of marine invasive species at all monitoring sites. Translucent bars represent the average from 2008-2023, while solid bars represent the average from the 2024 monitoring year.

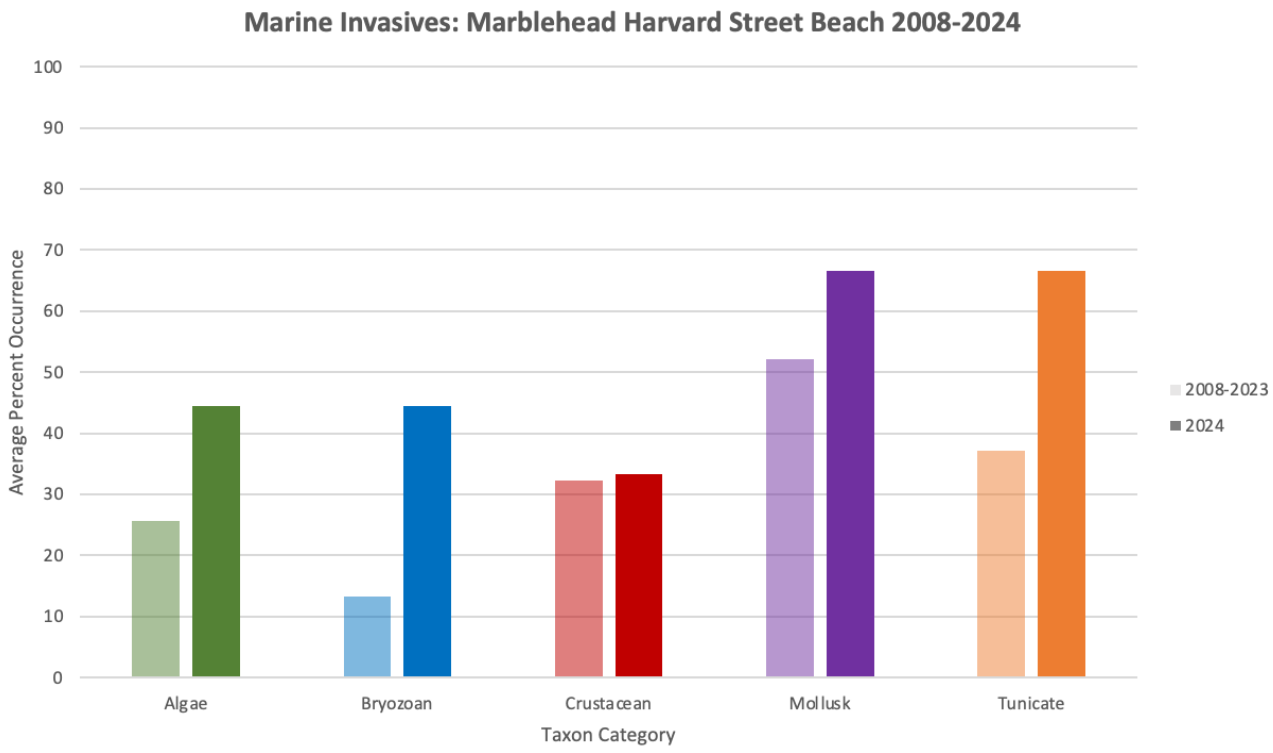
Harvard Street Beach (Marblehead)

Green fleece (*Codium fragile*) is an invasive seaweed now commonly found at Marblehead's Harvard Street Beach. Green fleece has distinct spongey branches and attaches to hard surfaces in tidepools and shallow coastal waters. It invades native kelp and eelgrass beds, leading to ecosystem changes. First observed in 2011, it was found during 66% of the monitoring surveys in 2024.

Green Fleece
Codium fragile

Unexpected Bryozoan (*Tricellaria*) forms bushy colonies with stiff, brown branches. Native to the Western Pacific, it was first observed on Cape Cod in 2010. Tricellaria is another invasive that was absent from Harvard Street Beach until 2017. Since then, it has been observed more frequently. In 2024, it was observed during 66% of the surveys.

Unexpected Bryozoan
Tricellaria inopinata



Average percent occurrence of marine invasive species at Harvard Street Beach, Marblehead. Translucent bars represent the average from 2008-2023, while solid bars represent the average from the 2024 monitoring year.

Lynch Park (Beverly)

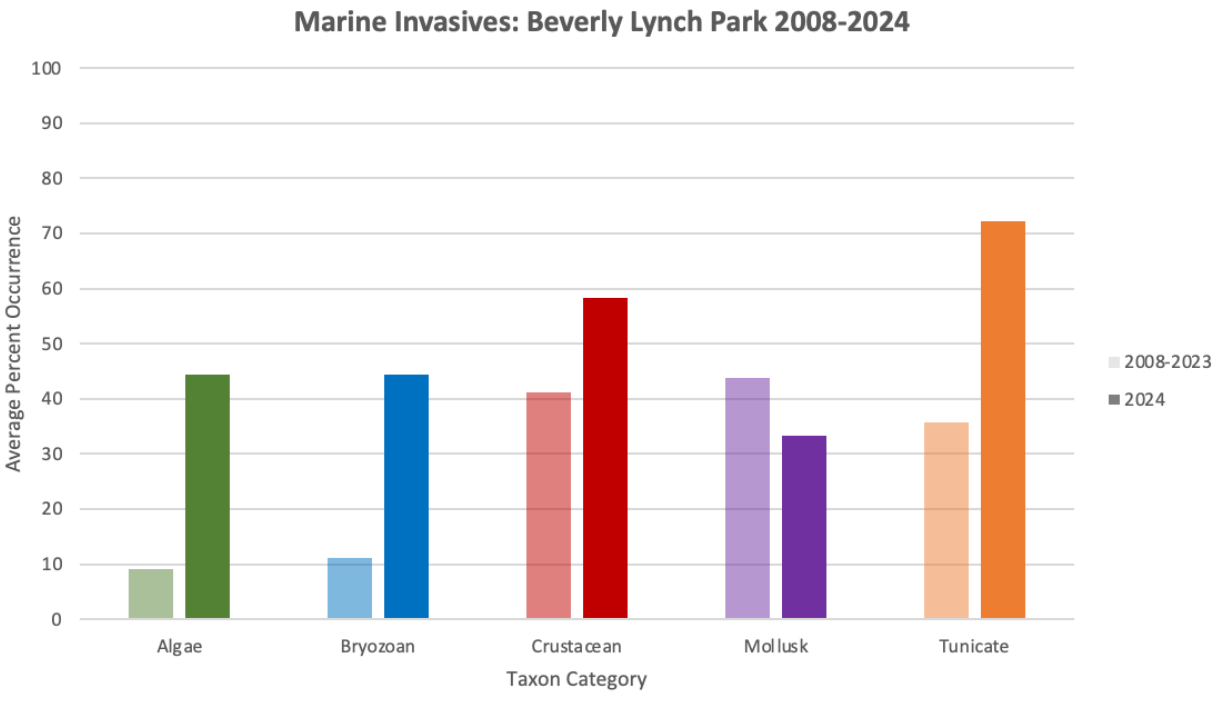
Green Crabs (*Carcinus*) and Asian Shore Crabs (*Hemigrapsus*) are two invasive crab species that are common in the rocky intertidal and cause harm to the local ecosystem, such as disturbing eelgrass beds, reducing native shellfish populations, and competing with local, native species. The frequency of Green Crabs and Asian Shore Crabs have remained high at Lynch Park since monitoring began in 2008. Asian Shore Crabs were observed during every survey at Lynch Park over the past three years.

Diplosoma Tunicate is a colonial tunicate that has a translucent green color and is slimy to the touch. It attaches to rocks, seaweeds, and eelgrass blades, forming continuous mats. It wasn't observed at Lynch Park until 2022 and is now observed between 33-66% of the time.

European Green Crab
Carcinus maenas

Asian Shore Crab
Hemigrapsus sanguineus

Diplosoma Tunicate
Diplosoma listerianum



Average percent occurrence of marine invasive species at Lynch Park, Beverly. Translucent bars represent the average from 2008-2023, while solid bars represent the average from the 2024 monitoring year.

Public Pier (Beverly)

The Orange-striped Anemone (*Diadumene*) is a very small anemone with an olive green to brown body with thin, orange stripes. It attaches to docks, rocks, and muddy banks, often in clusters close to the water's surface. At the Beverly Pier, it was first observed in 2011, and infrequently since then. During the 2024 monitoring year, however, it was observed at the dock during every survey (100% frequency).

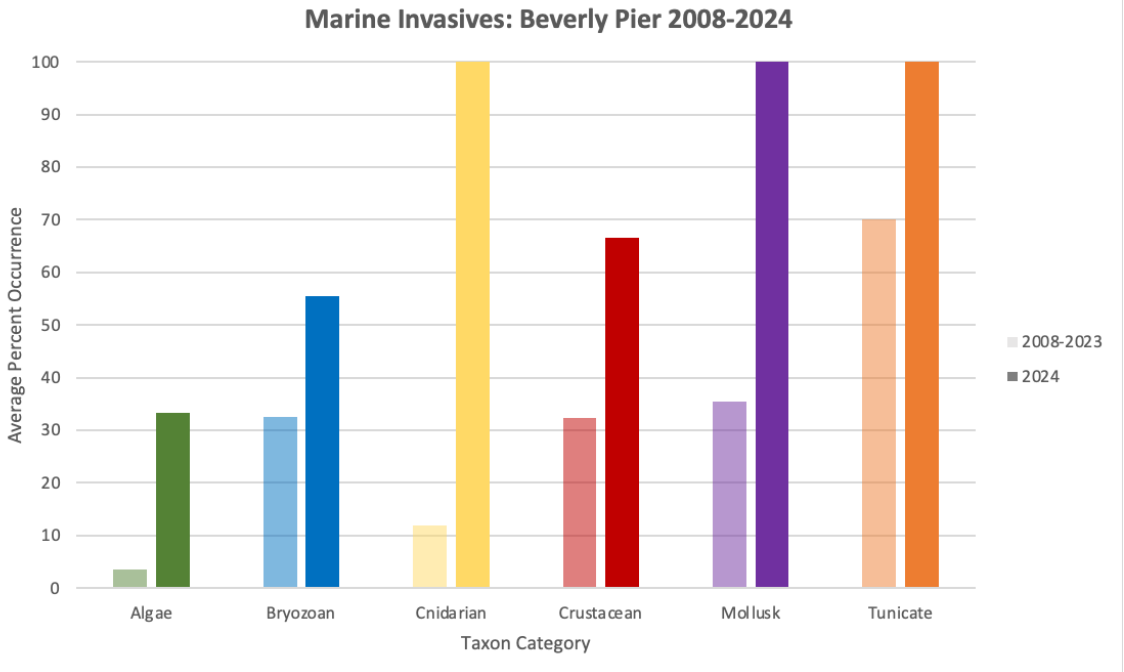
Orange Striped Anemone
Diadumene lineata

European Oysters (*Ostrea*) are flat, round bivalves that attach to hard structures, such as docks and rocks. They were brought to New England for aquaculture and accidentally released. They have spread to Connecticut and Nova Scotia and may carry diseases that impact the native Eastern Oyster (*Crassostrea*). European Oysters were first observed at the Beverly Pier during one survey in 2014 and were observed during every survey in 2024.

European Oyster
Ostrea edulis

Red Algae (*Grateloupia*) is a slimy red seaweed that was first observed on the North Shore in 2018 at the Beverly Public Pier. Since then, it has quickly increased in abundance. In 2024, it was observed at every monitoring survey at the Beverly Pier.

Red Algae
Grateloupia turuturu



Average percent occurrence of marine invasive species at Public Pier, Beverly. Translucent bars represent the average from 2008-2023, while solid bars represent the average from the 2024 monitoring year.

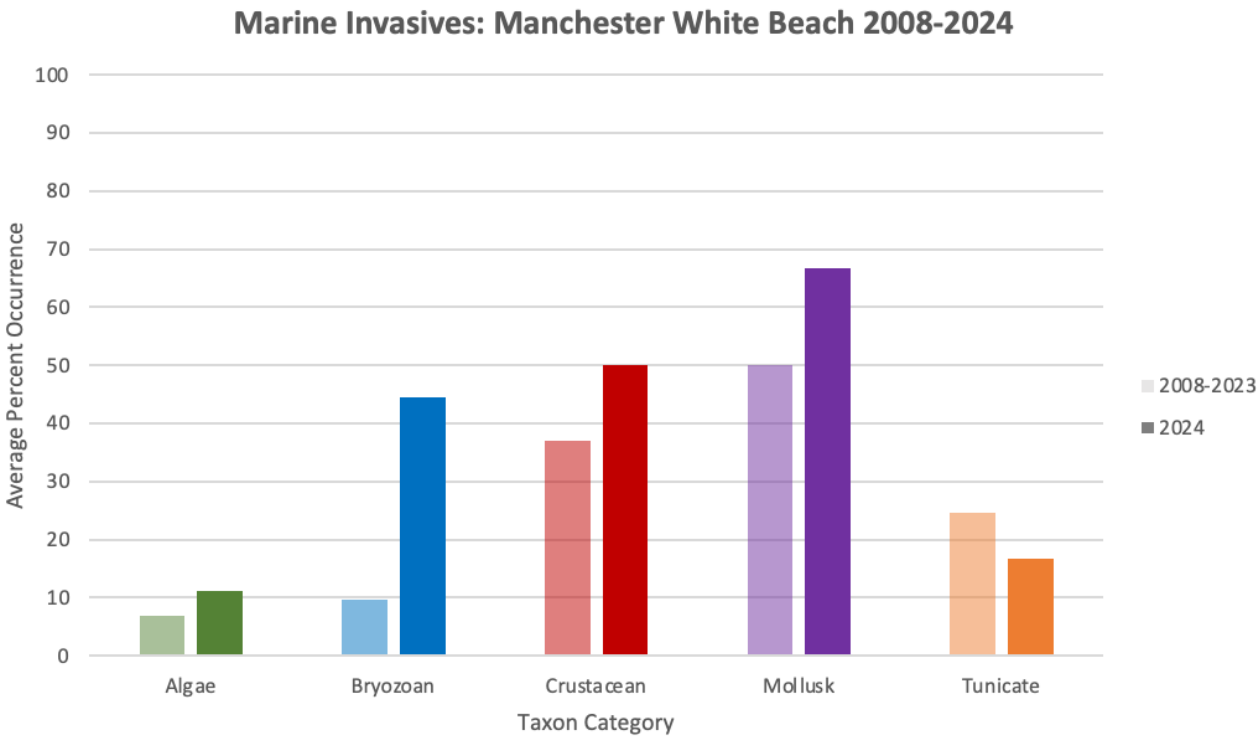
White Beach (Manchester)

Mystery Tunicate (*Didemnum*) is a creamy tan tunicate that forms dense colonies on rocks or other hard surfaces. Often described as “pancake batter,” it can form long, rope-like tendrils or large pancake-like mats. First observed in 2011, the frequency of *Didemnum* has increased over the monitoring period, yet, surprisingly, it was not observed at White Beach in 2024. This, along with the reduced frequency of two other colonial tunicates, Sheath Tunicate and Diplosoma, in 2024, has led to the decline in the occurrence of tunicates at White Beach in the graph.

Mystery Colonial Tunicate
Didemnum vexillum

Sea Potato (*Colpomenia*) is a brown seaweed that forms a hollow ball with thin, papery skin. It attaches to rocks, shellfish, and other seaweeds. It was first observed at White Beach in 2016 and has been observed with more frequency since then.

Sea Potato
Colpomenia peregrina



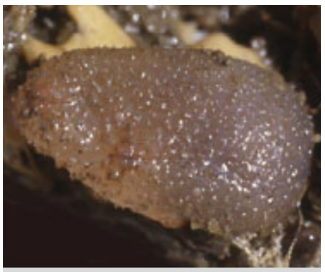
Average percent occurrence of marine invasive species at White Beach, Manchester. Translucent bars represent the average from 2008-2023, while solid bars represent the average from the 2024 monitoring year.

Winter Island (Salem)

European Rock Shrimp (*Palaemon*) have translucent bodies with distinct neon blue claws. Reaching 2.5 inches in length, they are commonly found in tidepools and near docks. European Rock Shrimp were first observed at Winter Island in 2011 and have been observed in the tidepool with more frequency. In 2024, they were observed during 66% of the surveys.

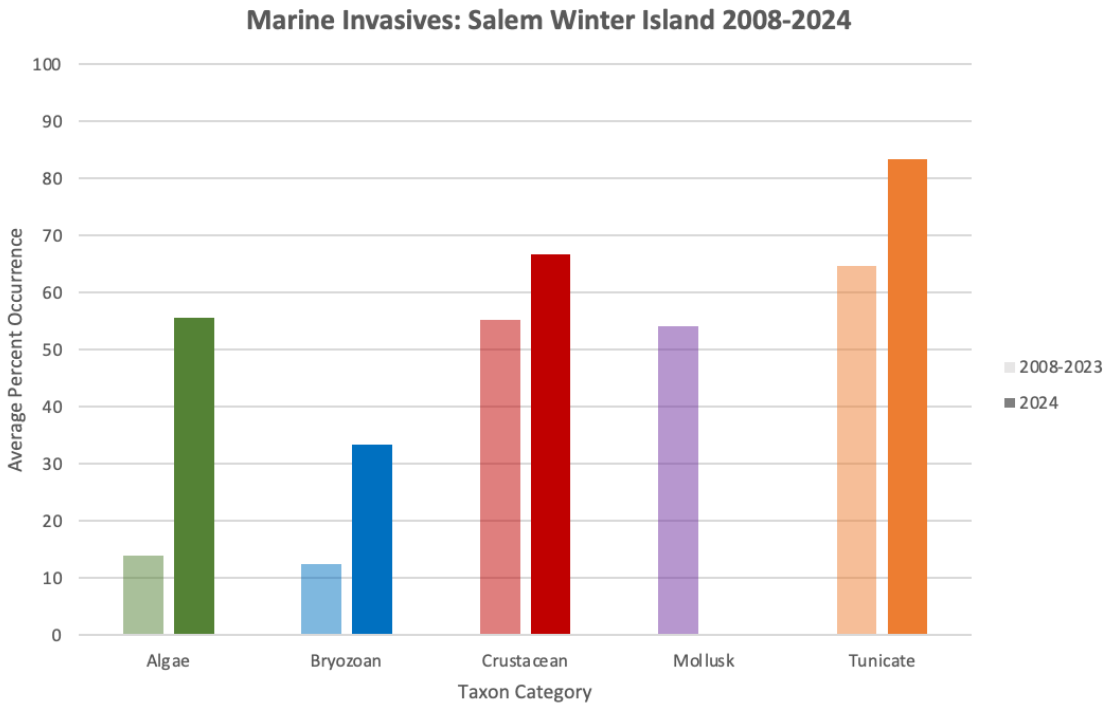
European Sea Squirts (*Ascidiella*) and Club Tunicates (*Styela*) are solitary tunicates that are often found in shallow, protected waters. They attach to hard surfaces, such as docks, rocks, and fishing gear. European Sea Squirts have a semi-translucent body with a rough texture, while Club Tunicates are brown with a leathery, "wart-like" texture. These two solitary tunicates have been a mainstay at the Winter Island tidepool, appearing in at least one survey per year since 2008.

European Rock Shrimp
Palaemon elegans



European Sea Squirt
Ascidiella aspersa

Club Tunicate
Styela clava



Average percent occurrence of marine invasive species at Winter Island, Salem. Translucent bars represent the average from 2008-2023, while solid bars represent the average from the 2024 monitoring year.

Discussion

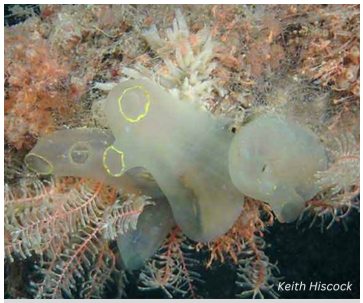
Our long-term data demonstrates an increase in the frequency of all taxonomic categories of marine invasive species observed in Salem Sound. While this increase is, in part, a result of their "invasive" tendencies, namely opportunistic, few predators, high fecundity, and wide range of tolerance, warming ocean water associated with climate change assists the spread and dominance of established marine invasive species, as well as the invasion of new non-native species.

In fact, several non-native or cryptogenic (of unknown origin) marine species are emerging as potential invaders in our region. These organisms include the following:

- The "sea vase" tunicate (*Ciona intestinalis*) has a smooth, transparent tunic with yellow "petals" on its siphon. It is frequently observed under docks in our area. It was originally thought to be cryptogenic, but genetic analysis shows it is native to the northeast Atlantic.

- Sea lemon nudibranchs (*Doris pseudoargus*) are "sea slugs" with an often bumpy, mottled yellow skin that can reach 4.5 inches long. The species arrived in the Northeast in 2017, when it was spotted off Cape Ann and observed at the Beverly Public Pier in 2024.

- Pink spotted anemone (*Aiptasiogeton eruptaurantia*) is a small, white anemone with rows of pink spots. Native to the southeast coast of the US and the Caribbean, the pink spotted anemone is known as "neo-native," as its range is expanding due to climate change. It was observed in Rhode Island in 2011 and is expected to continue its range expansion into Massachusetts.



Sea Vase
Ciona intestinalis

Sea Lemon Nudibranch
Doris pseudoargus

Pink Spotted Anemone
Aiptasiogeton eruptaurantia

Are you interested in monitoring marine invasive species this summer?

Learn more about these marine invasive species and how to monitor their abundance at our MIMIC (Marine Invader Monitoring and Information Collaborative) surveys throughout the summer. Check out the Salem Sound Coastwatch events calendar for summer monitoring dates in Marblehead, Salem, Beverly, and Manchester.

Salem Sound Coastwatch partners with the MA Office of Coastal Zone Management to monitor marine invasive species in Salem Sound throughout the summer. This work is funded by the Massachusetts Bays National Estuary Partnership.