

# The “State of the State” of Marine Invasive Species in Maine.



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2017 Maine Invasive Species Network Meeting  
Colby College  
03/22/2017

# Quick Outline

- “Marine Invasives101” - a very brief overview
  - vectors, impacts, research/management efforts
- Green Crabs – The “poster child” ...
  - Impacts to clam flats/eel grass
  - Populations dynamics
  - A commercial fishery
- Monitoring efforts and working groups
  - Questions? Comments? Words of Encouragement?....





# Marine Invasive Species

- Estuaries and coasts are often most heavily invaded
- In North America:
  - 298 marine invertebrates
  - 100 species of fish
- Gulf of Maine ~ 66
- Crustaceans, red algae, tunicates, mollusks most numerous







# What is an invasive species?

- Non-native
- Introduced
- Causes harm





# What is an invasive species?

- **Introduced**

- Vectors – transport mechanisms
- Shipping (51%)
- Fisheries/aquaculture – oysters, bait packaging, etc.
- Pet trade, accidental release, research







# What is an invasive species?

- Causes harm
  - Ecosystem resources
  - Economic resources





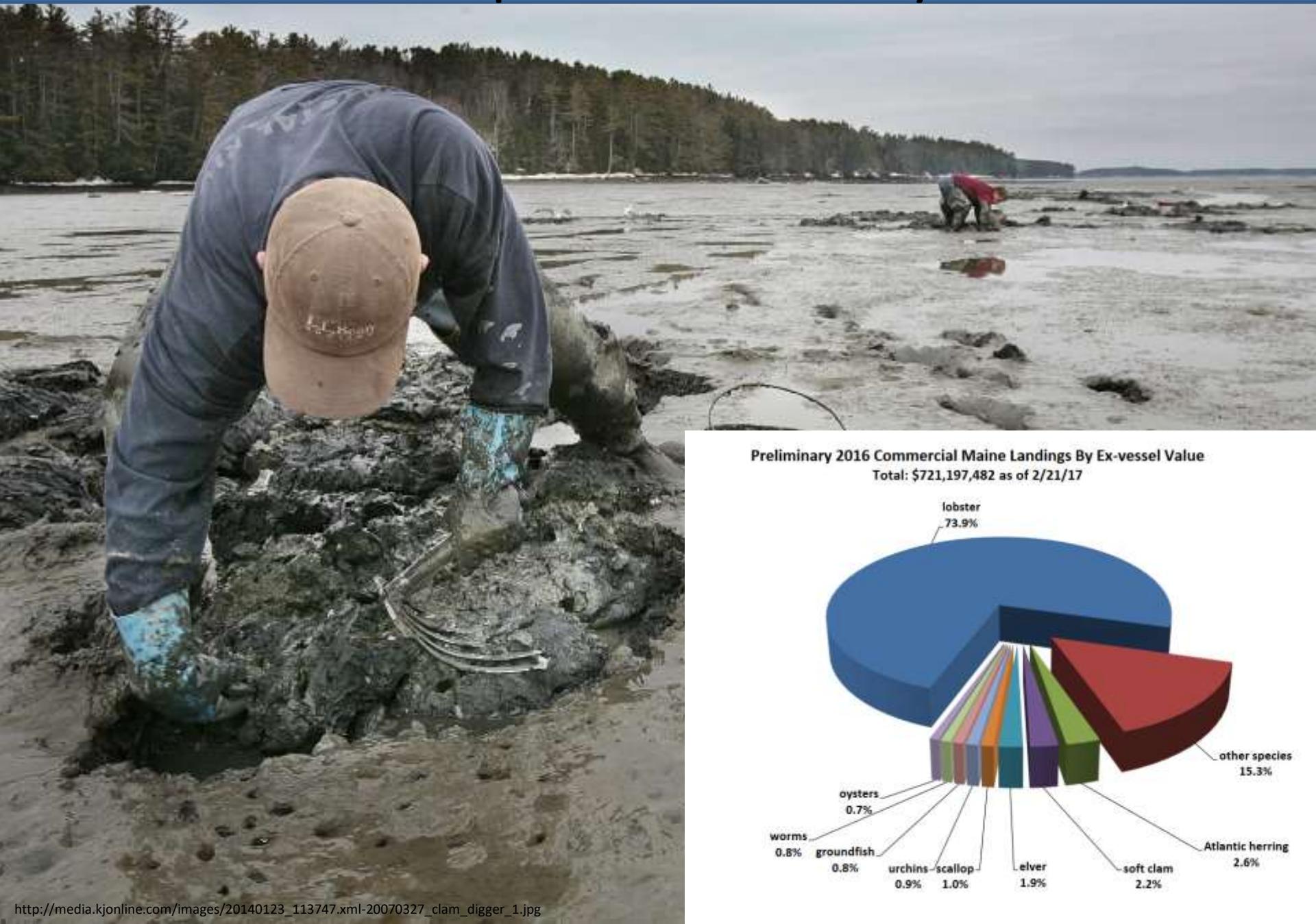
# Causes harm



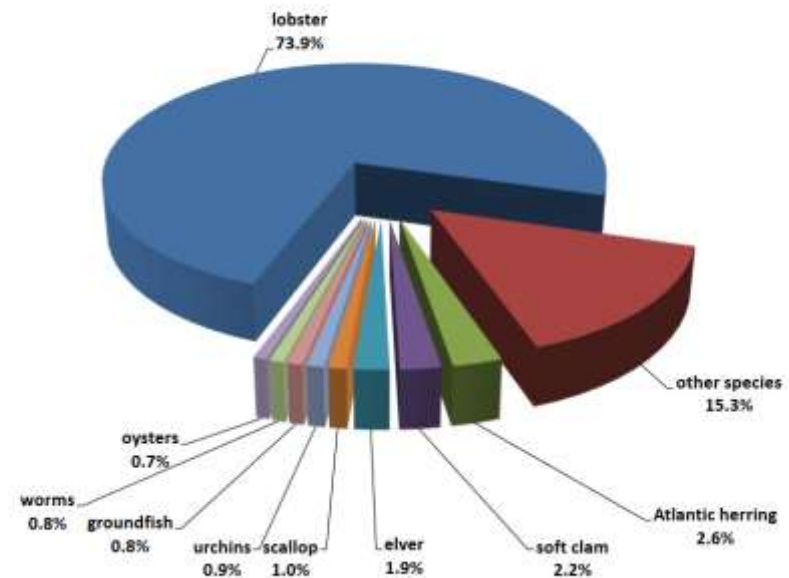
*Ciona intestinalis* on blue mussel aquaculture line, PEI. (Photo credit: J. Davidson)



# Impact to economy



Preliminary 2016 Commercial Maine Landings By Ex-vessel Value  
Total: \$721,197,482 as of 2/21/17







# Research, Management, and Monitoring

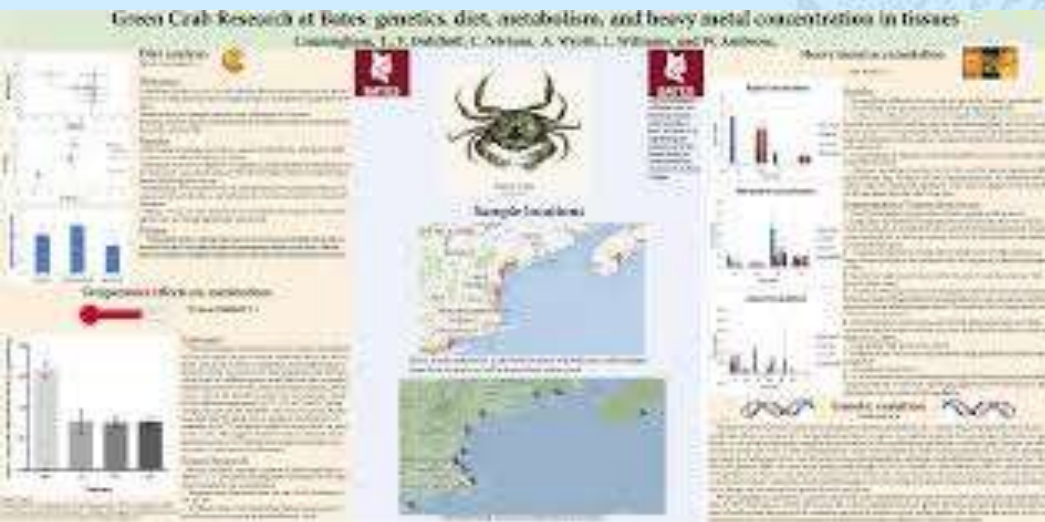
- **Research** areas looking at a range of topics from vectors to impacts on ecology, economy, and even social impacts. (UNE, U-Maine, GMRI, Wells NERR, etc.)
- **Management** difficult once established because of the “system” we’re working in (GOM).
  - Difficult to isolate species
  - Difficult to close areas or “fence things off”
  - Lacking knowledge on how these organisms are spreading (larval/juvenile/adult)
- MeMISCO- Maine Marine Invasive Species Collaborative
- **Monitoring:** Few regional/college programs; MIMIC and Vital Signs citizen science based.

# Green Crabs:

Maine's "poster child" for marine invasive species.



<http://www.seagrant.umaine.edu/green-crab-summit>







# Current/recent research efforts in Maine



- Dr. Brain Beal – Umaine Machias
- Predation impacts on the Soft Shell Clam (*Mya arenaria*) by the invasive Green Crab (*Carcinus maenas*).
- Growth and survival of Arctic Surf Clams at their southern extent.







Wetland Low  
B3 2-1  
Open



*“we retained all the living clams PLUS 467 wild 0-year class recruits that ranged in size from 2.5 mm to 13.0 mm. In the control pots (without any protective netting), the highest number of wild recruits was two.” –Brian Beal*



Brian Beal, 2015

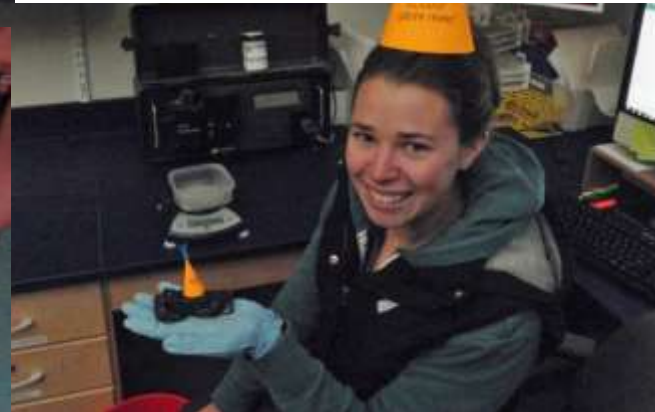




# Current/recent research efforts in Maine



- Wells NERR Research Dept./Maine DEP
- Trapping crabs at 3 stations 2X a month.
- Removal and abundance estimates.



From June-October 2015, **12,524** crabs trapped, all sites combined.







# Current/recent research efforts in Maine



## Loss of Eelgrass (*Zostera marina*) Associated With Green Crabs in Maquoit Bay, Maine

Hilary A. Neckles  
USGS Patuxent Wildlife Research Center  
Augusta, ME  
[hneckles@usgs.gov](mailto:hneckles@usgs.gov)



2001





2013



# Population-specific differences in behavior and physiology of the invasive green crab, *Carcinus maenas*

Collected crabs in Maine (ME), Nova Scotia (NS), Newfoundland (NL), and Iceland (Ice).

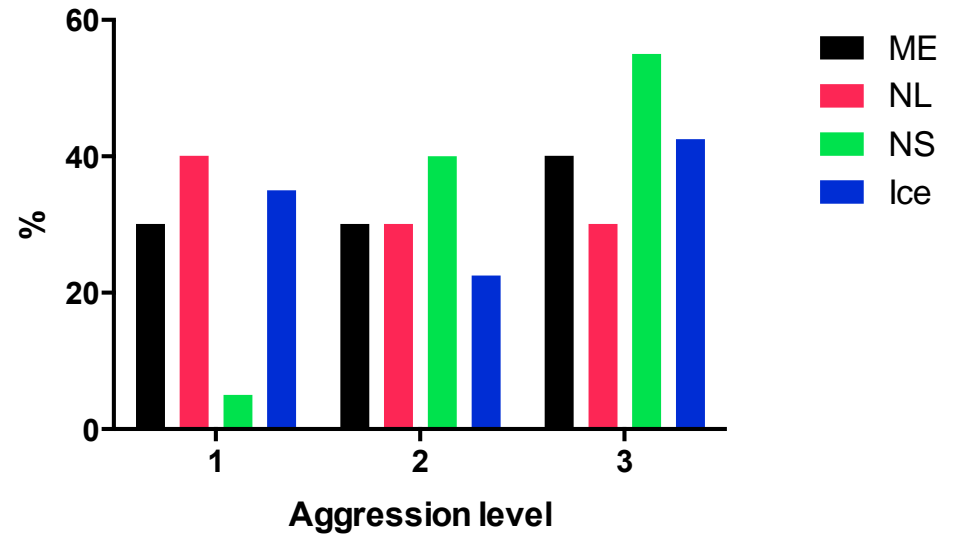
Tested aggression level

1: curls up

2: spreads claws

3: attacks

-> **Nova Scotia crabs are the most aggressive**



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Markus Frederich, Ph.D.



# Population-specific differences in behavior and physiology of the invasive green crab, *Carcinus maenas*

Placed crabs from Maine (ME), Nova Scotia (NS), Newfoundland (NL), and Iceland (Ice) into 15ft diameter mesocosm with different densities of eelgrass

Tested for eelgrass destruction

-> **Least aggressive crabs from ME uprooted the most plants, most aggressive crabs from NS caused the least damage**



Eelgrass plant cut by green crab



Mesocosm with 3 different densities of eelgrass



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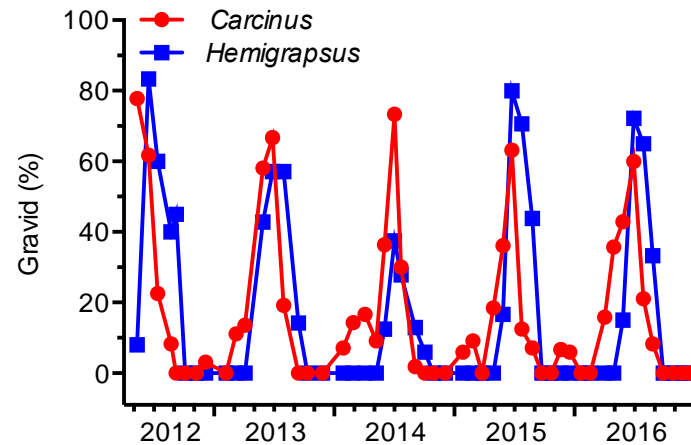
INNOVATION FOR A HEALTHIER PLANET

Markus Frederich, Ph.D.

# Monitoring green crabs, *Carcinus maenas*, and Asian shore crabs, *Hemigrapsus sanguineus*

Monthly survey in Biddeford pool shows stable coexistence of *C. maenas* and *H. sanguinaeus*.

This summer additional survey for crab larvae using a FlowCam.



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INNOVATION FOR A BETTER WORLD

Markus Frederich, Ph.D.





# Early Detection of the Chinese Mitten Crab – A Rapid Response Plan

Northeast Sea Grant staff are preparing a Northeast Rapid Response Plan for the region to guide management actions should mitten crabs be detected.



# If You Find A Mitten Crab

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- Do not throw it back alive!
  - Take a close-up photo.
  - Note the precise location where the animal was found
  - Freeze the animal or preserve it in rubbing alcohol
- 
- Report the sighting to  
**[beth.bisson@maine.edu](mailto:beth.bisson@maine.edu)**





# Citizen Scientist at work!



“MIMIC” and Vital Signs



# What is MIMIC?

- **Marine Invader Monitoring and Information Collaborative**
- A network of scientists, state agency workers, and trained volunteers
- Monitor for marine invasive species along the New England coastline
- Developed to help “fill the gaps” between the Rapid Assessment Surveys (RAS).





# MIMIC Summary

## Since 2008

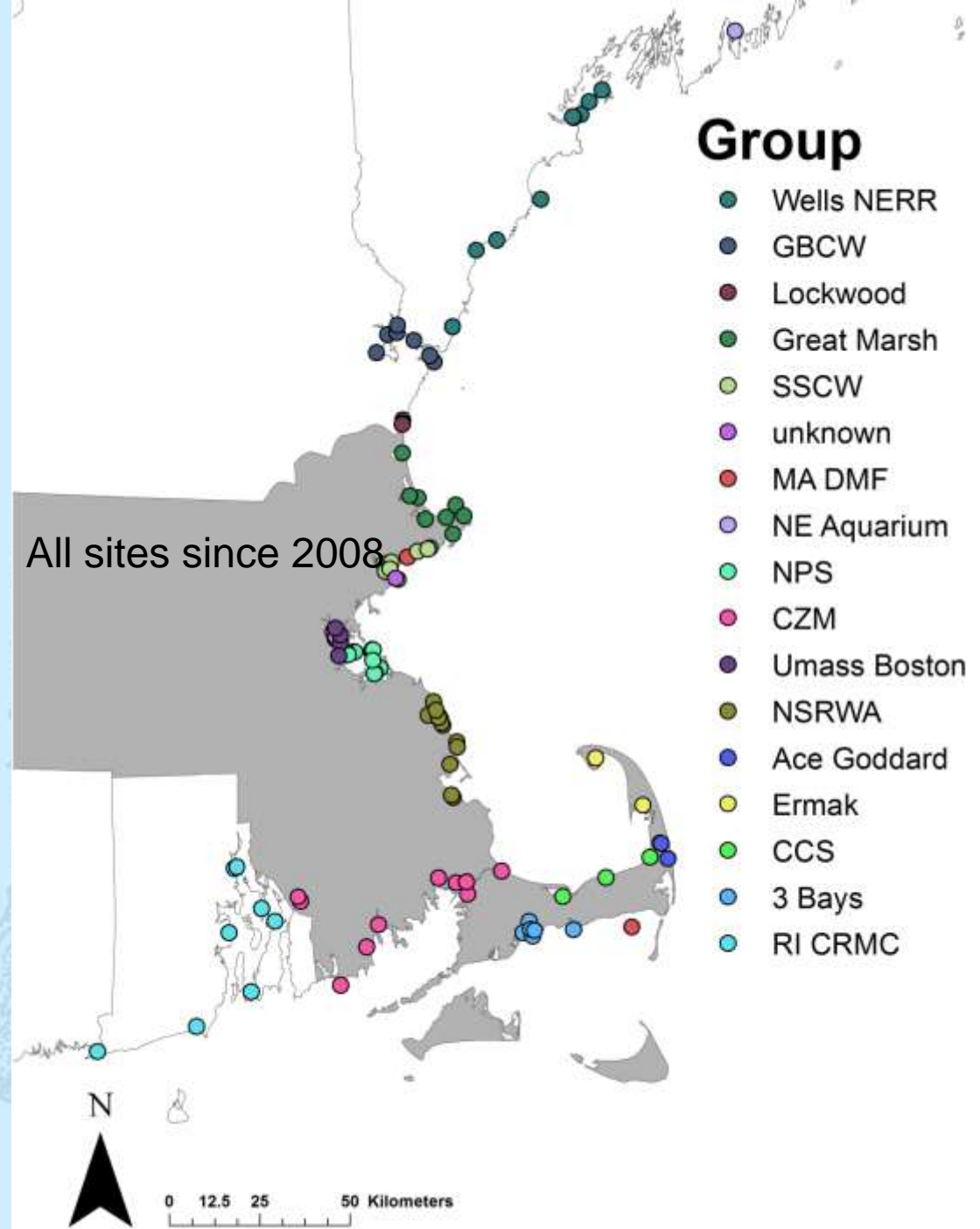
114 sites have been monitored  
15 non-profits and individuals have been involved from RI to ME  
Over 1000 (1181) monitoring events at over 100 sites (114)

## Currently

~50 sites monitored each year  
9 groups participating

## 7 Groups participating since 2008/2009

North South River Watershed Association  
Great Marsh  
Salem Sound Coastwatch  
Wells National Estuarine Research Reserve  
Three Bays Preservation  
National Park Service/New England Aquarium





## Is the ratio of native crabs to invasive crabs changing over time?

**Where to look:** Along the coast of ME and NH

**Who wants your data:** Elizabeth Stephenson (MMISCo - Maine Marine Invasive Species Collaborative) and Alyson Eberhardt (NH Sea Grant/University of New Hampshire Cooperative Extension)

Species ID card for Asian shore crab

Species ID card for green crab

Species ID card for Chinese mitten crab

Species ID card for Jonah crab

Species ID card for rock crab

[Mission Details!](#)

## Mission: Native vs. Invasive Crabs

### Research Question

How do the ratios of invasive and native crabs compare up and down the coast of Maine and New Hampshire? Is the ratio of native crabs to invasive crabs changing over time?

### You're invited

Scientists across the Northeast are working with local communities to help figure out how widespread the presence of invasive crabs, such as green crabs and Asian shore crabs, are and what impacts they are having on local ecosystems. There is still so much left unstudied in the marine environment and what we know of impacts of these marine invaders is also incomplete. We need more hands on deck to monitor our coastlines and truly dig into what effects these marine invaders may be having on our environment.



Jonah crab - VS user "pberhardt"

### Mission Steps

1. Decide on your field site location (a rocky intertidal zone near you) look up when low tide occurs.
2. Print the **Coastal Species Survey datasheet**. Because you will be documenting 5 species, you will need to print 3 extra copies of the last page of the datasheet (if you are working as a team, then each teammate will take on one of the species instead of one person looking for all 5).
3. Print these species ID cards:
  - **Asian shore crab**
  - **Green crab**
  - **Chinese mitten crab**
  - **Jonah crab**
  - **Rock crab**
4. Make a prediction. Do you think you will find any invasive or native crabs? Do you think there will be more of one than another? Explain your prediction in the field notes section of your datasheet (follow the link to the full teacher instructions at the bottom of this page for more detail around this step).
5. Gather your **fieldwork equipment** and head out into the field (at low tide) to search for native and invasive crabs!
6. Follow the random quadrat sampling method protocol ([here](#)) to determine where to place your quadrat.



Asian shore crab - VS user "one more time"





## How quickly is *Dasyphyllia japonica* moving up the coast?

**Where to look:** All along the coast

**Who wants your data:** Matt Bracken, Northeastern; Carol Thornber, URI; and Kathy Ann Miller and Robin Hadlock-Seeley, Shoals Marine Lab

*Dasyphyllia japonica* ID card

**Mission Details!**



Photo by: Vital Signs user  
16cady90 from Shapleigh  
Elementary School

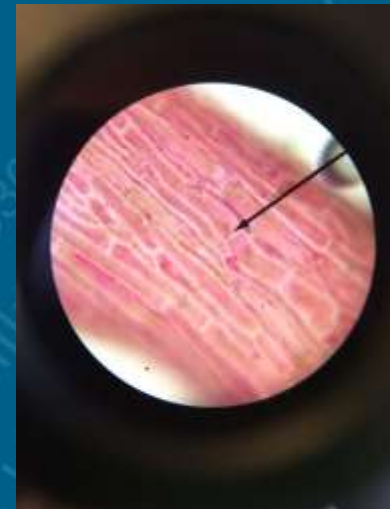


Photo by: Vital Signs user  
DJ3 from South Portland  
High School

# 2017 Rapid Assessment Survey??



- Coordinated by MA CZM
- Done every 2-3 years
  - (RI to ME)
- Funders and participating agencies have included:



University of  
New Hampshire



# Maine Marine Invasive Species

## Collaborative

“MeMISCO”

- Meets bi-annually (GMRI has been kind enough to host us so far!)
- NEANS Representation.
- Participants from a variety of State/Fed/Local agencies/orgs
  - DEP, DMR, Numerous Colleges/Universities, SeaGrant, USFWS, EPA, GMRI, Wells NERR, FOCB, others.
- Have produced some outreach/education materials as well as funding some “small scale” research projects (DMR *Didemnum* Surveys, Beal clam study expansion, etc.)

**THANK  
YOU!!!**

