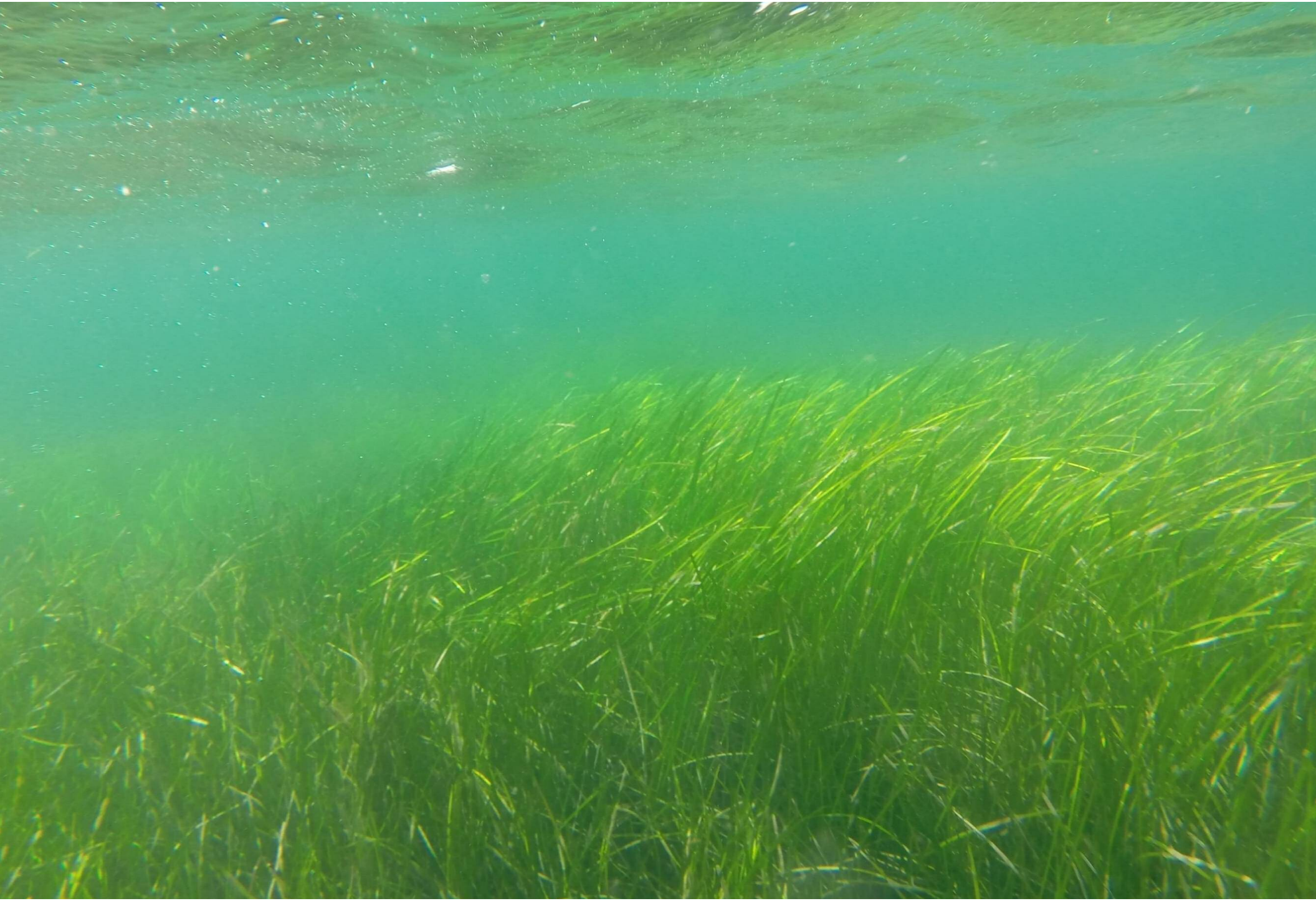
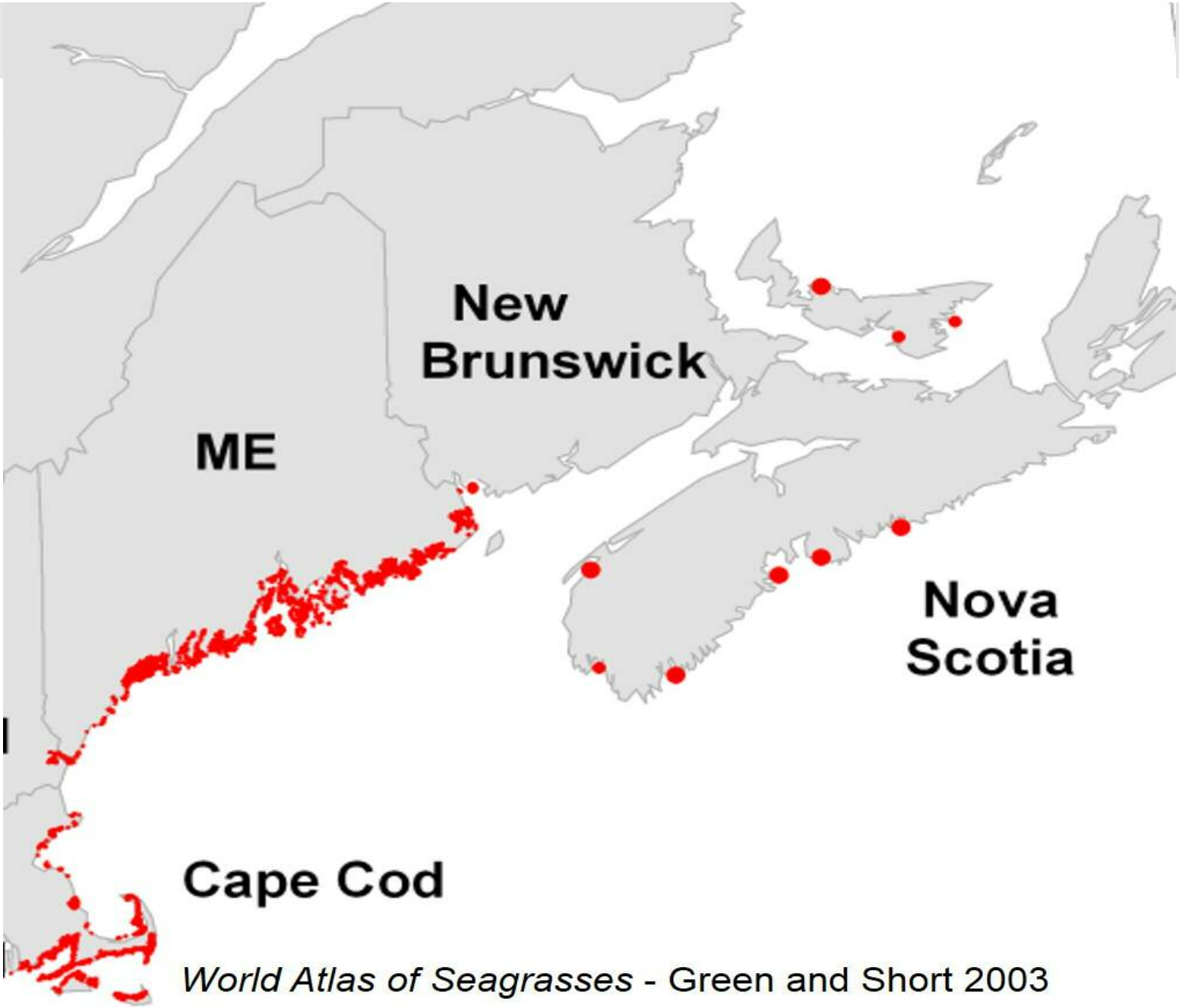
Impacts of Invasive Tunicates on Eelgrass

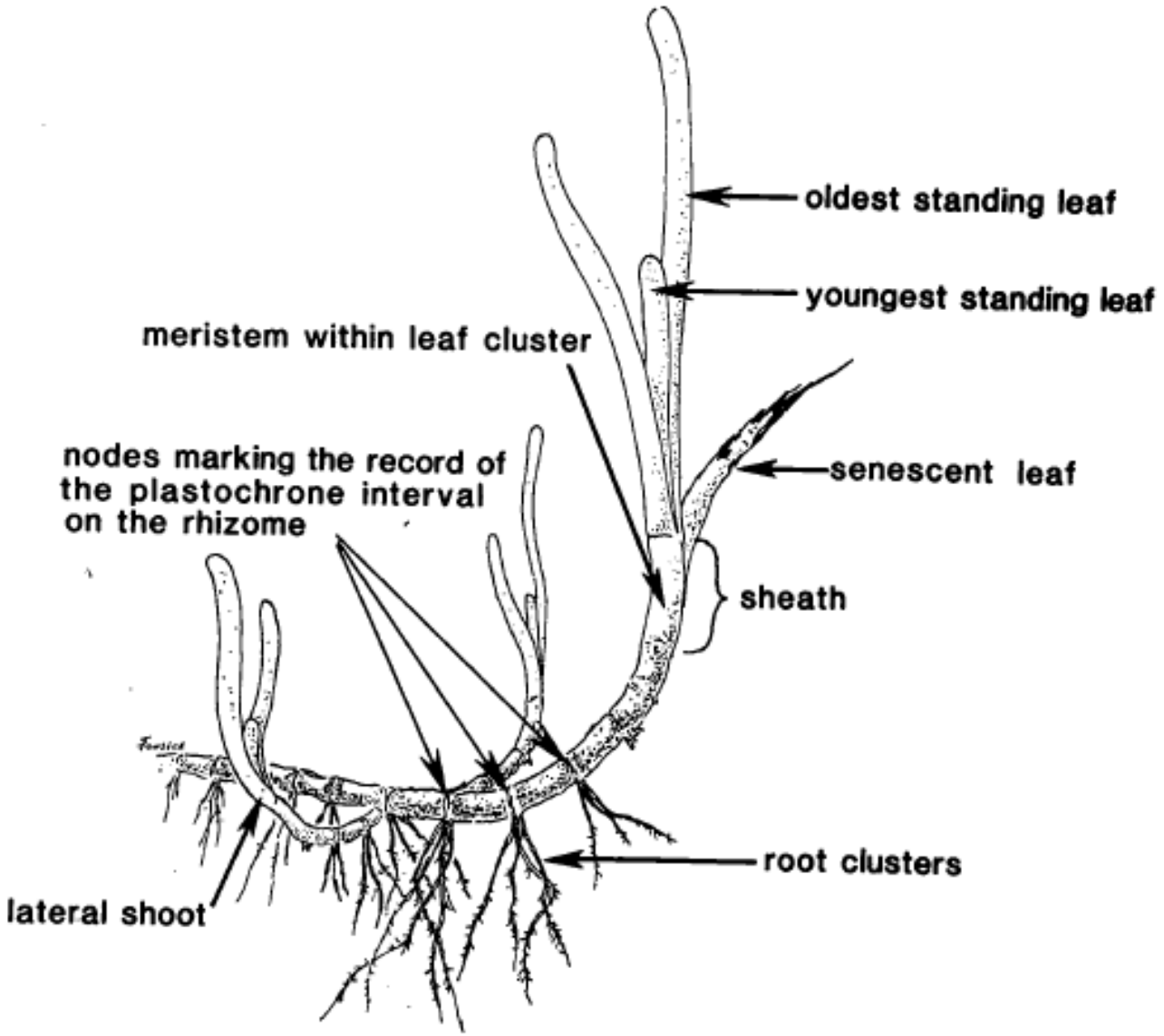
Phil Colarusso

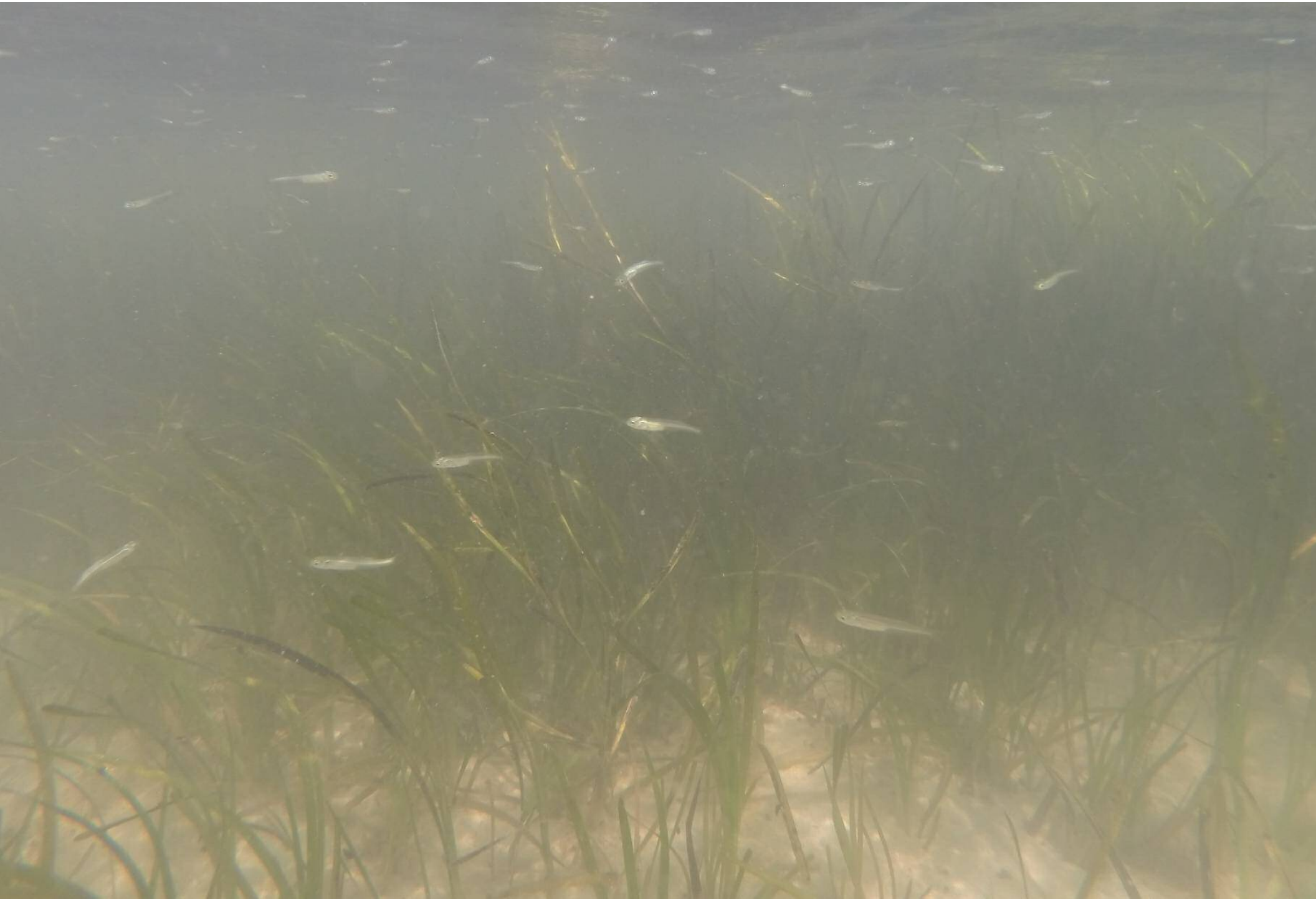
US EPA





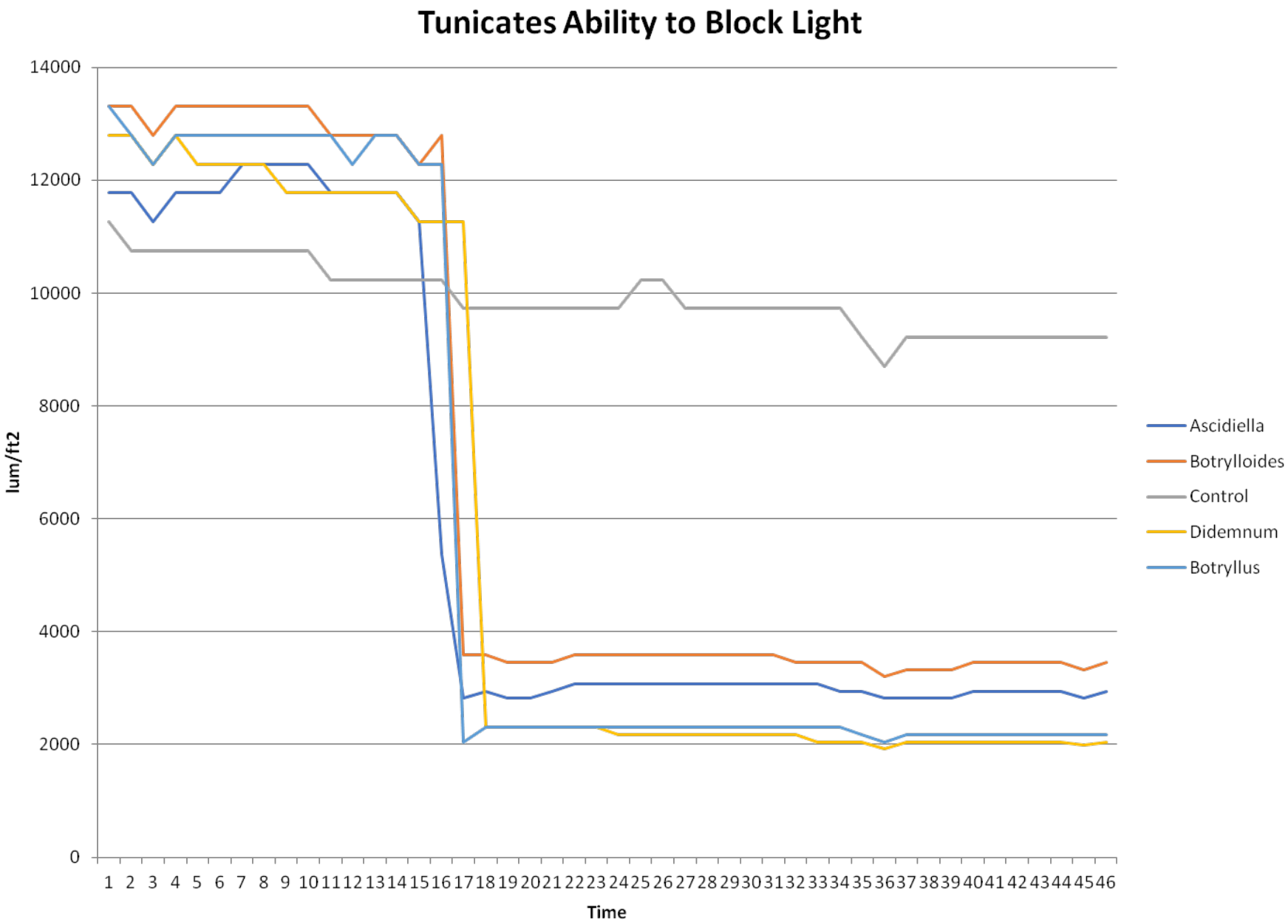
World Atlas of Seagrasses - Green and Short 2003


oldest standing leaf
youngest standing leaf
meristem within leaf cluster
senescent leaf
nodes marking the record of
the plastochrone interval
on the rhizome
sheath
root clusters
lateral shoot



Tunicates

- Colonial or individual
- Normally associated with hard substrates
- Voracious filter feeders
- Feeding and reproduction are temperature sensitive


Tunicates Ability to Block Light
lum/ft2
14000
12000
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Time
Ascidiella
Botrylloides
Control
Didemnum
Botryllus

mpact of unicates on elgrass rowth

- Growth (leaf elongation rates) were statistically greater in control shoots compared to shoots covered with tunicates

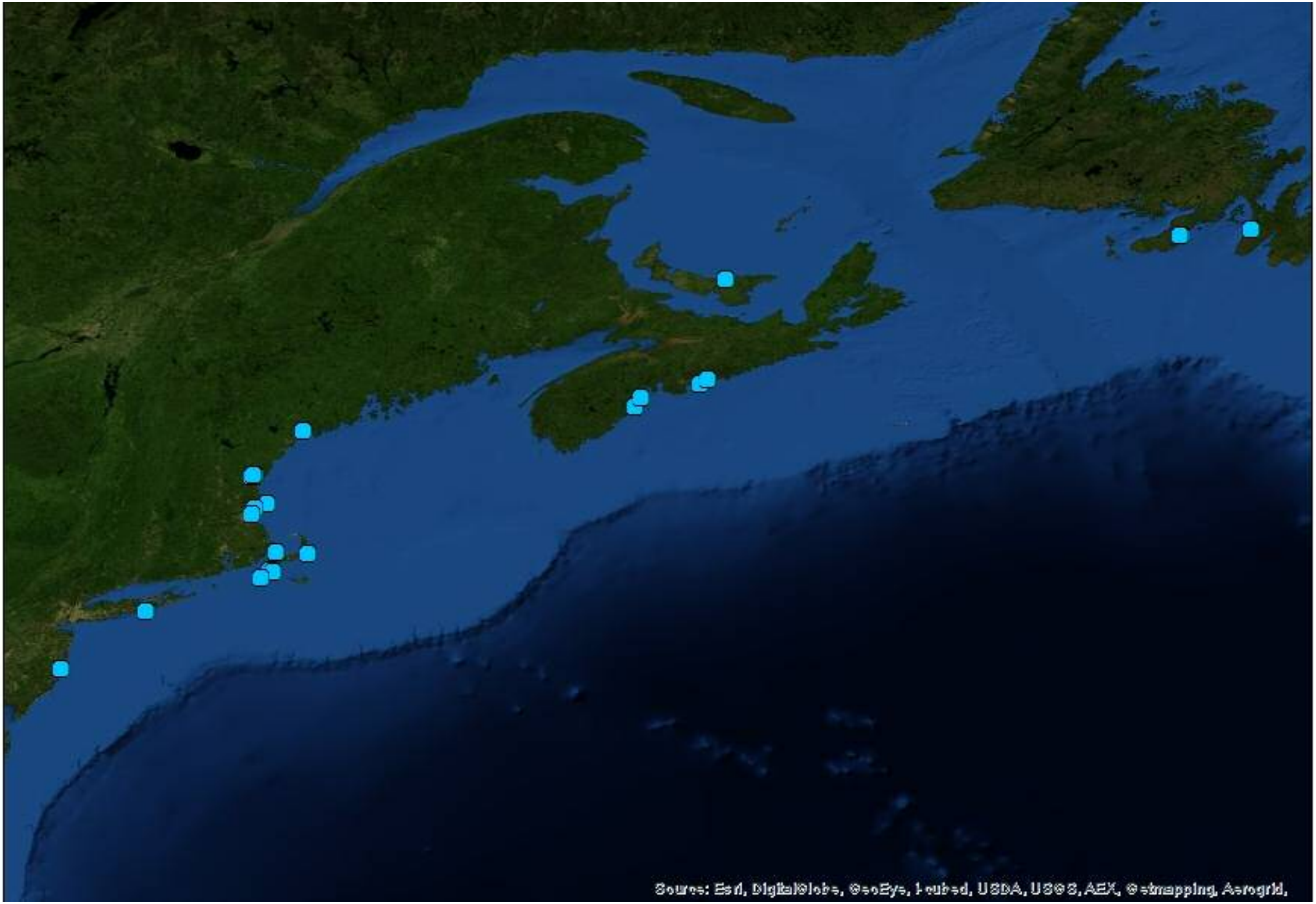
- Simple sugar (end products of photosynthesis) concentrations were significantly lower in control shoots compared to shoots covered with tunicates

mplications of unicate olonization

- Wong and Vercaemer (2012) attributed shoot mortality to presence of tunicates
- Tunicate biomass weighed leaves dow and reduced vertical profile of affecte shoots, reducing habitat complexity
- Morris et al (2009) linked tunicate presence on eelgrass to reduced bay scallop recruitment

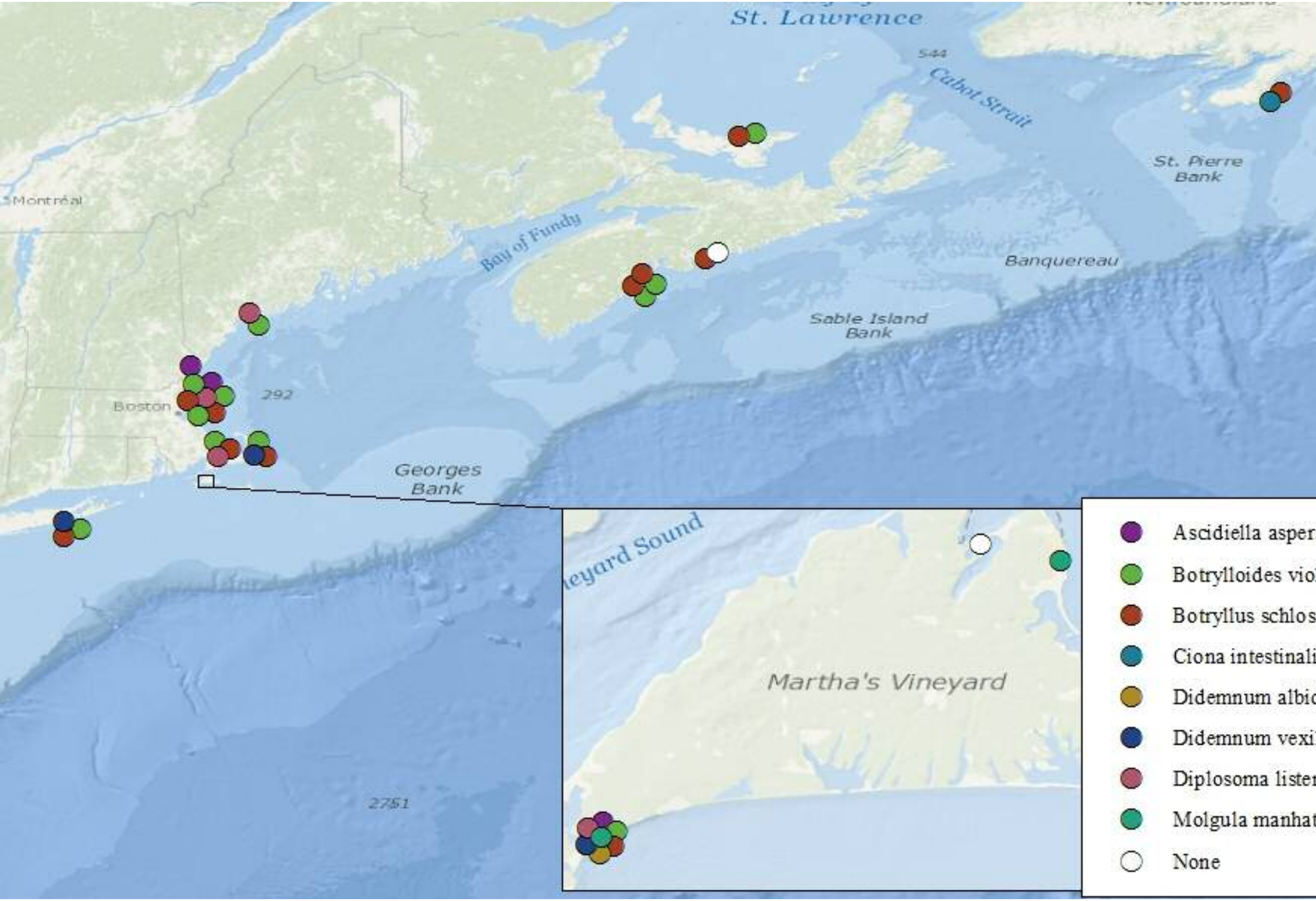
Latitudinal Survey

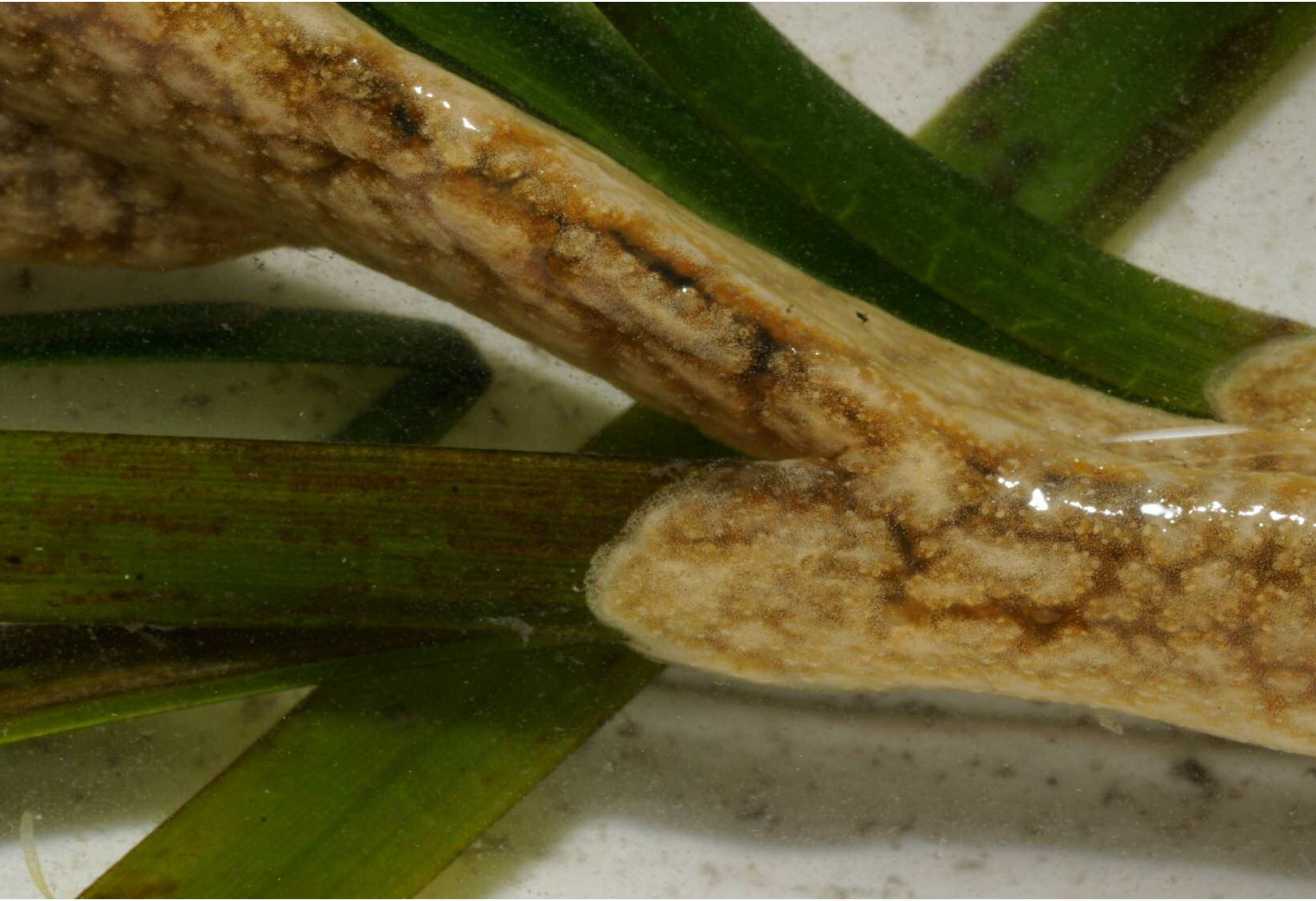
- 19 Sites (14 collaborators) from New Jersey to Newfoundland
- Flexible sampling design
- Quadrat samples were collected within eelgrass meadows
- Tunicate species identified
- Tunicate coverage quantified
- Where possible, eelgrass parameters and water temperature measured

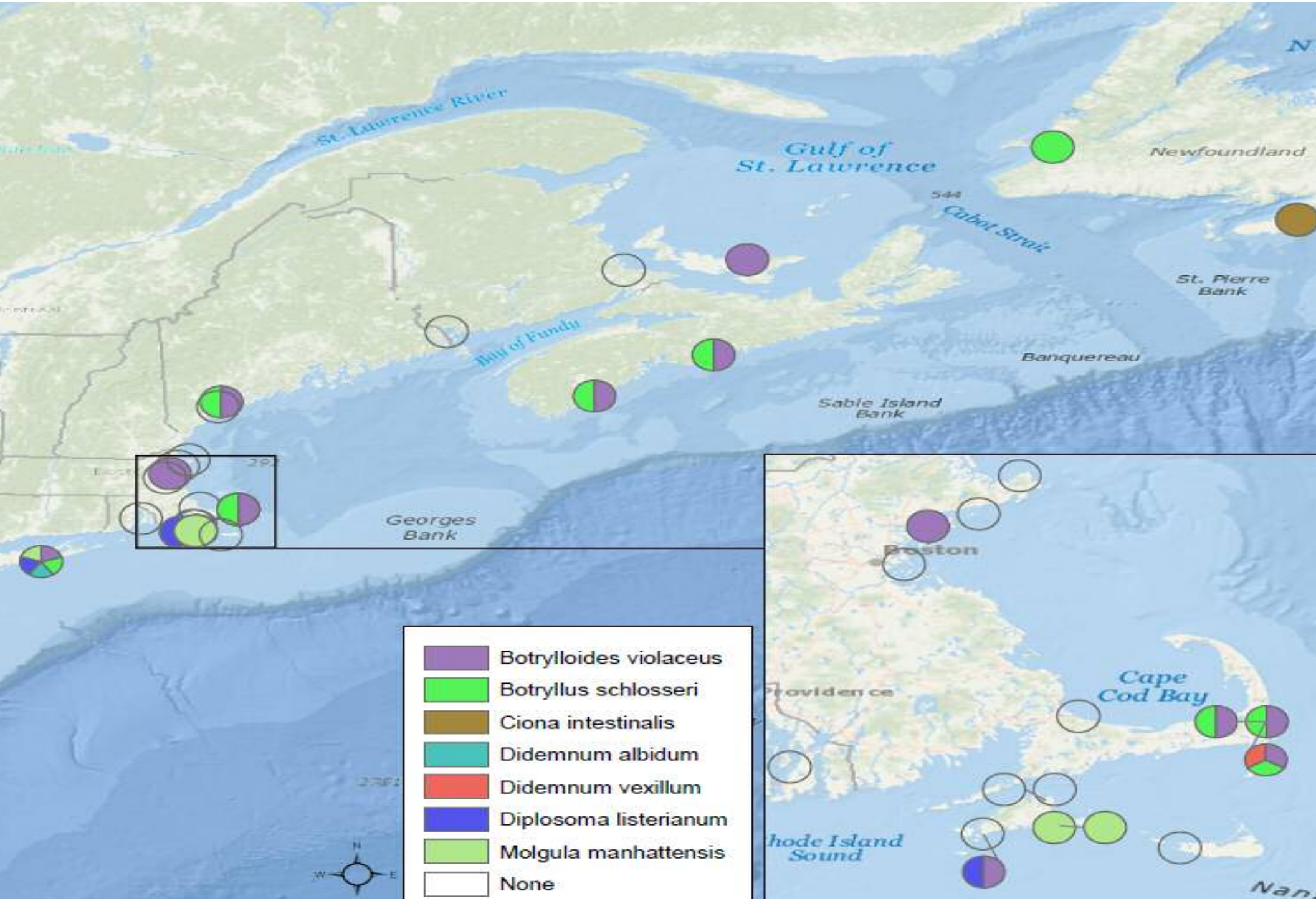

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid,

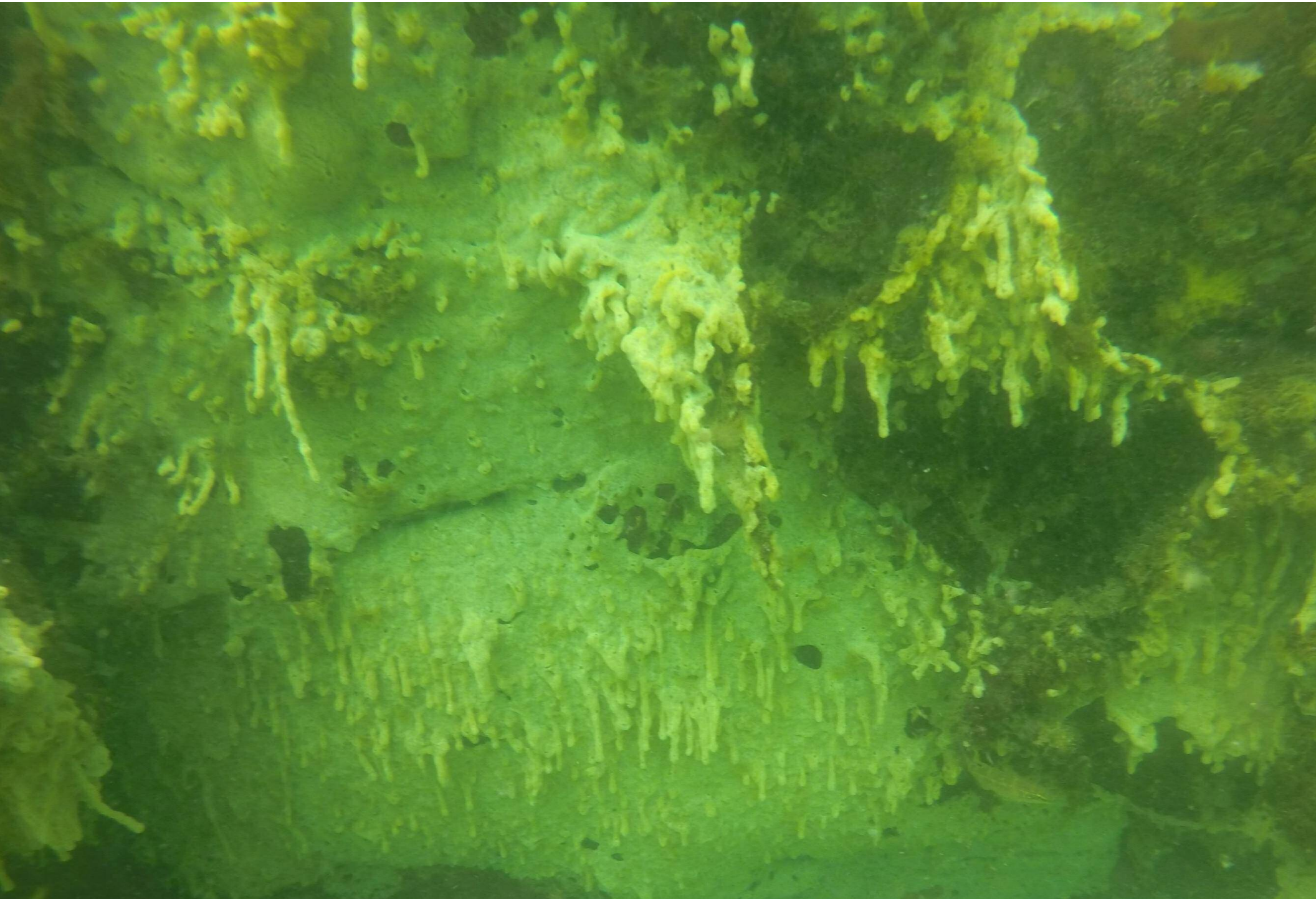
esults

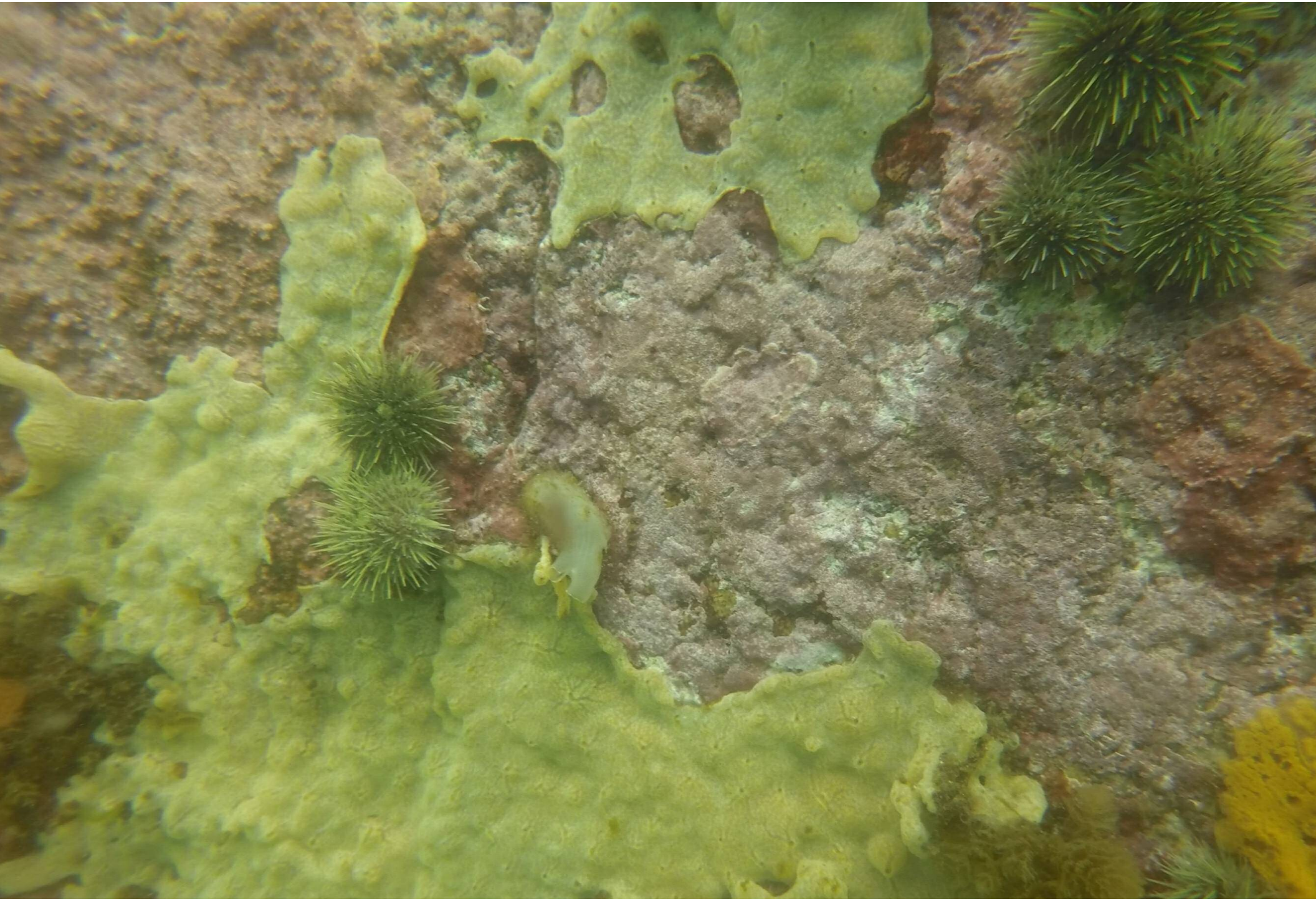
- 8 species of tunicates were found on eelgrass (6 invasive, 2 native)
- Most common and wide spread were *Botrylloides violaceus* and *Botryllus schlosseri*
- *Ciona intestinalis* was only seen in Newfoundland, where it is a new invader
- Tunicate coverage was generally low (0-25%), though some small number o shoots completely engulfed


St. Lawrence
544
Cabot Strait
St. Pierre Bank
Montréal
Bay of Fundy
Banquereau
Sable Island Bank
Boston
292
Georges Bank
Martha's Vineyard
2751
Ascidiella asper
Botrylloides vio
Botryllus schlos
Ciona intestinali
Didemnum albic
Didemnum vexil
Diplosoma liste
Molgula manhat
None




St. Lawrence River
Gulf of St. Lawrence
Newfoundland
544
Cabot Strait
St. Pierre Bank
Bay of Fundy
Banquereau
Sable Island Bank
Georges Bank
Boston
Cape Cod Bay
Providence
Rhode Island Sound
Botrylloides violaceus
Botryllus schlosseri
Ciona intestinalis
Didemnum albidum
Didemnum vexillum
Diplosoma listerianum
Molgula manhattensis
None





Conclusions

- What we do know
  - In some years, in generally late summer/early fall, tunicates can proliferate and extensively colonize eelgrass
  - The extent of that colonization can vary significantly, in extreme cases it can cause shoot mortality and reduce the complexity of the habitat
  - There are hotspots, but it is a widespread issue

Conclusions

- What we'd like to know
  - Why do tunicates colonize eelgrass some years, but not others?
  - Are warming water temperatures playing a factor?
  - Can we quantify the impacts?

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