Conserving Rockweed Animal Systems for Sustainable Harvest

Hannah Webber
Schoodic Institute/
University of Maine
2019 Beaches Conference
June 14, 2019

https://klemmeramanda.wixsite.com/crassh

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Understanding rockweed food webs along the coast of Maine

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Rockweed, an intertidal seaweed, has been harvested along the coast of Maine for decades. The combination of economic value, potential conservation impacts, and public interest make rockweed habitats a unique system to study food-web dynamics. The overall research objectives of the CRASSH team are: (1) understanding the role of rockweed in rocky intertidal invertebrate/bird food webs in light of harvesting and (2) bringing together diverse stakeholders towards the common goal of maintaining robust

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Today's talk:

1. Project overview: Objectives, research questions, methods.
2. Challenges and opportunities.

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This project is funded by:

Sea Grant Maine

MAINE DEPT. OF INLAND FISHERIES AND WILDLIFE

Pittman-Robertson Funds

MAINE OUTDOOR HERITAGE FUND

Eastern Maine Conservation Initiative

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Project objective: Assess animal and abiotic responses to rockweed harvest

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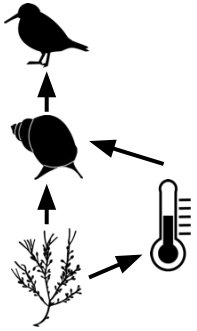
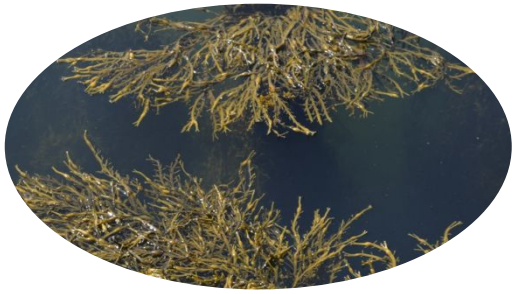
Research Objectives

Characterize the ecosystem linkages between:

- Rockweed biomass and architecture
- Abiotic environment (temperature, light, wave action)
- Intertidal invertebrate assemblages
- Coastal birds



Assess the potential for harvest to influence this ecosystem



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Characterize the ecosystem linkages and
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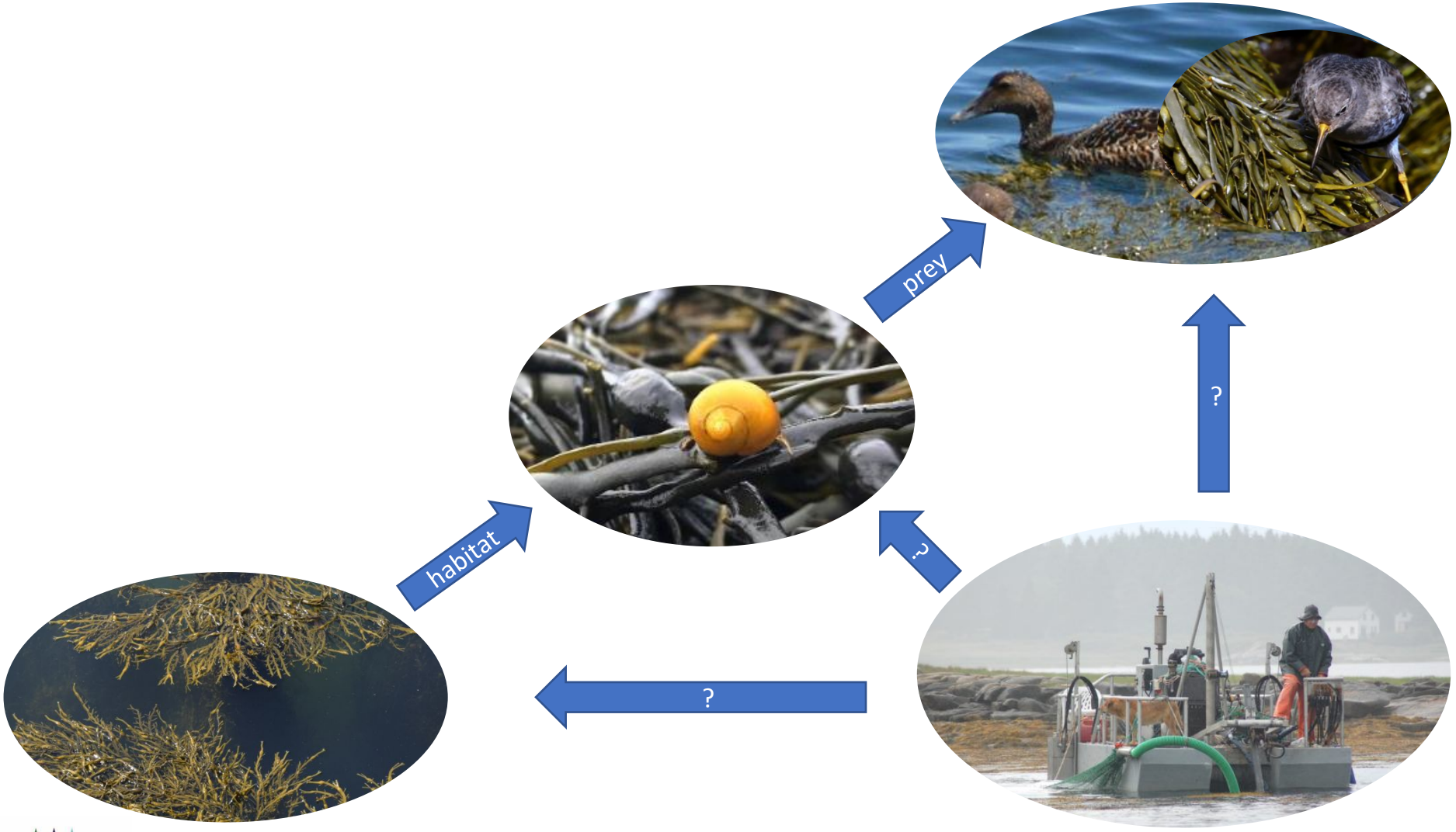

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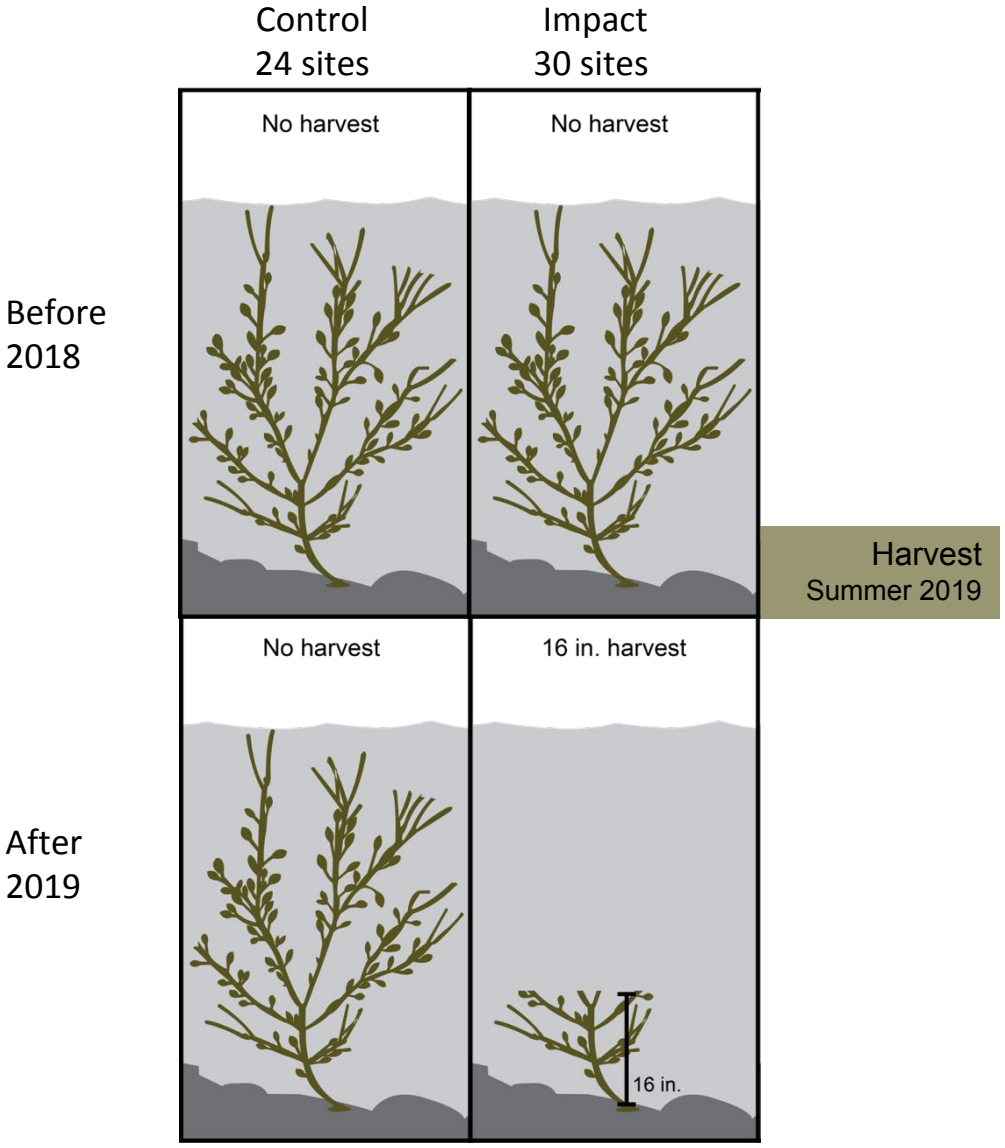
Before-After Control-Impact (BACI) Study Design



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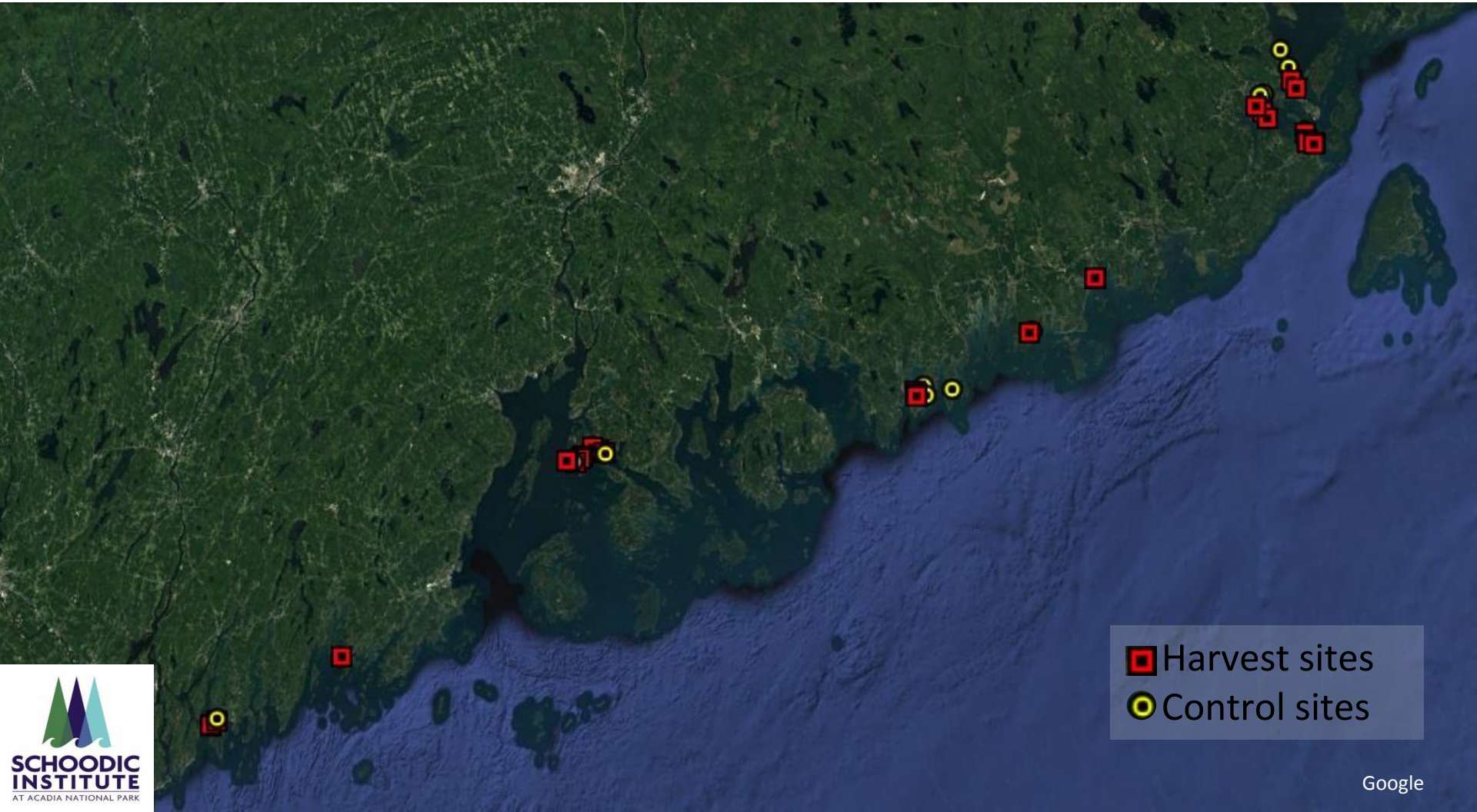
Study Sites

- 54 sites total (30 harvested, 24 control)
- Control sites in harvest-quality areas



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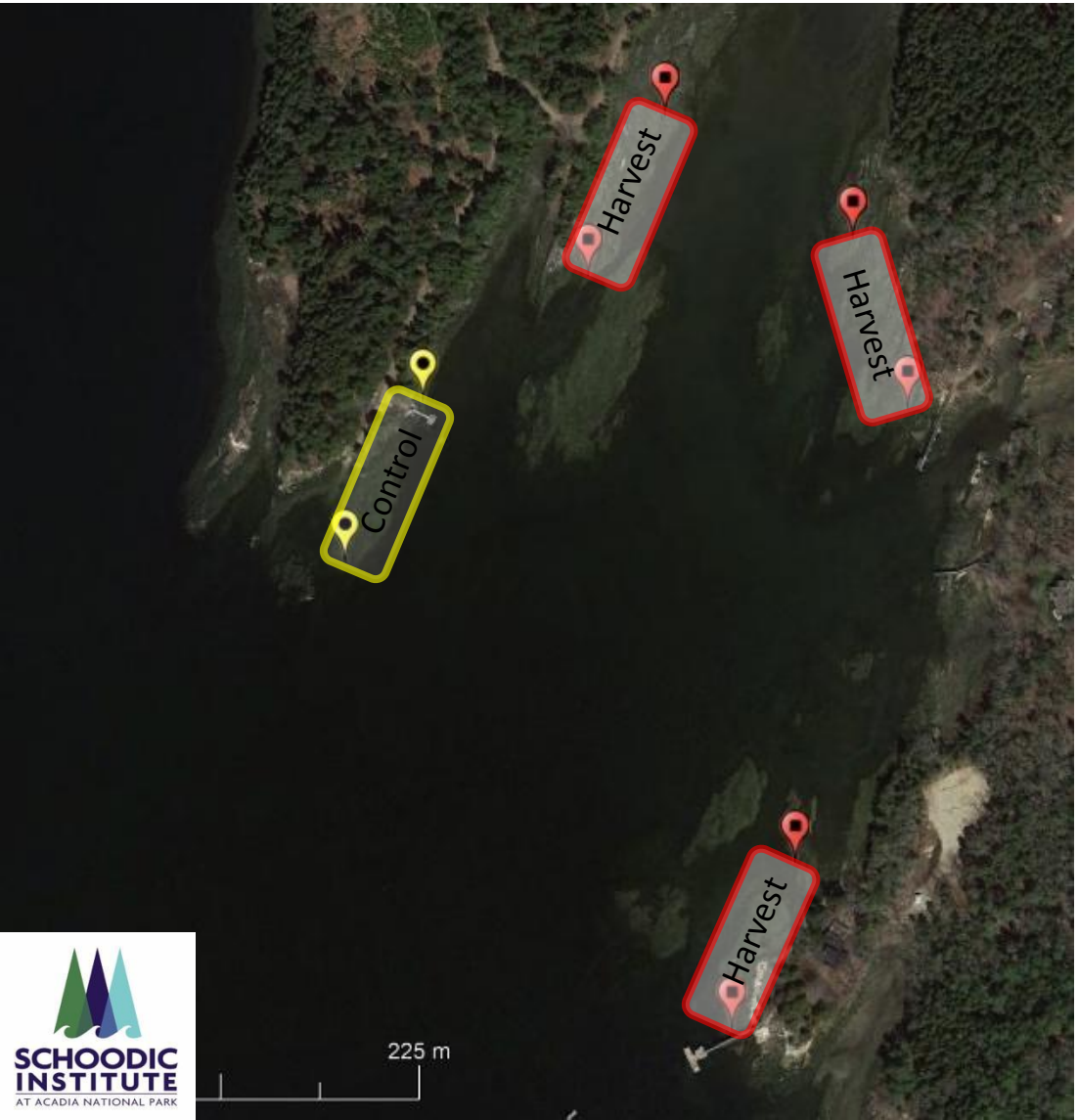
Study Sites



- Commercial sized sites (100m)
- Minimum of 100m between sites

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Biomass Assessment

- Two to three 10-meter transects sampled in high, medium, and low rockweed zones

- Five quadrats sampled along each transect

- In each quadrat:
    - weigh rockweed
    - count holdfasts
    - measure 3 random individuals

site biomass = average biomass per quadrat x % rockweed coverage of site x site area

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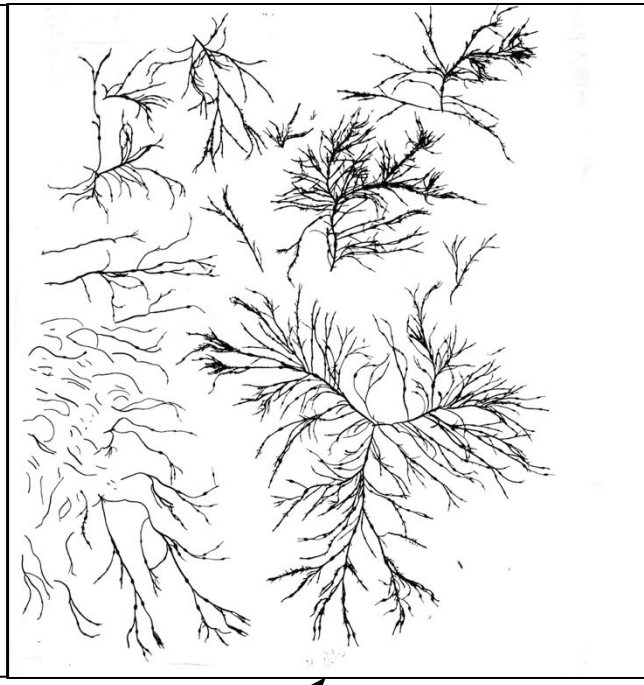
Architecture

1.

2.

3.



Photos: H. Webber

4. Relate

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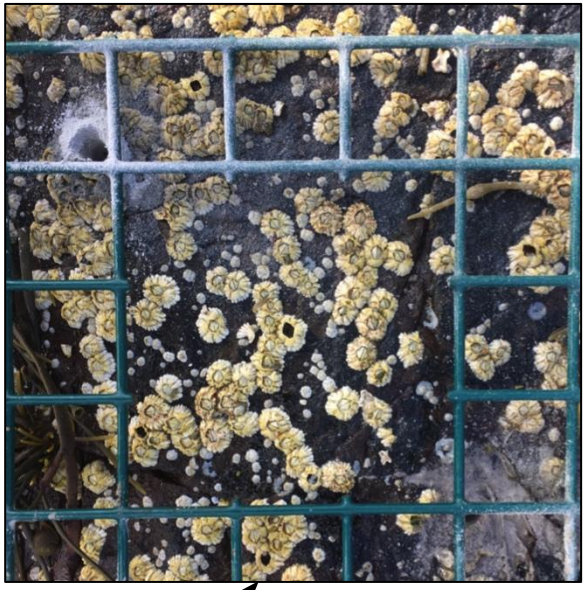
Abiotic conditions and benthic community

1.

2.



3.

Photos: H. Webber

4. Relate

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Intertidal Invertebrate Assemblages

- Low tide surveys
- Examine effect of harvesting on invertebrate
    - prey availability for birds
    - abundance and community structure


Photo: Hannah Mittelstaedt


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Intertidal Invertebrate Assemblages

Methods

- Collect samples of:
  - algal canopy
  - benthic surface
  - sediment core
  - rockweed holdfasts
  - Preserve samples, count and identify invertebrates, measure biomass
- Analyze for (1) prey availability for birds, and (2) invertebrate community structure


Photo: Adam Kuykendall


Photo: Hannah Mittelstaedt


Photo: Steve Heald


Photo: Hannah Mittelstaedt

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Birds use rockweed habitats


Photo: Lindsay Tudor


Photo: Amy Baron


Photo: Rockweed Coalition

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Photo: Lindsay Tudor


Photo: Amy Baron


Photo: Rockweed Coalition

Birds use rockweed habitats

Does rockweed harvest change bird use of rockweed habitats?

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Bird Surveys

Bird Abundance

- 20 minute survey

- Count all species present in plot, noted at time of first detection

- Record distance (laser rangefinder) and angle from point of observation

Bird Behavior

- Concurrent 20 minute survey

- Behaviors classified as: feeding, sleeping, alert, body maintenance, aggression and locomotion (Leon and Smith 1999)

- Common Eider and shorebird only

- Instantaneous observation of behavior is recorded every 60 sec. for 20 min., or until birds leave plot (Goudie and Ankney 1986)


Photo: Hannah Mittelstaedt

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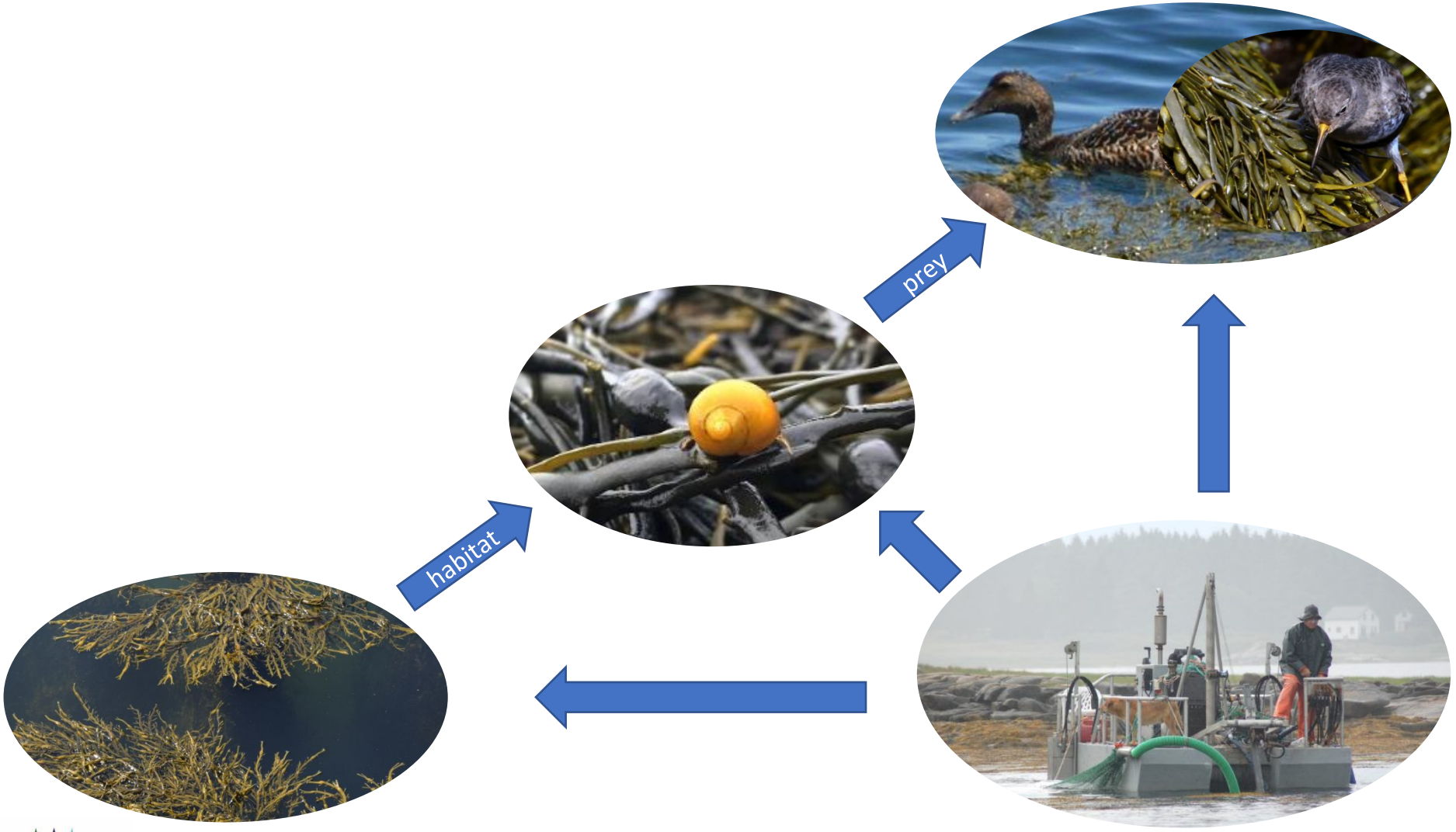

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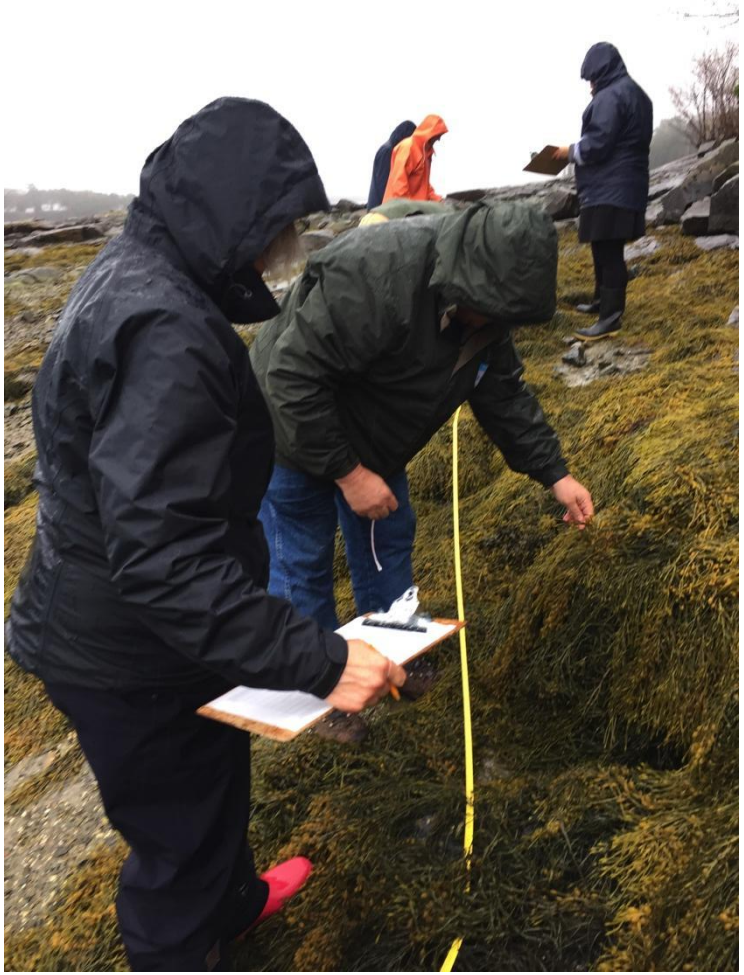
Challenges and Opportunities:

- Uncertainty—Harvesters, DMR, Land owners.
- Opportunity to engage landowners in the research.
- Opportunity to develop citizen science protocol for biomass assessment (with planning grant from Broad Reach Fund).



Thanks!

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CRASSH team at advisory meeting, Nov. 2018--thanks advisors!

Sea Grant Maine

U.S. Fish & Wildlife Service
Department of the Interior

Maine Dept. of Inland Fisheries and Wildlife

Maine Outdoor Heritage Fund

Pittman-Robertson Funds

1865 The University of Maine

Maine Maritime Academy 1941

Acadian Seaplants

Ocean Organics

Maine DMR Marine Resources

SOURCE micronutrients
Essential to thrive

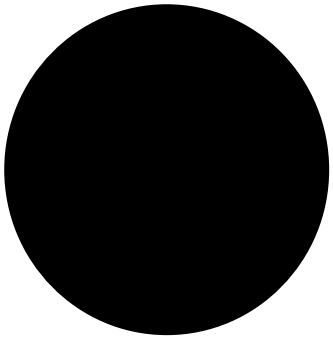
Schoodic Institute at Acadia National Park


Photo: Adam Kuykendall

Opportunity to develop citizen science protocol for biomass assessment (with planning grant from Broad Reach Fund).

Citizen science is about people and data…
people have to do something in order for the data to do something.

https://www.dunnigan.net/



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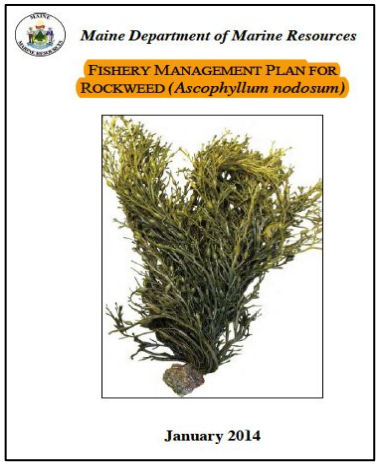

The following data should be recorded and submitted to the Department in an Excel spreadsheet:

- Sector identification
- Transect number
- GPS latitude
- GPS longitude
- Date
- Time
- Low water time
- Exposure
- Substrate
- Transect length
- Quadrat number
- *Ascophyllum* weight (kg/.25 m^2)
- *Fucus* weight (kg/.25 m^2)
- Individual *Ascophyllum* length measurements (cm)
- *Ascophyllum* Bed width (m)
- Epiphytes
- Other algal species
- Faunal species
- Notes (other pertinent information)
- Name of surveyor(s)

Besides biomass density, general information on the transect location, substrate type, wave exposure, slope and any other particular details of the bed shall be recorded. Bare patches are considered a natural property of the zone and all zero values (quadrats without clumps) shall be recorded and counted. The width of the bed at the transect point shall also be recorded and used to calibrate area measurement from aerial photos/maps.

Data integration

Sector holders shall submit to the Department an Excel computer file (with paper back-up) that includes all above information for each individual sector or subsector. Biomass will be calculated as follows: Total biomass = Total Area x Average Biomass/Sector (Sample Area).

DMR will hold periodic training workshops to train sector holders in biomass assessment methodology.

Audits

Independent/third party audits will be conducted on a random subset of the sectors or subsectors held by each entity to validate the results of each entity's assessments. Audits may be conducted in conjunction with the sector-holder's assessment. The latter option is preferred as it would eliminate discrepancies in assessment results. Audits should be conducted prior to the start of harvesting.

Preset/metadata

- Sector identification
- Transect number
- GPS latitude
- GPS longitude
- Date
- Time
- Low water time
- Exposure
- Substrate
- Transect length
- Quadrat number
- *Ascophyllum* weight (kg/.25 m2)
- *Fucus* weight (kg/.25 m2)
- Individual *Ascophyllum* length measurements (cm)
- *Ascophyllum* Bed width (m) (tricky to delineate)
- Epiphytes (would have to have a very clear protocol if anything beyond Y/N)
- Other algal species
- Faunal species
- Notes (other pertinent information)
- Name of surveyor(s)

"…simplification at scale and complexity with care—generate more robust science outcomes." (Parrish et al, 2018)

"They love this place...all I'm doing is connecting them to a place they love in one more way." (Parrish @WSN2018)

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Citizen science project check—Is this a match?

"…simplification at scale and complexity with care—generate more robust science outcomes."
(Parrish et al, 2018)

"I hear you and have run into the problem of balancing "citizen science" with real science. If citizen science is to be more than just citizen education (which is most often a more appropriate label) then it has to have scientifically relevant resolution. We deal with this on XXX system all the time. A peer reviewed study came out and showed that the citizen science group missed significant patterns revealed by scientists in their study. They learn a lot but they did not inform us about real differences. I think we can do better than that."
(name withheld)

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