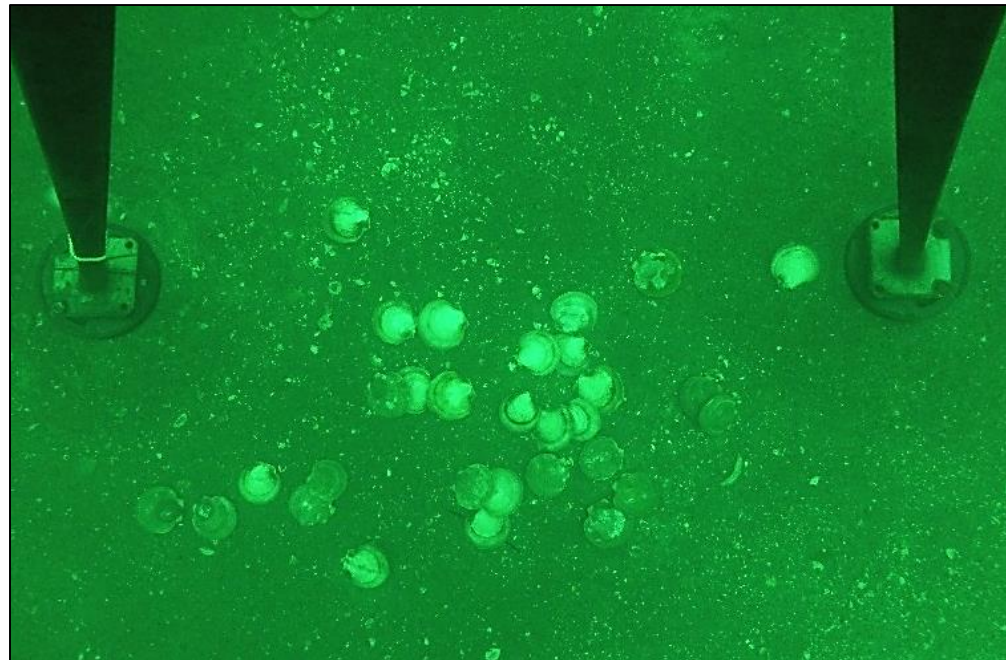


RSA Share Day May 4, 2017

Habitat Characterization and Sea Scallop Resource Enhancement Study in a Proposed Habitat Research Area - Year Three

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Stock Enhancement

- Enhancement is a valuable technique to protect stocks from stochastic events.
- Enhancement of fisheries stocks has been a successful practice internationally since the early/mid-1900s.
- Regional fisheries species including shrimps, some finfish and scallops have all seen improved stock biomasses due to enhancement.
- The Japanese enhancement of the scallop fishery is considered the best example of a success story in this field and has yielded successful enhancement projects in France, New Zealand and Canada.
- 1995-1998, Seastead Project was conducted south of Martha's Vineyard and illustrated the feasibility of scallop mariculture locally.



CFF Scallop Enhancement Goals

1. Characterize benthic environment within closed portions of CAI on Georges Bank to identify areas suitable for seed relocation.
2. Initiate a seeding program to investigate survival and growth of 55-75 mm scallops transplanted from areas of high density to low density.
3. Monitor the seeded areas to ascertain natural mortality, growth and other factors influencing scallop production with SMAST drop camera and CFF ROV.
4. Cost/benefit analysis of a scallop enhancement program.
5. Continue monitoring enhanced seedbed with SMAST drop camera and CFF towed benthic sled.
6. Transplant scallops from NLCA and evaluate difference between source environment and seeded environment.*
7. Deploy spat collectors to determine if settlement is occurring in enhanced seedbed.*
8. Continue monitoring source environment and seeded environment with HabCam and CFF towed benthic sled.

CFF Scallop Enhancement Goals- YR 1

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CFF Scallop Enhancement Goals – YR 2

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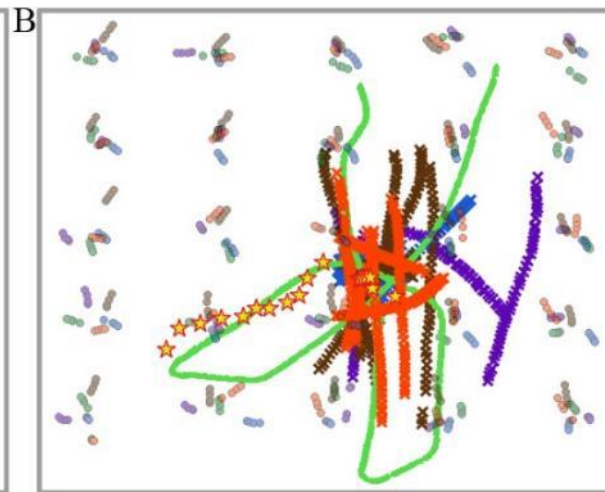
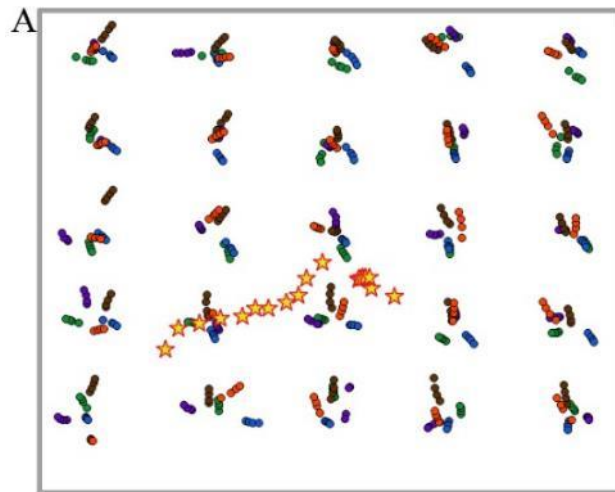
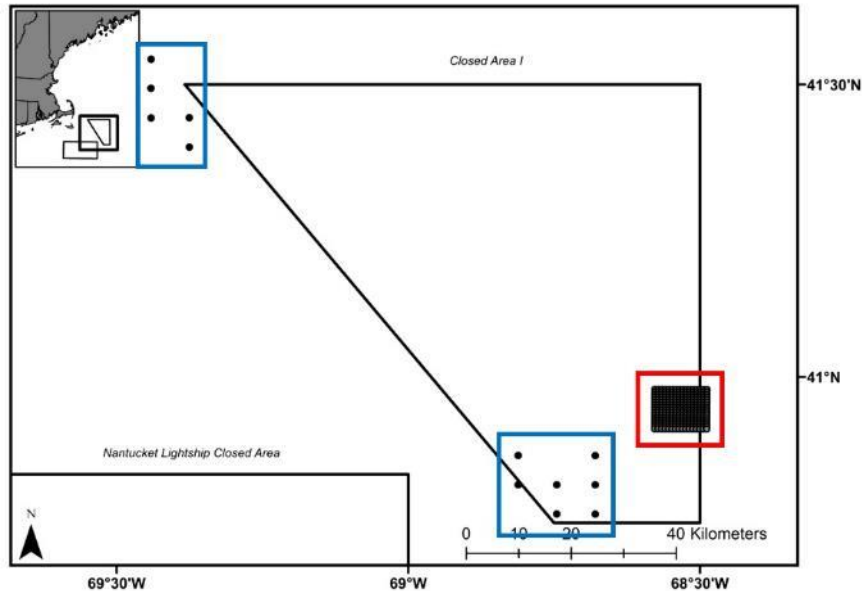
CFF Scallop Enhancement Goals – YR 3

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CFF Enhancement Accomplishments

YEAR ONE: METHODS

- 1) SMAST drop camera surveys to identify **seed collection** and **drop off** sites. **Collection sites** had substantially higher scallop densities than **drop off sites**.
- 2) 2100 bushels from the NW of CA1, and dumped in the NE corner of the NE DHRA.
- 3) Enhancement site was monitored prior to seeding, immediately after seeding (Day 0), 10 and 21 days after seeding, and three months after seeding.

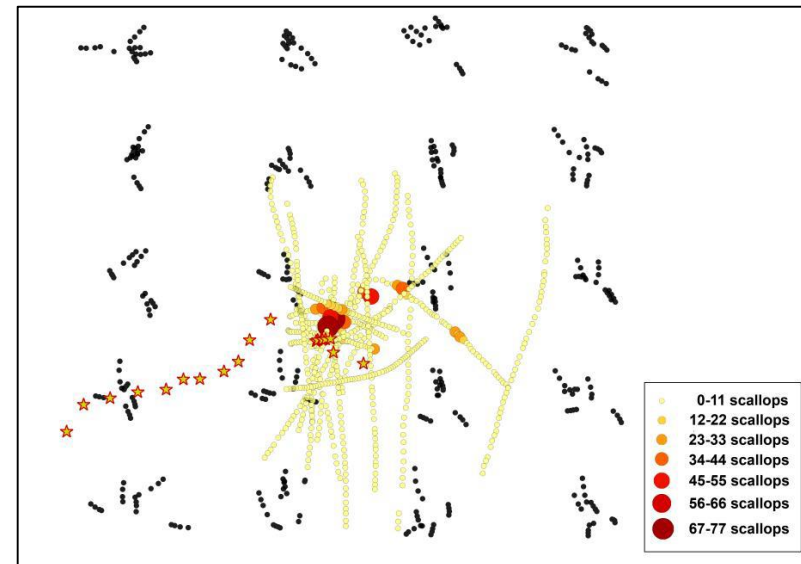
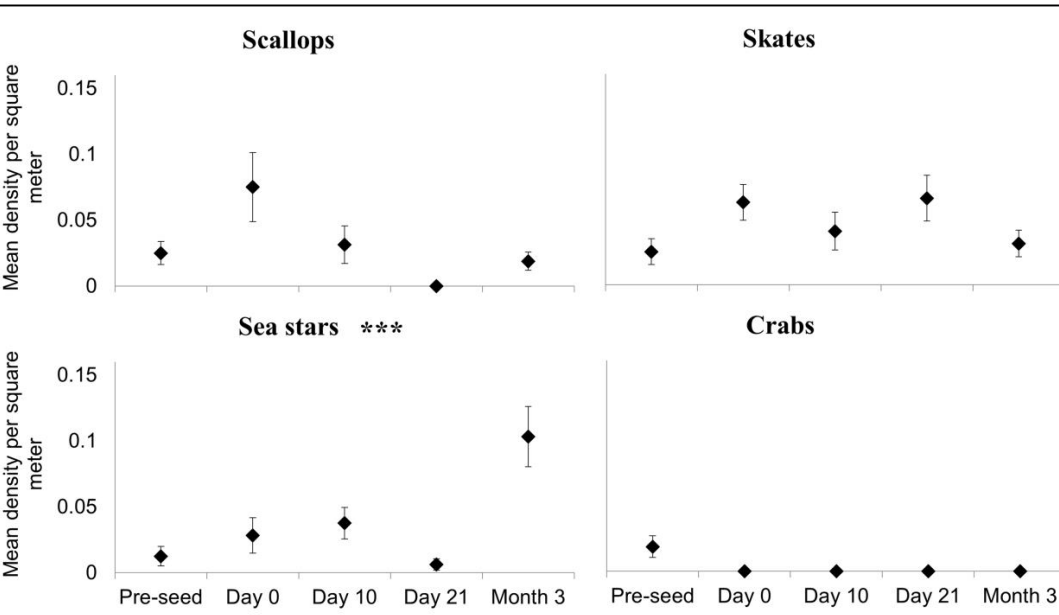
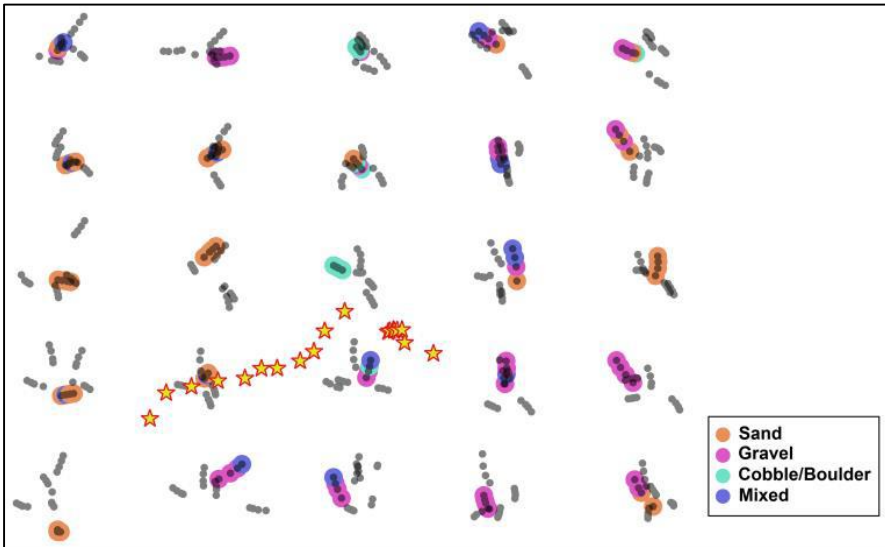


- ★ June drop
- × Month 3 transect
- Month 3 grid
- Day 36 HabCam
- × Day 21 transect
- Day 21 grid
- × Day 10 transect
- Day 10 grid
- × Day 0 transect
- Day 0 grid
- May pre-seeding

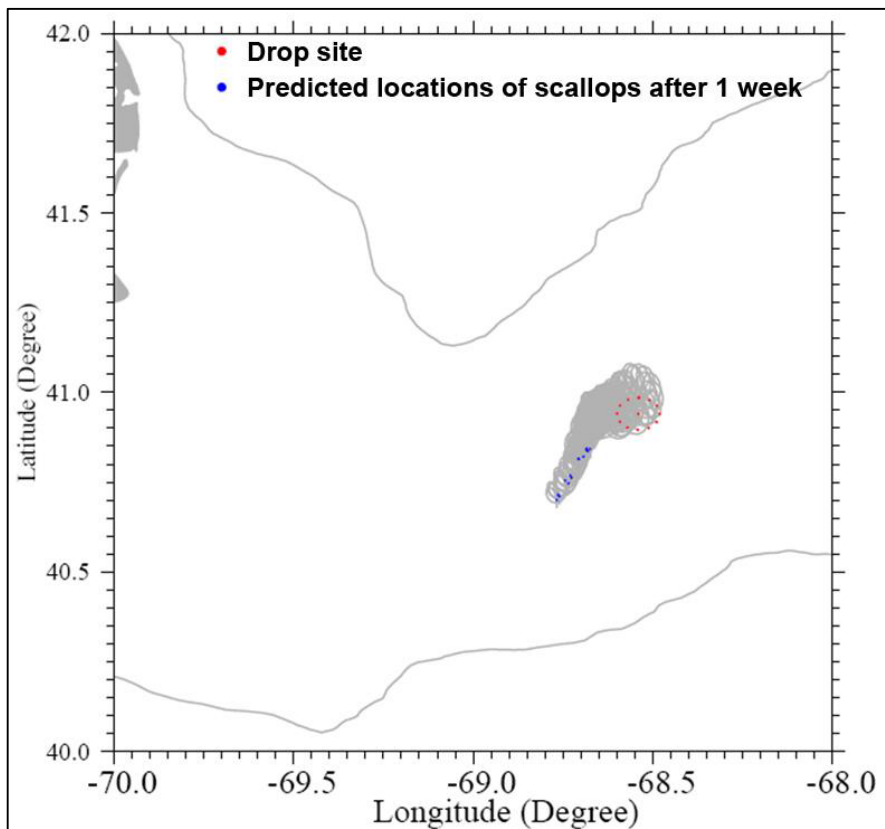
CFF Enhancement Accomplishments

YEAR ONE: RESULTS

- 1) Benthic sediment types were determined based on SMAST video pyramid images.
- 2) Scallops and predators counted at each station.
- 3) It was unclear over the large area if scallop density increased after seeding.

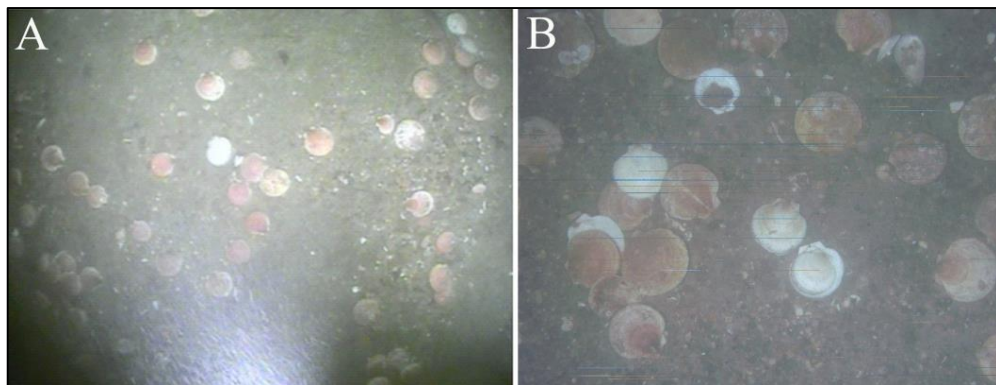


CFF Enhancement Accomplishments



YEAR ONE: RESULTS

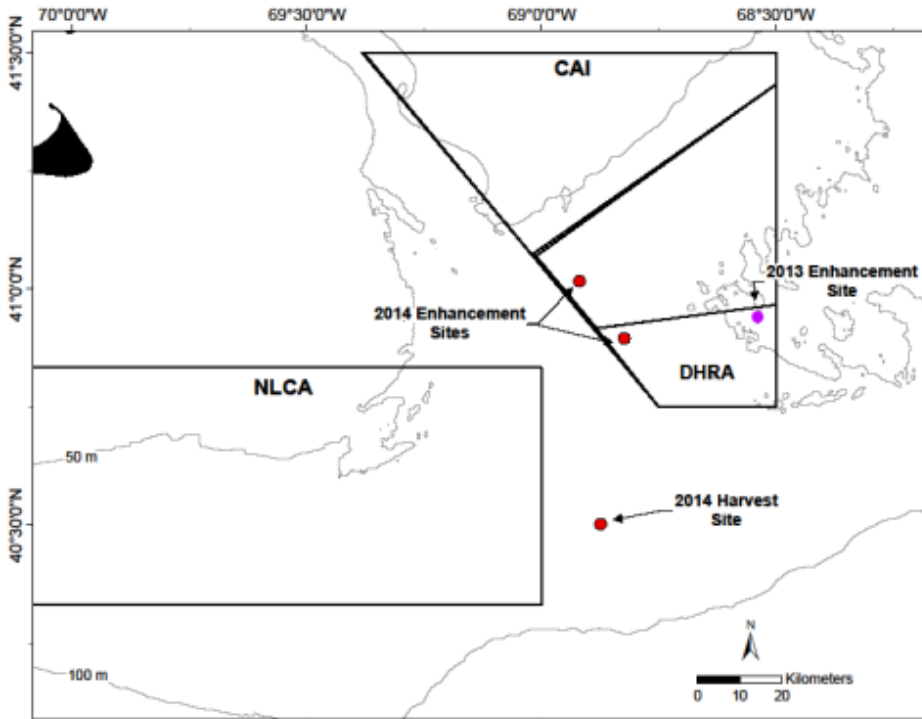
- 4) Drift analysis was limited as it assumed scallops would act as passive drifters.
- 5) Scallop sizes were calculated from HabCam footage.
- 6) Cost analysis identified that a survival rate of only 14.2% would be enough to cover the expenses of moving scallops.



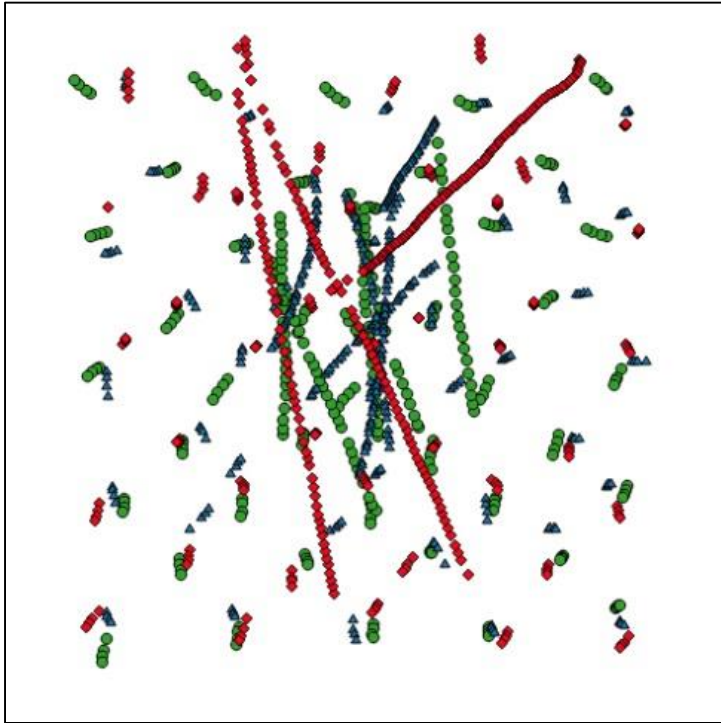
CFF Enhancement Accomplishments

YEAR TWO: METHODS

- 1) Chose new sites for harvest and seeding compared to 2013 due to potentially improved habitat conditions.
- 2) Used new techniques to monitor seeding sites – SMAST drop cam and REMUS.
- 3) Conducted testing on spat collection.
- 4) Deployed SeaHorse current meters.

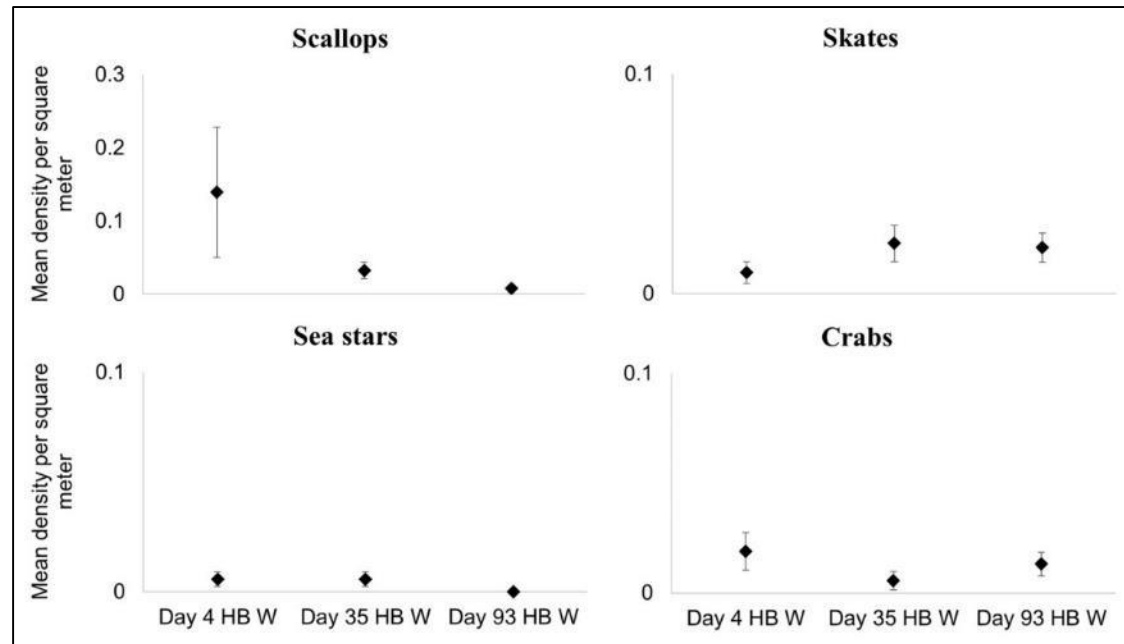


CFF Enhancement Accomplishments



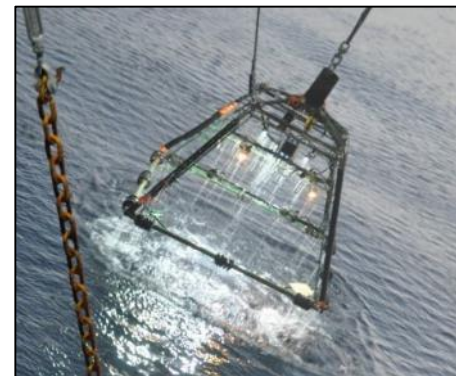
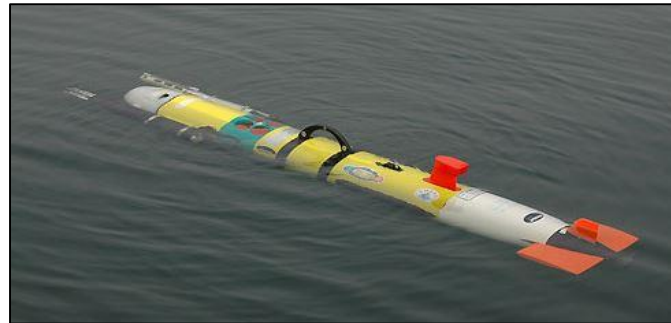
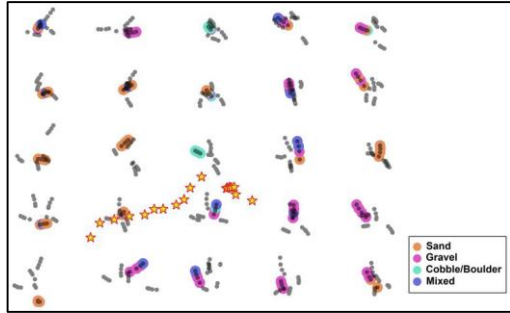
YEAR TWO: RESULTS

- 1) It remained difficult to identify if scallop density increased due to seeding.
- 2) Spat settled in research areas.
- 3) Current meters identified that currents at study sites were much different than model estimates.



CFF Enhancement Accomplishments

After 2 years of research:



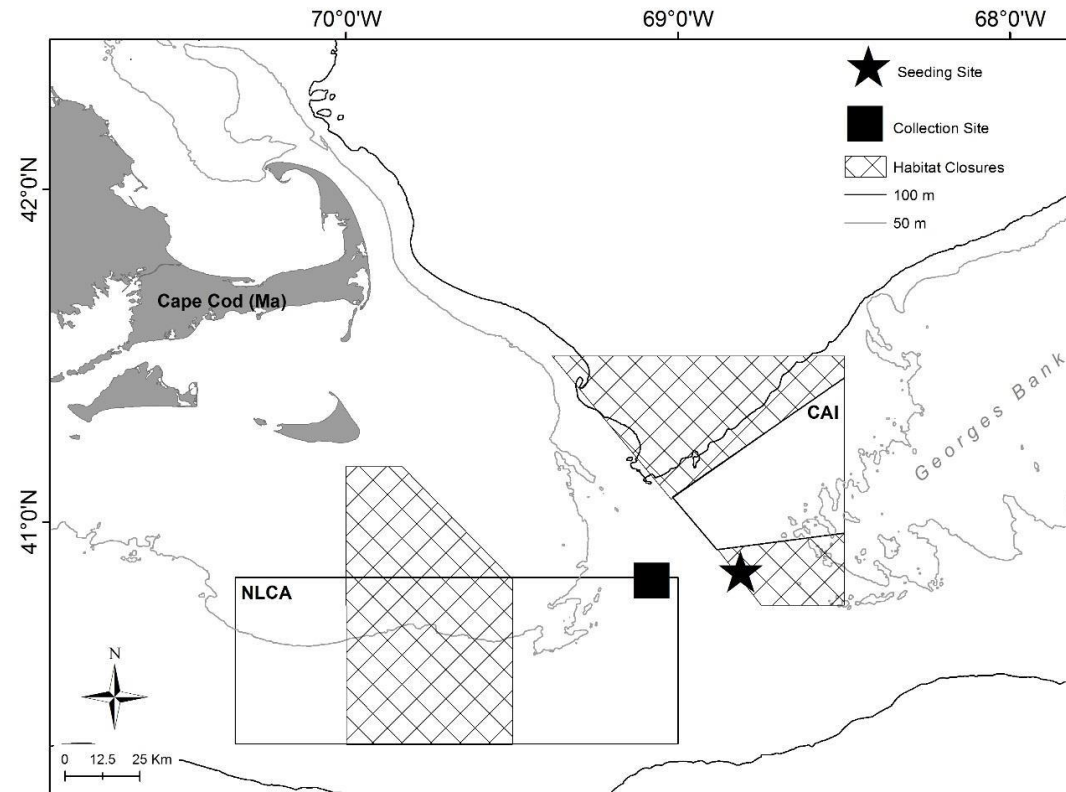
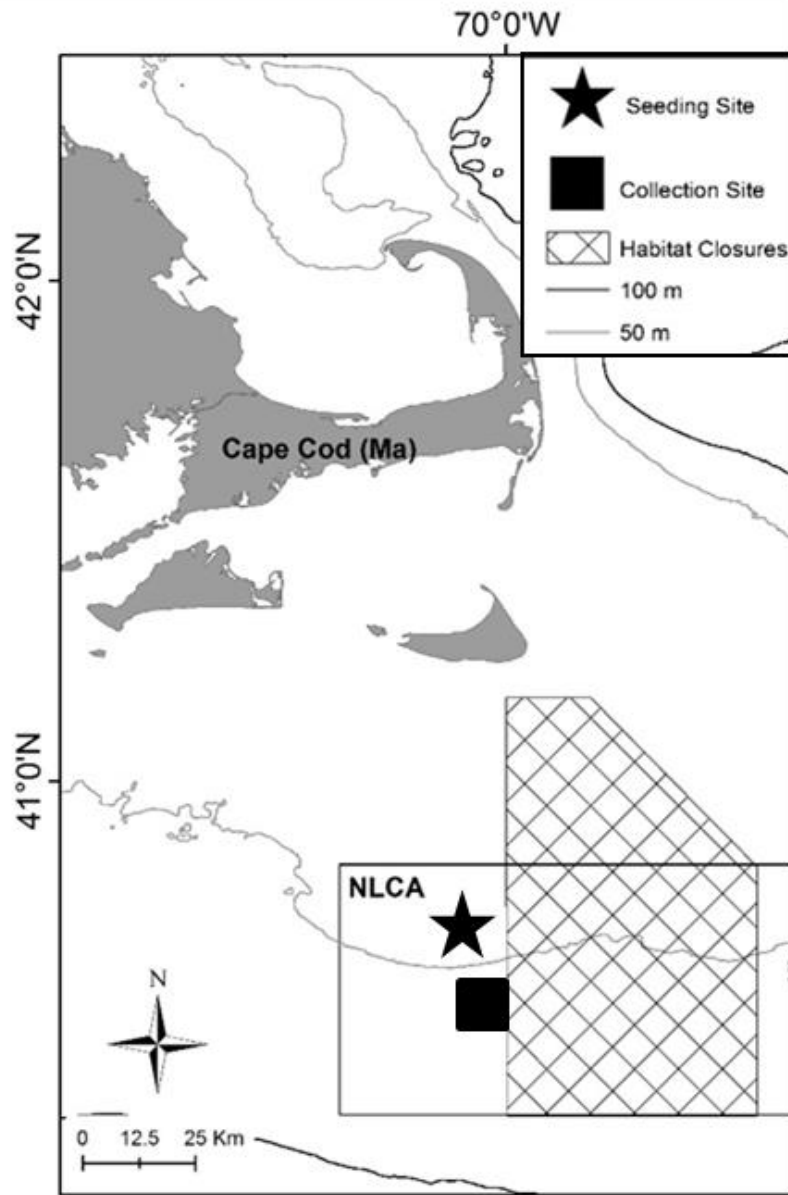
We also identified three major unknowns regarding scallop transplanting at different seeding densities:

- 1) Scallop dispersal rate
- 2) Scallop mortality rate
- 3) Predator interactions

CFF Enhancement Accomplishments

YEAR THREE: METHODS

- 1) Collected and seeded from new sites to identify better habitats for seeding.
- 2) Focused effort to improving seeding and monitoring techniques – developed and tested 2 novel methods.

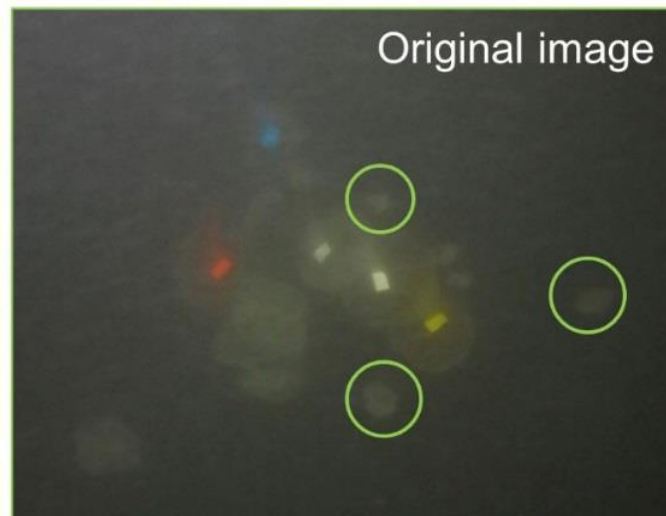
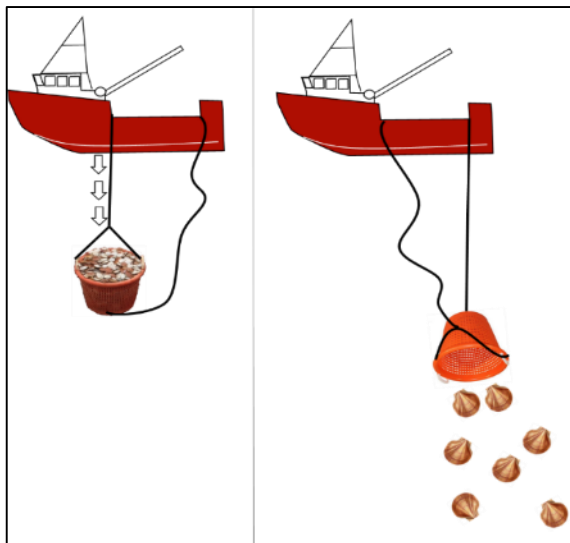


CFF Enhancement Accomplishments

YEAR THREE

METHOD 1

- 1) **Method 1:** Used GAVIA to monitor marked scallops on bottom.
- 2) **Method 2:** Use camera stands to monitor scallops released immediately under.



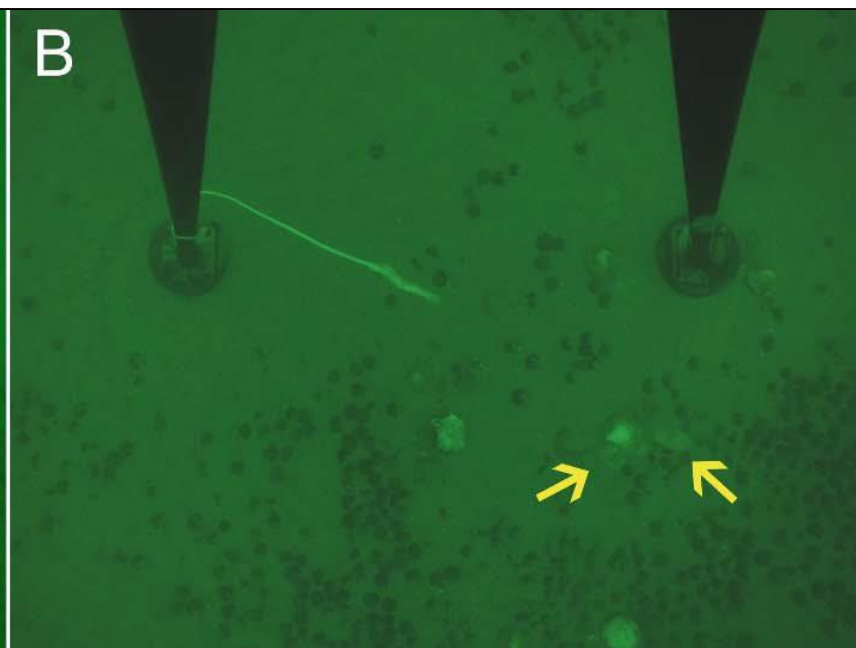
Due to logistical complications with the GAVIA, testing of this method was not completed.

CFF Enhancement Accomplishments

YEAR THREE

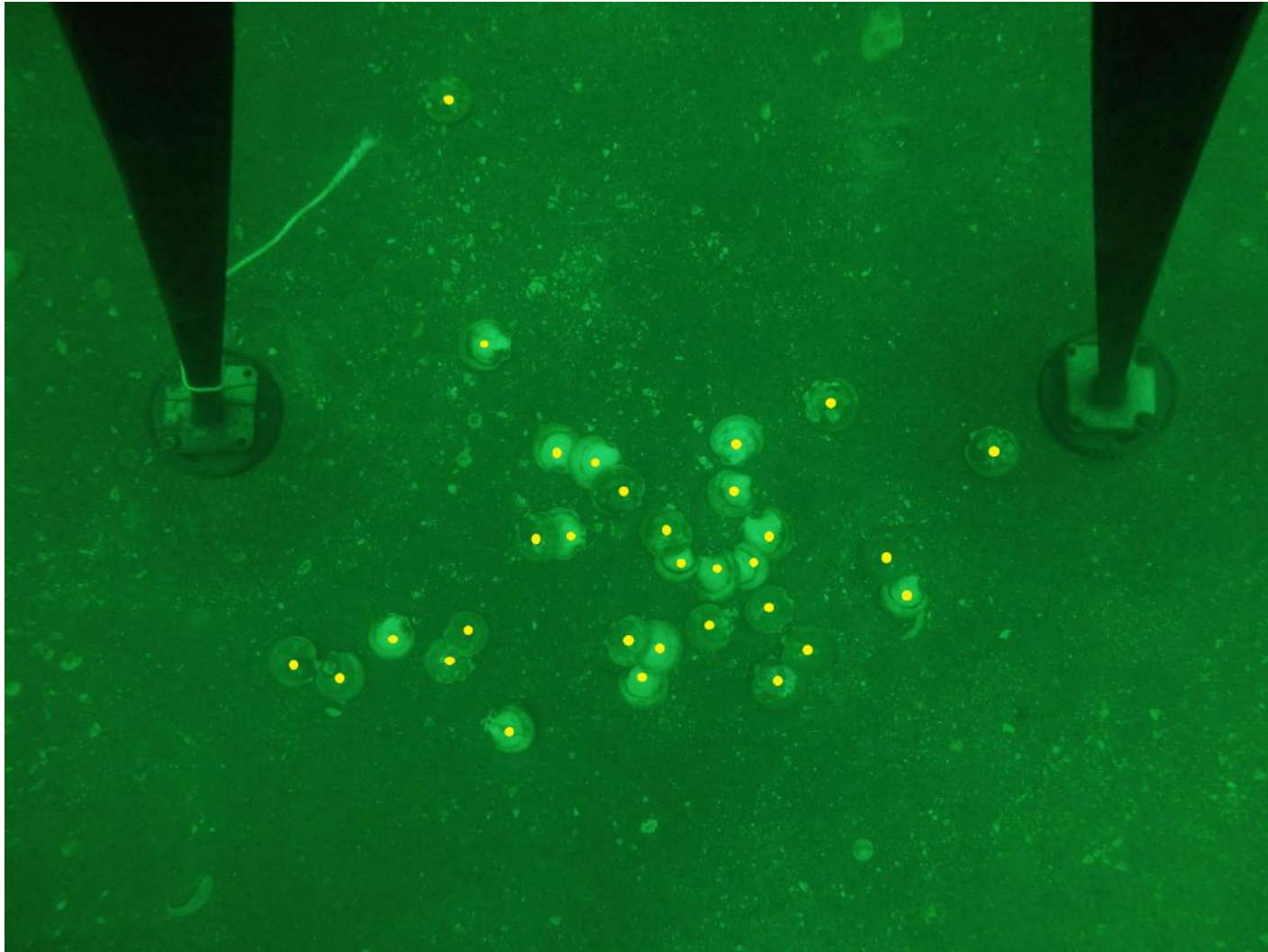
- 1) **Method 1:** Use GAVIA to tracked marked scallops on bottom.
- 2) **Method 2:** Use camera stands to track scallops released immediately under.

METHOD 2



CFF Enhancement Accomplishments

Estimate scallop dispersal rate



CFF Enhancement Accomplishments

Predator Interactions: Lobster



CFF Enhancement Accomplishments

Predator Interactions: Moon Snails



CFF Enhancement Accomplishments

Life on a scallop ground



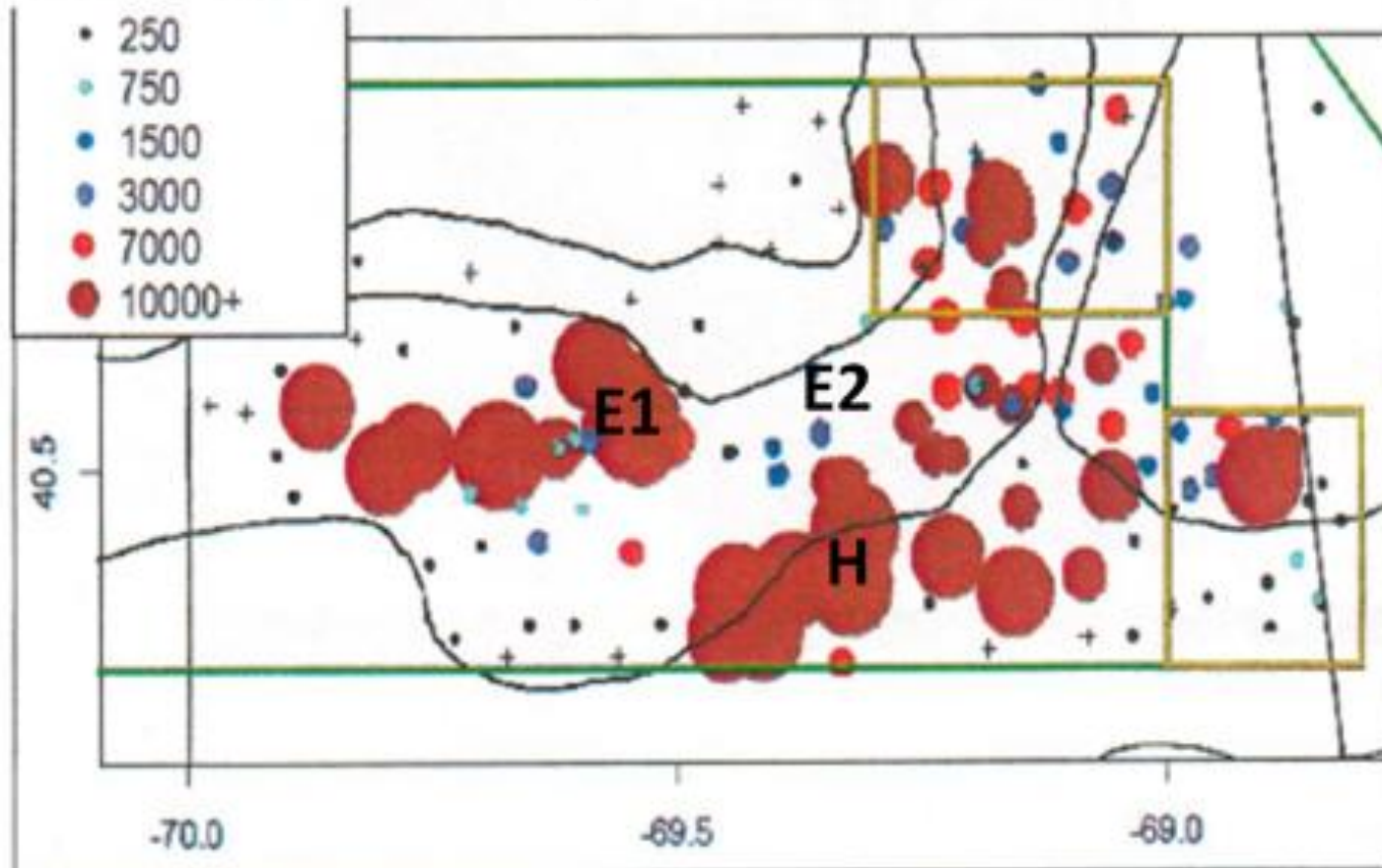
CFF Enhancement: Next Steps

Test new seeding sites:

One with a preexisting population of scallops (E1) and one without (E2).

Dredge Survey

Biomass (g/tow meats)



CFF Enhancement: Next Steps

- Camera stands updated with higher quality cameras, lights and batteries to allow for 24-48 hour deployments.
- This will allow us to identify dispersal over a much larger time period, and potentially a mortality rate, as previous sampling lasted only a few hours.
- Additionally, a 48 hour deployment, may allow for a better indication of predator species that can quickly respond to this influx of prey.
- We have conducted multiple tests on the new frame and camera system, including an at-sea test. Next enhancement trip will be in late-June (EFP pending).



“I am fundamentally against meddling with the natural environment and this is an expensive project that proposes such an idea as an end result.”