Vineyard Wind Monitoring Plan

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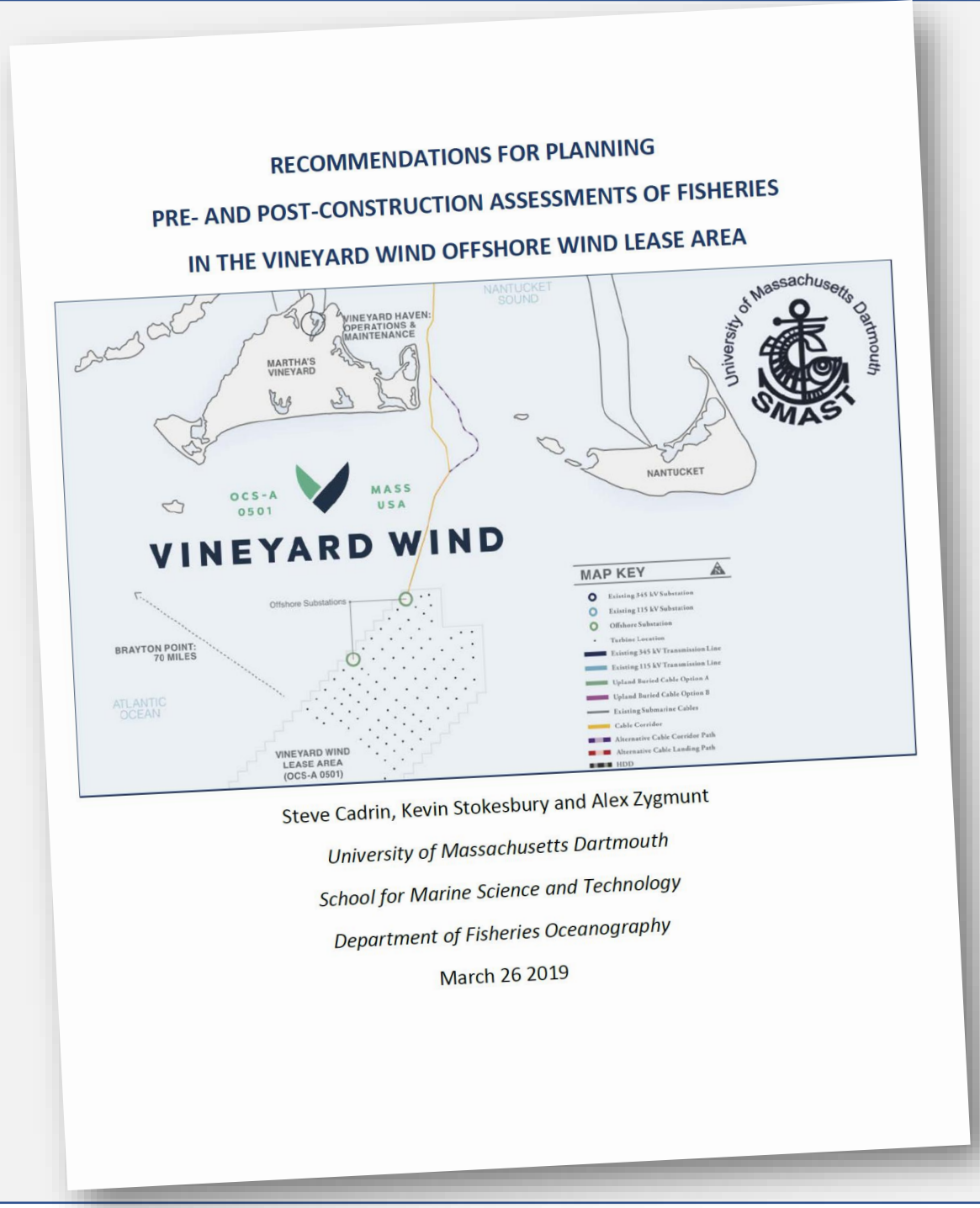
VINEYARD WIND

Rhode Island Fisheries Advisory Board (March 11 2020)

Monitoring Plan Recommendations

- Background
  - SMAST-Vineyard Wind Agreement
  - State and Federal Guidance
  - Scientific Best Practices
- Currently Available Monitoring Data
  - Oceanographic Surveys
  - Benthic Surveys
  - Fish and Invertebrate Trawl Surveys
  - Avian Surveys
  - Marine Mammal and Sea Turtle Surveys
- Workshops with Fishermen
- Meetings with Regulators
- Recommendations
- Appendices



RECOMMENDATIONS FOR PLANNING

PRE- AND POST-CONSTRUCTION ASSESSMENTS OF FISHERIES

IN THE VINEYARD WIND OFFSHORE WIND LEASE AREA

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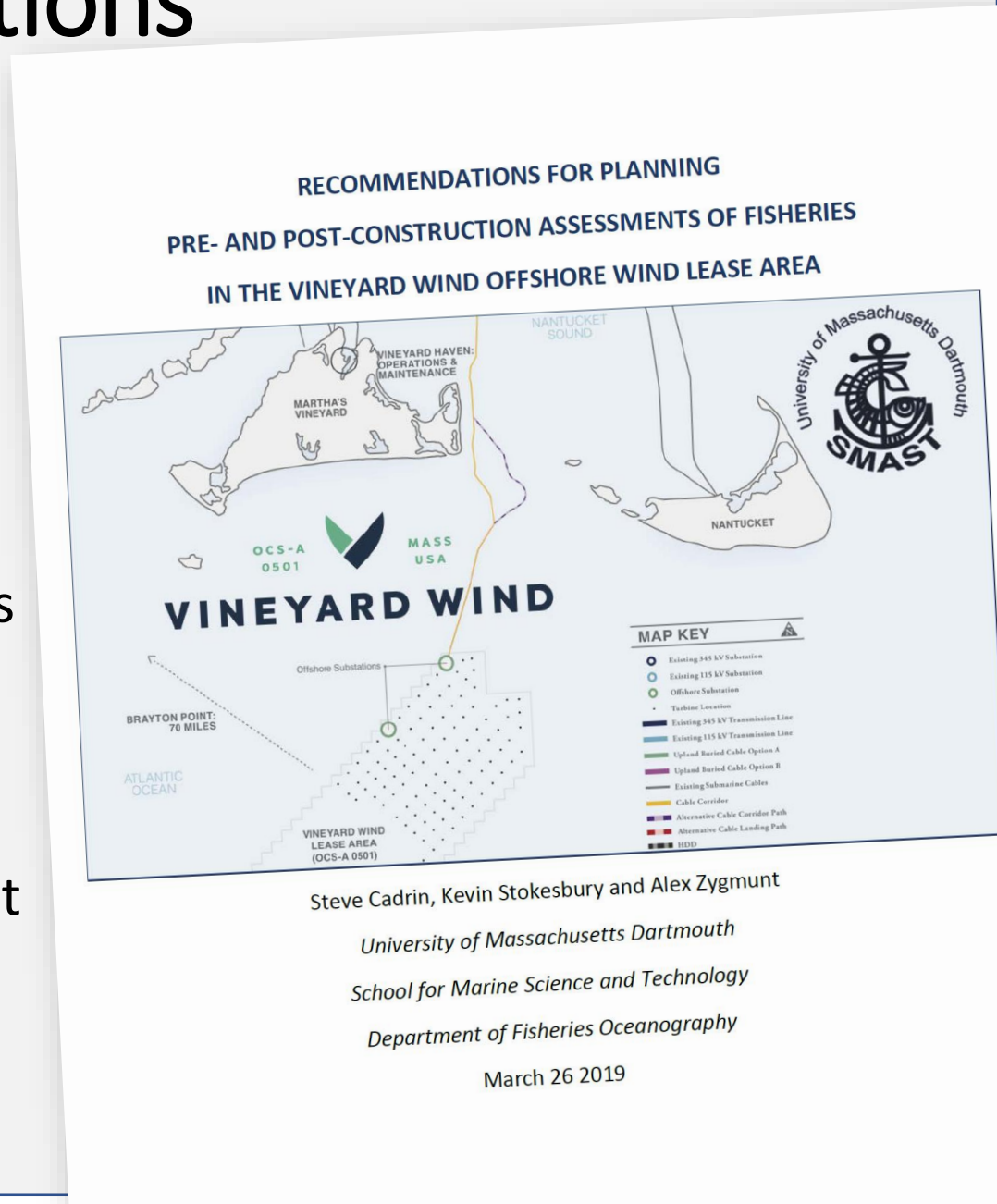
March 26 2019

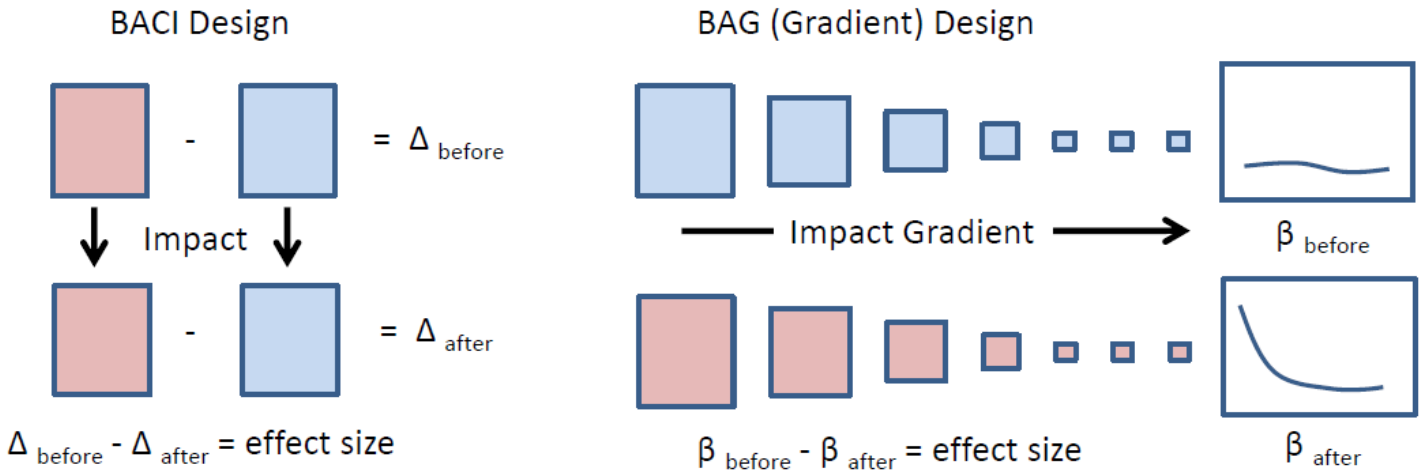
Monitoring Plan Recommendations

- Seasonal Fishery Resource Surveys
  - Benthic survey
  - Trawl survey
  - Trap survey
  - Plankton survey
- Supplemental Studies
  - Movement patterns of juvenile and adult life stages from tagging
  - Egg and larval dispersal
  - Optical survey transects near turbines
  - Analysis of fishery monitoring data to detect impact on highly migratory species
  - Monitoring burial of cables
  - Monitoring and research on acoustic impacts



Dave Secor

Atlantic Offshore Renewable Energy Development and Fisheries Workshop



Design elements	BACI	BAG
Site selection	Control site issues	Informed by effect size
Independence	Pseudo-replication?	Non-independence assumed
Confounding environmental signal	Problem	Some can be incorporated
Predictions	Discrete (Y/N) bounded effect; difficult to model	Effects gradient; supports models

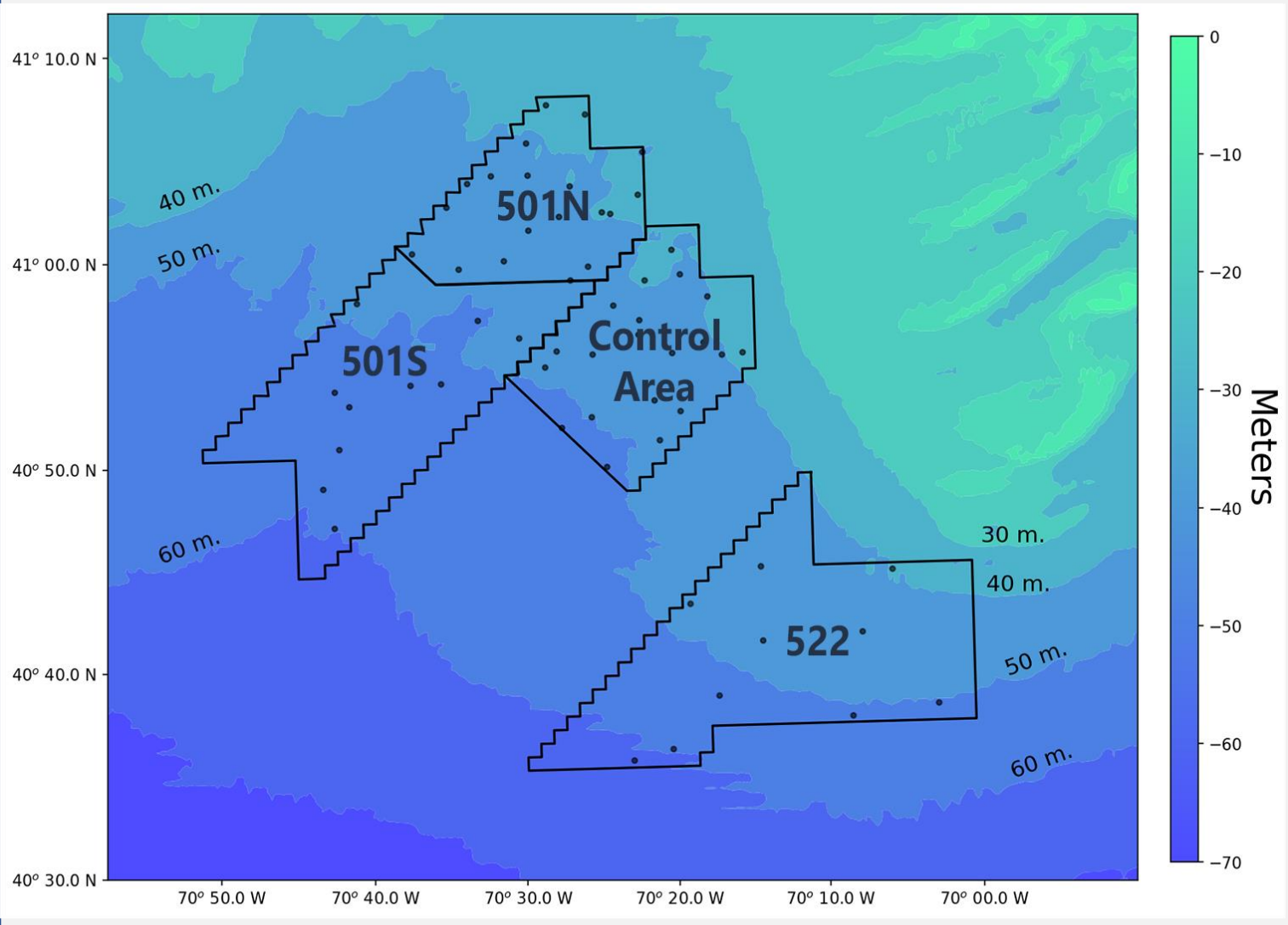
Vineyard Wind Bottom Trawl Survey

Pingguo He and Chris Rillahan (UMass Dartmouth – SMAST)
(For Vineyard Wind LLC, Contact : Crista Bank)

“Beyond-BACI” Experimental Design

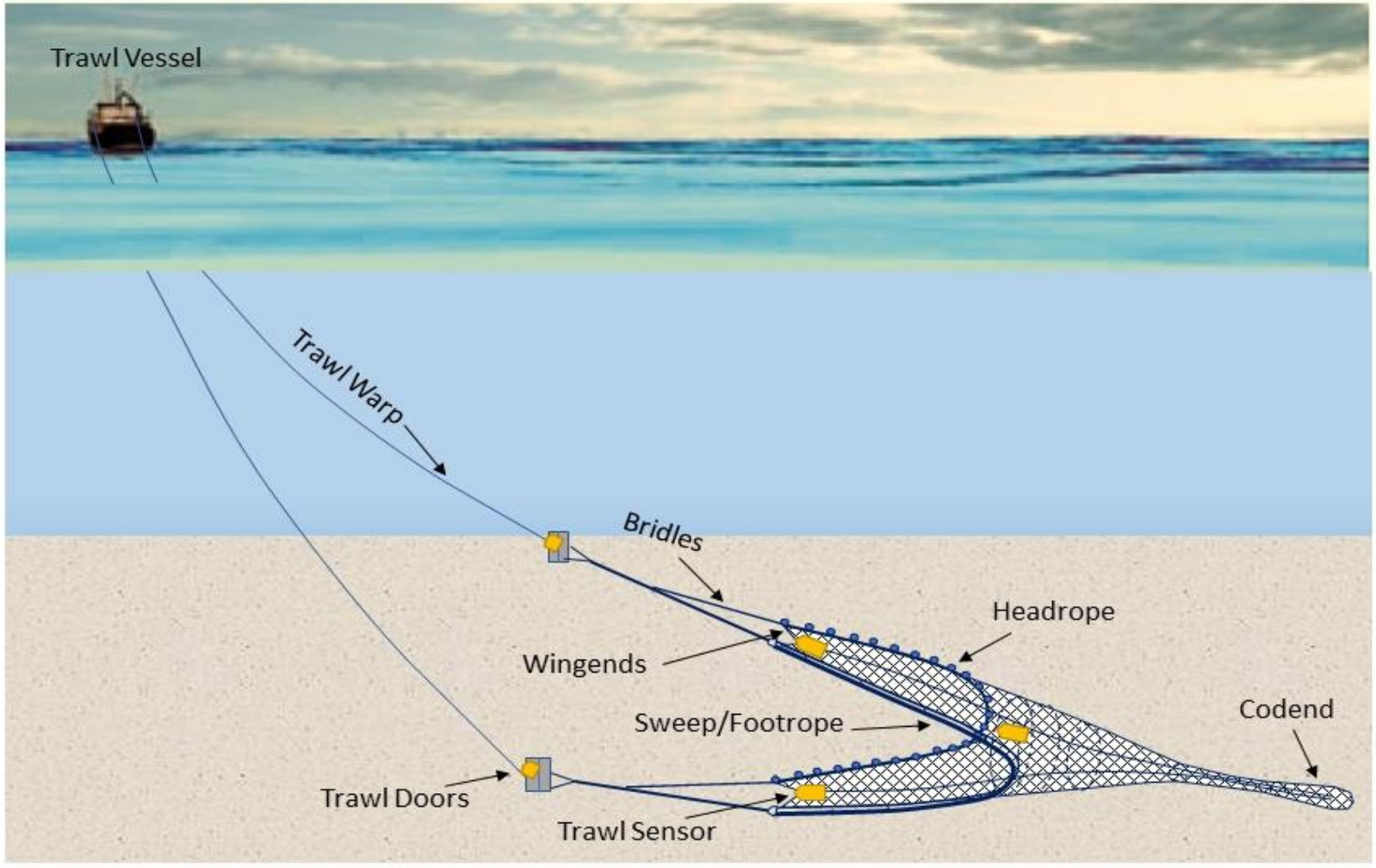
- The “beyond-BACI” approach controls for spatial and temporal variations in fish populations (Underwood, 1991).
- To account for spatial variability in fish populations, multiple tows are completed across the development and control areas.
- Quarterly surveys account for temporal variations in fish assemblages.
- The statistical analysis will compare catch rates, population structure and community composition before, during and after construction, compared to the control area, to determine the effects the wind farm has on fish communities.

Survey Design/Survey Area



- Tow locations are selected using systematic random sampling.
- Areas are split into sub-sections. Tow locations are then randomly generated within the sub-section.
  - Sampling resolution: 1 station every 3.6 – 15.6 sq. nautical miles
- 60 tows per season
  - 20 tows in both 501N Study Area and Control Area.
  - 10 tows in both 501S and 522 Study Areas
- Tow duration: 20 minutes
- Tow speed: 3.0 knots
- Daytime only
  - 30 minutes after sunrise – 30 minutes before sunset

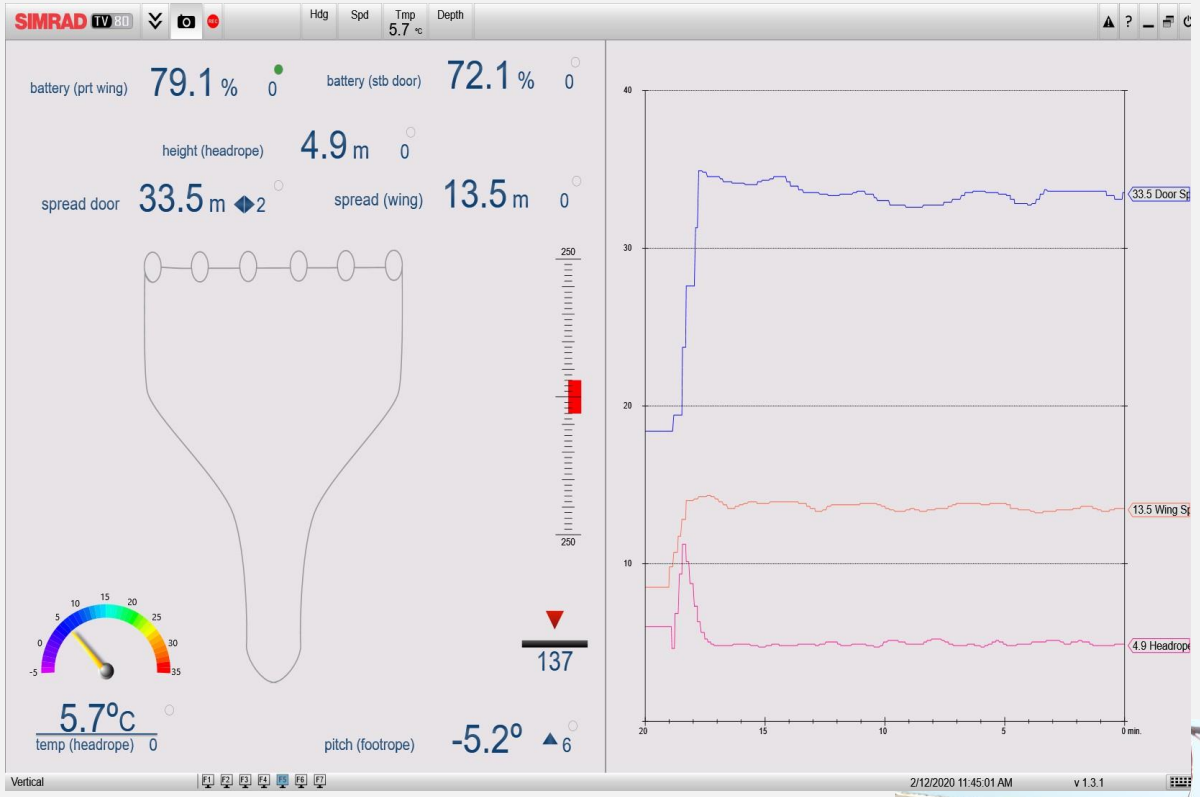
Trawl Design – NEAMAP Trawl



- Trawl design conducive to sampling a wide-variety of fish species with differing life history strategies.
  - Three-bridle, four seam bottom trawl developed by Northeast Trawl Advisory Panel
  - Relatively stable geometry
- Three-bridle design allows for a high vertical opening.
- Uses a “flat-sweep” to reduce escape of fish under the net.
  - Permissible due to sandy/mud bottom
- 1” knotless liner to catch juvenile fish.

Data Collected

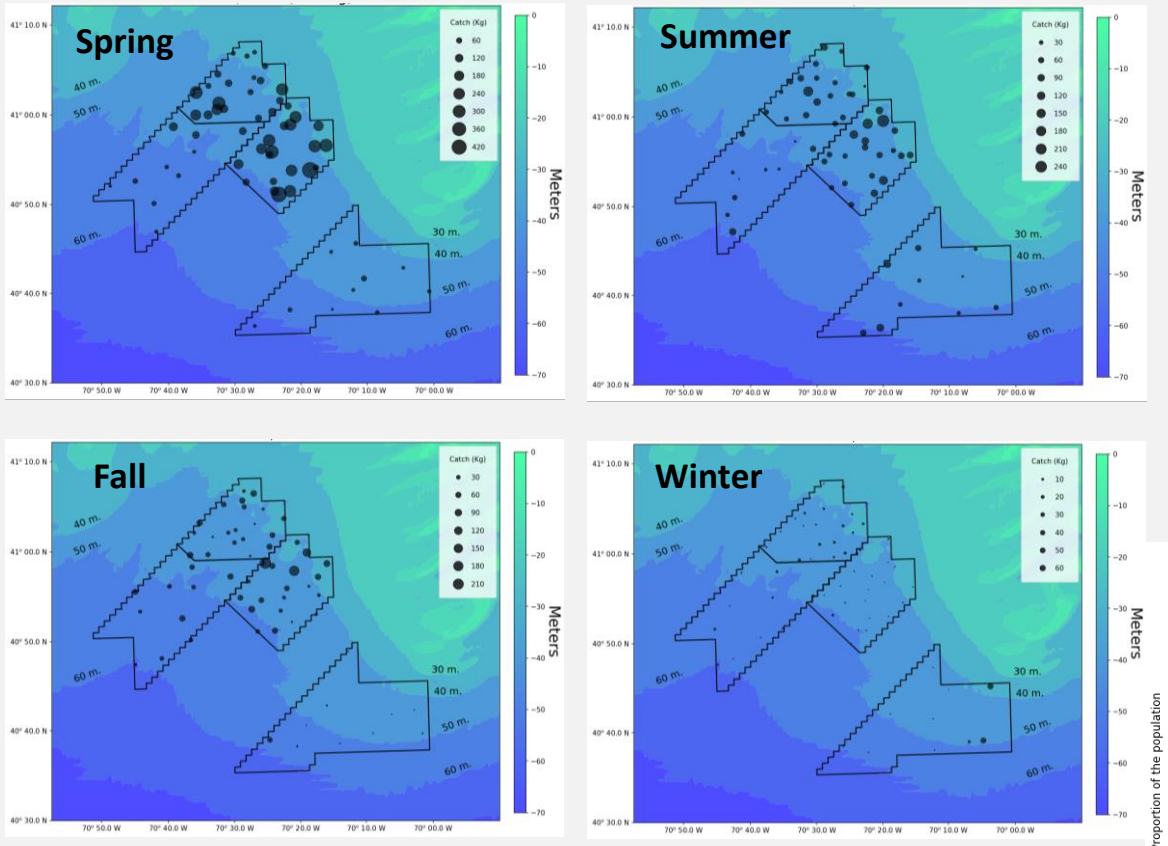
- Environmental
  - Sea state, Wind speed, Wind direction
  - Bottom temperature
- Biological
  - Aggregated catch weight for each species
  - Individual length and weights
    - 50-100 individuals/tow
- Trawl Geometry
  - SIMRAD PX Trawl Monitoring System
  - Wingspread – Horizontal opening of the net mouth
  - Door Spread – Horizontal distance between the trawl doors
  - Headline Height – Vertical opening of the net
  - Pitch sensor in the net belly – Used to ensure the net is on the bottom

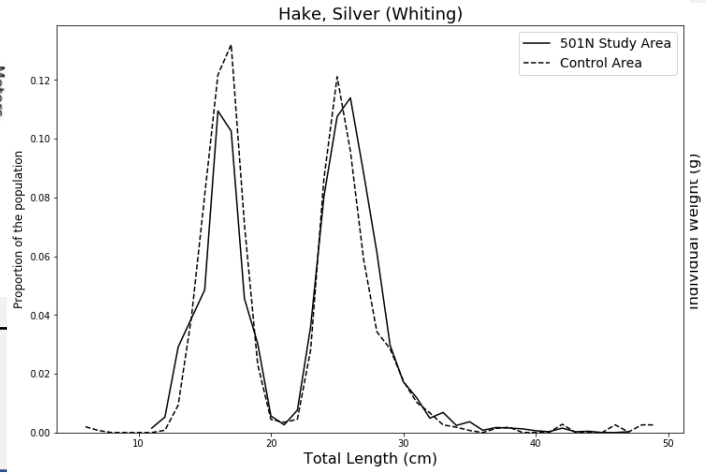


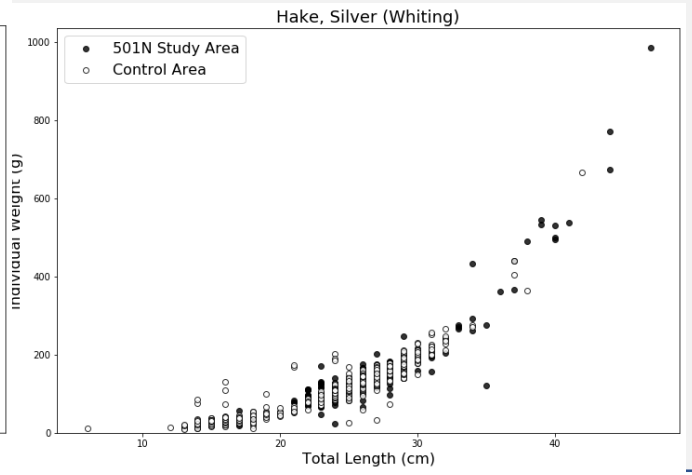
Work Completed to Date and Preliminary Results

- 4 surveys completed
  - June, August, November (2019) and February (2020)
  - 2 Fishing vessels
    - F/V Guardian (June)
    - F/V Heather Lynn (August, November and February)
  - 240 tows
  - 53 species
    - Smallest: 6 cm Whiting
    - Largest: 2.5 m Thresher Shark
  - 3,650 aggregated catch weights
  - 69,299 individual fish measurements (Length, Weight)

Silver Hake (Whiting)



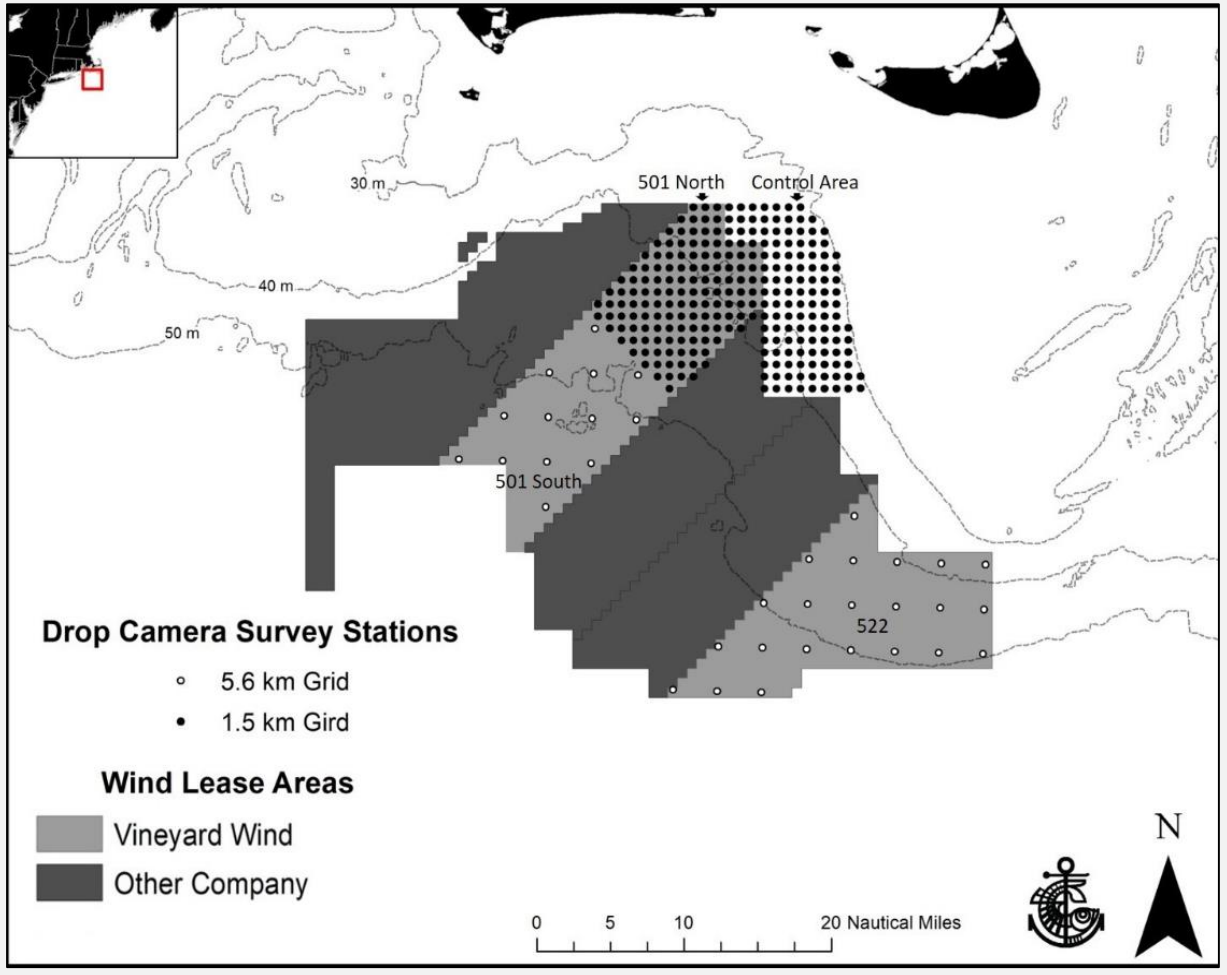


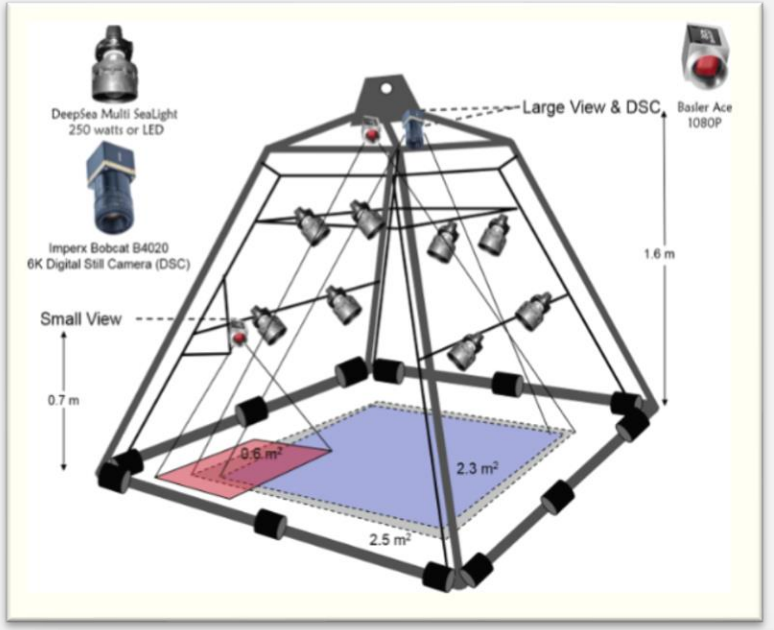


Future Work

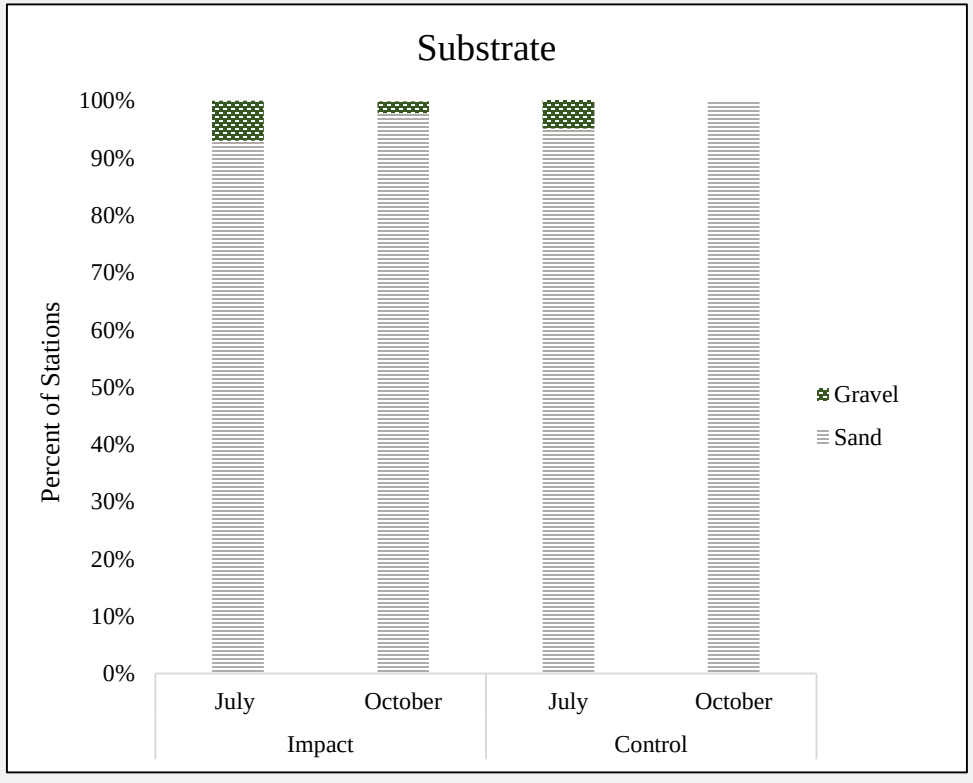
- Annual Report (Spring 2020)
  - Reporting survey effort and catch.
  - Comparative analysis between 501N study area and control area.
    - Catch rates, species composition and population structure between areas.
    - Ensures the adequacy of the control area.
- Future Actions
  - Re-evaluation or selection of control area (the current control area is partially in a future development area)
  - Data sharing
- Future Surveys (2020-2021) – in planning

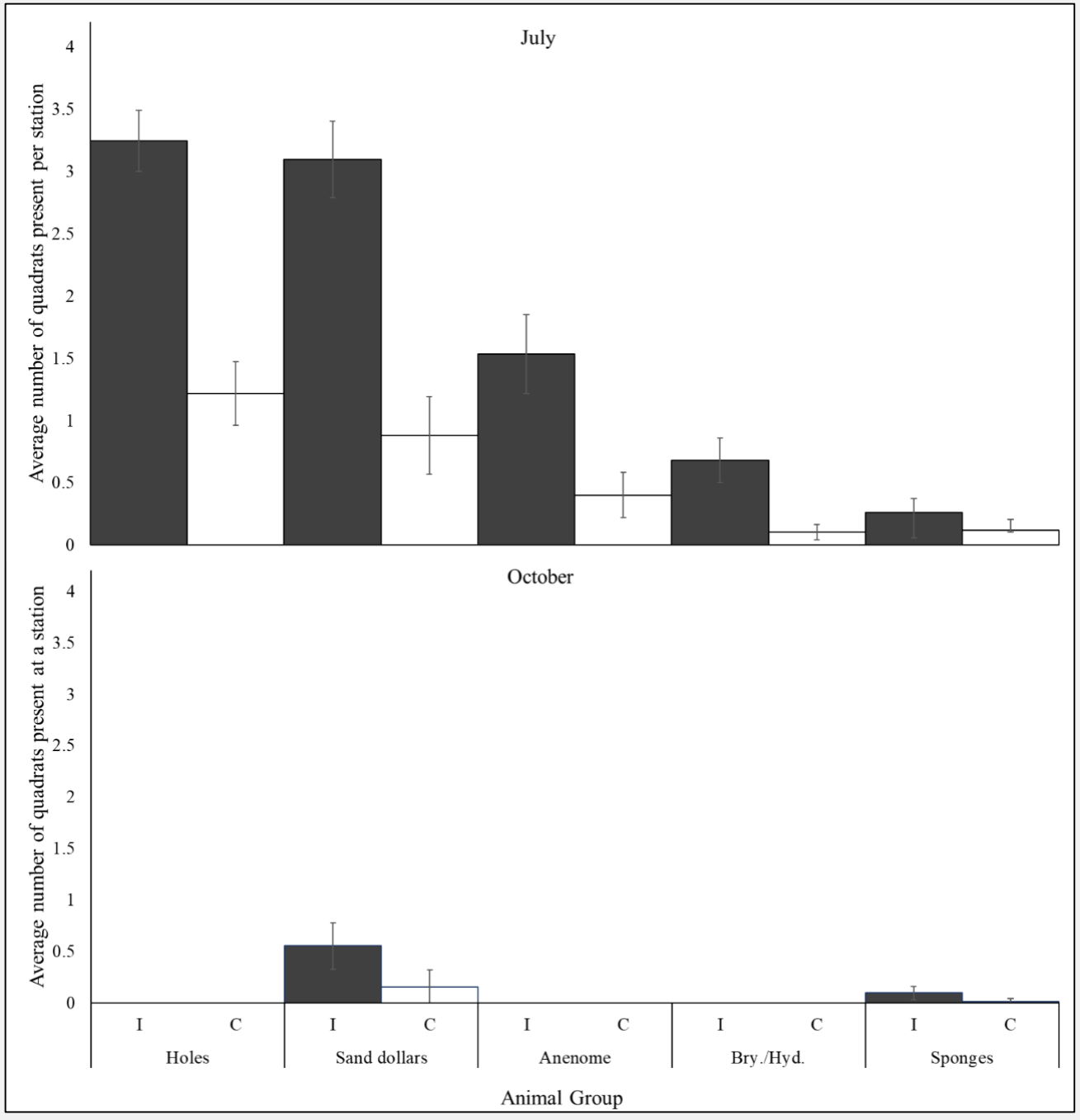
SMAST DROP CAMERA SURVEY: VINEYARD WIND LEASE AREA

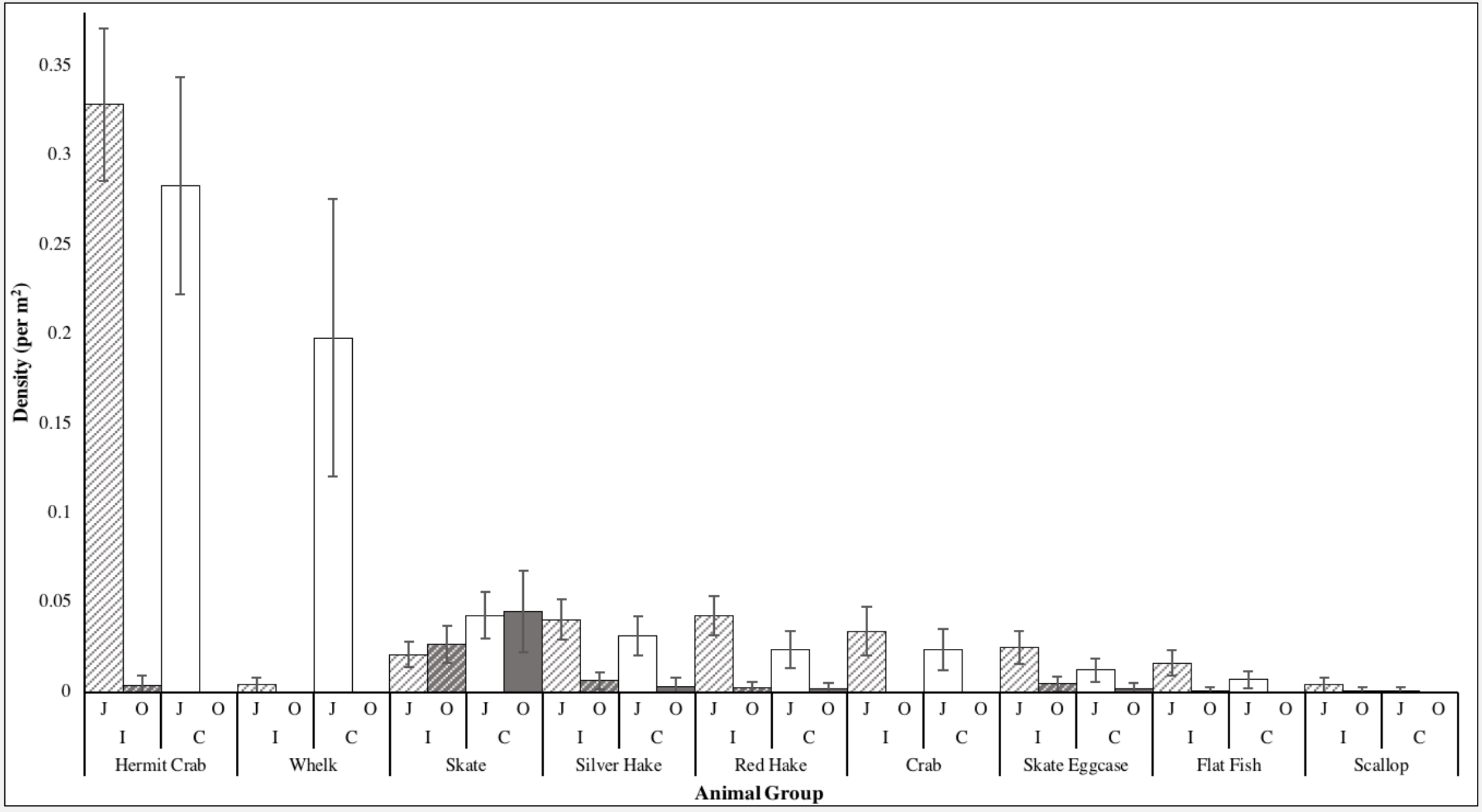




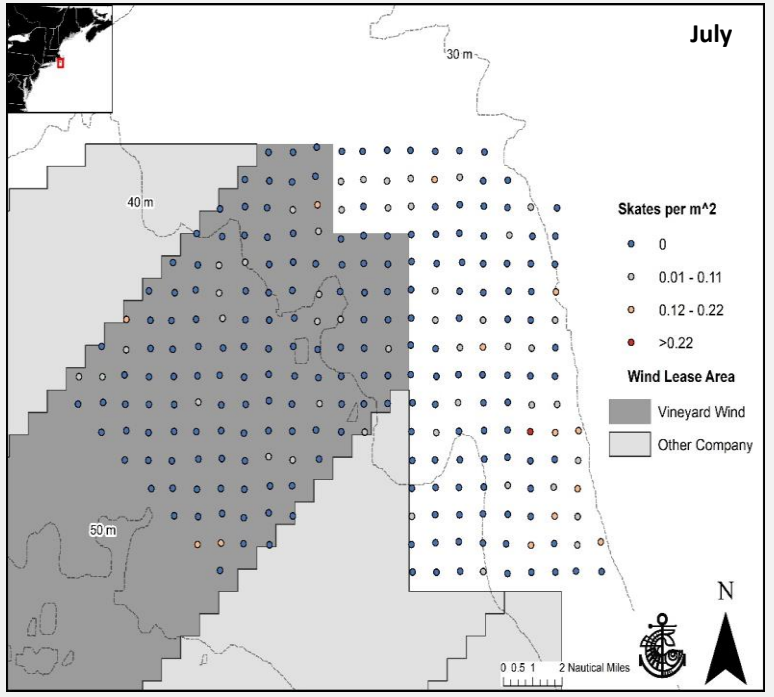
Animal Group	Quadrats Present	Counts
Holes (burrowing animals)	599	
Sand Dollars	564	
Hermit Crabs	429	732
Anemones	224	
Waved Whelk	181	391
Skates	123	131
Bryozoans/Hydrozoans	101	
Sliver hake	86	95
Red hake	82	84
Sponges	65	
Crabs (cancer spp.)	58	69
Skate Egg Case	49	51

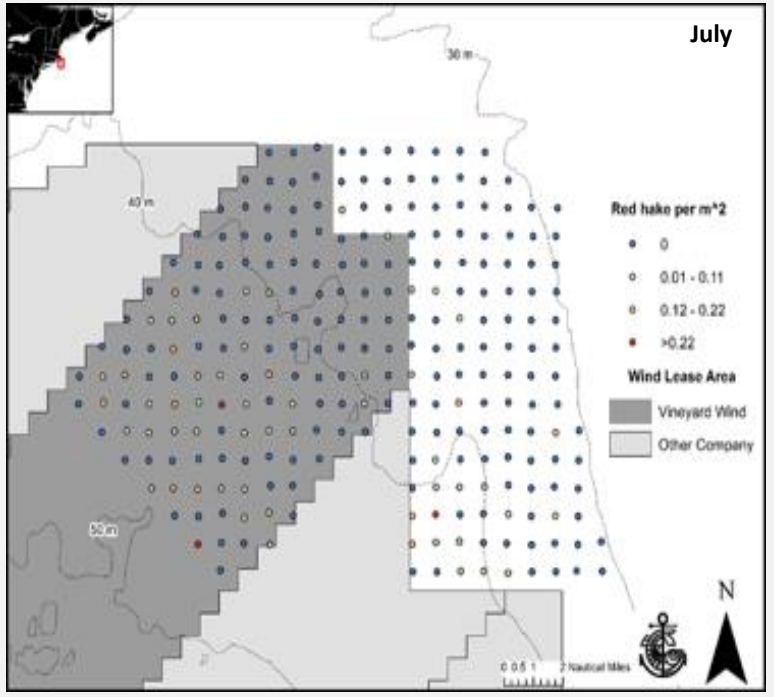


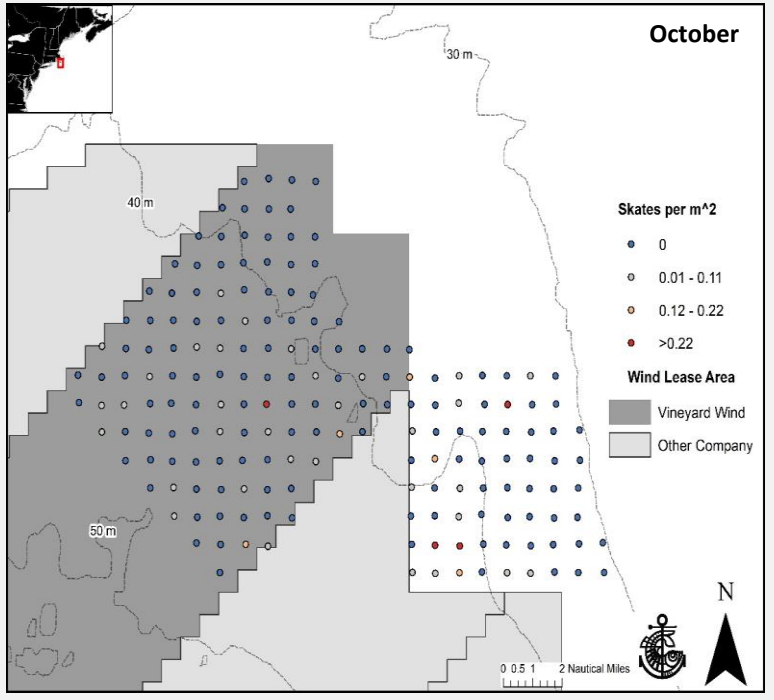


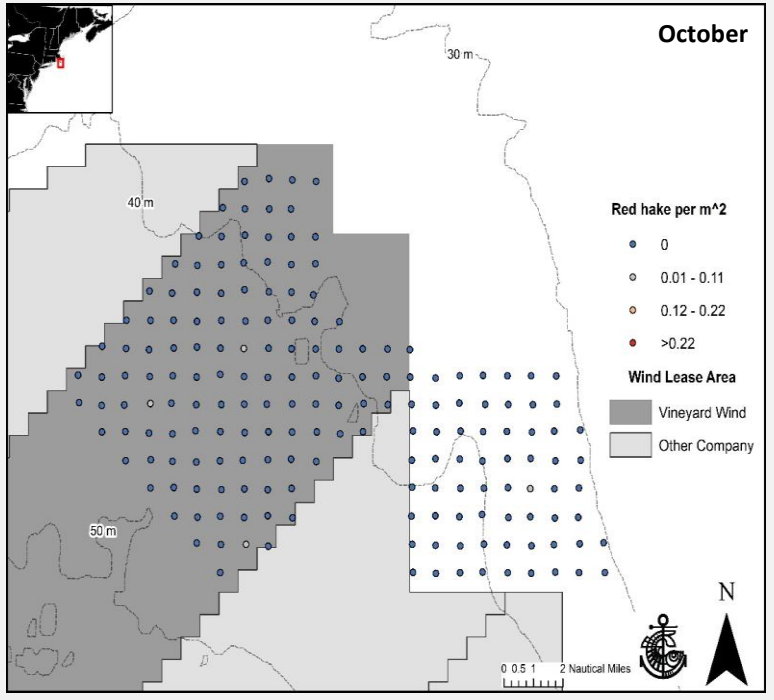

Density (per m²)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
J O J O
I C
Hermit Crab
Whelk
Skate
Silver Hake
Red Hake
Crab
Skate Eggcase
Flat Fish
Scallop
Animal Group

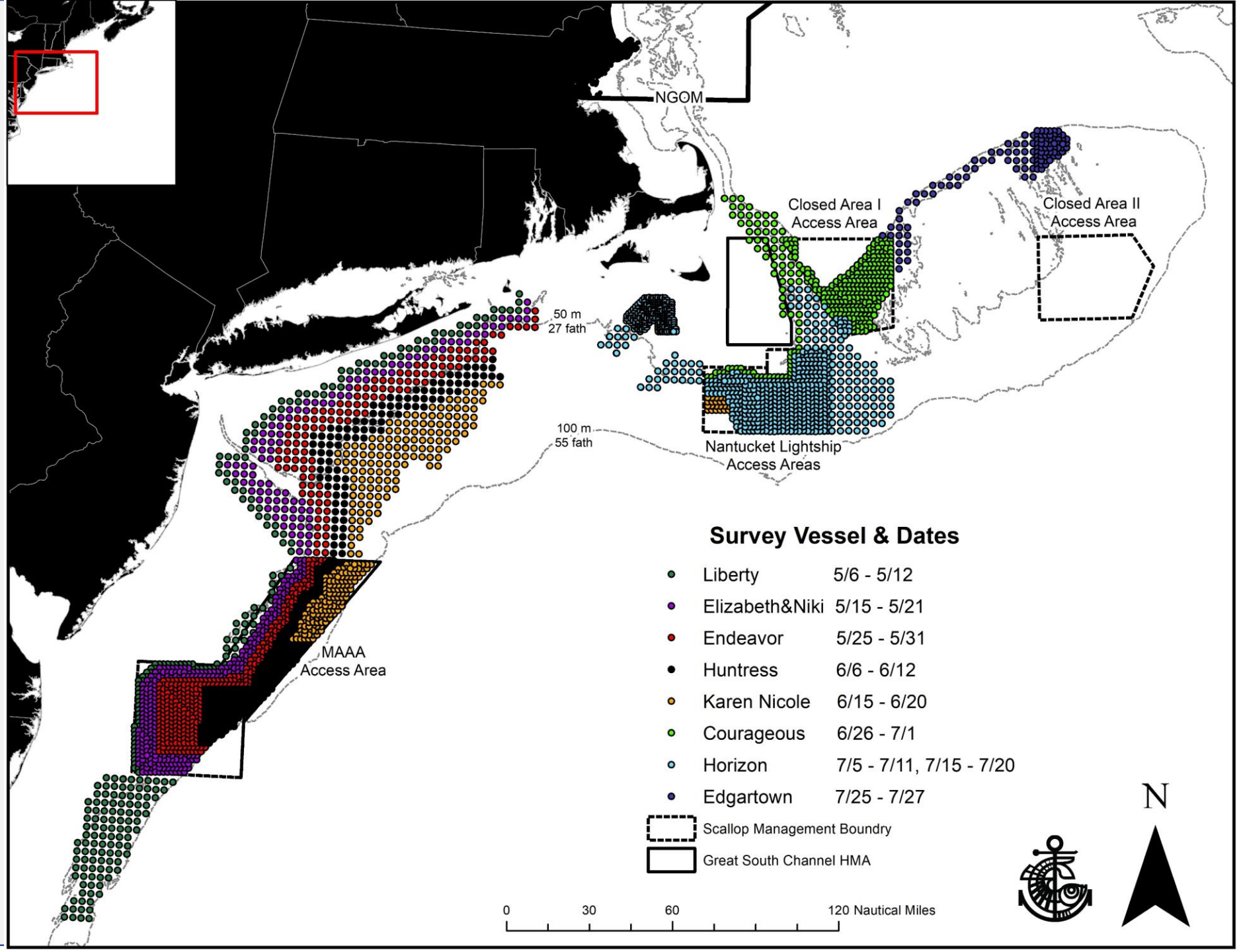

VW_501BACI
Station: 210 Quadrat: 1
Temperature: 11.69°C
Depth: 21.89 Fathom
40.987257N 70.350068W
3:51:39.000 PM 7/17/2019


July
30 m
40 m
50 m
Skates per m^2
0
0.01 - 0.11
0.12 - 0.22
>0.22
Wind Lease Area
Vineyard Wind
Other Company
N
0 0.5 1 2 Nautical Miles


July
30 m
40 m
50 m
Red hake per m^2
0
0.01 - 0.11
0.12 - 0.22
>0.22
Wind Lease Area
Vineyard Wind
Other Company
N
0 0.5 1 2 Nautical Miles


October
30 m
40 m
50 m
Skates per m^2
0
0.01 - 0.11
0.12 - 0.22
>0.22
Wind Lease Area
Vineyard Wind
Other Company
N
0 0.5 1 2 Nautical Miles

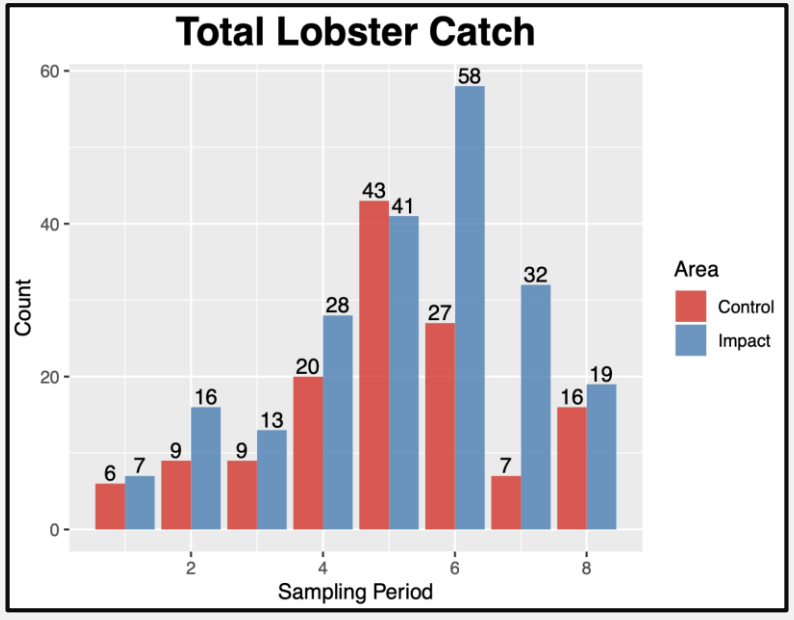

October
30 m
40 m
50 m
Red hake per m^2
0
0.01 - 0.11
0.12 - 0.22
>0.22
Wind Lease Area
Vineyard Wind
Other Company
N
0 0.5 1 2 Nautical Miles

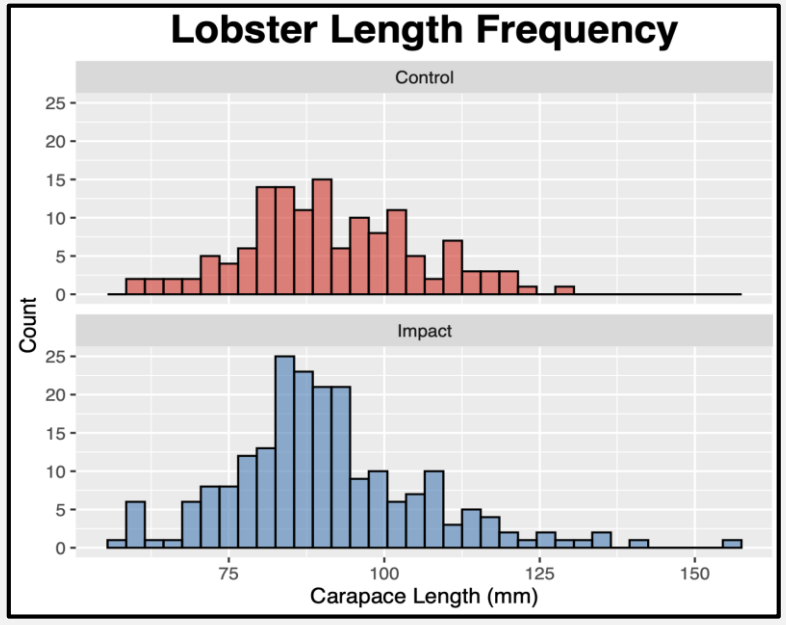

NGOM
Closed Area I
Access Area
Closed Area II
Access Area
50 m
27 fath
100 m
55 fath
Nantucket Lightship
Access Areas
MAAA
Access Area
Survey Vessel & Dates
Liberty 5/6 - 5/12
Elizabeth&Niki 5/15 - 5/21
Endeavor 5/25 - 5/31
Huntress 6/6 - 6/12
Karen Nicole 6/15 - 6/20
Courageous 6/26 - 7/1
Horizon 7/5 - 7/11, 7/15 - 7/20
Edgartown 7/25 - 7/27
Scallop Management Boundry
Great South Channel HMA
0
30
60
120 Nautical Miles
N

Ventless Trap Survey: Lobster

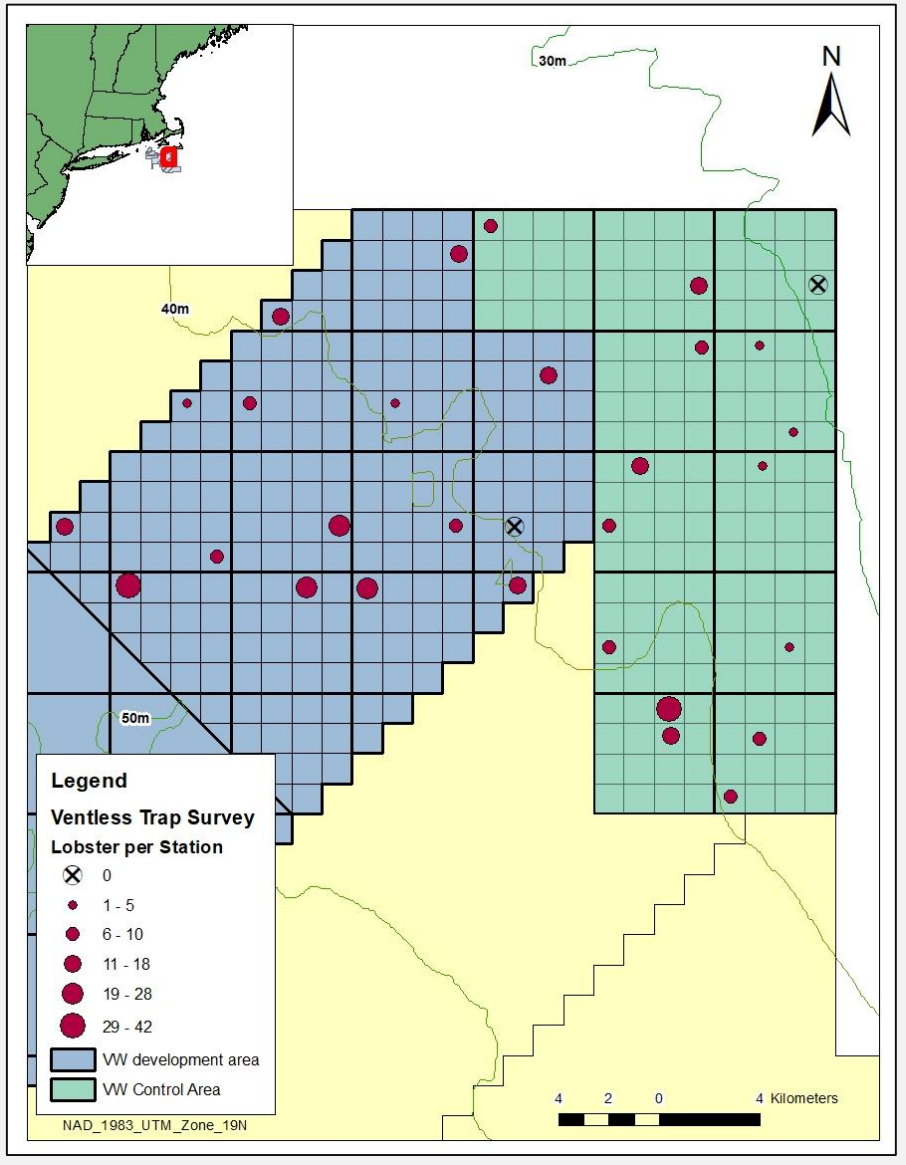
Total Lobsters: 351

- Control (n=214, 91.3 ±2.38mm)
- Impact (n=137, 90.8 ± 2.15mm)

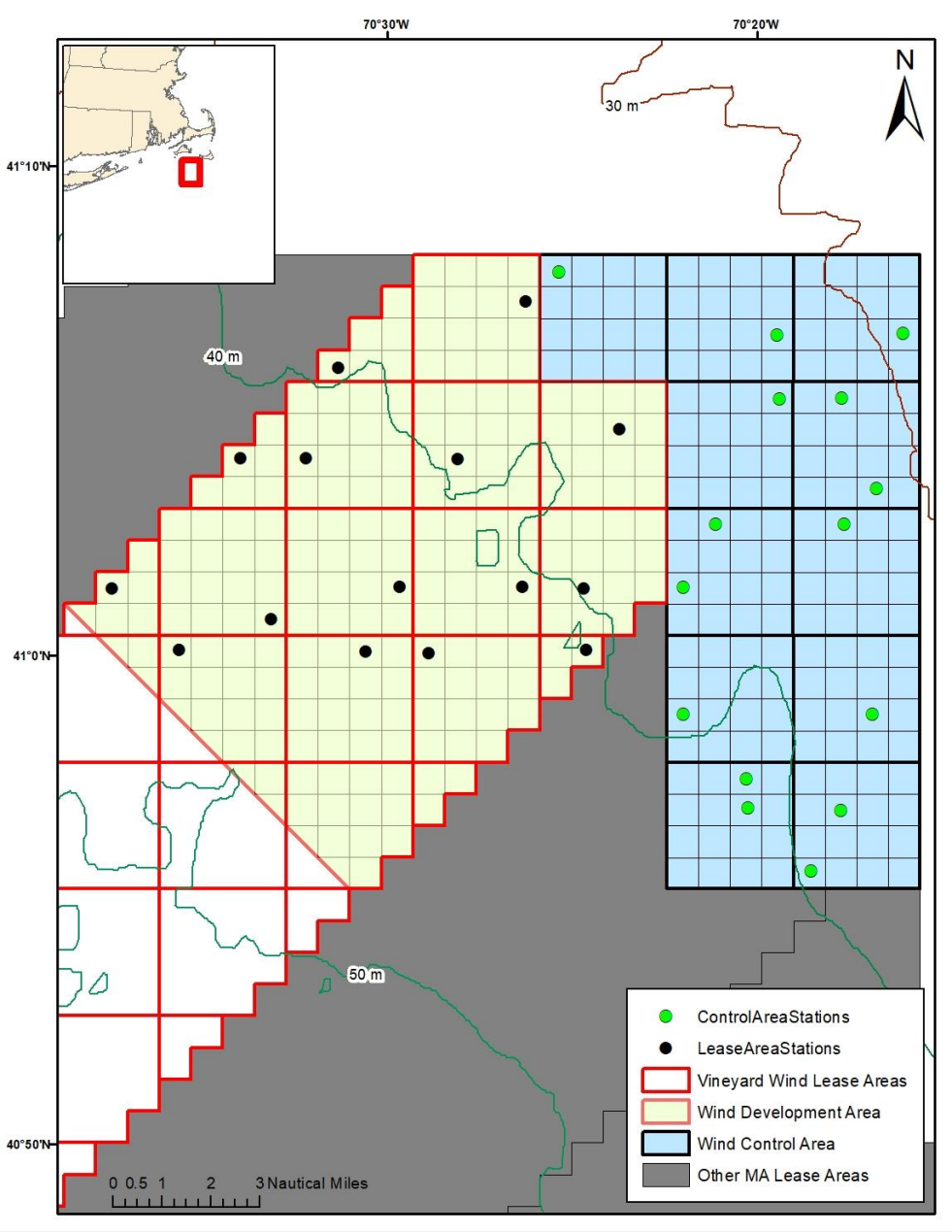


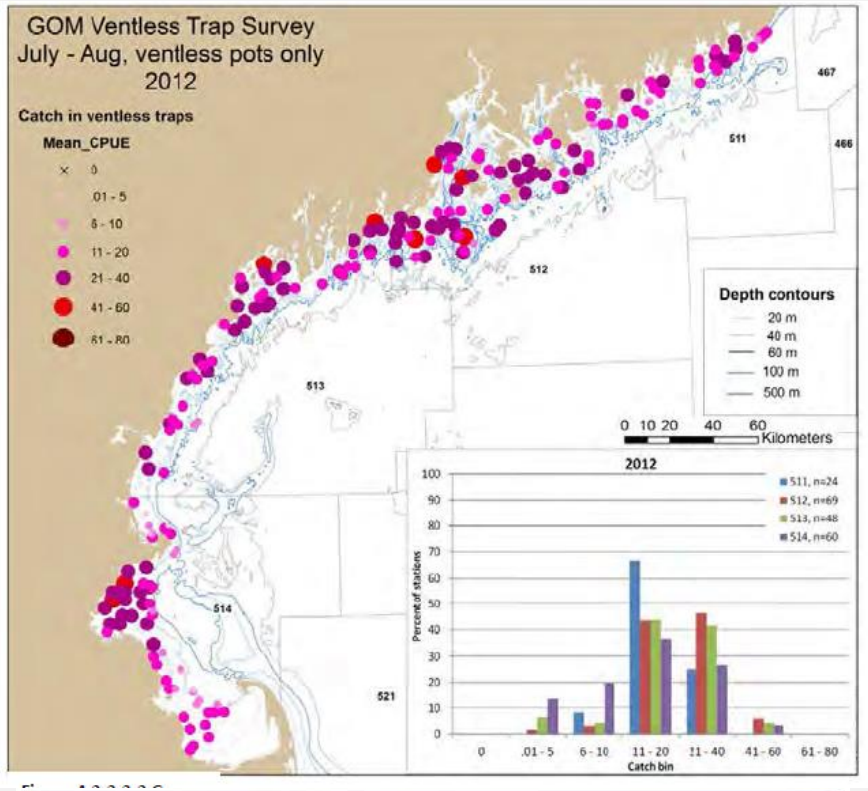


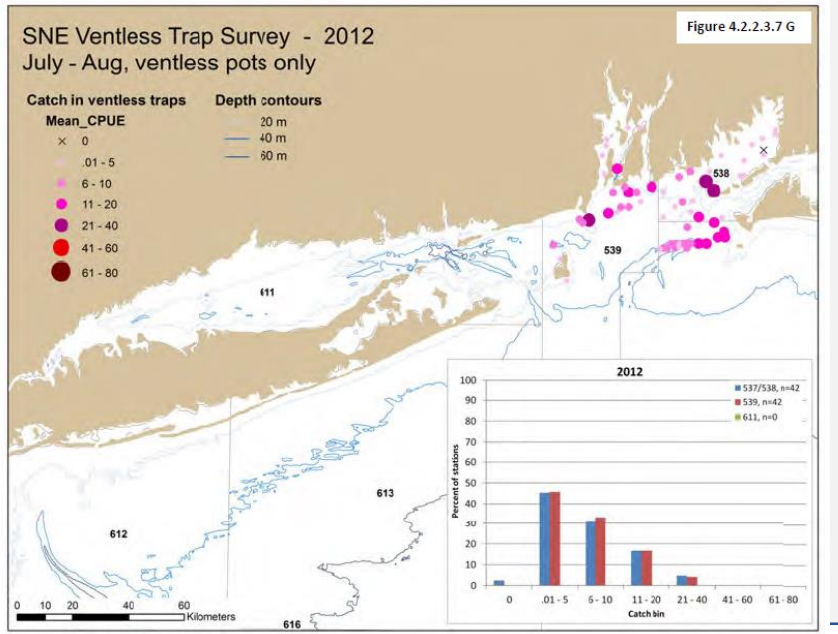
- 1.88:1 Male-Female sex ratio
  - 39% of females carrying eggs
- Lobster size breakdown:
  - Vented (n=196, 95.5 ± 2.12mm
  - Ventless-(n=155, 85.1 ±2.12mm



Lobster: Ventless Trap and larval sampling



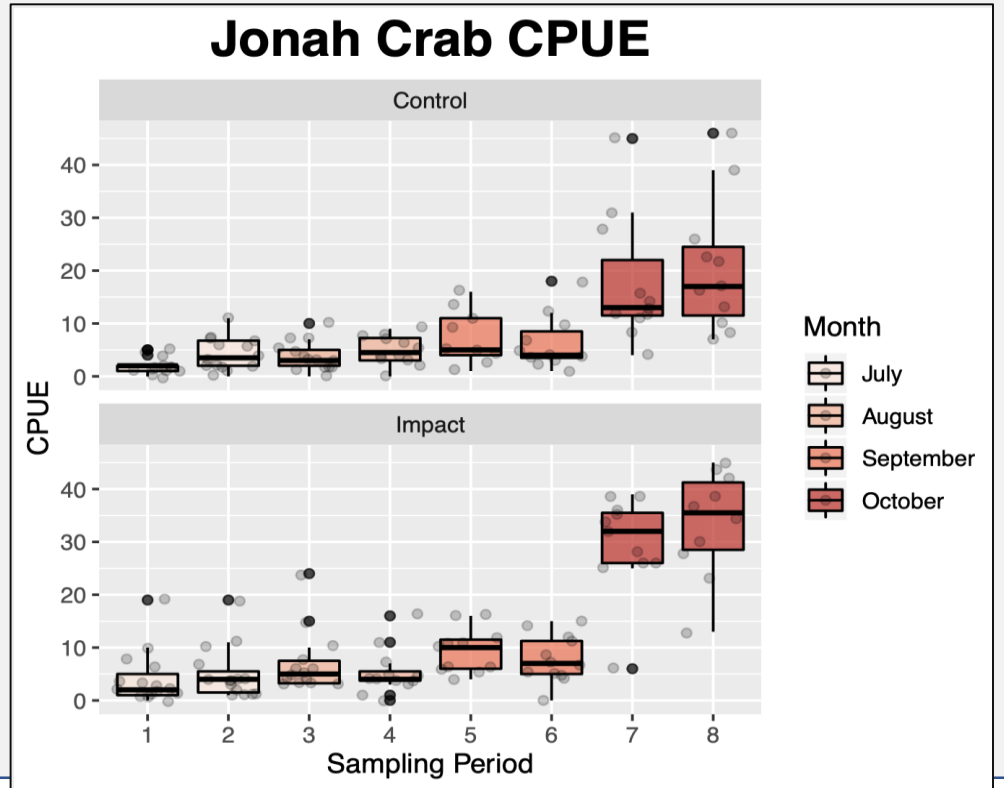


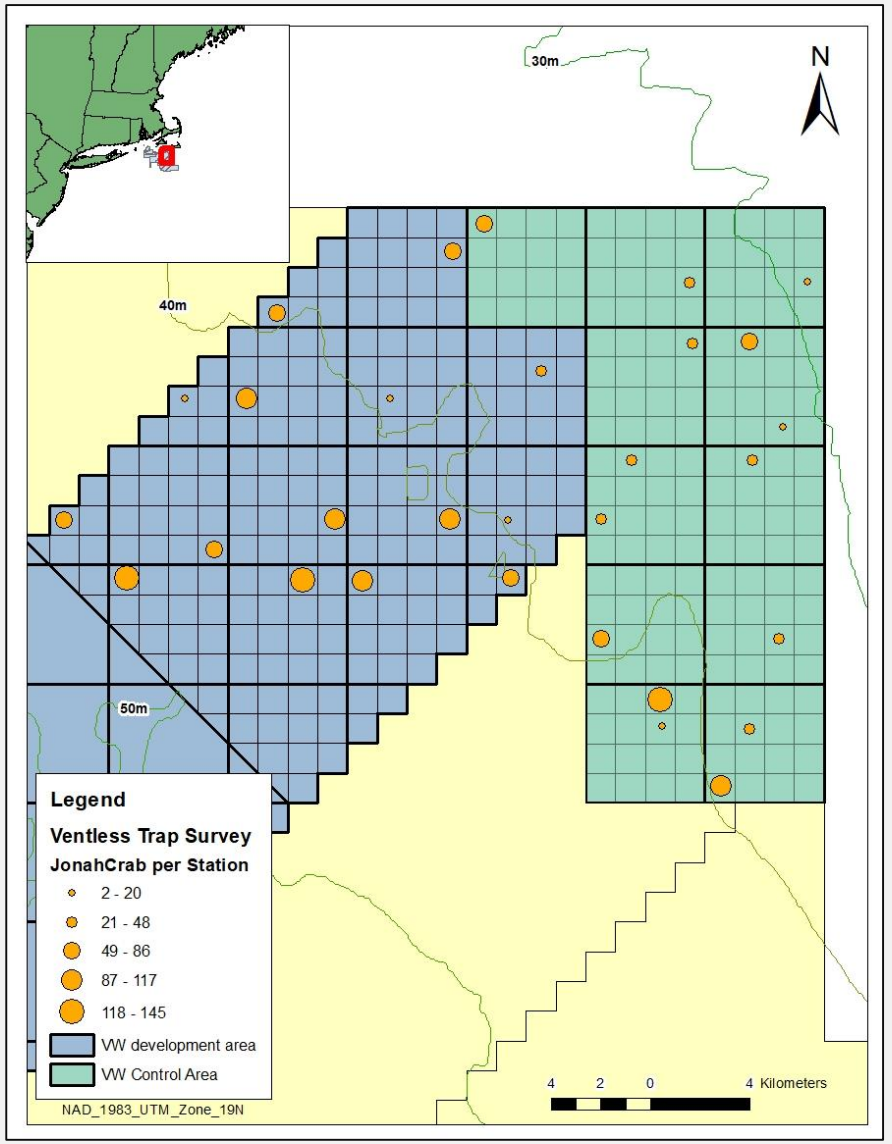


Ventless Trap Survey: Jonah crab

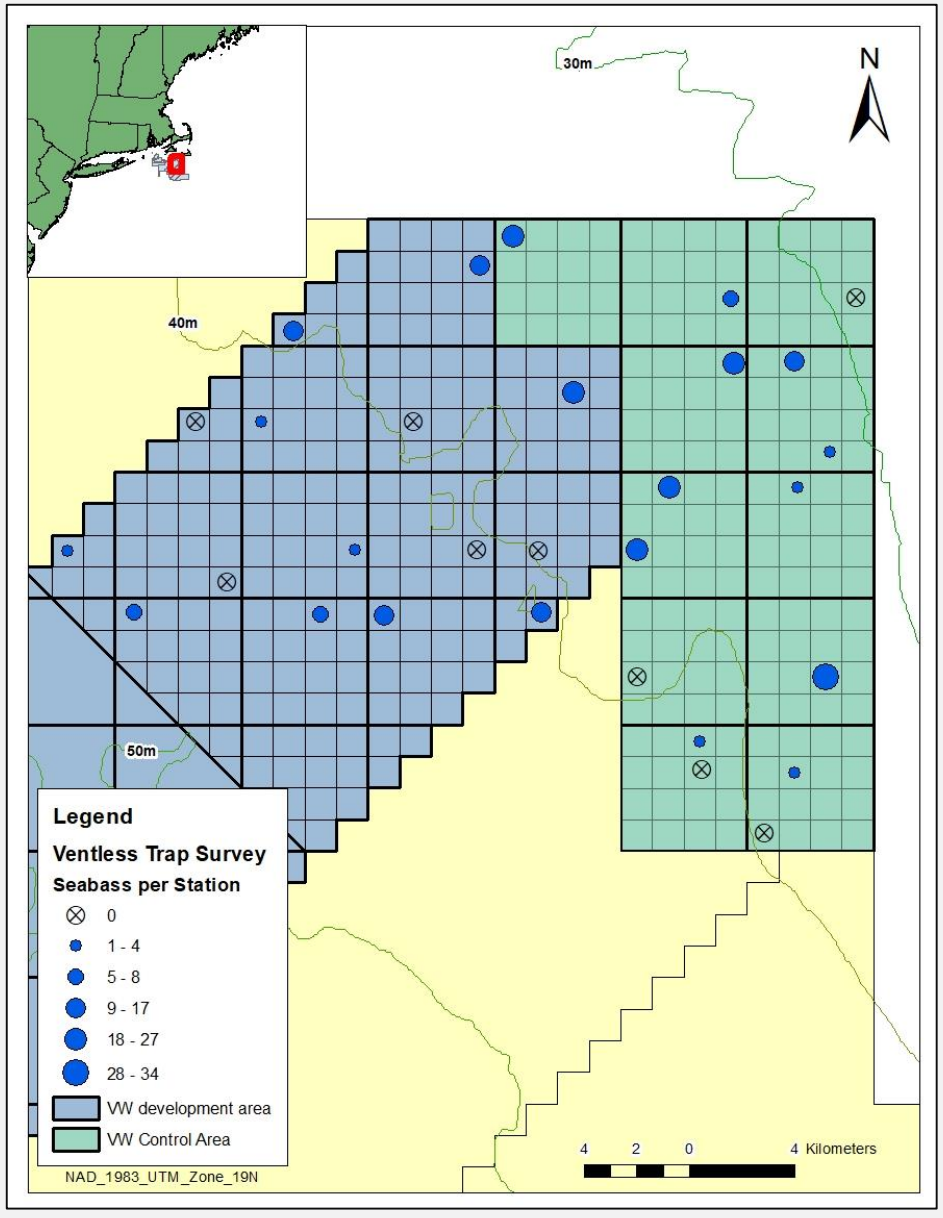
Total Jonah Crabs: 1897

- Control Area (n=758, 119.0 ±0.78mm)
- Impact (n=1160, 115.2 ± 0.68mm)
- 22:1 Male-Female sex ratio





Black Sea Bass



Black sea bass:

Area	Trap Hauls	Collected	Dissected
Impact	92	89	35
Control	78	161	37

- 79% Empty Stomachs
- 21% Had Contents (mostly Rock or Hermit crab)

Lobster Larvae survey

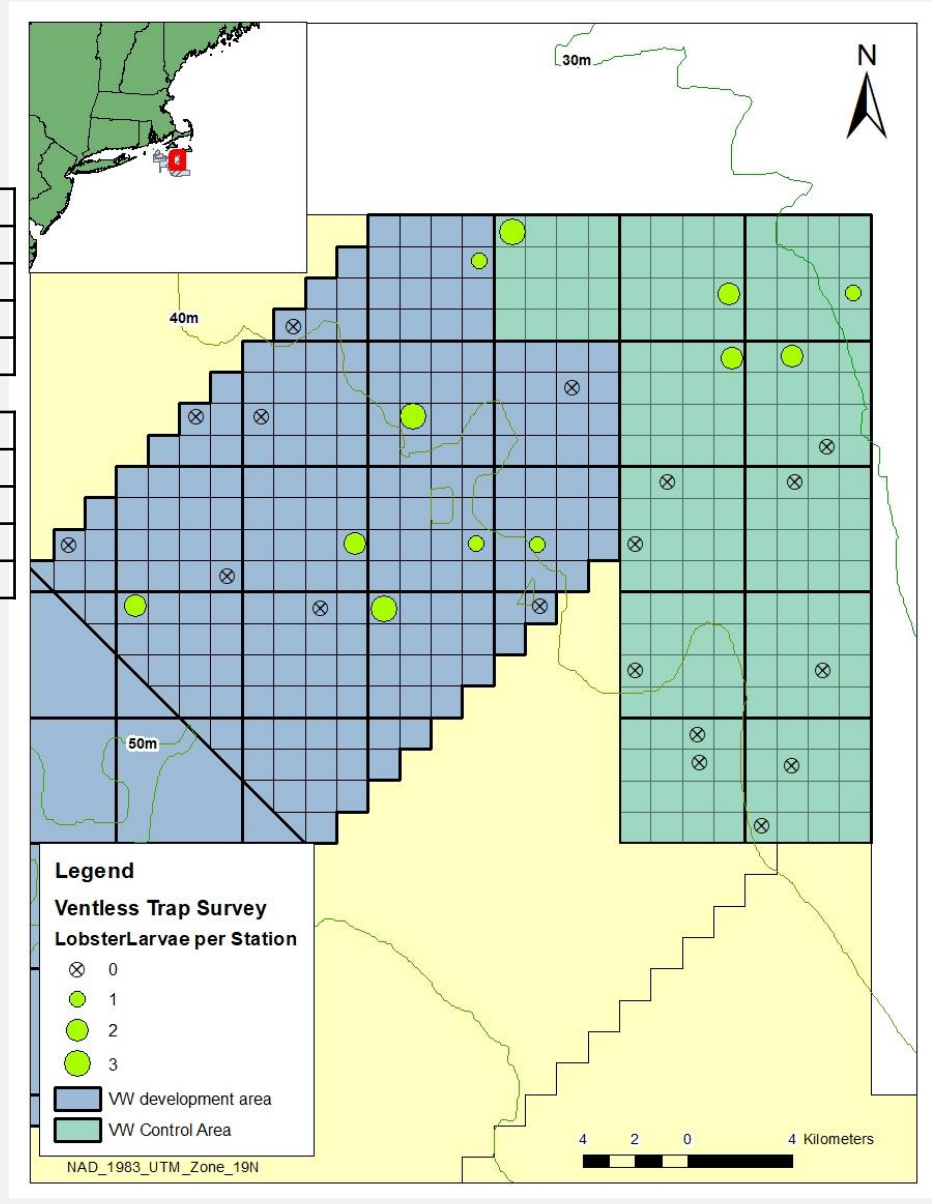
Larval Tows:

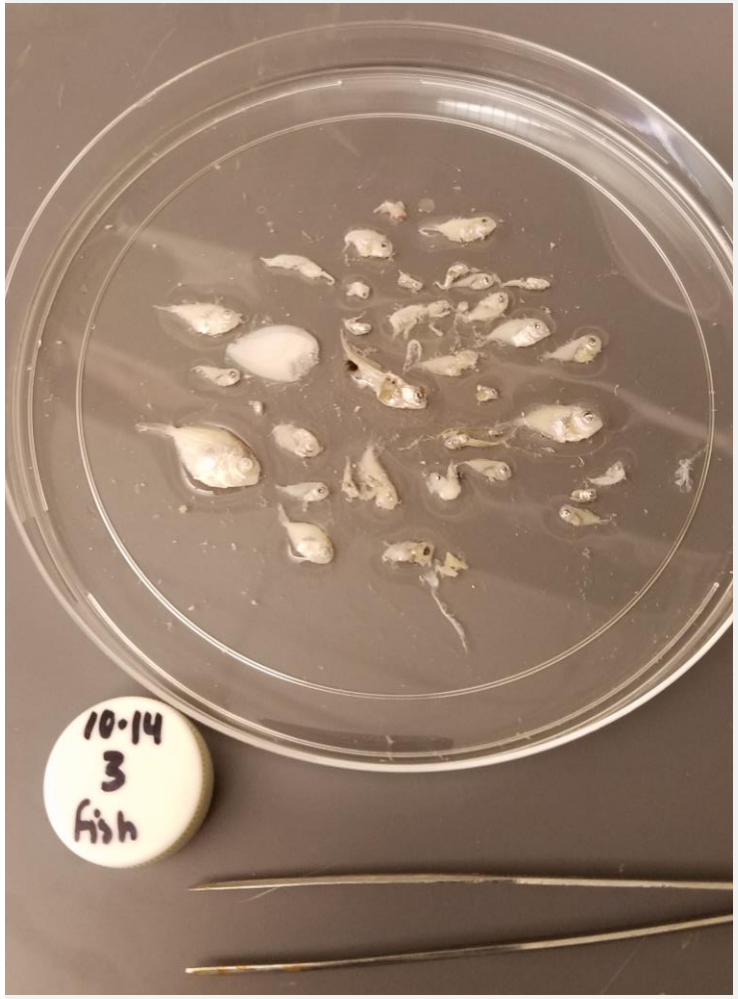
Impact

Date	Stage 2	Stage 3	Stage 4	Total
6/26/19	3	0	0	3
7/9/19	3	4	0	7
7/24/19	0	1	1	2
8/16/19	0	0	1	1

Control

Date	Stage 2	Stage 3	Stage 4	Total
6/12/19	4	0	0	4
6/24/19	1	0	0	1
7/8/19	3	1	0	4
8/5/19	0	1	0	1





Questions?