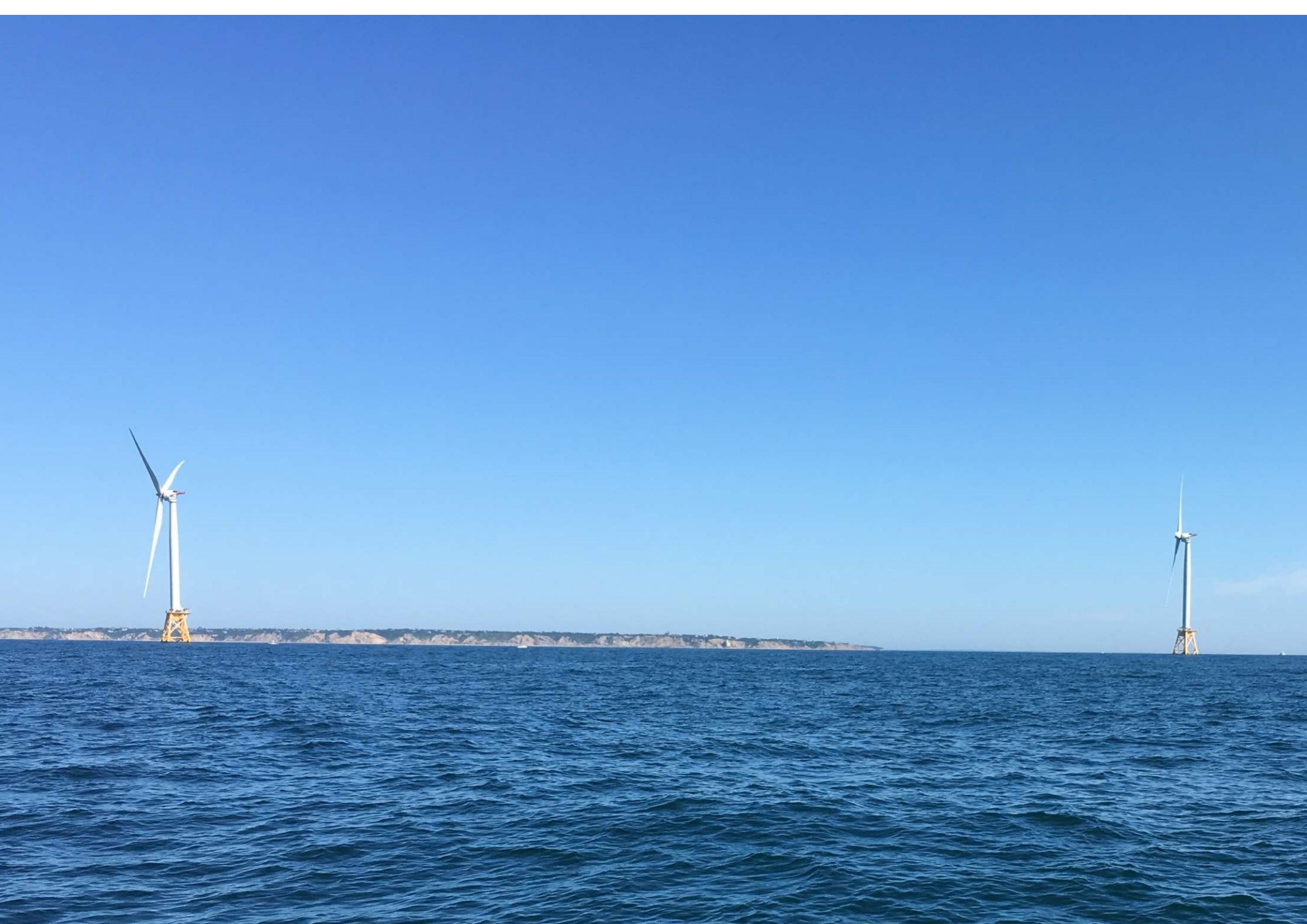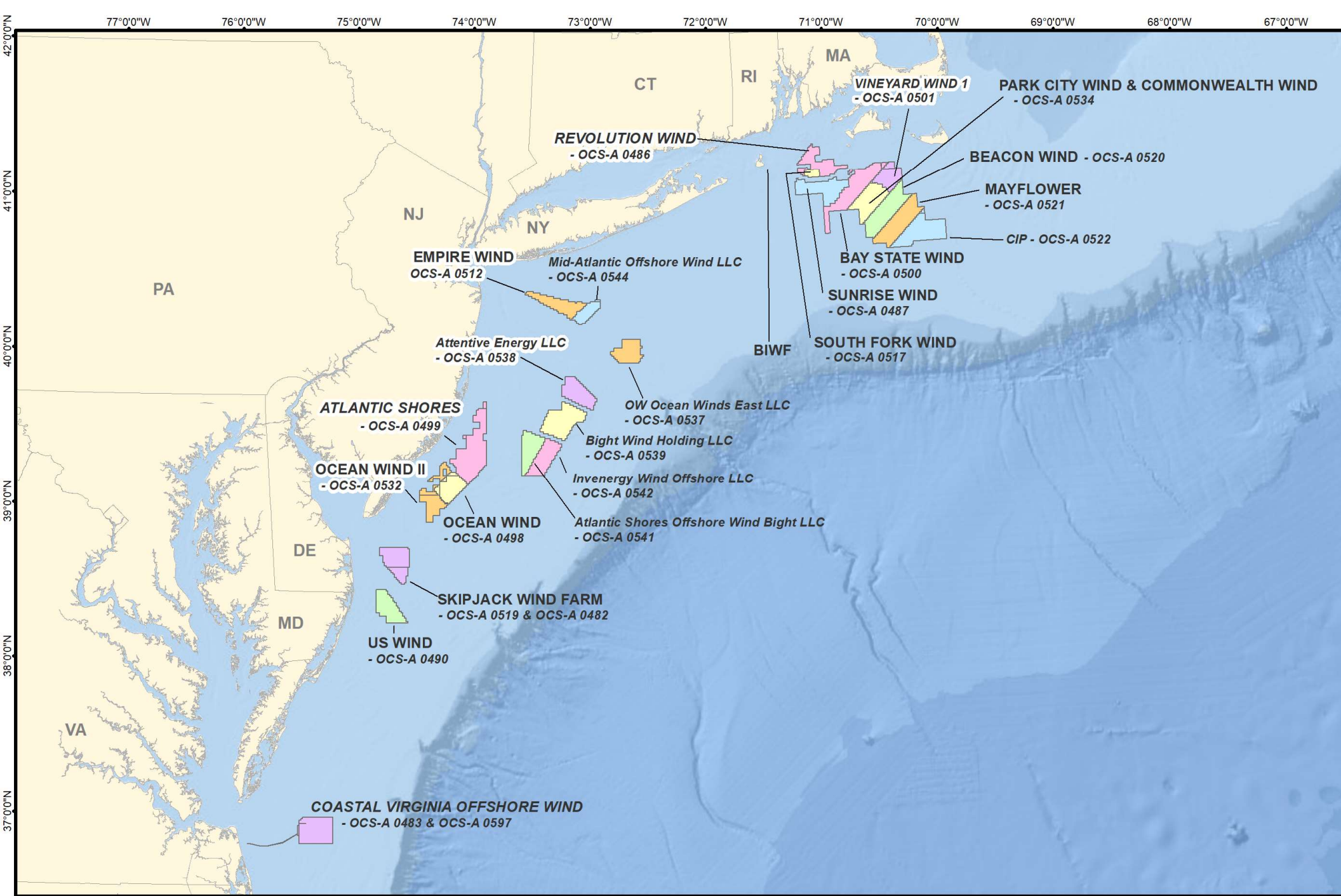# Lobster and cancer crab responses to offshore wind farm development in Southern New England
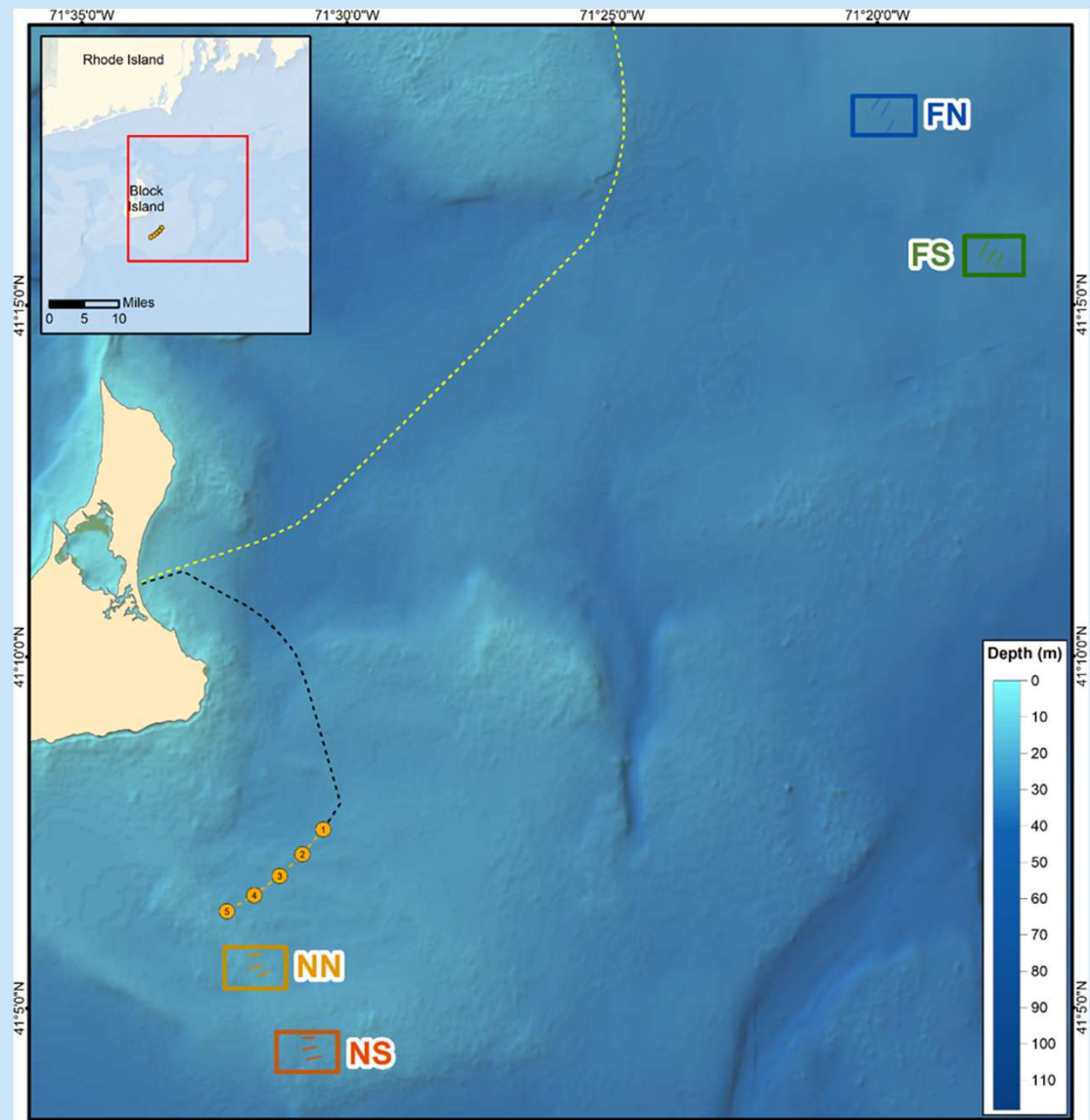
BEM April 2023

Dara Wilber, Lorraine Brown, Matt Griffin, and Drew Carey

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Map of offshore wind lease areas along the Northeast and Mid-Atlantic coast, showing the following labeled areas:

- VINEYARD WIND 1 - OCS-A 0501
- PARK CITY WIND & COMMONWEALTH WIND - OCS-A 0534
- BEACON WIND - OCS-A 0520
- MAYFLOWER - OCS-A 0521
- CIP - OCS-A 0522
- REVOLUTION WIND - OCS-A 0486
- BAY STATE WIND - OCS-A 0500
- SUNRISE WIND - OCS-A 0487
- SOUTH FORK WIND - OCS-A 0517
- BIWF
- EMPIRE WIND OCS-A 0512
- Mid-Atlantic Offshore Wind LLC - OCS-A 0544
- Attentive Energy LLC - OCS-A 0538
- OW Ocean Winds East LLC - OCS-A 0537
- ATLANTIC SHORES - OCS-A 0499
- Bight Wind Holding LLC - OCS-A 0539
- OCEAN WIND II - OCS-A 0532
- Invenergy Wind Offshore LLC - OCS-A 0542
- OCEAN WIND - OCS-A 0498
- Atlantic Shores Offshore Wind Bight LLC - OCS-A 0541
- SKIPJACK WIND FARM - OCS-A 0519 & OCS-A 0482
- US WIND - OCS-A 0490
- COASTAL VIRGINIA OFFSHORE WIND - OCS-A 0483 & OCS-A 0597

Lobster Trap Survey

- Power Analysis – ASMFC data
  (using data from 2006-2012)

- Commercial lobster boats from Pt. Judith and Newport

- 5 night soak, twice a month

- Vented and ventless traps

- Four Study Blocks
  - 2 Near Field
  - 2 Far Field

- Seven Years of Surveys:
  May – October 2013-2019

Ventless Lobster Survey Begins
May 2013

Construction Begins
July 2015

Construction Ends
September 2016

Ventless Lobster Survey Ends
October 2019

2013　2014　2015　2016　2017　2018　2019

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Block Island Wind Farm Ventless Trap Survey
May 2013 – October 2019

Lobster Metrics
- Sex
- Carapace length
- Egg status: presence, absence, spent
- Shell disease prevalence
- Shell hardness: hard, soft
- Cull status

Crabs and Black Sea Bass Metrics
- Counts
- Size for a subsample

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Sampling Effort

11,923 traps
2,007 trawl arrays

Catch Totals for the Study

	n
American lobster	44,844
Jonah crab	101,295
Rock crab	50,113
Black sea bass	8,375

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Lobster Statistical Models

BACI design - each GLM had a unique structure and error distribution
- CPUE - normal error distribution with a log-link
- Shell disease and ovigery - logistic regression w/ binomial error
- Temperature most common covariate included in models

Baseline – May – Oct. 2013, 2014

Construction Phase I – Jul. – Oct. 2015
(turbine installation)

Construction Phase II – Apr. – Sep. 2016
(cable laying)

Operation – May – Oct. 2017, 2018, 2019

Ventless Lobster Survey Begins May 2013		Construction Begins July 2015	Construction Ends September 2016			Ventless Lobster Survey Ends October 2019
2013	2014	2015	2016	2017	2018	2019

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Environmental Variation between Locations
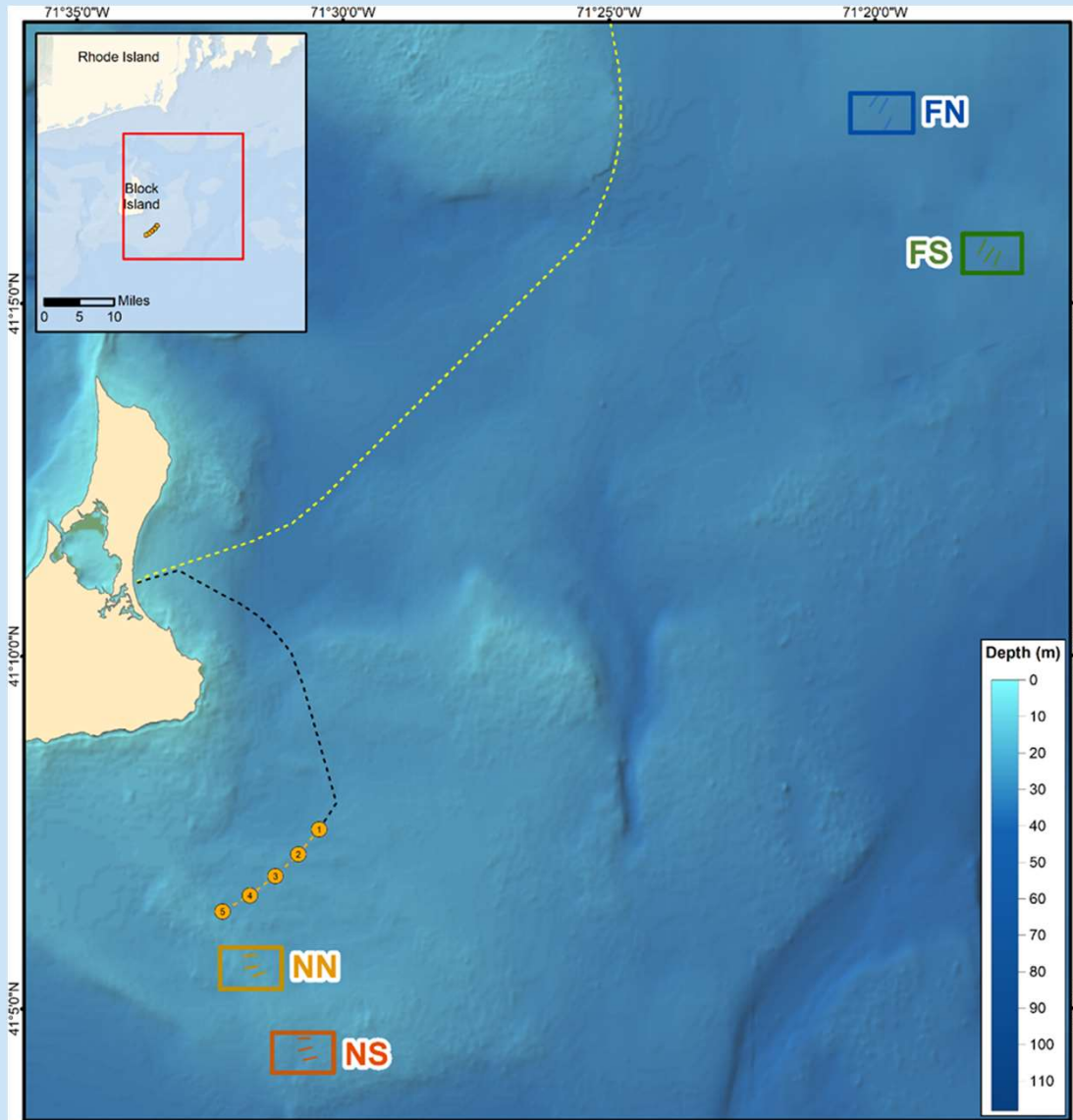
Temperature Variation among Sites
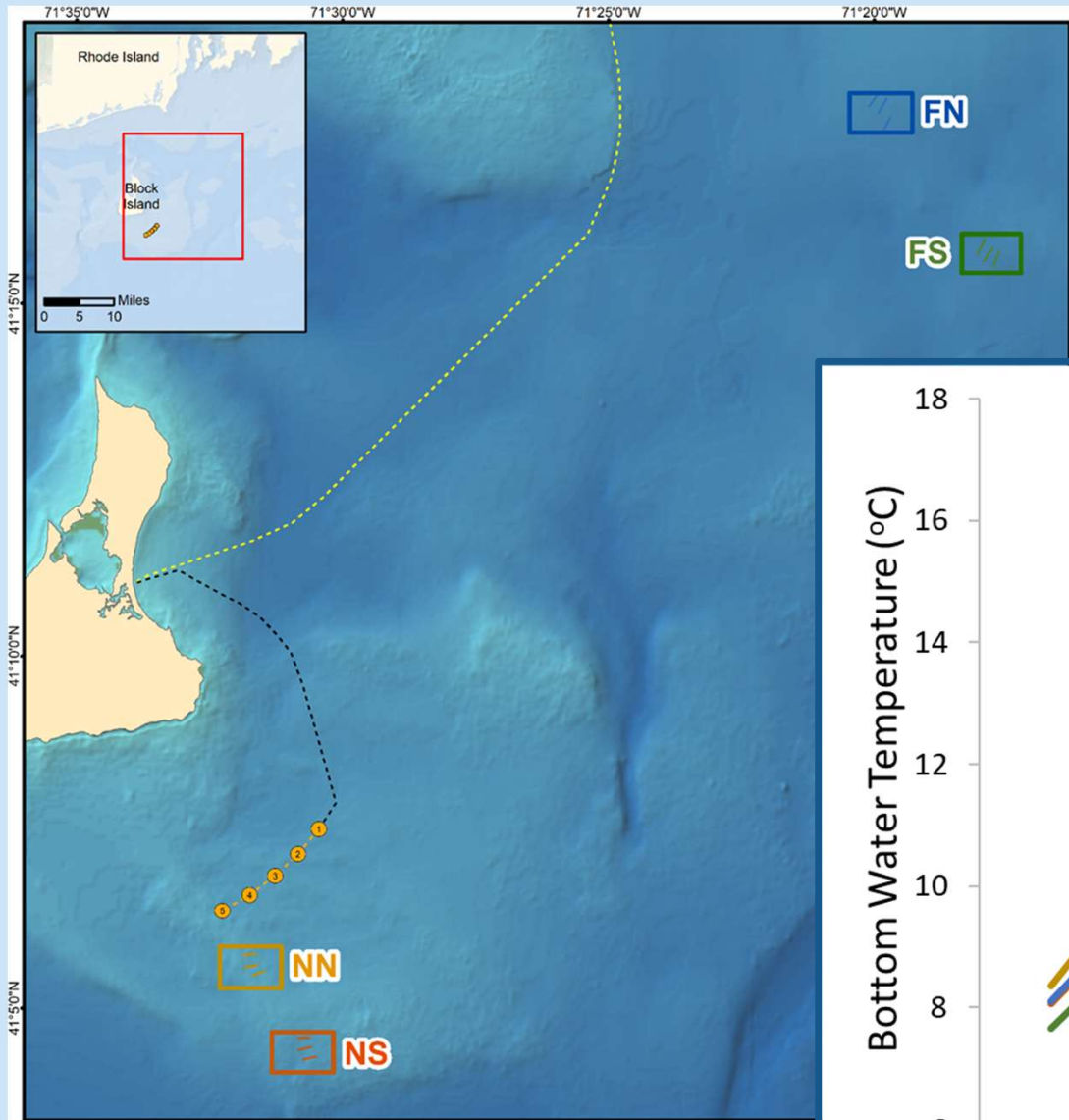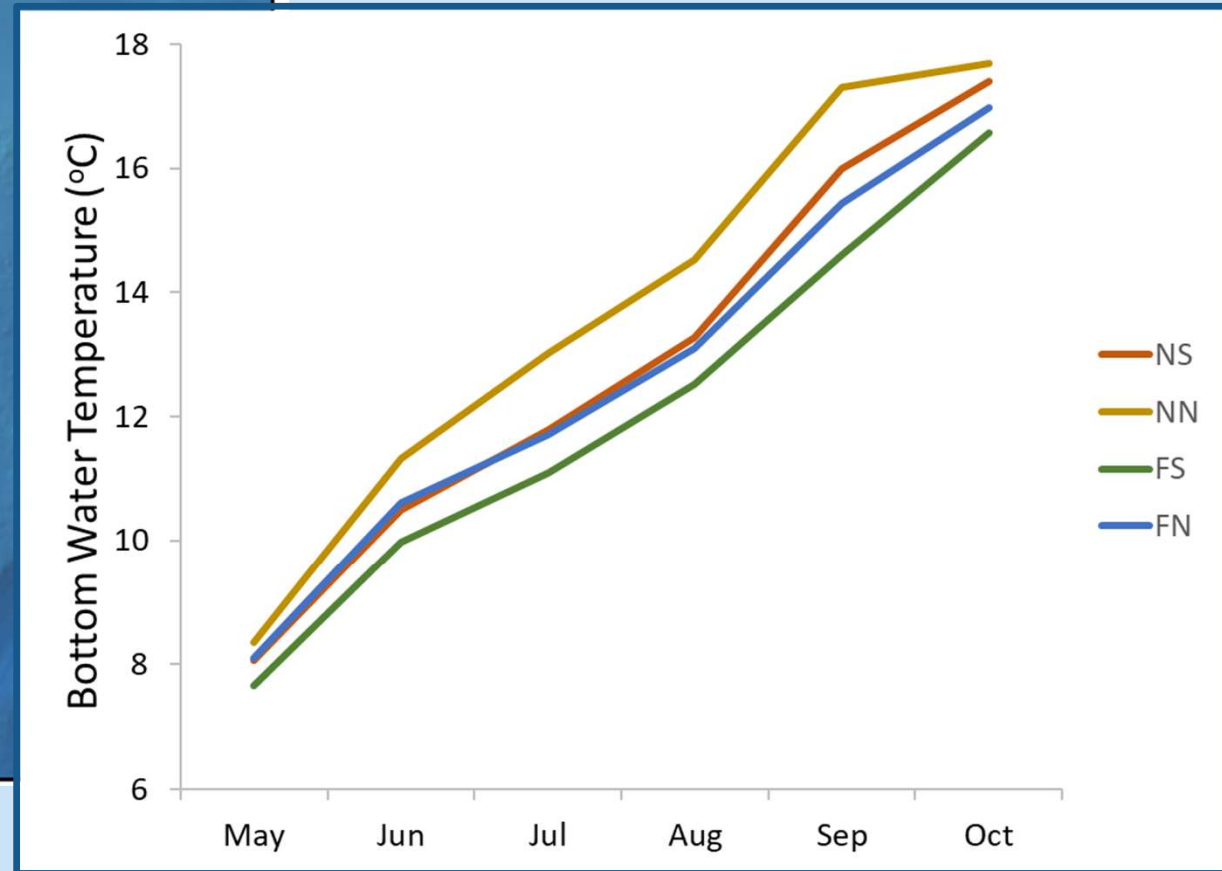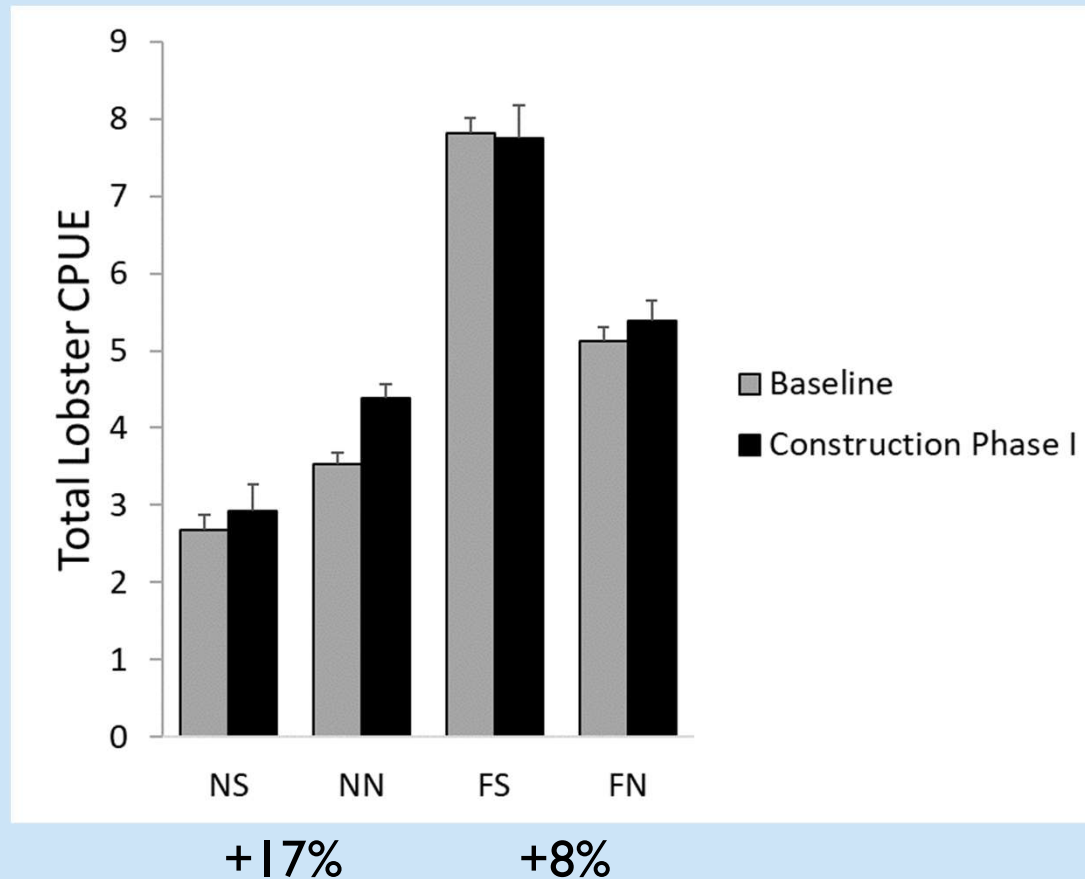
Seasonal Variation in Lobster CPUE
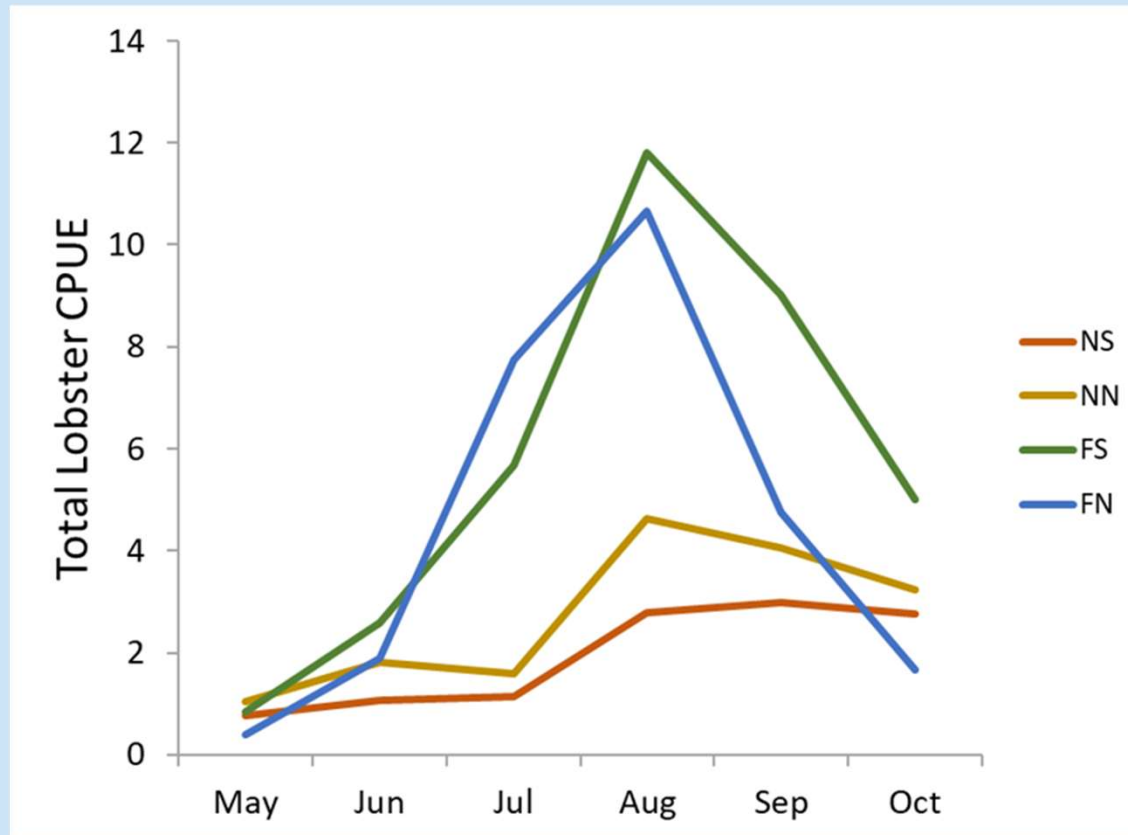
Seasonal Variation in Ovigery
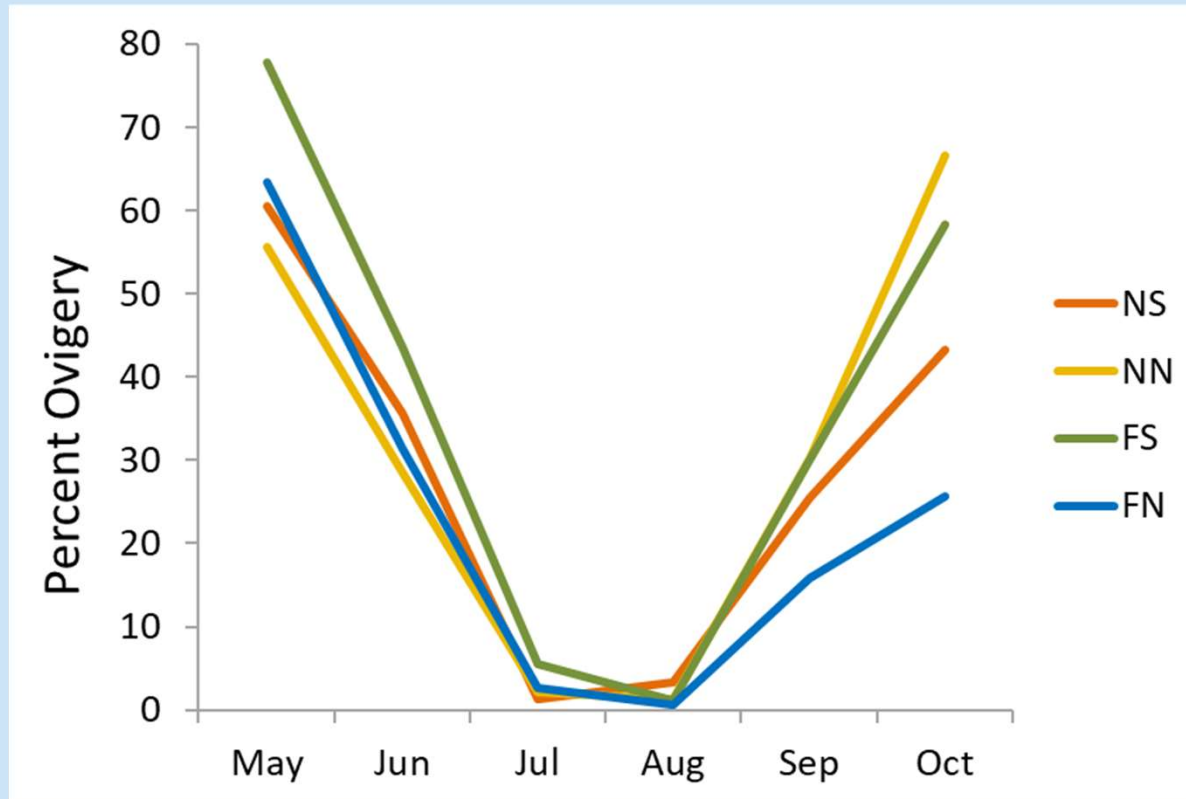
Seasonal Variation in Hatching

Lobster Catch
Baseline - Construction

+17%   +8%
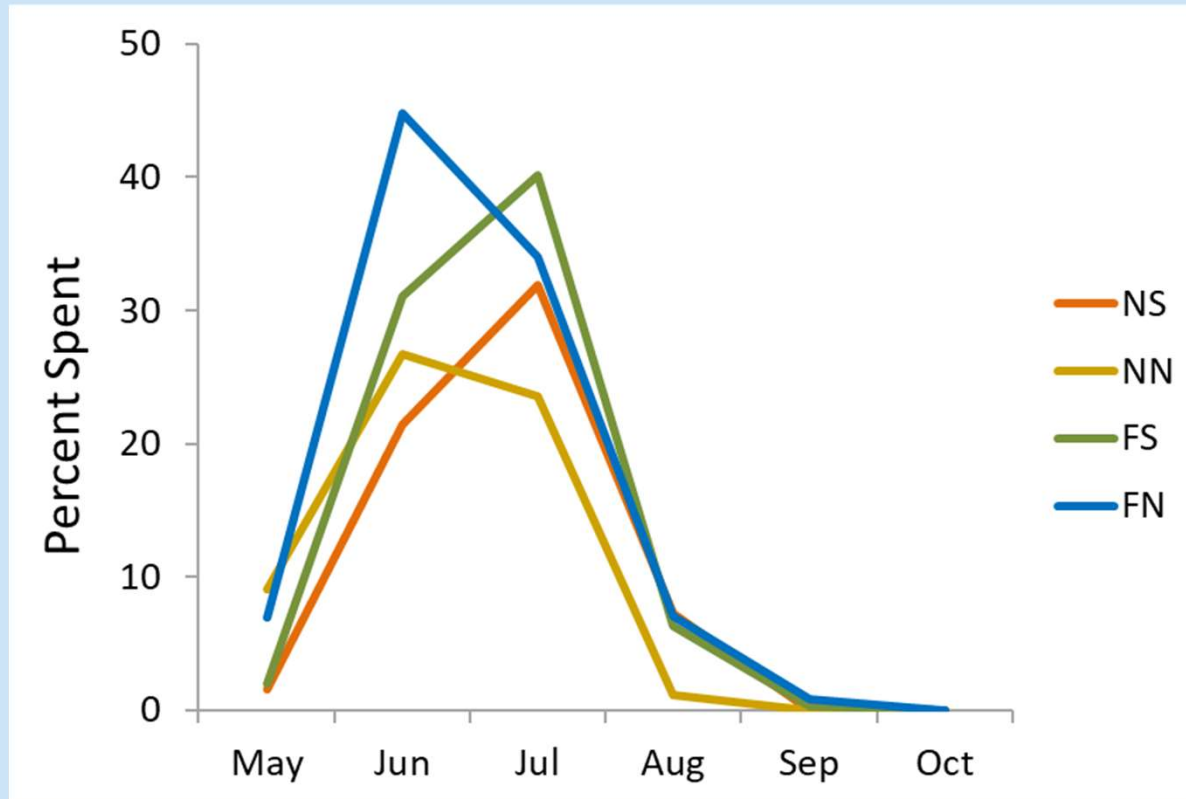
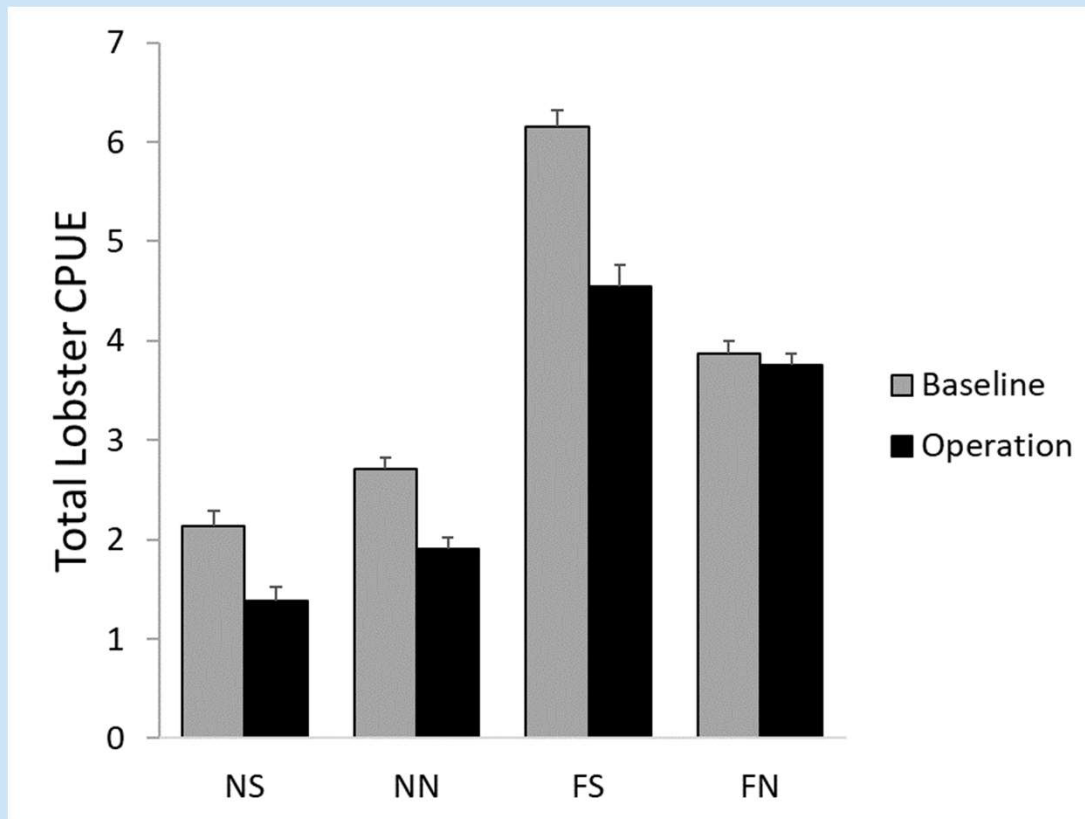Phase I includes pile driving and occurred in 2015

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Lobster Catch
Baseline - Construction
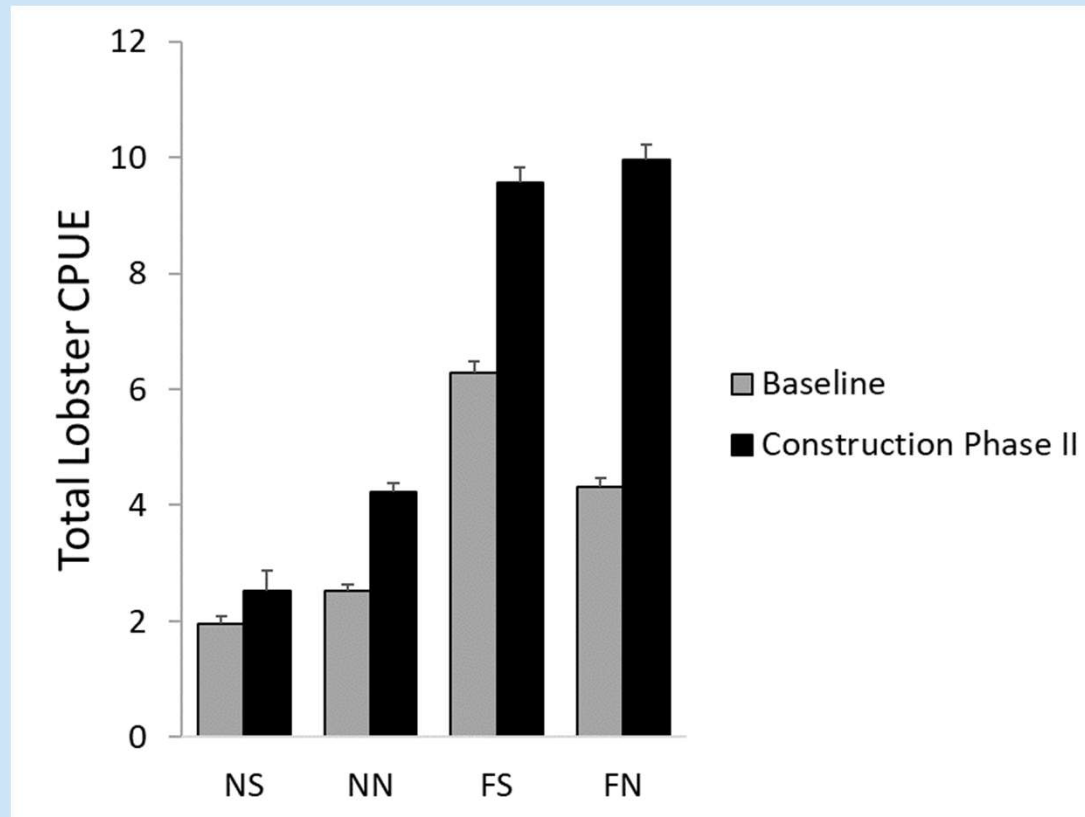
+50%   +100%

Phase II includes cable laying and occurred in 2016
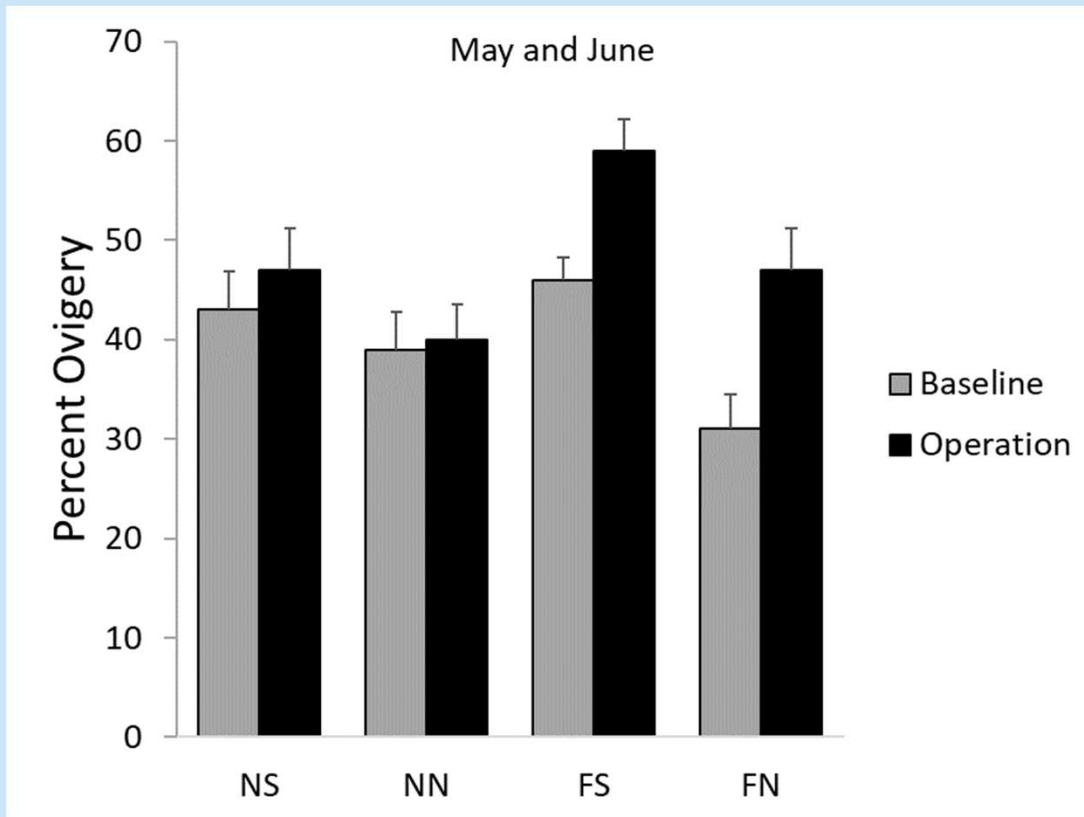
Lobster Catch Model
Baseline vs Operation

Catch Decrease
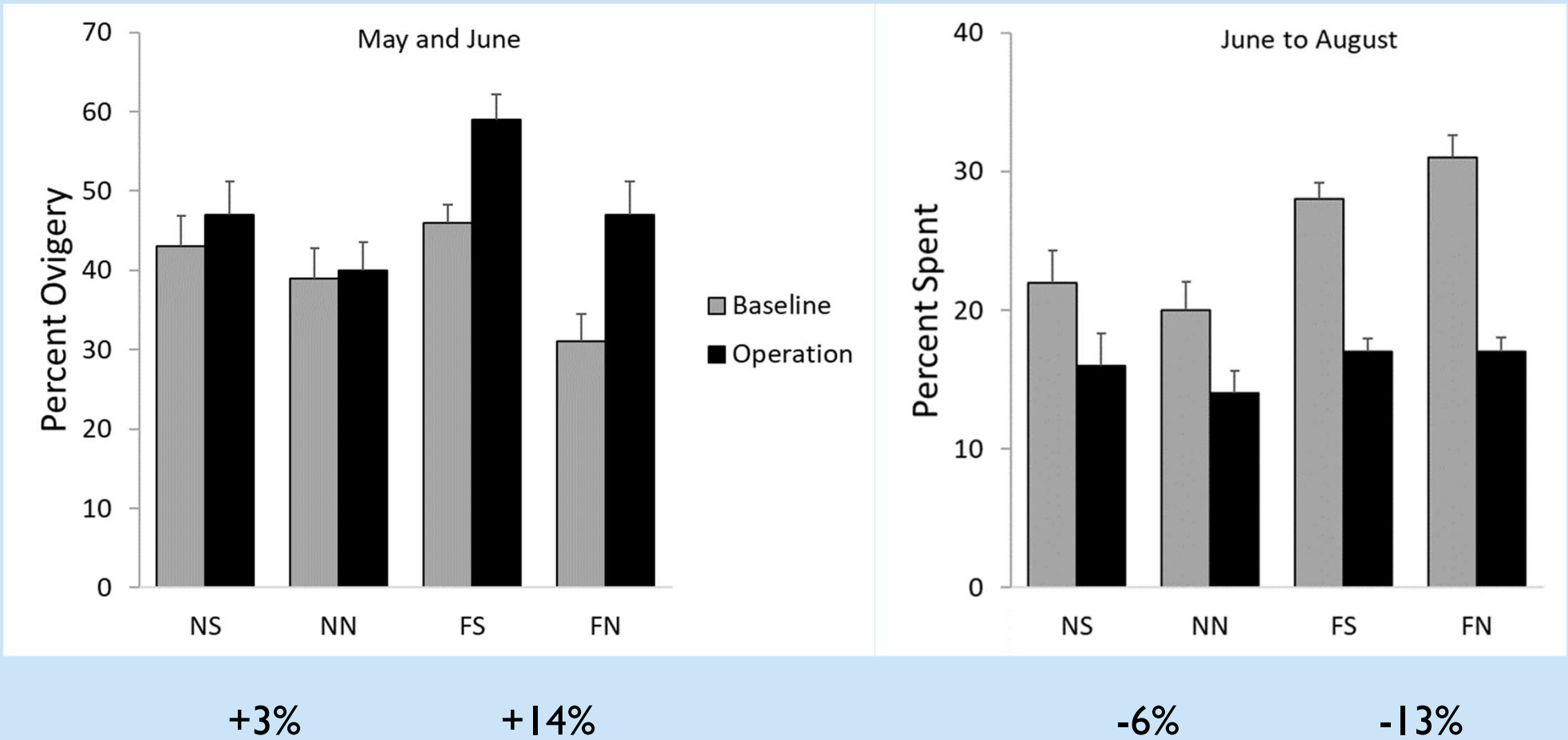
Near Field 0.8 lobster/trap
Far Field 0.9 lobster/trap

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Lobster Reproduction
Baseline vs Operation

+3%   +14%

Lobster Reproduction
Baseline vs Operation

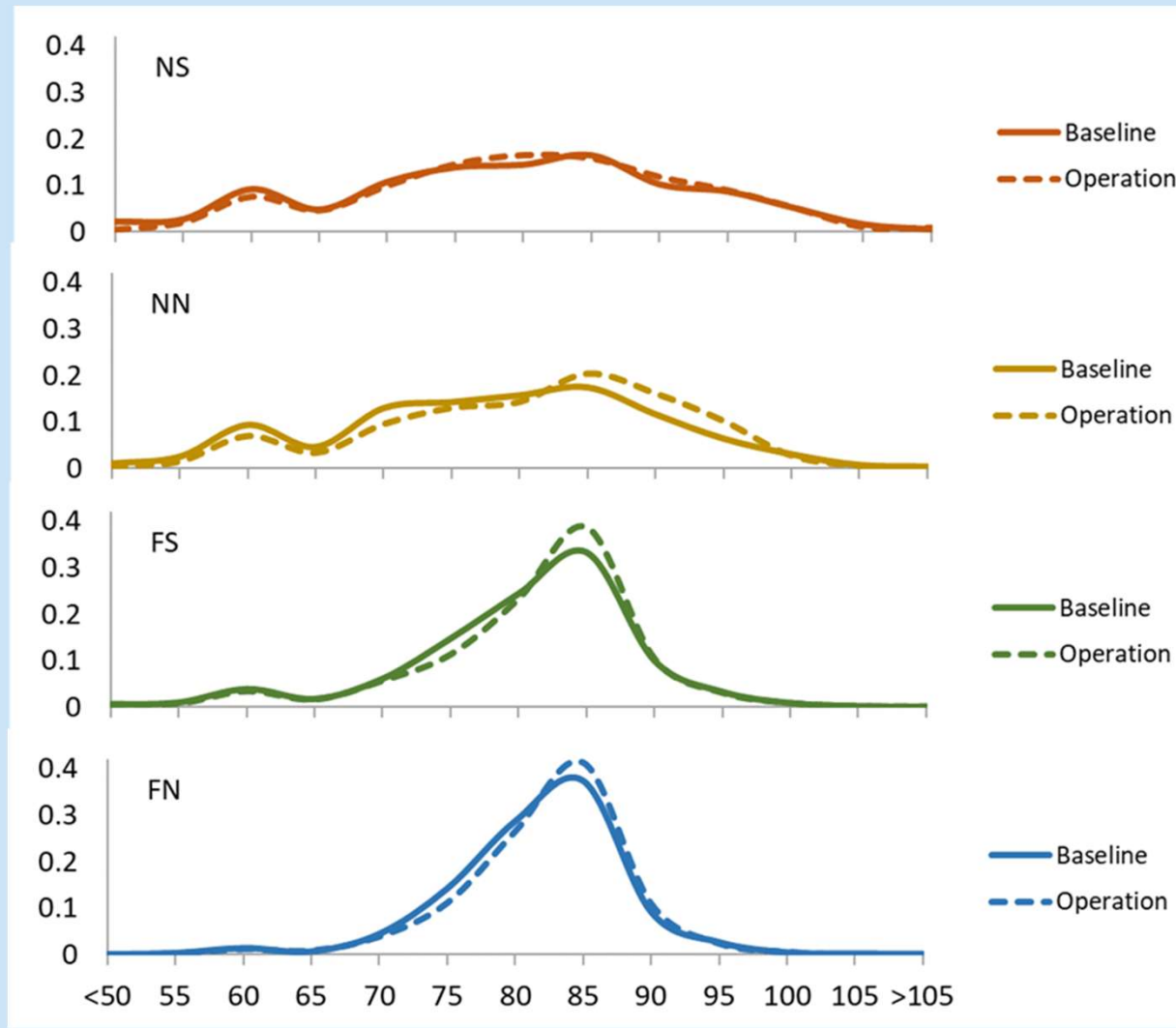

+3%   +14%   -6%   -13%

Lobster Shell Disease
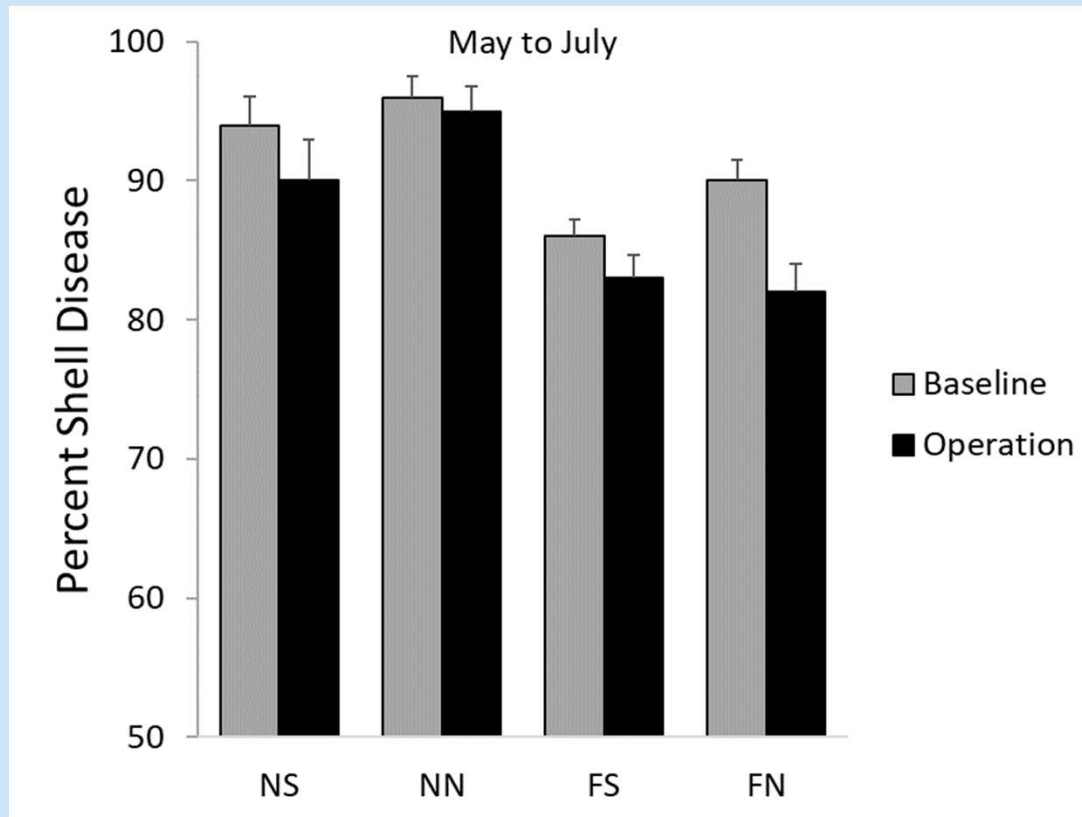
-2%   -4%

*Shell disease was examined only for ovigerous/spent females in May to July to control for shell age.

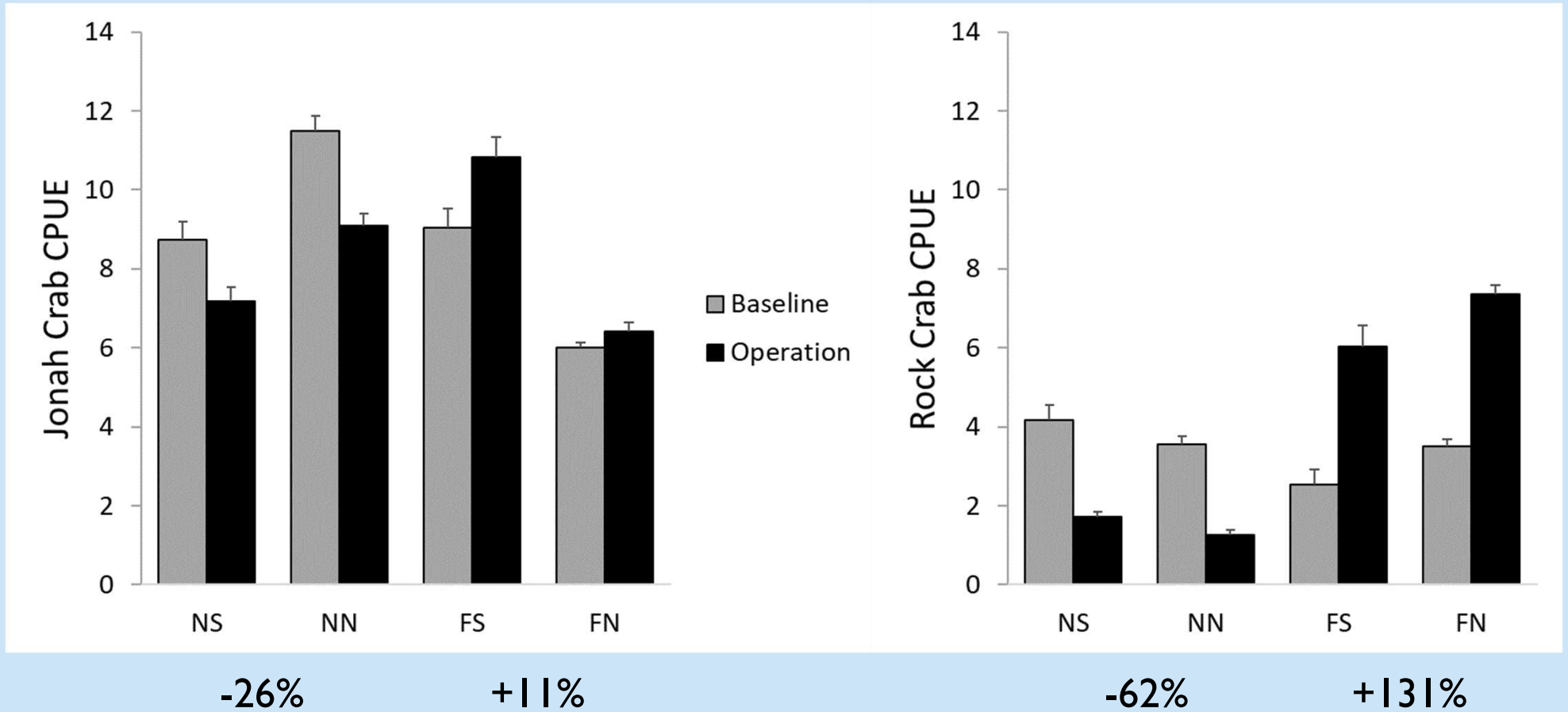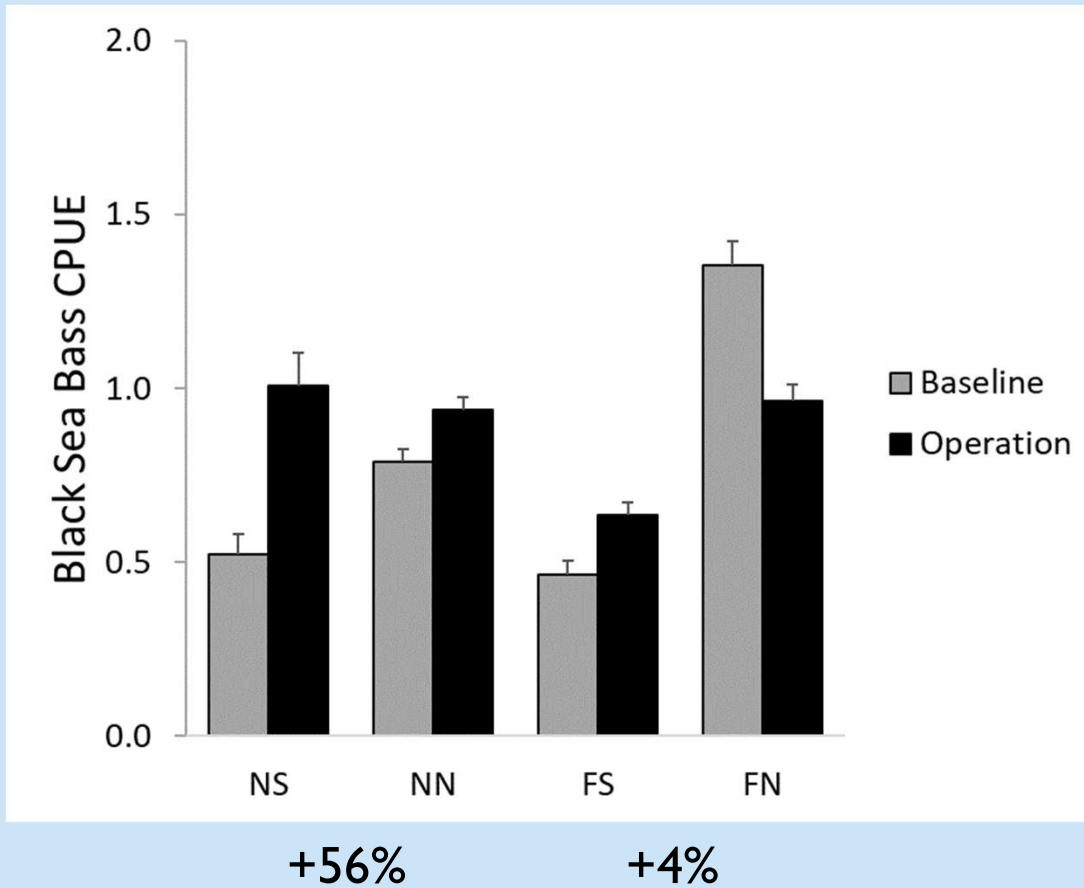INSPIRE ENVIRONMENTAL

Lobster Size Distributions

Crab Catch Rates

-26%   +11%
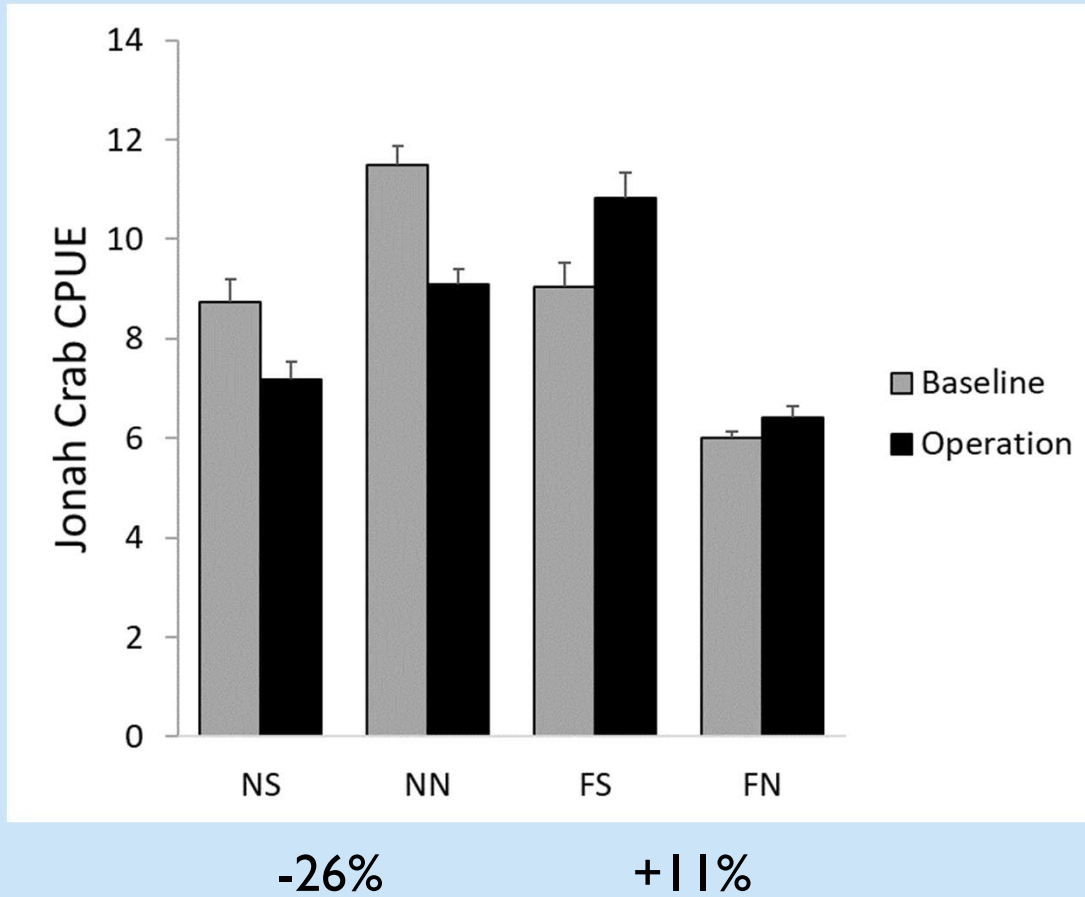
Crab Catch Rates

Black Sea Bass Catch Rates

+56%   +4%

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Summary

Lobsters

Baseline vs. Construction:

- No adverse impact associated with pile driving
- During cable installation, the increase in catch was smaller near the wind farm

Baseline vs. Operation:

- Decrease in catch rates was similar between locations, but proportionally greater near the wind farm
- Shell disease prevalence varied by a few % points – not ecologically significant
- Ovigery trends involved larger % differences that warrant directed research

Crabs and Black Sea Bass

- Spatio-temporal variation in catch rates is consistent with predator-prey interactions
- Directed research needed on this topic

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Lessons Learned

- A single reference location may not serve multiple study objectives well.

  - BIWF reference locations demonstrated no major impact on lobstering grounds
  - Deeper, cooler water than BIWF
  - May have confounded project impacts with unrelated temporal shifts in lobster distributions

- Consider gradient designs because several impact mechanisms (EMF, noise, vibrations) are stronger near the source.

- Comparing results to regional surveys is useful for interpreting temporal trends.

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Acknowledgements

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America's First Offshore Wind Farm

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