Vineyard Wind Monitoring Plan

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UMass School for Marine Science & Technology

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
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

BACI Design

\[ \Delta_{before} - \ = \Delta_{after} \]

\[ \text{Impact} \]

\[ \Delta_{before} - \Delta_{after} = \text{effect size} \]

BAG (Gradient) Design

\[ \beta_{before} \]

\[ \text{Impact Gradient} \]

\[ \beta_{after} - \beta_{after} = \text{effect size} \]

\[ \beta_{before} - \beta_{after} = \text{effect size} \]

<table>
<thead>
<tr>
<th>Design elements</th>
<th>BACI</th>
<th>BAG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site selection</td>
<td>Control site issues</td>
<td>Informed by effect size</td>
</tr>
<tr>
<td>Independence</td>
<td>Pseudo-replication?</td>
<td>Non-independence assumed</td>
</tr>
<tr>
<td>Confounding</td>
<td>Problem</td>
<td>Some can be incorporated</td>
</tr>
<tr>
<td>environmental signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predictions</td>
<td>Discrete (Y/N) bounded effect; difficult to model</td>
<td>Effects gradient; supports models</td>
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</table>
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)
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
<table>
<thead>
<tr>
<th>Animal Group</th>
<th>Quadrats Present</th>
<th>Counts</th>
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<tbody>
<tr>
<td>Holes (burrowing animals)</td>
<td>599</td>
<td></td>
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<tr>
<td>Sand Dollars</td>
<td>564</td>
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<tr>
<td>Hermit Crabs</td>
<td>429</td>
<td>732</td>
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<td>Anemones</td>
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<td>Waved Whelk</td>
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<td>Skates</td>
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<td>Bryozoans/Hydrozoans</td>
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<td>Silver hake</td>
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<tr>
<td>Red hake</td>
<td>82</td>
<td>84</td>
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<tr>
<td>Sponges</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Crabs (cancer spp.)</td>
<td>58</td>
<td>69</td>
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<tr>
<td>Skate Egg Case</td>
<td>49</td>
<td>51</td>
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**Substrate**

- Gravel
- Sand

**Impact**

- July
- October

**Control**

- July
- October
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:

- 79% Empty Stomachs
- 21% Had Contents (mostly Rock or Hermit crab)
### Lobster Larvae survey

#### Larval Tows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Total</th>
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<tr>
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#### Control

<table>
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#### Map

- **Legend**
  - 0: No larvae
  - 1: 1 larvae
  - 2: 2 larvae
  - 3: 3 larvae

- **Map details**
  - Location of larval tows
  - Legend for larval stage distribution
  - Distance scale (km)

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*Image of a shrimp*
Questions?