Before-After-Gradent Fishery Monitoring Design in the US Wind Lease Area OCS-A0490
David Secor and Michael O’Brien

Goal: Impact to black sea bass fisheries

1. Using fishing gears and BAG and BACI designs, detect impacts of,
   • Construction disturbance
   • Reef effect (<120 m from foundations)
   • Spill over effect (>120 m from foundations)
2. Deploy and test ropeless gear in the pot fishery
3. Engage commercial and recreational fishers
Ocean City, MD Fisheries

Recreational Charter – Robust

Commercial – In decline, some resilience
Lease OSC-A 0490
US Wind Projects MarWin and Momentum
121 x 18 MW Turbines

Indian River DE
Ocean City MD

Goal: Impact to black sea bass fisheries

1. Using fishing gears, detect impacts:
   - Construction disturbance
   - Reef effect (<120 m from foundations)
   - Spill over effect (>120 m from foundations)

2. Test ropeless gear in the black sea bass pot fishery

3. Engage commercial and recreational fishery sectors in the survey
Before After Control Impact Design

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

Before After Gradient Design

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

BACI and BAG designs both rely on baseline sampling (top rows) to assess impacts (bottom rows). BACI relies on careful control site selection, relying on the assumption that the wind tower influences along with other environmental forcing such as storms will influence control and impact sites similarly. BAG designs do not require control sites and rely on incorporation of key impact and environmental gradients (Secor 2018).
Pot survey lends itself to BAG design

15 x 40” ventless pots per rig
1 day soak

Reef Effect
Spillover Effect

Each string, terminates with an Edgetech ropeless device
Pot Survey Hypotheses

(1) Reef Effect (<120 m): amplitude

\[ X > 10 X \]

(3) Spillover Effect (≥120 m): amplitude

\[ X > 1.5 X \]

Control Sites (2 strings, 9 months)

Project Sites (4 strings, 8 months)

(2) Turbine Impact: Distribution function and variance

\[ \beta_{\text{before}} \]

\[ \beta_{\text{construction}} \]

\[ \beta_{\text{after}} \]
### Catch

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Pot Survey, 6+ years, 8 surveys/yr; 2 d/survey

Key question: Do we have sufficient power?

**BACI Period** | Years          | Monthly Surveys | N | Sites |
---              |---------------|----------------|---|-------|
**TRIAL (BEFORE)** | 2022          | May-Aug        | 4 | 4-6   |
**BEFORE**       | 2023-2024     | Mar-Nov        | 8 | 6     |
**CONSTRUCTION** | 2025-2026     | Mar-Nov        | 8 | 6     |
**AFTER**        | 2027-2028     | Mar-Nov        | 8 | 6     |
**Total**        | 2022-2028     | Mar-Nov        | 8 | 6     |
The Reef Effect: Recreational fishing

Key challenge: What’s the control?

1. Use existing wreck sites as controls
2. Use controls as baselines to evaluate
   • Colonization by black sea bass
   • Relative catch rates

Black sea bass shoaling on Block Island Wind Farm structures (from Hutchison et al. 2020)

Photo by D. Monti
Recreational Survey Design Implementation

BACI Design

Control Wreck 1: Great Eastern Reef (<2 m relief)

Treatment Planned Turbine Foundations (BACI)

Control Wreck 2: USS Saetia (2-4 m relief)
Methods

• 15 min water column jigging
• 15 x 3 min “drops”
• 3 anglers

Mostly undersized black sea bass (control)
Recr. Survey, 6+ years, 6 surveys/yr; 2 d/survey

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<td>Total</td>
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<td>May-Oct</td>
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Do we have sufficient power....Not quite relevant (yet)

- Black sea bass dominant at control wreck sites
- Only Northern sea robin caught at project sites (structureless)
- Will not be able to evaluate power until turbines are in place
Hypotheses
1. Smaller fish will initially colonize sub-foundations
2. Condition indices will be higher for sub-foundations than for wrecks (density-dependence)
3. Diet will be less diverse on sub-foundations than for wreck
4. Pelagic prey will be more important for sub-foundations than for wrecks

MD WEA baseline data from past MD DNR support
Take-homes

1. Think about fisheries, not just fish biology.
2. Ask fishers their views on survey goals.
3. Structure designs around hypotheses.
4. Build in a trial year - you’ll need it!
5. Less may be more - incorporate power design.