Learning from the Experts Webinar Series

A Panel on Nature Based Design Enhancements for Offshore Wind Farms

Carl Lobue
Ocean Program Director
The Nature Conservancy

Dr. Annie Murphy
Senior Scientist
INSPIRE Environmental Services

February 9, 2022
A Panel on Nature Based Design Enhancements for Offshore Wind Farms

Ido Sella
Co-Founder & CEO
ECOncrete Tech LTD

Captain Dave Monti
No Fluke Fishing LLC

February 9, 2022
Meeting Procedures

Webinar recordings and presentations will be available at:
www.nyserda.ny.gov/osw-webinar-series

Participation for Members of the Public:

> Members of the public will be muted upon entry.

> Questions and comments may be submitted in writing through the Q&A feature at any time during the event.

> If technical problems arise, please contact Sal.Graven@nyserda.ny.gov
Learning from the Experts

This webinar series is hosted by NYSERDA’s offshore wind team and features experts in offshore wind technologies, development practices, and related research.

DISCLAIMER:
The views and opinions expressed in this presentation are those of the presenter and do not represent the views or opinions of NYSERDA or New York State.
Nature Based Design Enhancements for Offshore Wind Farms

Carl LoBue
NY Ocean Program Director
www.nature.org/turbinereefs
Nature-Based Design and Offshore Wind

Annie Murphy, PhD
INSPIRE Environmental
NYSERDA Webinar
February 9, 2022
Artificial Reef Effect

Novel structures may lead to shifts in connectivity at multiple scales

- **energy flow**
  - Organic enrichment of surrounding sediments
  - Higher trophic levels
  - Facilitate poleward expansion

- **species distributions**
  - Opportunistic non-indigenous species colonization

Degraer et al. 2020
Turbine Reefs
Nature Based Design of Offshore Wind Infrastructure

Nature-based Design includes options that can be integrated in or added to the design of offshore wind infrastructure to create, expand, enhance, or restore habitat for native species or communities.

Enhanced Scour Protection Layers
A combination of large and small structures with various sized holes and/or rocks with a range of shapes and sizes increases the surface area and habitat complexity of scour protection layers. This promotes biodiversity by providing adequate shelter for large, mobile species and suitable refuge for smaller species, juvenile life stages, and attached organisms.

Mimicking Existing Complex Habitat
Habitats created by installation of offshore wind infrastructure can be optimized by mimicking naturally occurring complex habitat features.

Materials Designed to Promote Growth
Calcium carbonate (CaCO₃) or natural shell can be mixed into concrete structures to provide suitable chemical composition for larval settlement of calcareous organisms such as bivalves.

Nature-Based Design and Offshore Wind Knowledge Gaps

• **Engineering:** Can the novel structures (e.g., scour protection layers) be augmented to mimic natural habitat?

• **Offshore setting:** Does the use of NBD products for offshore wind structures facilitate colonization and use by mobile species (enhance ecological function)?

• **Connectivity:** How does local habitat distribution influence the colonization and use of NBD products at novel wind structures (e.g., vicinity of the nearest natural reef habitat)?
Considerations

• **Goals:** Identify measurable objectives that the NBD is aiming to achieve; align with permitting requirements, mitigation measures; targeted focal species

• **Monitoring Programs:** specifically designed to evaluate performance of the NBD based on the specific goals

• Technical – structure stability, durability, chemical composition

• Environmental – depth, current velocity, sediment dynamics

• Logistical – costs, fishing activities, decommissioning (Rigs-to-Reefs)

• Ecological – complexity of structure, local species, local recruitment

• Risks – structural failure, unforeseen costs, non-indigenous species, competition for resources

Degraer et al. 2020
Catalog of Nature-Based Design Products


- NBD products currently available from US suppliers and have potential relevance to offshore wind designs
- Questionnaire to each supplier to collect information on available product designs, known ecological advantages, intended use, and estimated costs
- Focal species – current US northeast wind leases
  - EFH species
  - Habitat preferences and geographic range overlapping with current wind leases
  - Species with high economic or ecological importance
  - Species considered sensitive to offshore wind development

Table 1. Focal Species with Potential to Utilize NBD Options Around Offshore Wind Structures

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Life Stage Associated with Structured Habitat</th>
<th>Primary Function of Hard Substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>truthfish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atlantic Cod</td>
<td>Gadus morhua</td>
<td>J, A</td>
<td>N/F/S/R</td>
</tr>
<tr>
<td>Atlantic Herring</td>
<td>Clupea harengus</td>
<td>F</td>
<td>A</td>
</tr>
<tr>
<td>Black Sea Bass</td>
<td>Centropristis striata</td>
<td>I, A</td>
<td>N/F/S</td>
</tr>
<tr>
<td>Gag Grouper</td>
<td>Myctophum microlepis</td>
<td>I, A</td>
<td>F/S/N/R</td>
</tr>
<tr>
<td>Gray Triggerfish</td>
<td>Balistes capriscus</td>
<td>E, I, A</td>
<td>F/S/N/R</td>
</tr>
<tr>
<td>Haddock</td>
<td>Melanogrammus aeglefinus</td>
<td>I, A</td>
<td>N/F/S</td>
</tr>
<tr>
<td>Ocean Pilot</td>
<td>Micromis americanus</td>
<td>E, I, A</td>
<td>N/F/S/R</td>
</tr>
<tr>
<td>Red Hake</td>
<td>Ursophis chuss</td>
<td>I, A</td>
<td>N/S</td>
</tr>
<tr>
<td>Scup</td>
<td>Stenotomus chrysops</td>
<td>I, A</td>
<td>N/F/S</td>
</tr>
<tr>
<td>Summer Flounder</td>
<td>Peniaphis dentulus</td>
<td>I, A</td>
<td>F</td>
</tr>
<tr>
<td>Tautog</td>
<td>Tauropterus onitis</td>
<td>I, A</td>
<td>N/F/S</td>
</tr>
<tr>
<td>Crustaceans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Lobster</td>
<td>Homarus americanus</td>
<td>E, I, A</td>
<td>F/S</td>
</tr>
<tr>
<td>Jonah Crab</td>
<td>Cancer borealis</td>
<td>I, A</td>
<td>F</td>
</tr>
<tr>
<td>Rock Crab</td>
<td>Cancer immunus</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Mollusks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Mussel</td>
<td>Mytilus edulis</td>
<td>I, A</td>
<td>A</td>
</tr>
<tr>
<td>Eastern Oyster</td>
<td>Crassostrea virginica</td>
<td>I, A</td>
<td>A</td>
</tr>
<tr>
<td>Anthezia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fried Anemone</td>
<td>Metridium senile</td>
<td>I, A</td>
<td>A</td>
</tr>
<tr>
<td>Northern Star Coral</td>
<td>Astrangia pavoiae</td>
<td>I, A</td>
<td>A</td>
</tr>
<tr>
<td>Sea Whip</td>
<td>Leptosynia virgulata</td>
<td>I, A</td>
<td>A</td>
</tr>
<tr>
<td>Sponges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boring Sponge</td>
<td>Cliona celata</td>
<td>I, A</td>
<td>A</td>
</tr>
<tr>
<td>Red Beard Sponge</td>
<td>Microciona prolifera</td>
<td>I, A</td>
<td>A</td>
</tr>
</tbody>
</table>

A - Adult  
E - Egg  
J - Juvenile  
L - Post-larvae  
A - Attachment  
F - Feeding  
N - Nursery  
R - Reproduction  
S - Shelter
NBD Catalog

Potential application to offshore wind infrastructure

Product Description

Ecological Advantage

Specification

Estimated Product Costs

Publications
Turbine Reefs
Nature Based Design of Offshore Wind Infrastructure

Nature-based Design includes options that can be integrated in or added to the design of offshore wind infrastructure to create, expand, enhance, or restore habitat for native species or communities.

Enhanced Scour Protection Layers
A combination of large and small structures with various sized holes and/or rocks with a range of shapes and sizes increases the surface area and habitat complexity of scour protection layers. This promotes biodiversity by providing adequate shelter for large, mobile species and suitable refuge for smaller species, juvenile life stages, and attached organisms.

Mimicking Existing Complex Habitat
Habitats created by installation of offshore wind infrastructure can be optimized by mimicking naturally occurring complex habitat features.

Materials Designed to Promote Growth
Calcium carbonate (CaCO₃) or natural shell can be mixed into concrete structures to provide suitable chemical composition for larval settlement of calcareous organisms such as bivalves.
Bring concrete to life

Dr. Ido Sella

www.econcretetech.com
ECOncrete® is an environmental concrete technology that complies with Marine construction standards and provides biological, and structural benefits.
70% of coastal and marine structures are concrete based.
ECOncrete® Patented Solution

Material composition
Surface complexity
Macro design
Patented Solution

ECOncrete® Admix complies with US, UK, EU, & Australian standards for general and workability concrete admixture

- ASTM C494, Standard Specification for Chemical Admixtures for Concrete,
- Australia: Special purpose admixture, Section 3 and 4 of AS 1478.1-2000 (R2018).
BRINGING CONCRETE TO LIFE

Biodiversity: 2X

Water Quality: 16X

Native : invasive species ratio: 3:1

Carbon Sink: 7X

Species Richness: 2X

Habitat Creation: INCREASED
BRINGING CONCRETE TO LIFE

Biodiversity: 2X
Water Quality: 16X
Carbon Sink: 7X
Native : invasive species ratio: 3:1
Species Richness: 2X
Habitat Creation: INCREASED
40+ Locations | 7 Seas | 10 Countries

- Shoreline Protect
- Wet cast Marine Mattress
- ECO Seawall
- Tide Pool Armor
- ECO Armor Block
- Drycast ECO Mat
Offshore Applications

Turbine Reefs: Nature-Based Designs for Augmenting Offshore Wind Structures in the United States

Technical Report
November 2021
Shark River Island, Neptune City, NJ
Stabilizing a highly eroded shoreline along a Community Waterfront

Jun. 2018, Jun 2021  Shark River Island, Neptune City, NJ, USA
Two months post installation
Fort Salonga, Long Island, USA
Protecting Underwater Energy Cables

Dec. 2020
Fort Salonga, Long Island, USA
The Netherlands – Lauwersmeer Dike
Dike reinforcement pilot with Underwater Marine Life Enhancement

Nov. 2021
Wadden Sea, Groningse Lauwersmeerdijk, Netherlands
Cable protection, Fuerteventura, Spain
Submarine electrical cable protection. Fuerteventura-Lanzarote, Canary Islands.
Bioenhancing Offshore facilities

Dec 2021-March 2022  Fuerteventura-Lanzarote, Canary Islands, Spain
Anti-trawling blocks, Melendugno, Italy  
Submarine gas pipeline protection. Albania-Italy. Bioenhancing-protecting Offshore facilities

📅 July 2021-April 2022  📍 Melendugno, Italy  📂 200 units of 8m³
ECOncrete Tech Ltd. and LafargeHolcim (US) Inc. developing an eco-engineered concrete product for scour protection and ecological uplift of offshore wind energy infrastructure.
ECOscour protection. BIRD Grant.
Analysis of the biological enhancement, production and Offshore placement

📅 Jan 2021-Aug 2022  📍 East Coast, USA
ECOscour protection. BIRD Grant.
Analysis of the biological enhancement, production and Offshore placement

📅 Jan 2021-Aug 2022  📍 East Coast, USA
Mooring units for Floating Offshore Wind

ECOncrete mooring units for Floating Offshore Wind Parks.

📅 Jan 2022-Dec 2022📍 Canary Islands, Spain
Let’s build responsibly, together
Fishing Among Giants
Capt. Dave Monti

• Recreational fisherman
• Charter captain/fishing guide
• Fishing journalist... Providence Journal and 15 others
• Fish advocate, conservation & offshore wind
• Saltwater Anglers Association Board and RI Charter & Party Boat Association
• RI Marine Fisheries Council, vice chair
• Am. Saltwater Guides Association board
Structure and Fishing

• As a charter captain and fishermen I spend most of my fishing days seeking out structure... natural structure like ledges, channel breaks, deep holes, rock clusters, banks or man made like, bridge abutments, jetties, ocean platforms, artificial reefs, etc.

• Know of no structure that has been bad for fishing... natural or man made
Fishing in the BIWF
Enhanced fishing and pressure
Block Island Wind Farm

- Southern New England Offshore Wind Energy Science Forum (12/17)... 50 scientists present research findings.
- BIWF has had no remarkable adverse effects on the environment, fish, mammals, birds and people.
Scientists at the Forum also said that the cumulative effects of hundreds of turbines in the same area are unknown, based on European/BIWF experiences believe we will have a positive cumulative impact

Seven years: enhanced/complemented habitat, created life, attacking fish of all sizes we like to catch, eat and/or release
Moving forward

**Offshore wind and fishing can coexist and thrive**

- Block Island Wind Farm is the proof
- Enhance structure at base of pylons
- Conduct fish and habitat research before, during and after wind farm construction
- We have a proven research protocol via the BIWF, let’s follow it, learn as we go and improve our fisheries and ability to offset negative climate impacts
Fishing among giants
Coming Next:

March 2, 1:30 p.m. ET
Research Priorities for Offshore Wind
Carrie Cullen Hitt, NOWRDC

Visit wind.ny.gov to register

We want your feedback! Send suggestions for future webinar topics to offshorewind@nyserda.ny.gov.