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

Learning from the Experts Webinar Series

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

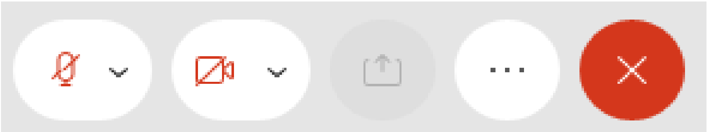
Meeting Procedures

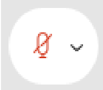
Webinar recordings and presentations will be available at:

www.nyserda.ny.gov/osw-webinar-series

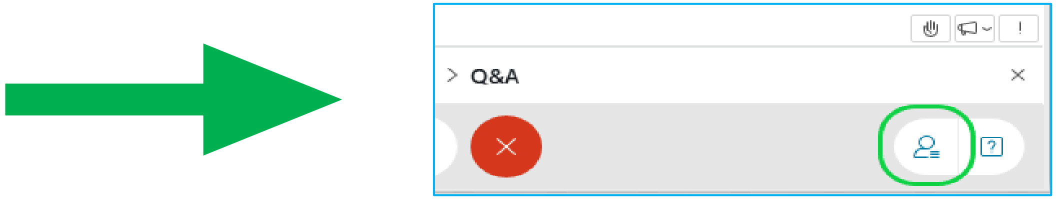
Participation for Members of the Public:

> Members of the public will be muted upon entry.



You'll see  when your microphone is muted

> 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.

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Nature Based Design Enhancements for Offshore Wind Farms

The Nature Conservancy

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

annie@inspireenvironmental.com

Artificial Reef Effect

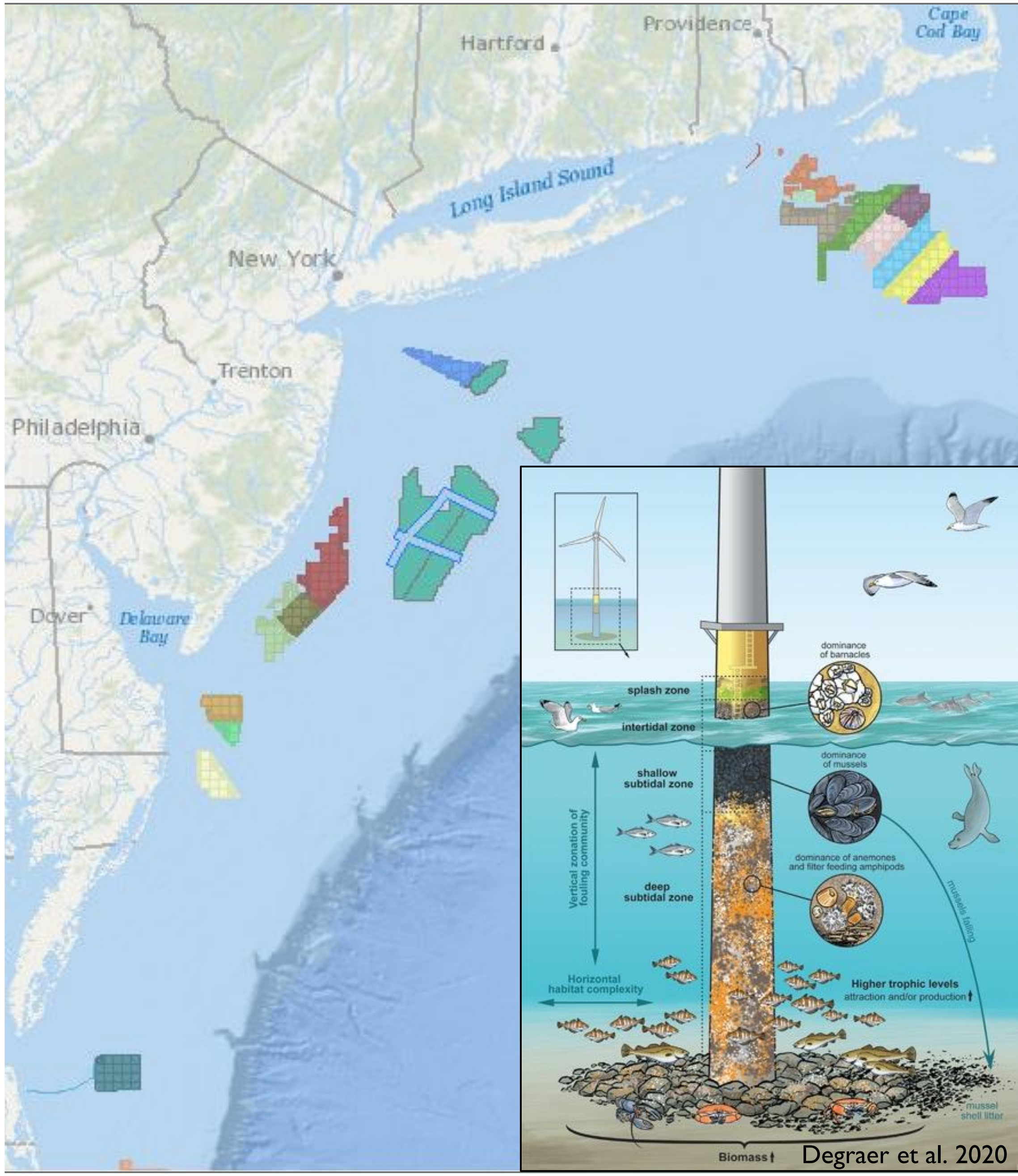
Novel structures
may lead to shifts in connectivity at multiple scales

energy flow

- Organic enrichment of surrounding sediments
- Higher trophic levels connectivity

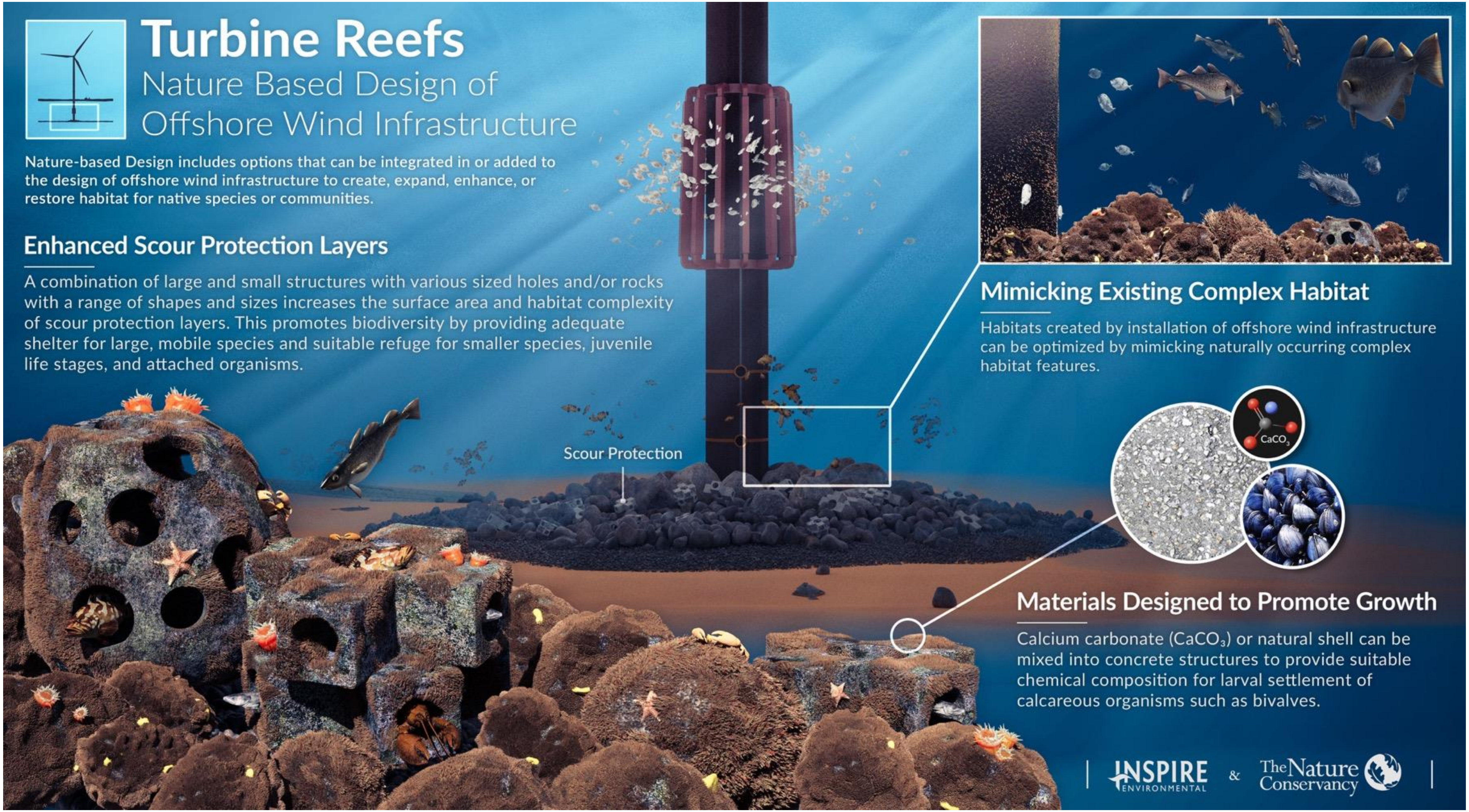
species distributions

- Facilitate poleward expansion
- Opportunistic non-indigenous species colonization



Degraer et al. 2020

INSPIRE ENVIRONMENTAL



https://www.nature.org/en-us/newsroom/wind-turbines-marine-life/

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)?

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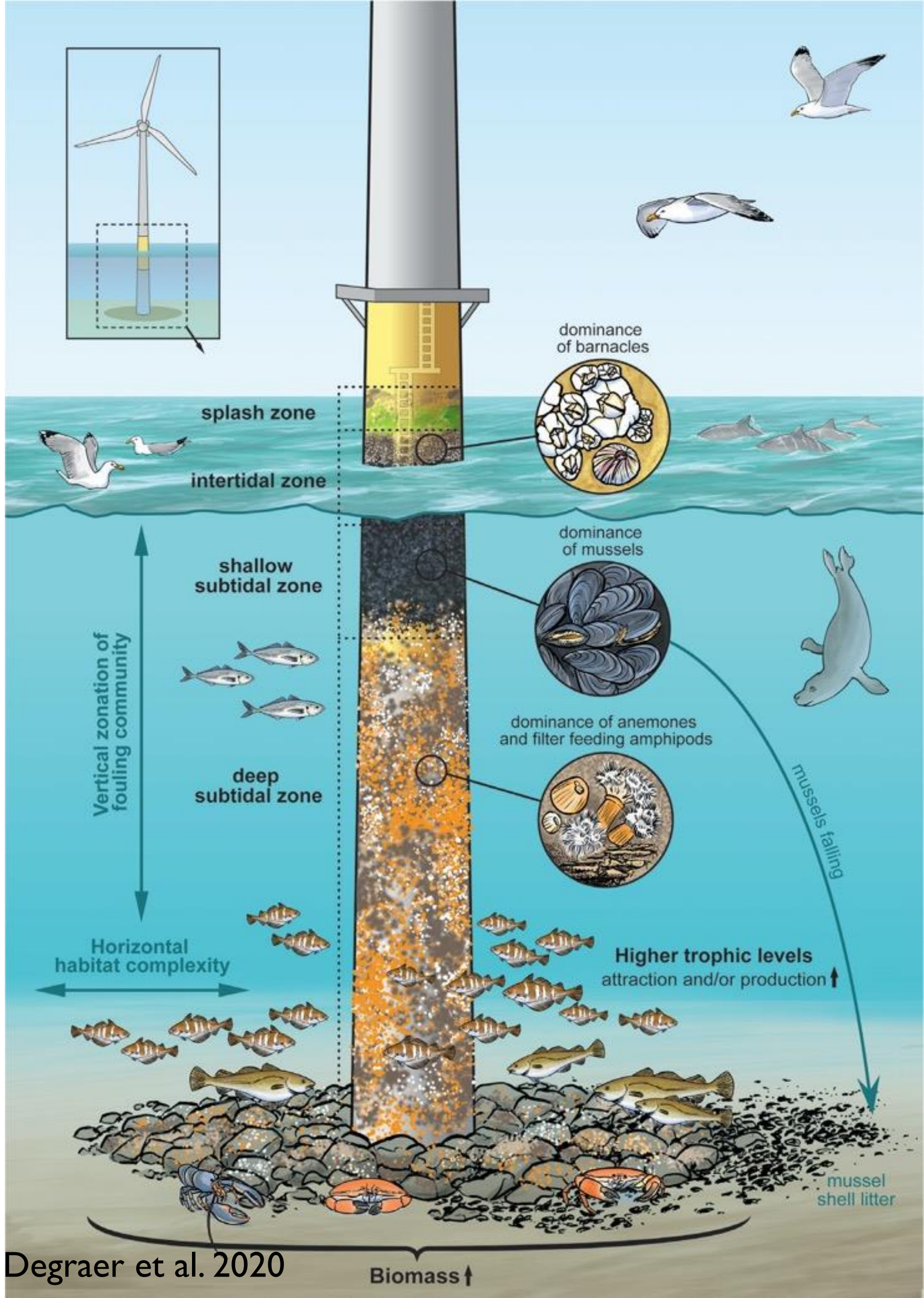
Considerations

- 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

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Catalog of Nature-Based Design Products

www.nature.org/content/dam/tnc/nature/en/documents/TurbineReefReport_Nature-BasedDesignsOffshoreWindStructures_Final2022.pdf

- 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

Common Name	Scientific Name	Life Stage Associated with Structured Habitat	Primary Function of Hard Substrate
Finfish			
Atlantic Cod	*Gadus morhua*	J, A	N / F / S / R
Atlantic Herring	*Clupea harengus*	E	A
Black Sea Bass	*Centropristis striata*	J, A	N / F / S
Gag Grouper	*Mycteroperca microlepis*	J, A	F/ S / N / R
Gray Triggerfish	*Balistes capriscus*	E, J, A	F / S / N / R
Haddock	*Melanogrammus aeglefinus*	J, A	N / F / S
Ocean Pout	*Macrozoarces americanus*	E, J, A	N / F / S / R
Red Hake	*Urophycis chuss*	J, A	N / S
Scup	*Stenotomus chrysops*	J, A	N / F / S
Summer Flounder	*Paralichthys dentatus*	J, A	F
Tautog	*Tautoga onitis*	J, A	N / F / S
Crustaceans			
American Lobster	*Homarus americanus*	L, J, A	N / S
Jonah Crab	*Cancer borealis*	J, A	F / S
Rock Crab	*Cancer irroratus*		F / S
Mollusks			
Blue Mussels	*Mytilus edulis*	J, A	A
Eastern Oyster	*Crassostrea virginica*	J, A	A
Anthozoa			
Frilled Anemone	*Metridium senile*	J, A	A
Northern Star Coral	*Astrangia poculata*	J, A	A
Sea Whip	*Leptogorgia virgulata*	J, A	A
Sponges			
Boring Sponge	*Cliona celata*	J, A	A
Red Beard Sponge	*Microciona prolifera*	J, A	A

A – Adult
E – Egg
J – Juvenile
L – Post-larvae

A – Attachment
F – Foraging
N – Nursery
R – Reproduction
S – Shelter

NBD Catalog

Potential application to offshore wind infrastructure

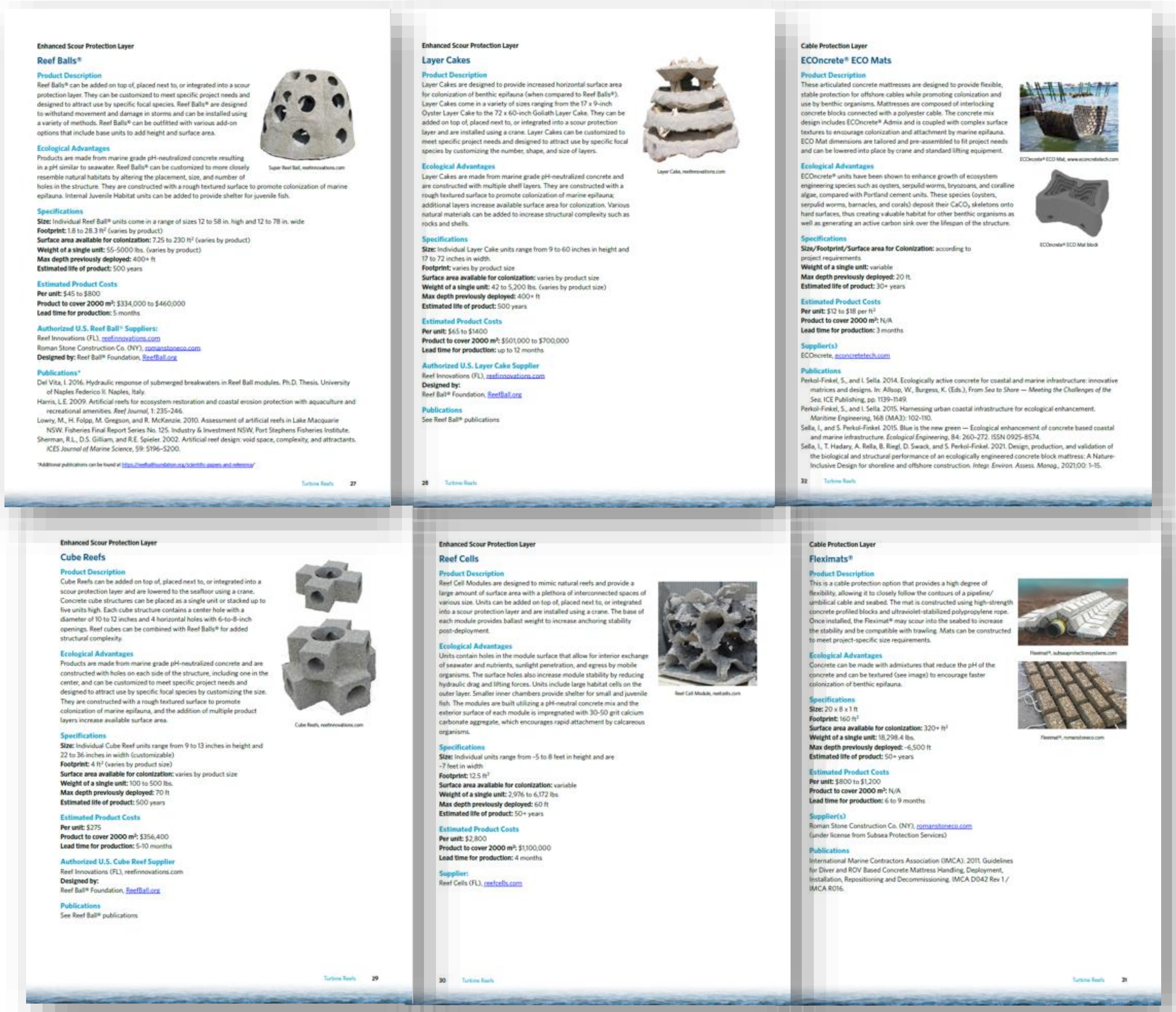
Product Description

Ecological Advantage

Specification

Estimated Product Costs

Publications



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Turbine Reefs

Nature Based Design of Offshore Wind Infrastructure

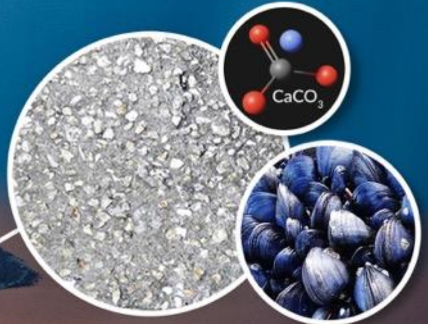
Nature-based Design includes options that can be integrated in or added to the design of offshore wind infrastructure to create, expand, enhance, or restore habitat for native species or communities.

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 ($CaCO_3$) or natural shell can be mixed into concrete structures to provide suitable chemical composition for larval settlement of calcareous organisms such as bivalves.

INSPIRE ENVIRONMENTAL & The Nature Conservancy

ECONCRETE

Bring concrete to life

Dr. Ido Sella

ECOncrete® is an environmental concrete technology that complies with Marine construction standards and provides biological, and structural benefits.

Concrete Problem

70%

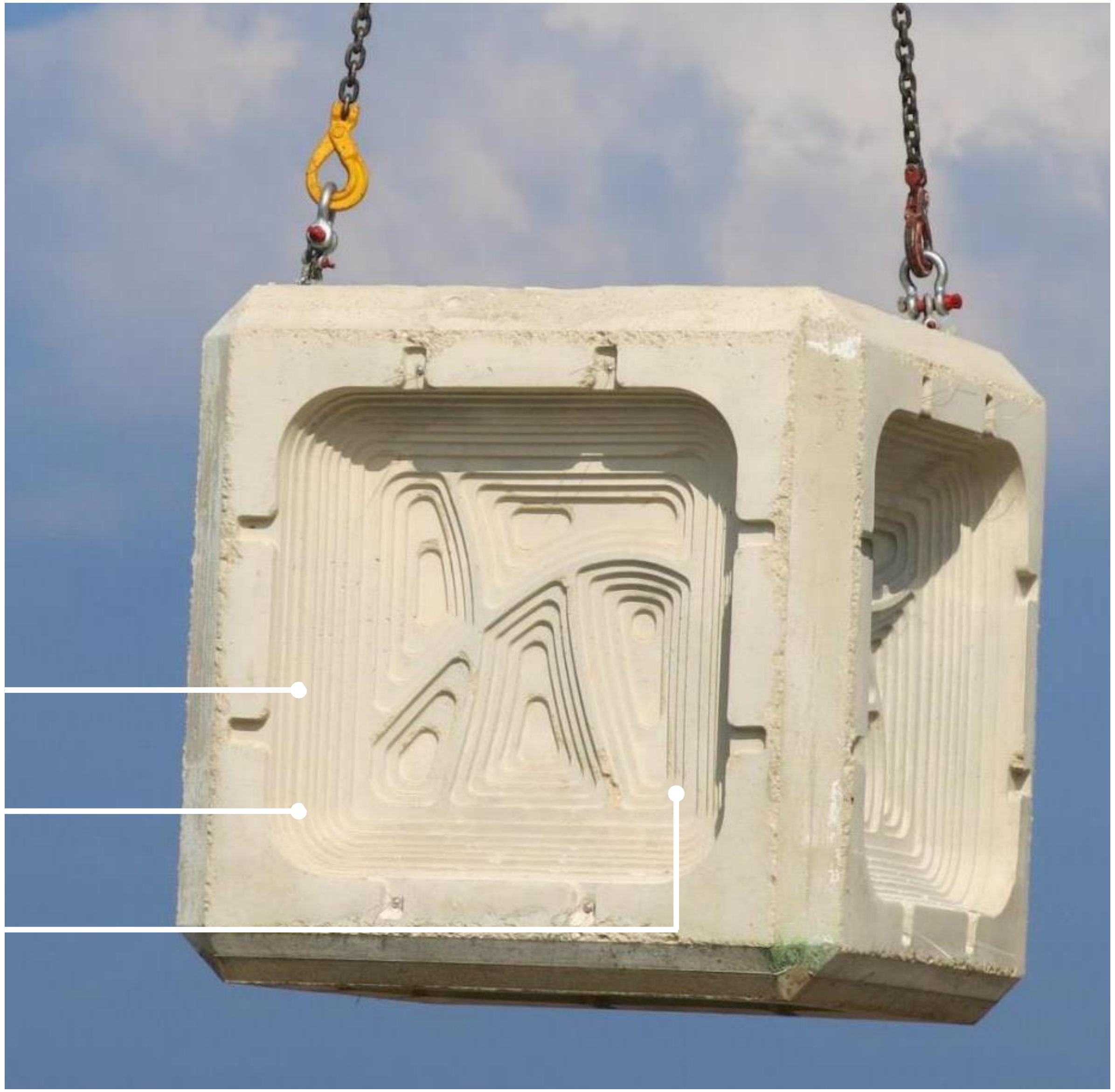
of coastal and marine structures are concrete based

ECOncrete® Patented Solution

Material composition

Surface complexity

Macro design



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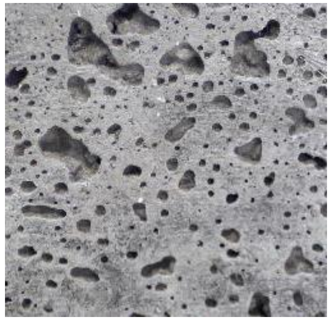

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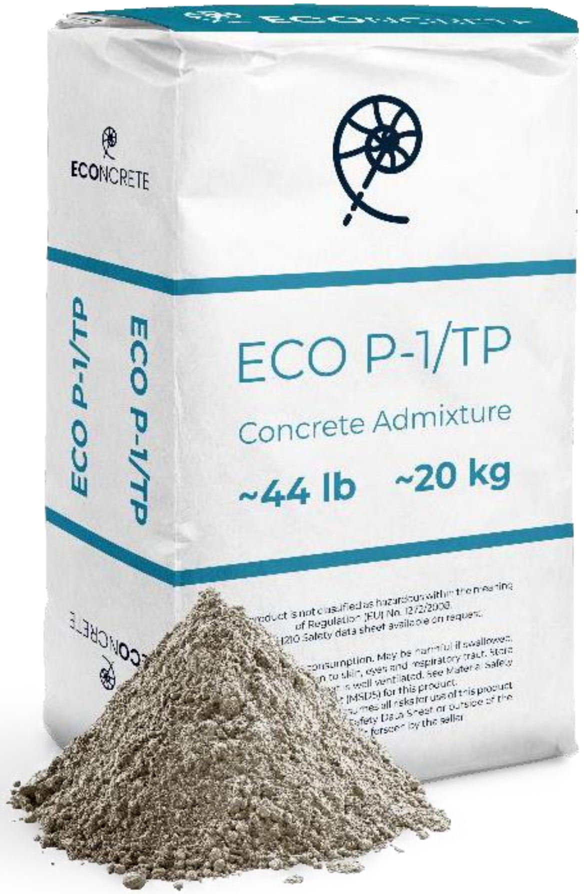
Patented Solution

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

- ASTM C494, Standard Specification for Chemical
- Admixtures for Concrete.
- EU/UK/IS: Improve workability of concrete admixture (SI 89 and the EN 934-1 2008 and EN 934-2: 2009 + A1:2012).
- Australia: Special purpose admixture, Section 3 and 4 of AS 1478.1-2000 (R2018).



BRINGING CONCRETE **TO LIFE**

Biodiversity
2 X

Water Quality
16 X

Carbon Sink
7 X

Native : invasive species ratio
3:1

Species Richness
2 X

Habitat Creation
INCREASED

ECONCRETE

BRINGING CONCRETE **TO LIFE**

Biodiversity
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INCREASED

ECONCRETE

BESSER Trusted Since 1904

PORT of SAN DIEGO Waterfront Development

Puerto de Vigo Autoridad Portuaria de Vigo

IGY MARINAS

PSEG LONG ISLAND

Quadrum

BROOKLYN BRIDGE PARK

HOLCIM

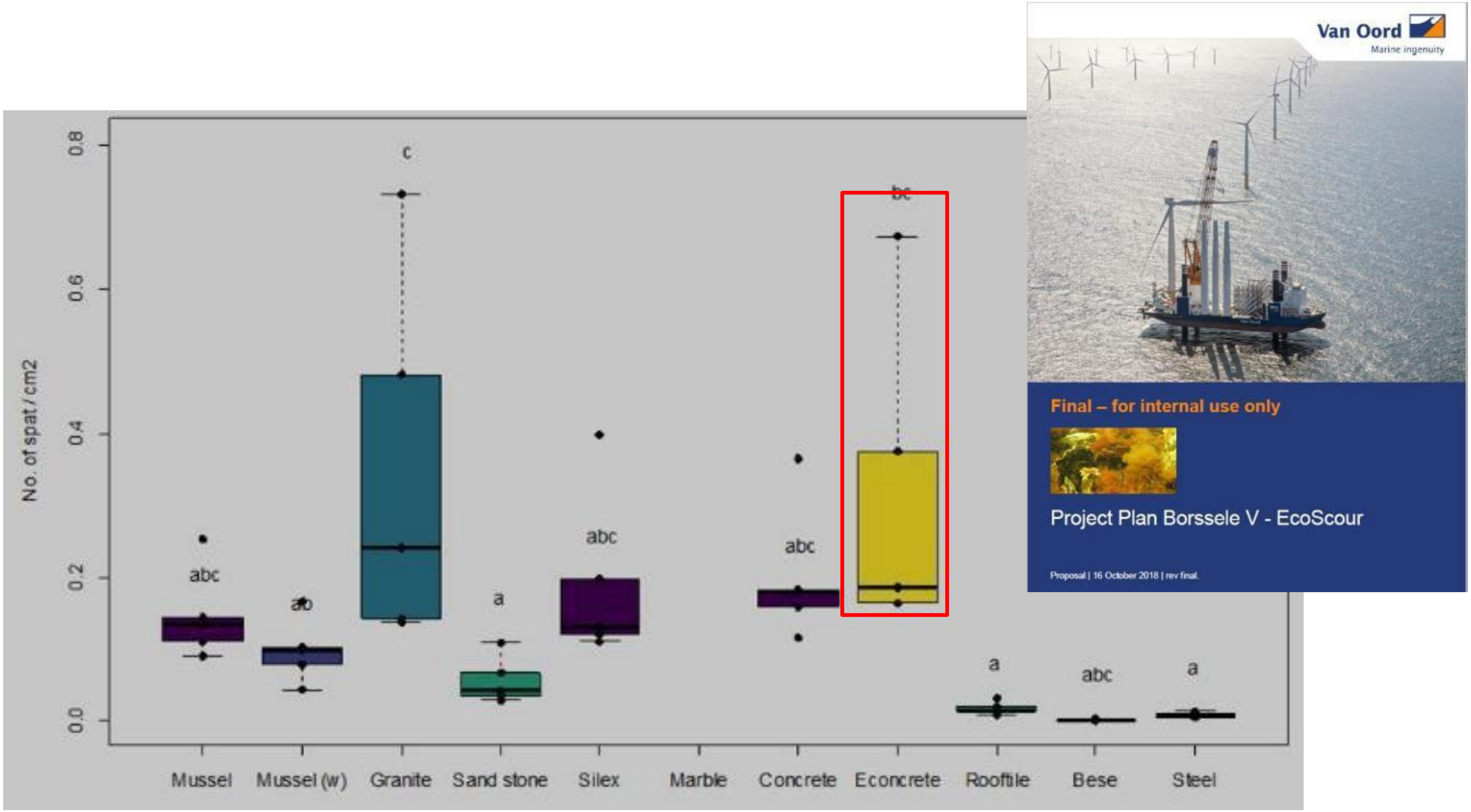
ARUP

Port of Rotterdam

PORT OF SAN FRANCISCO

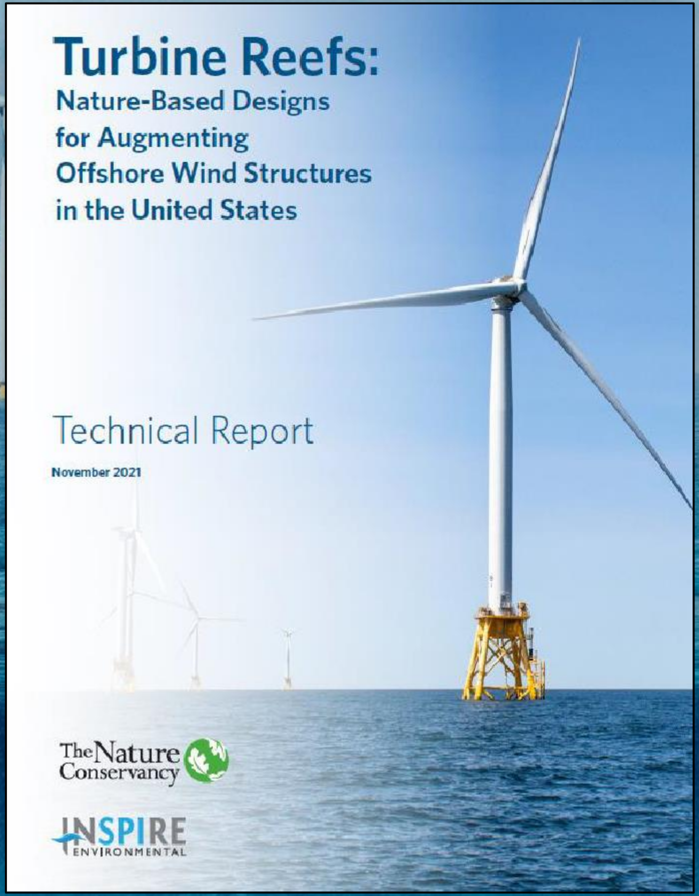
suez

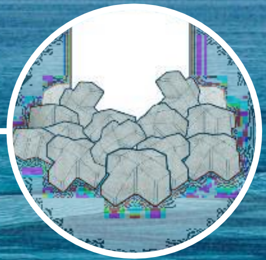
40+ Locations | 7 Seas | 10 Countries



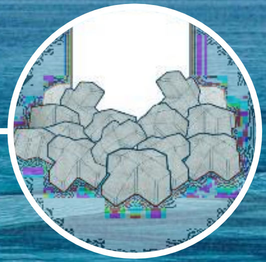
No. of spat / cm2
0.0
0.2
0.4
0.6
0.8
abc
ab
c
a
abc
abc
bc
a
abc
a
Mussel
Mussel (w)
Granite
Sand stone
Silex
Marble
Concrete
Econcrete
Rooftile
Bese
Steel
Van Oord
Marine ingenuity
Final – for internal use only
Project Plan Borssele V - EcoScour
Proposal | 16 October 2018 | rev final.

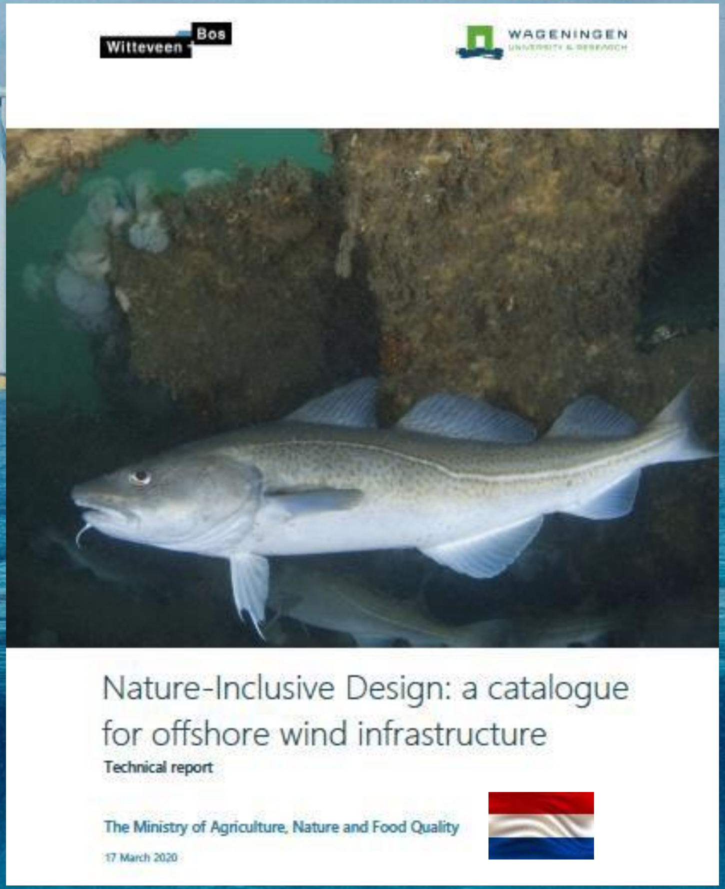
Offshore Applications





Offshore Applications




Witteveen + Bos

WAGENINGEN UNIVERSITY & RESEARCH

Nature-Inclusive Design: a catalogue for offshore wind infrastructure

Technical report

The Ministry of Agriculture, Nature and Food Quality

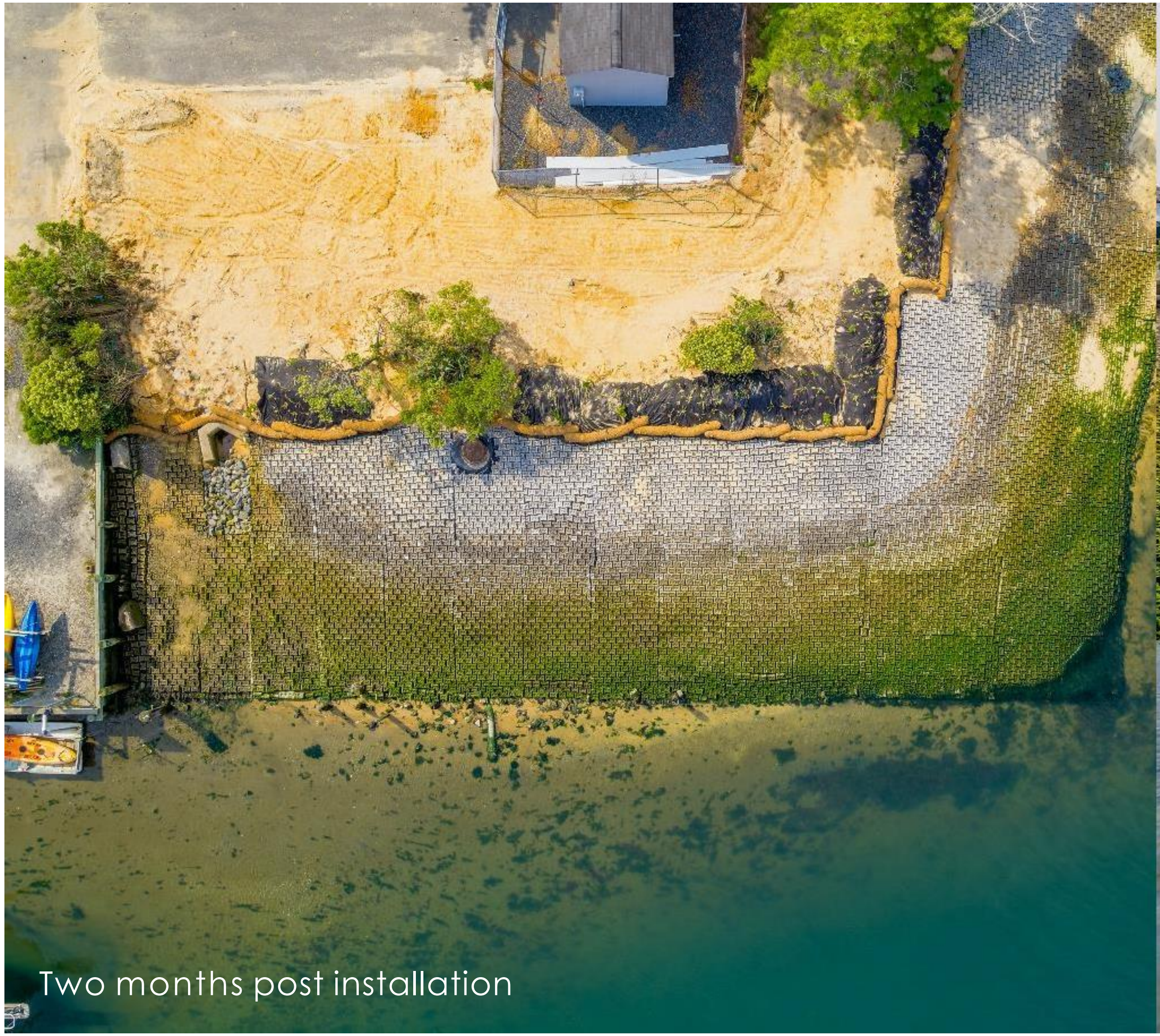
17 March 2020

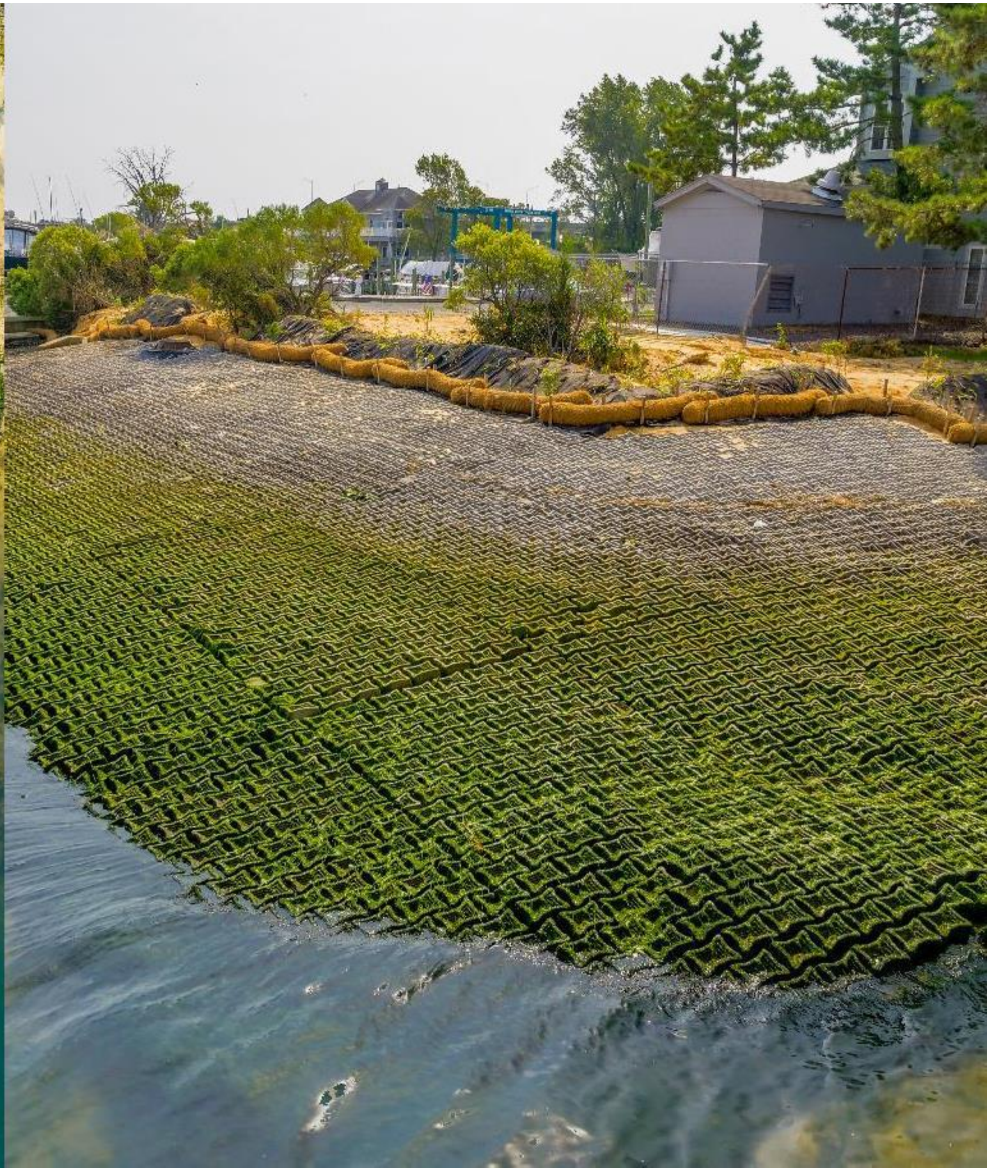
Shark River Island, Neptune City, NJ

Stabilizing a highly eroded shoreline along a Community Waterfront

Jun. 2018, Jun 2021 | Shark River Island, Neptune City, NJ, USA

BESSER
Trusted Since 1904

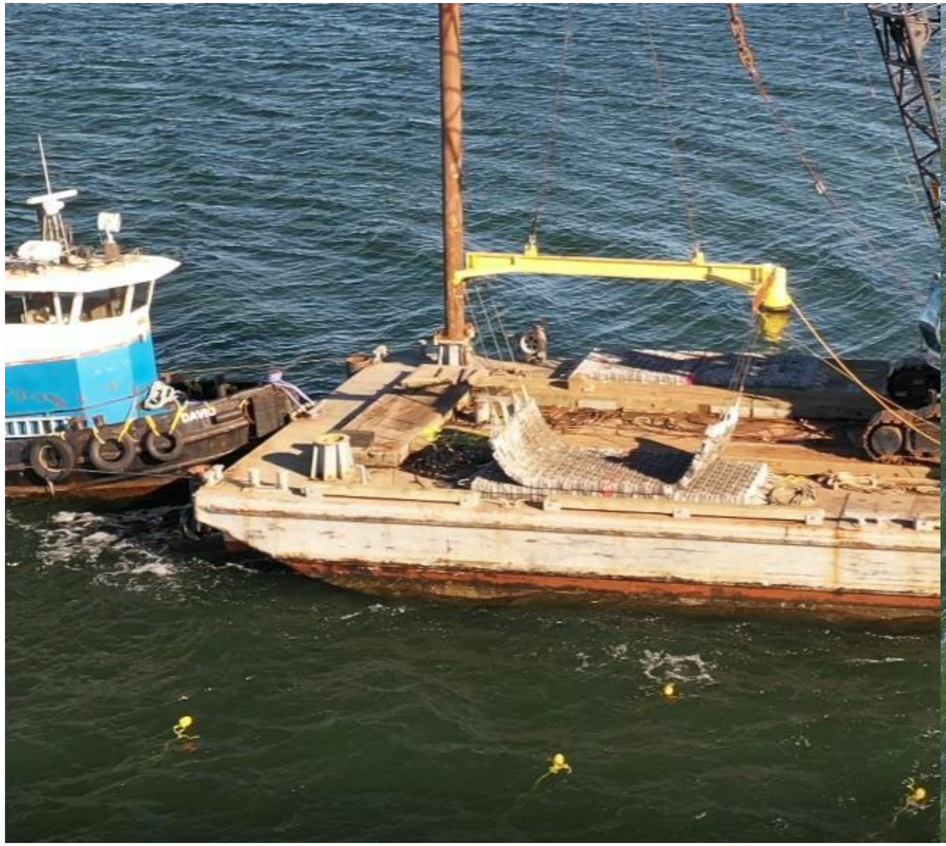

Two months post installation



Fort Salonga, Long Island, USA

Protecting Underwater Energy Cables

Dec. 2020 Fort Salonga, Long Island, USA





BLAKESLEE

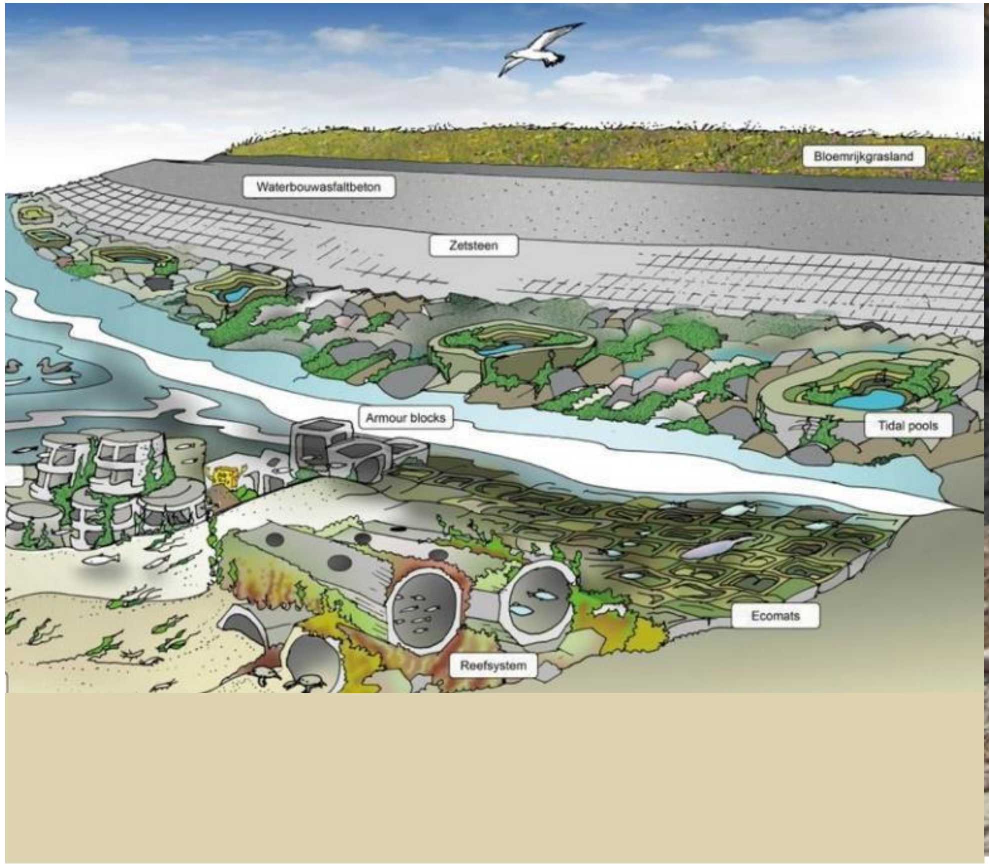

The Netherlands – Lauwersmeer Dike

Dike reinforcement pilot with Underwater Marine Life Enhancement

Nov. 2021

Wadden Sea, Groningse Lauwersmeerdijk, Netherlands

ARCADIS heijmans Waterschap Noorderzijlvest



Cable protection, Fuerteventura, Spain

UNDER CONSTRUCTION

Submarine electrical cable protection. Fuerteventura-Lanzarote, Canary Islands.
Bioenhancing Offshore facilities

Dec 2021-March 2022

Fuerteventura-Lanzarote,
Canary Islands, Spain

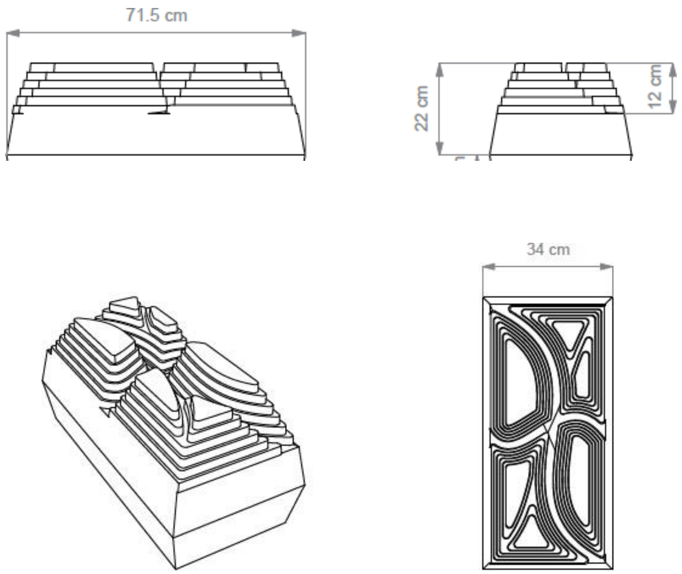
RED ELÉCTRICA DE ESPAÑA

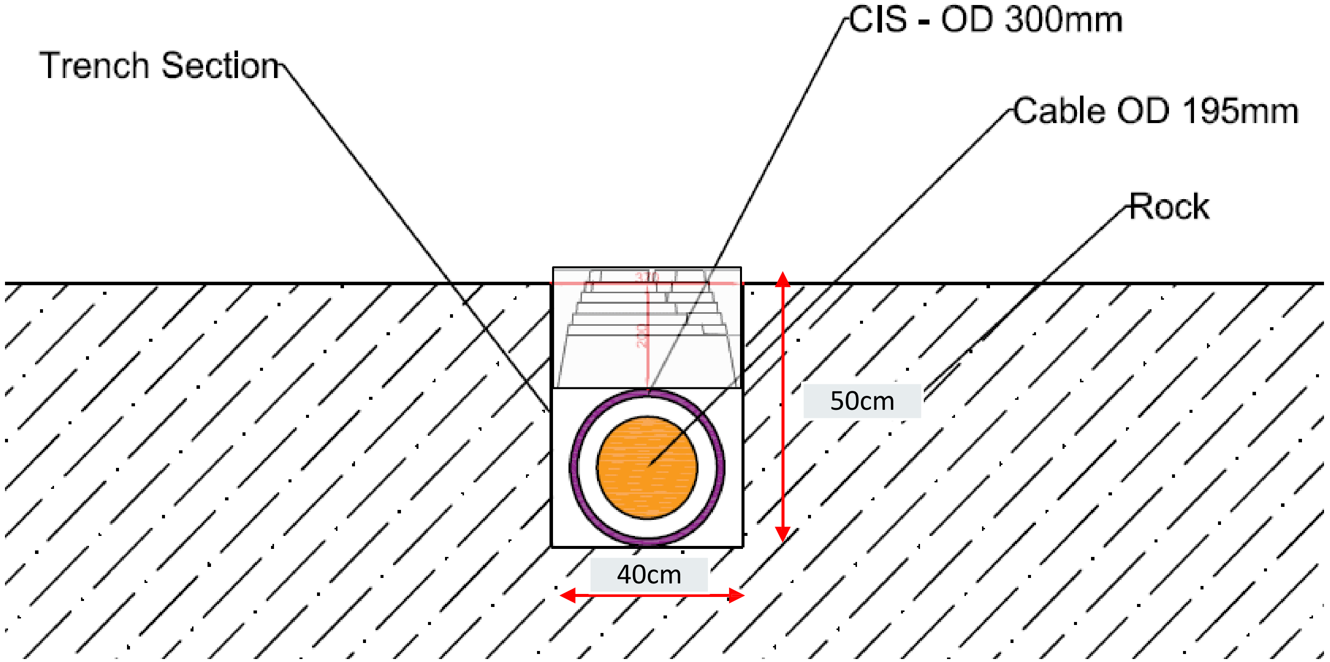
TECNOAMBIENTE

A TRADEBE COMPANY

SISGEN

Prysmian Group





Anti-trawling blocks, Melendugno, Italy
UNDER CONSTRUCTION

Submarine gas pipeline protection. Albania-Italy. Bioenhancing-protecting Offshore facilities

July 2021-April 2022

Melendugno, Italy

200 units of 8m³

Morello s.r.l.


ENERGY.GOV

SCIENCE & INNOVATION ENERGY ECONOMY SECURITY & SAFETY SAVE ENERGY, SAVE MONEY

Department of Energy

Department of Energy Announces Eight New Projects Through BIRD Energy Partnership with Israel

DECEMBER 21, 2020

ECOncrete Tech Ltd. and **LafargeHolcim (US) Inc.** **developing** an **eco-engineered** concrete product for scour protection and ecological uplift of offshore wind energy infrastructure.

R & D

UPCOMING CONSTRUCTION

ECOscour protection. BIRD Grant.

Analysis of the biological enhancement, production and Offshore placement

Jan 2021-Aug 2022   East Coast, USA

HOLCIM

ECONCRETE

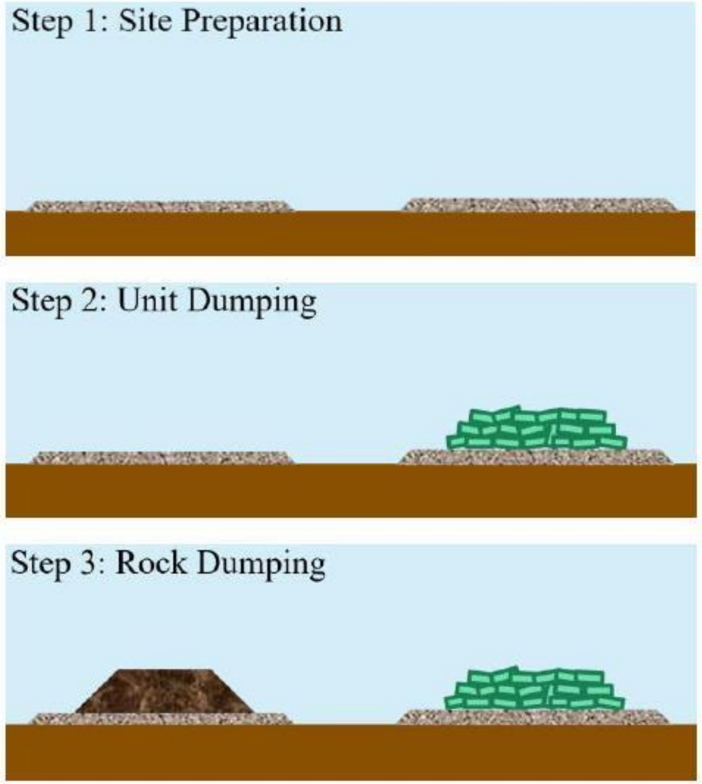
ECOscour protection. BIRD Grant.

Analysis of the biological enhancement, production and Offshore placement

R & D

UPCOMING CONSTRUCTION

Jan 2021-Aug 2022 East Coast, USA



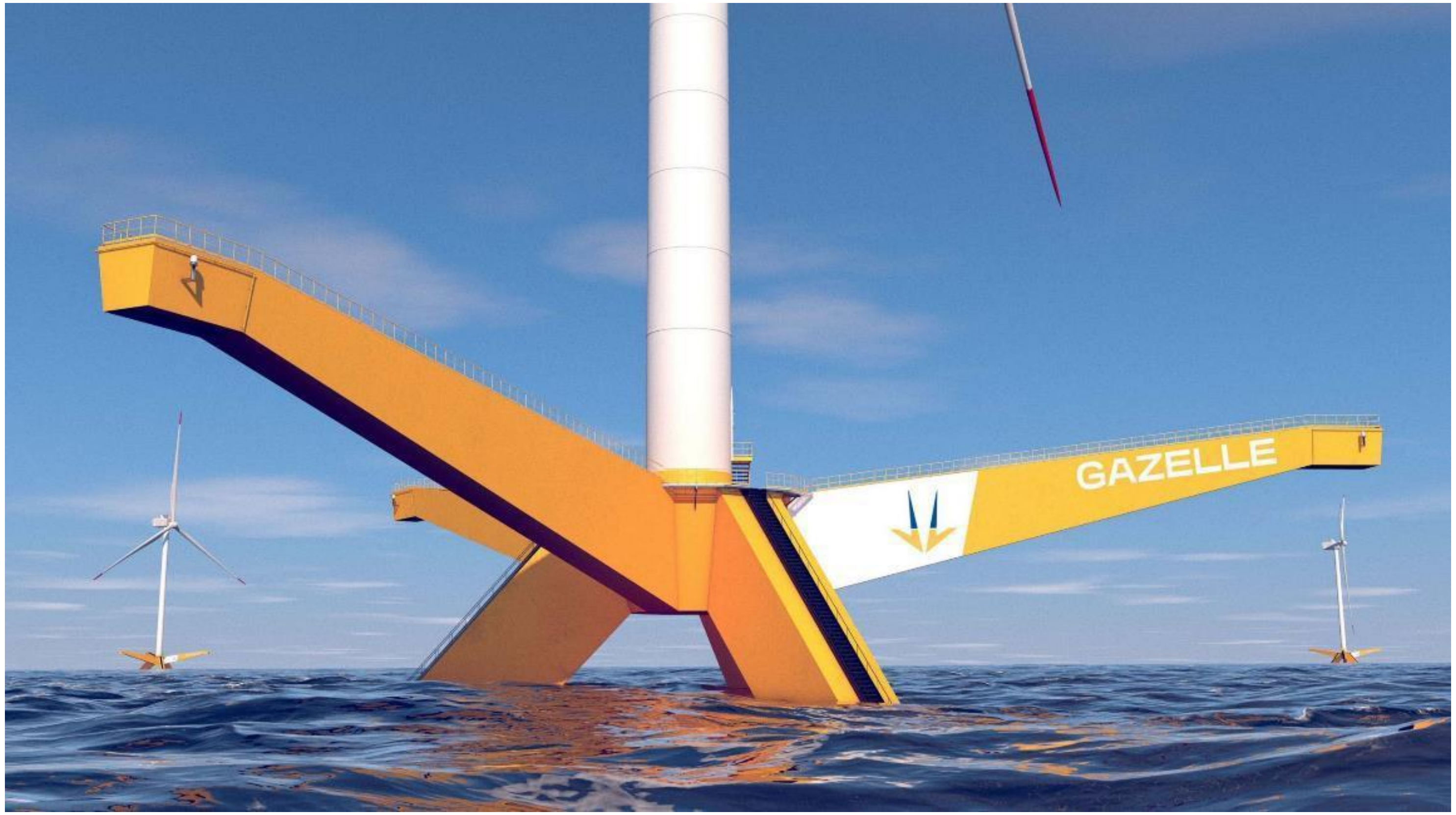
Mooring units for Floating Offshore Wind

R & D

UPCOMING CONSTRUCTION

ECOncrete mooring units for Floating Offshore Wind Parks.

Jan 2022-Dec 2022 Canary Islands, Spain



ECONCRETE

Let's build responsibly, together

www.econcretetech.com

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

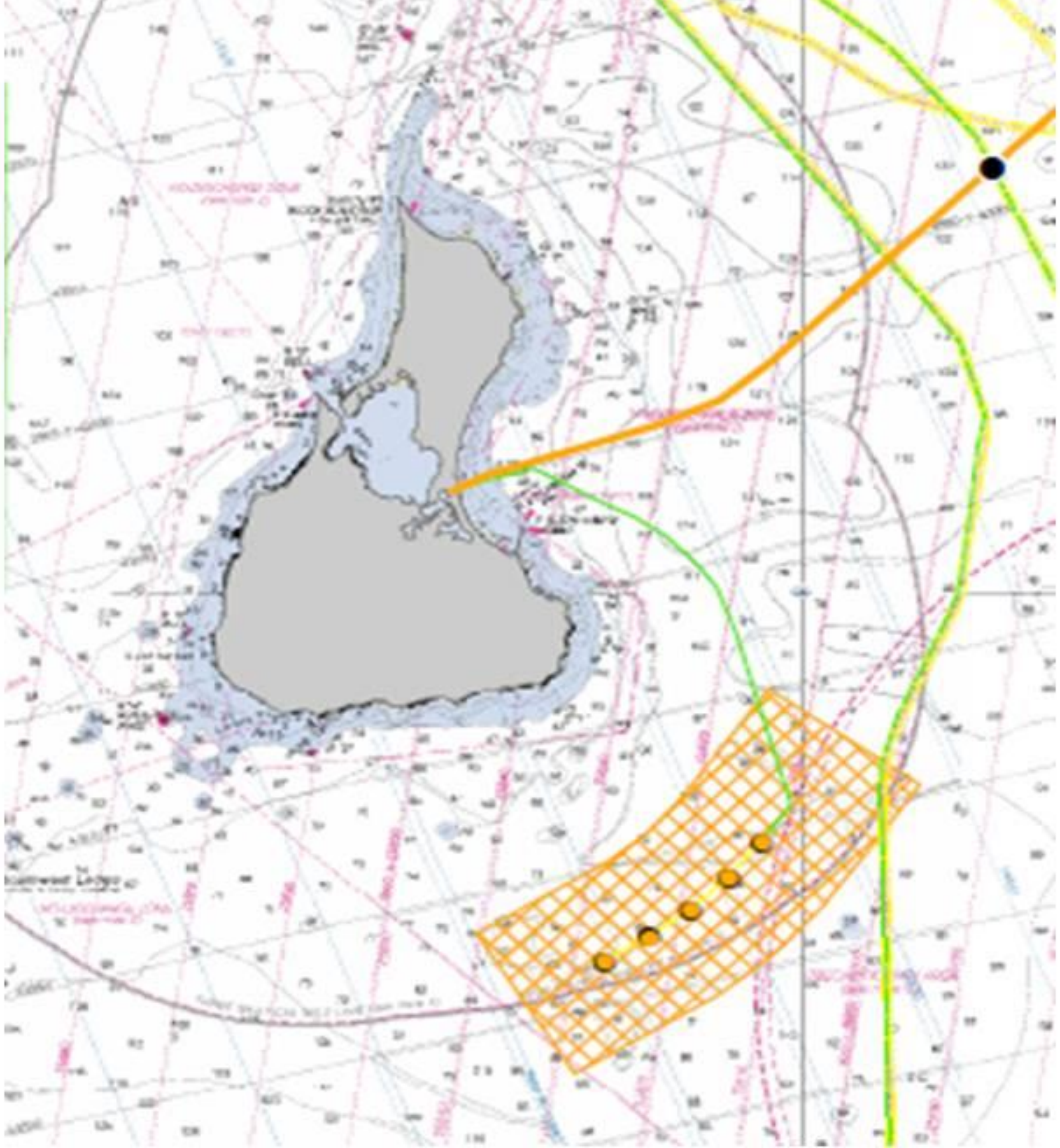

FISH
300


swim

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




OFFSHORE

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.

Block Island Wind Farm

- 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.