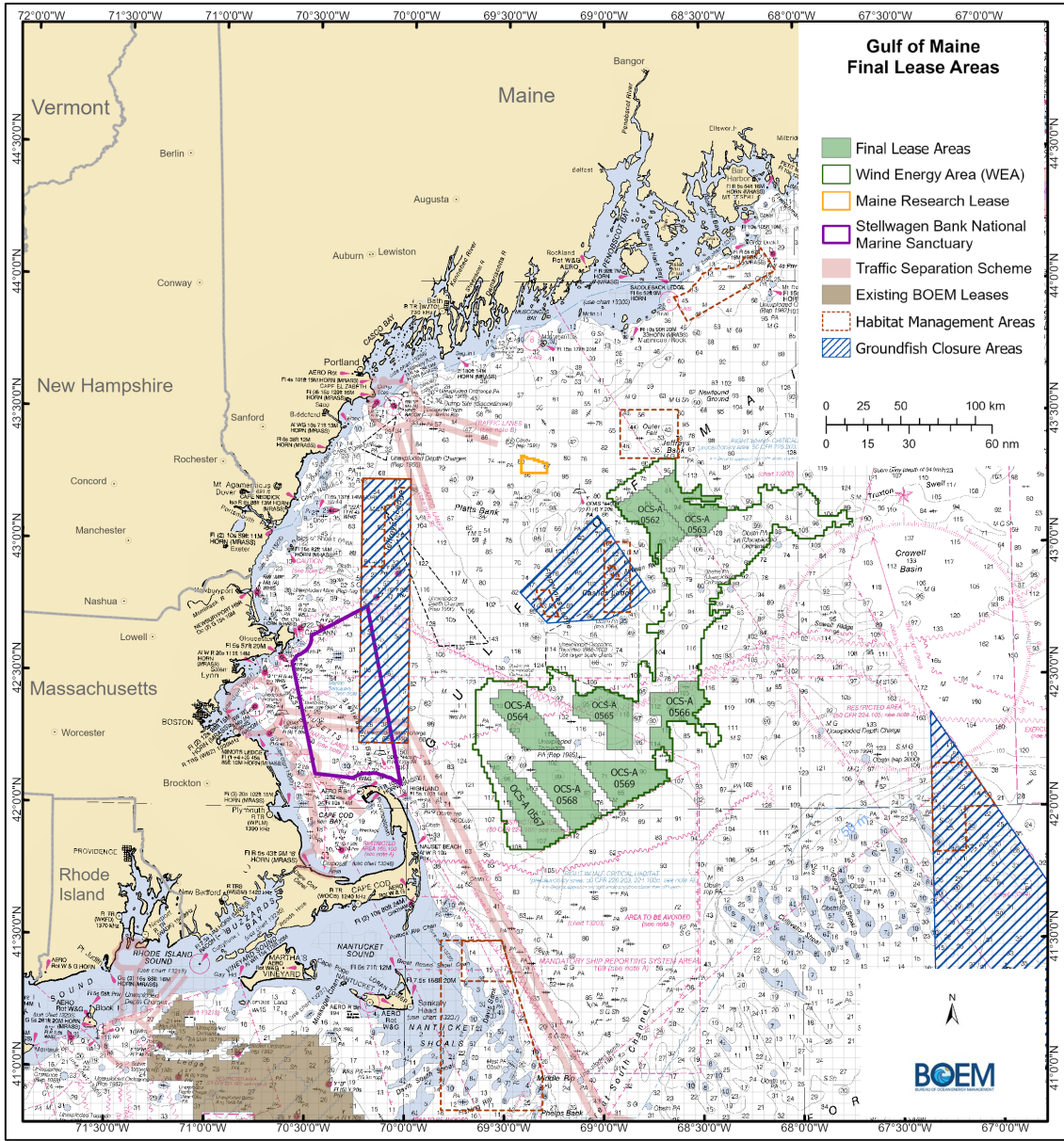
Offshore Wind Procurement

- **September 9, MA announced projects selected for long-term offshore wind contract negotiation**
  - MA selection of 2,678 MW and RI selection of 200 MW
  - SouthCoast Wind = 1,087 MW (+ 200 MW for RI)
  - Avangrid (NE Wind) = 791 MW
  - Vineyard Offshore = 800 MW
  - Economic and workforce development commitments including supply chain and port infrastructure investments
  - Environmental and fisheries mitigation plans and funding
- **Vineyard Wind 1 Project (806 MW) in construction**
- **With these projects, 3.4 GW offshore wind in development pipeline**

MASSACHUSETTS CLEAN ENERGY CENTER

Gulf of Maine FSN & Lease Auction

- **September 16, BOEM announced Final Sale Notice**
  - 8 lease areas; totaling 850,082 acres
  - Total acreage represents 12% reduction from area in Proposed Sale Notice
  - Reduction based on public comment & engagement regarding important fishing areas, sensitive habitats, and consideration of existing and future vessel transit
  - Areas removed in response to herring and groundfish fishing effort
  - Created transit corridors between lease areas
  - Retains sufficient acreage to support states' offshore wind energy goals
- **Gulf of Maine Auction set for October 29**



ROSA
Responsible Offshore Science Alliance

Responsible Offshore Science Alliance

October MA OSW FWG

Leading Regional Research on Offshore Wind & Fisheries

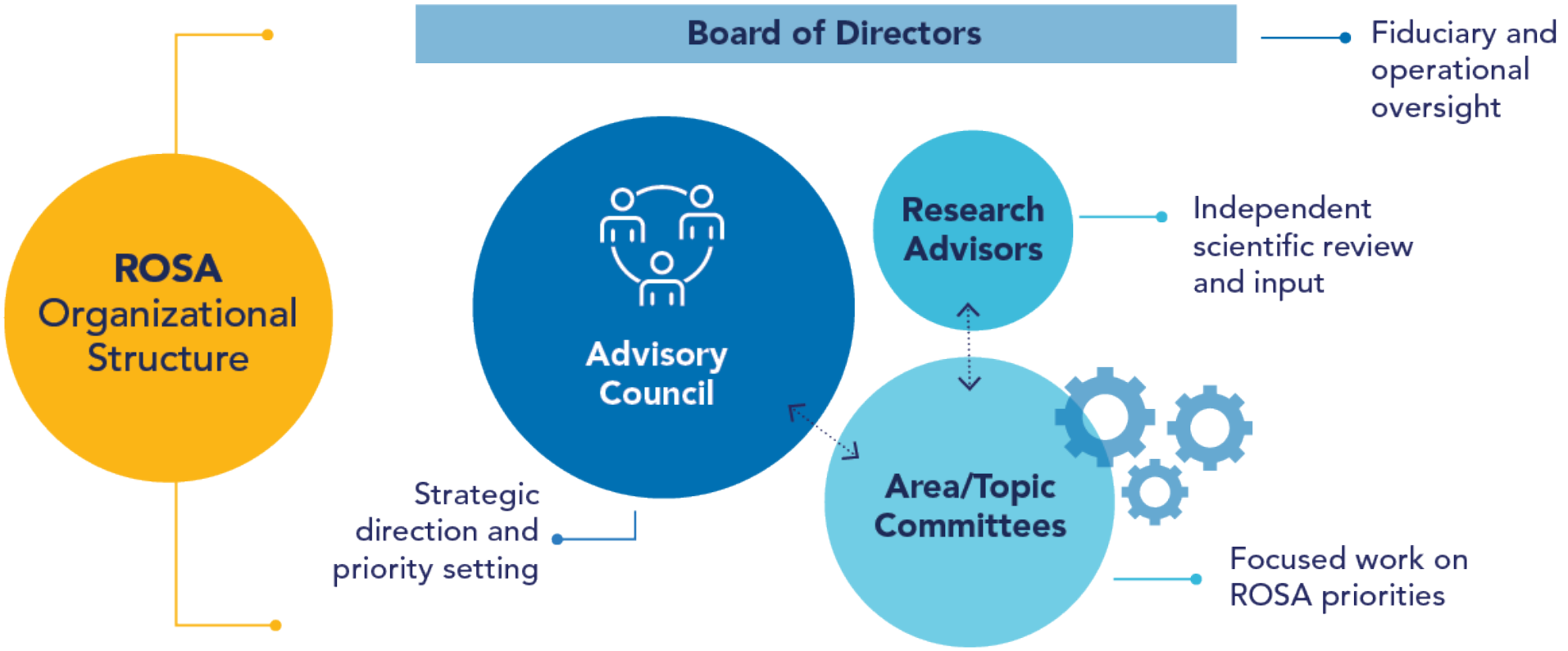
Mission:

The Responsible Offshore Science Alliance (ROSA) is a nonprofit organization that **advances research, monitoring, and methods** on the effects of **offshore wind energy development on fisheries** across US federal and state waters.

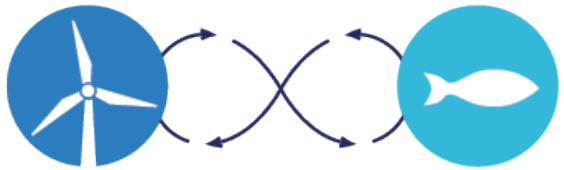
We serve as an objective resource for all sectors and facilitate the coordination of regional scientific research to collaboratively and efficiently deepen understanding.

ROSA

ROSA's Organizational Structure

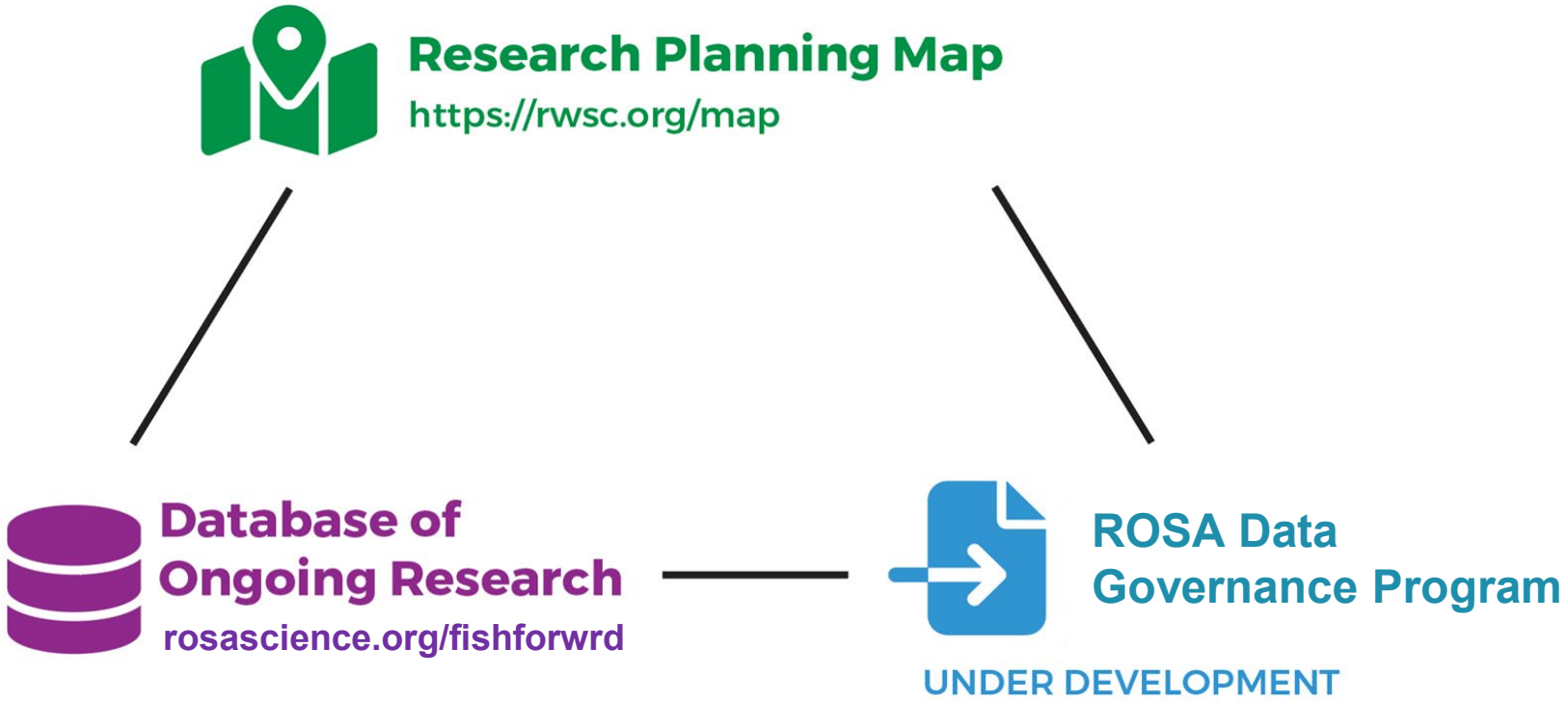


COLLABORATION + SCIENCE = IMPROVED UNDERSTANDING



ROSA

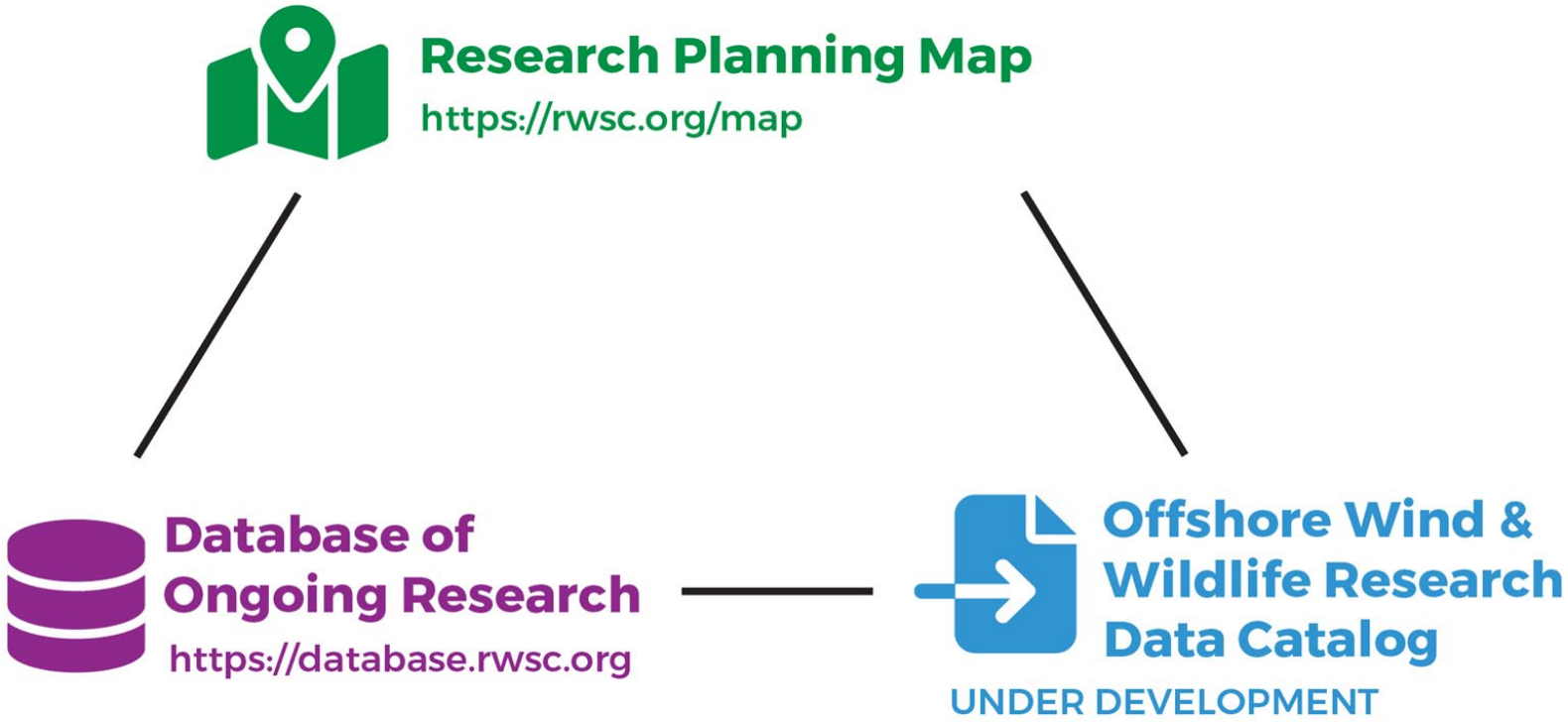
Offshore Wind & Fisheries Data Landscape



ROSA
Responsible Offshore
Science Alliance

Who is funding what, and what is that funding producing?

Offshore Wind & Wildlife Data Landscape

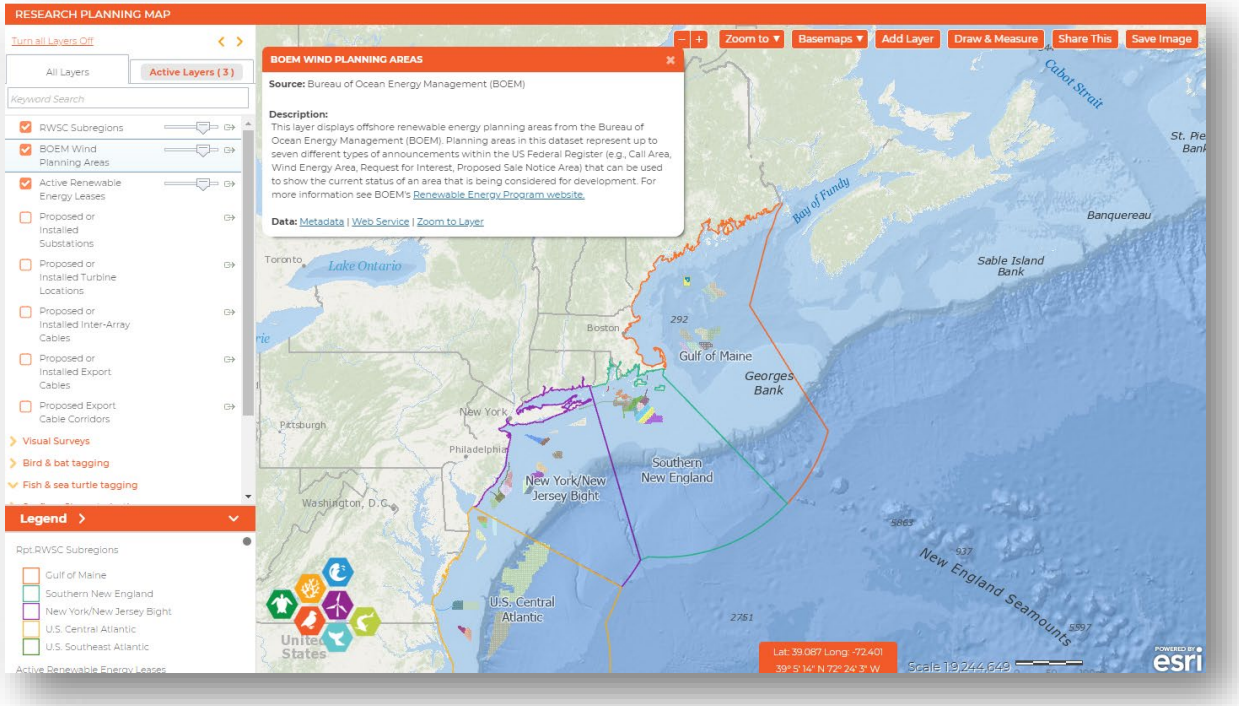


Who is funding what, and what is that funding producing?

RWSC
Regional Wildlife Science Collaborative for Offshore Wind

Research Planning Map

https://rwsc.org/map



- Shows the locations of where data are being collected/research conducted
- Includes POC for each effort and where available, includes links to:
  - Entry for project in RWSC Database
  - Where data are stored
- Funded by BOEM
  - Represents one year of data aggregations and app development (leverages Northeast Ocean Data Portal)
  - Another year remaining to refine data layers, build additional app functions, and determine long-term funding plan

RWSC

Regional Wildlife Science Collaborative for Offshore Wind

Research Planning Map Process

Data needs are identified by RWSC Subcommittee & ROSA Advisory Council members

RWSC or ROSA works to identify data source, and/or develops a template to collect data

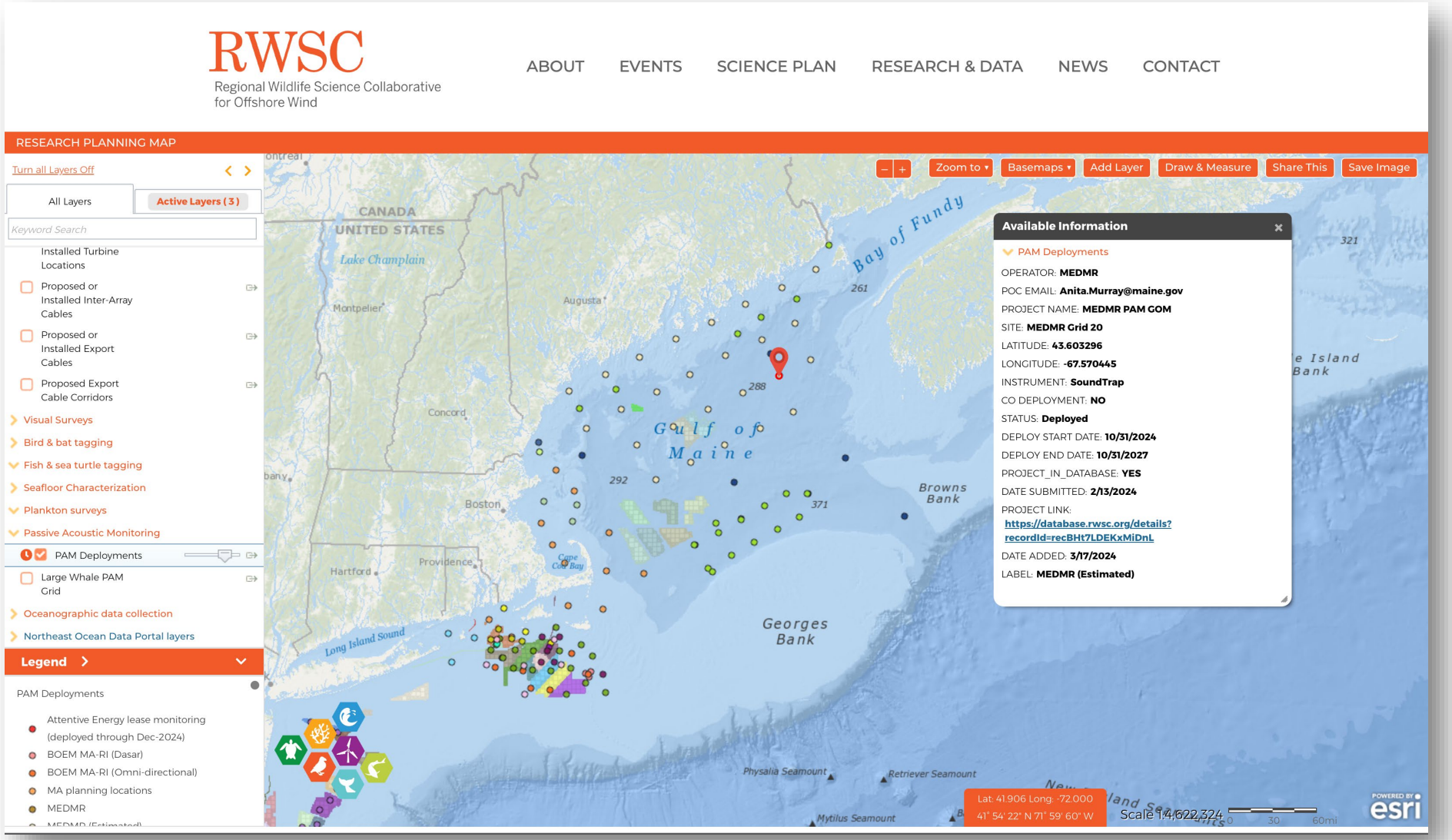
RWSC GIS Staff, together with Duke MGEL, curates data for the RWSC Map

Metadata and GIS data are organized and uploaded to the Research Planning Map

RWSC
Regional Wildlife Science Collaborative for Offshore Wind

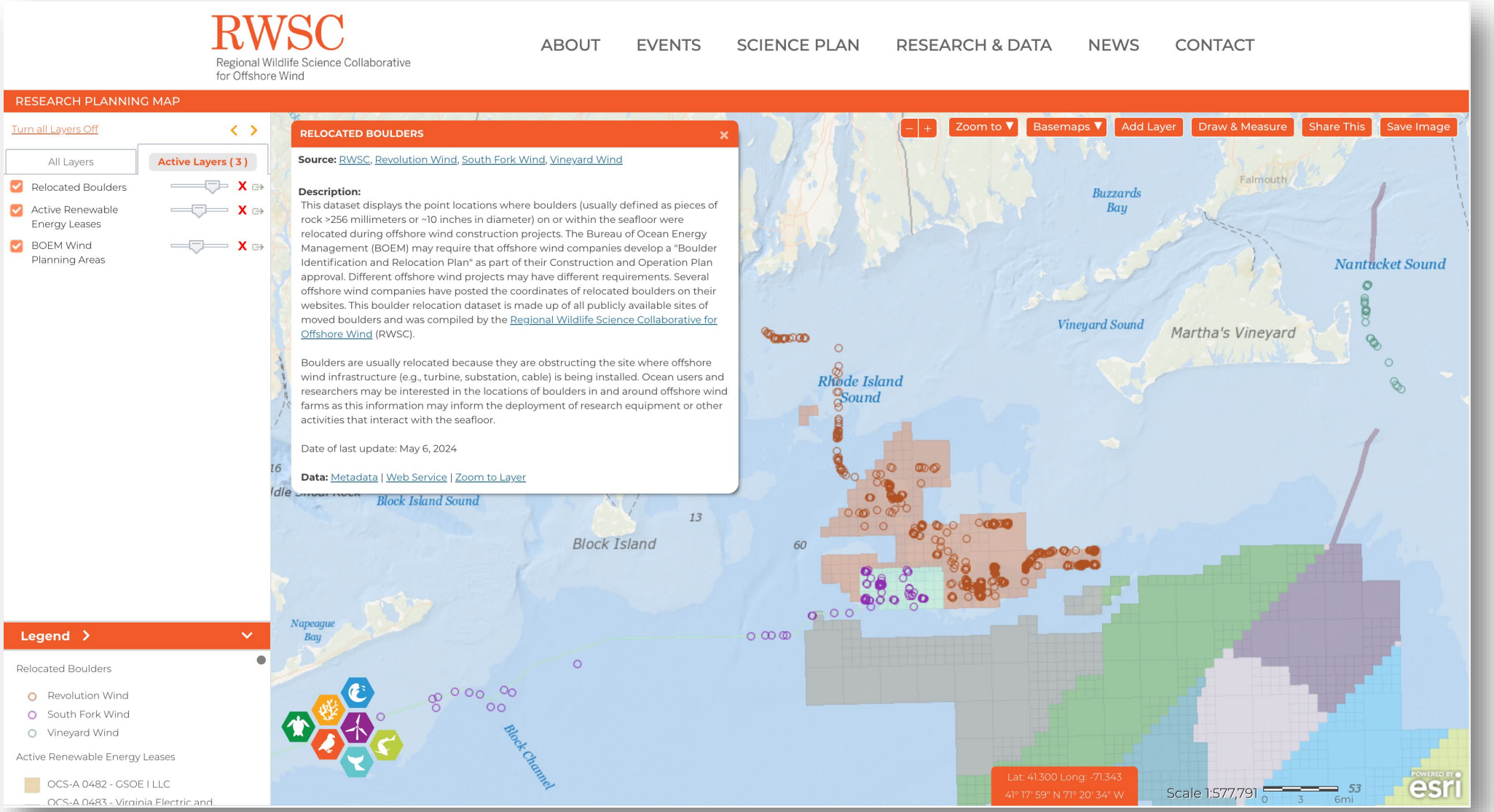
Research Planning Map

https://rwsc.org/map



Research Planning Map

https://rwsc.org/map



Map Demo

How to receive updates

All RWSC Subcommittee meetings open to the public:
https://rwsc.org/events

Contact information

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nnapoli@northeastoceancouncil.org

RWSC
Regional Wildlife Science Collaborative for Offshore Wind

All ROSA Advisory Council meetings open to the public: https://www.rosascience.org/our-work/advisory-council-priorities-and-meetings/

Contact information

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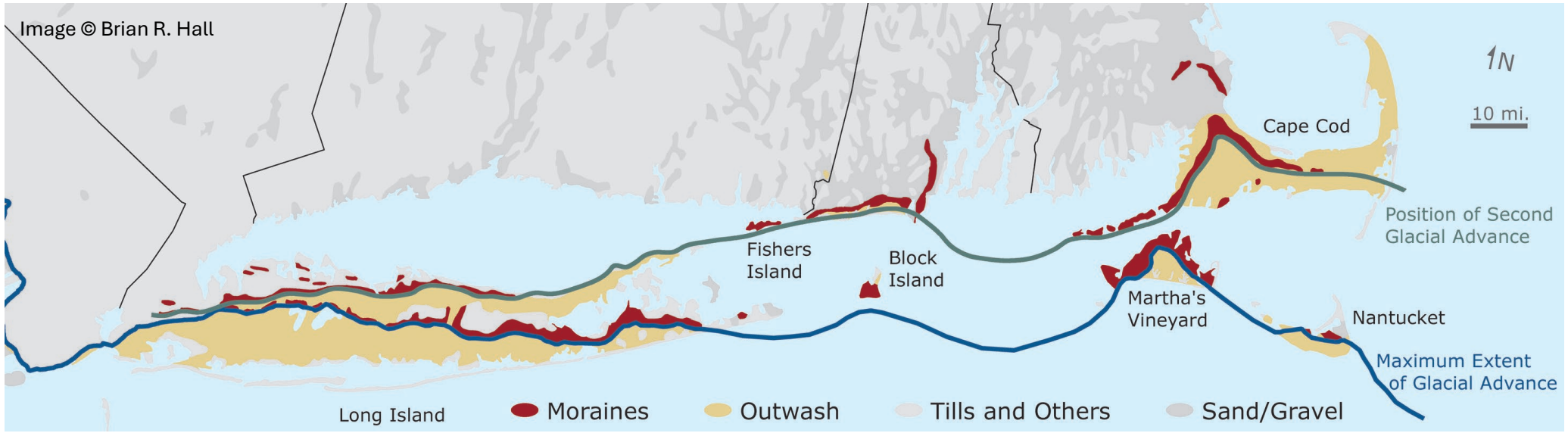
ROSA
Responsible Offshore Science Alliance

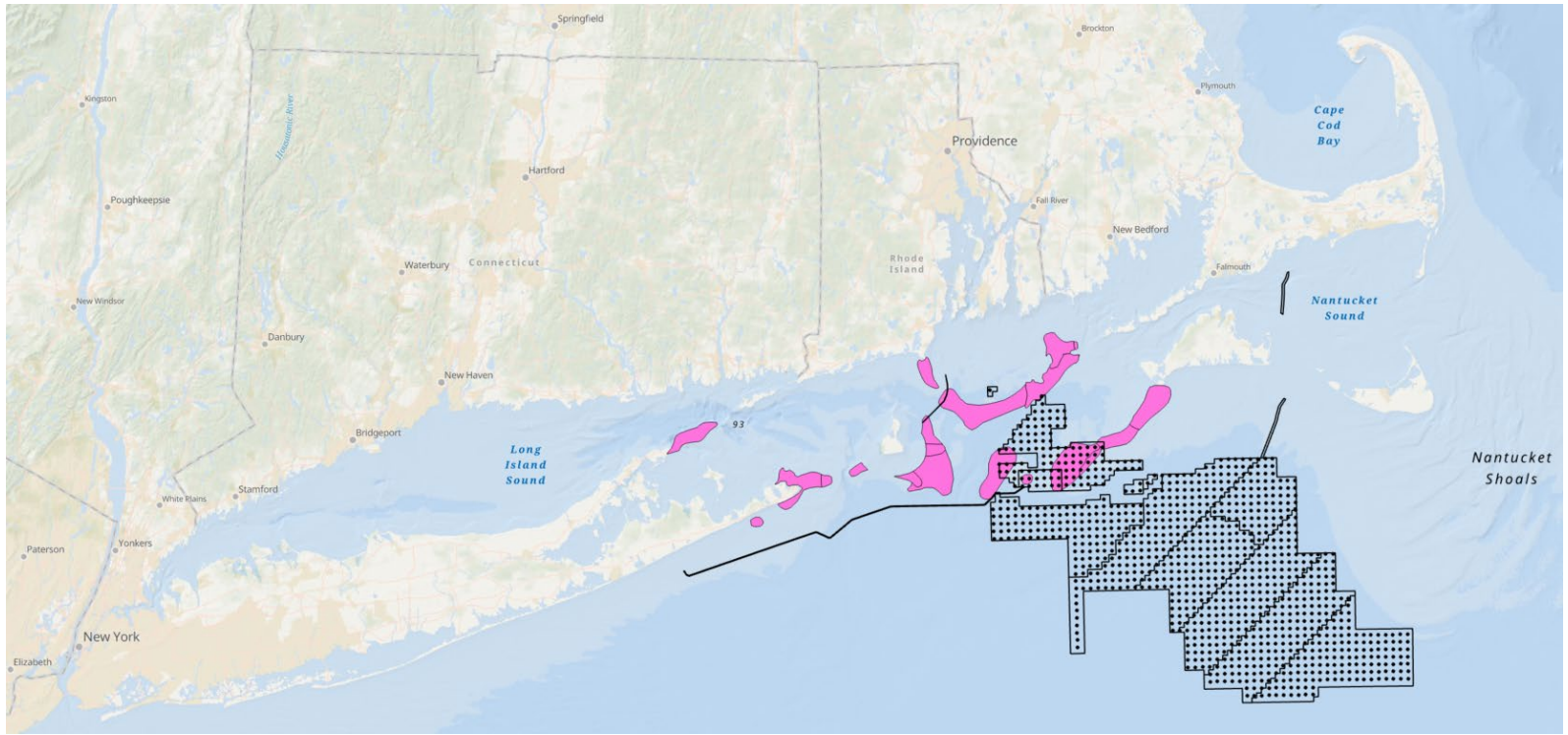
Boulder Relocation: Developing Management

Hollie Emery

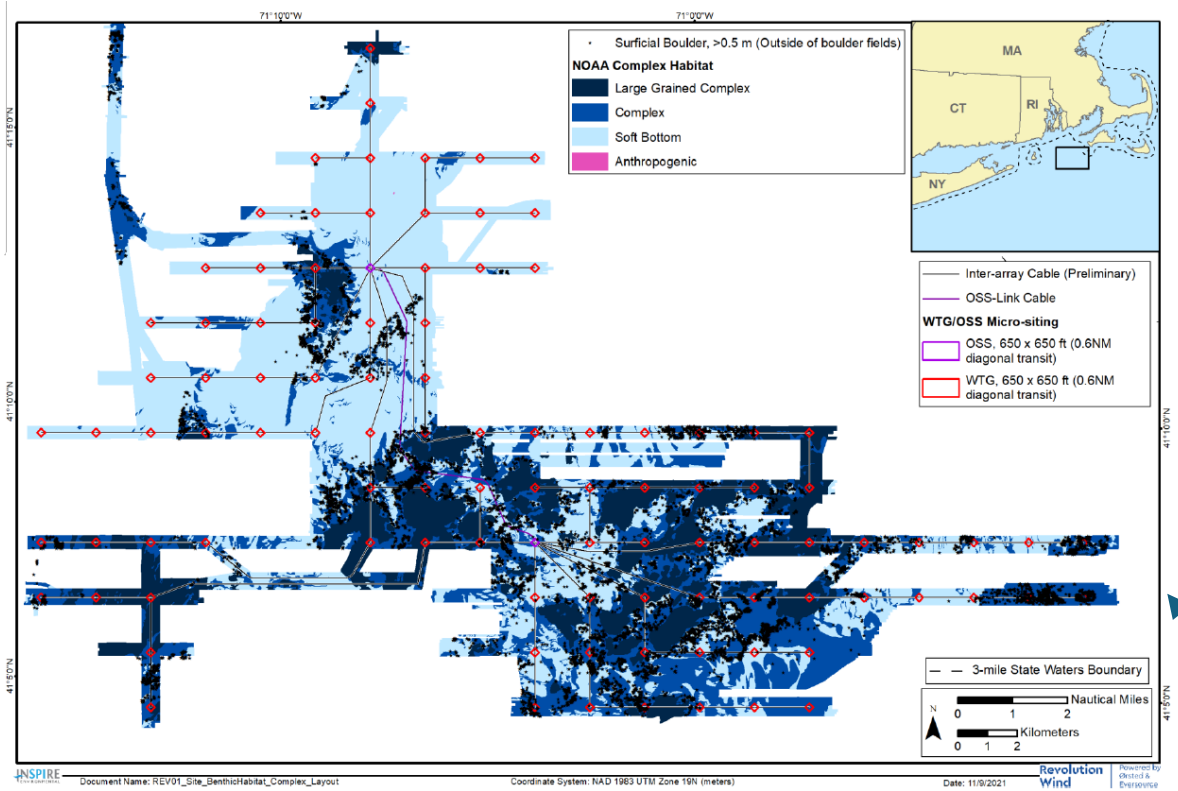
Massachusetts Office of Coastal Zone Management

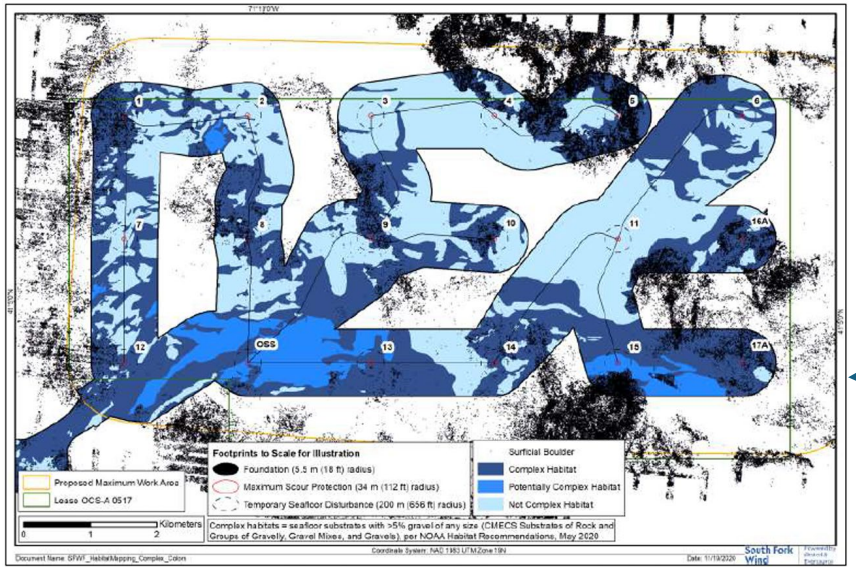


Geological Context

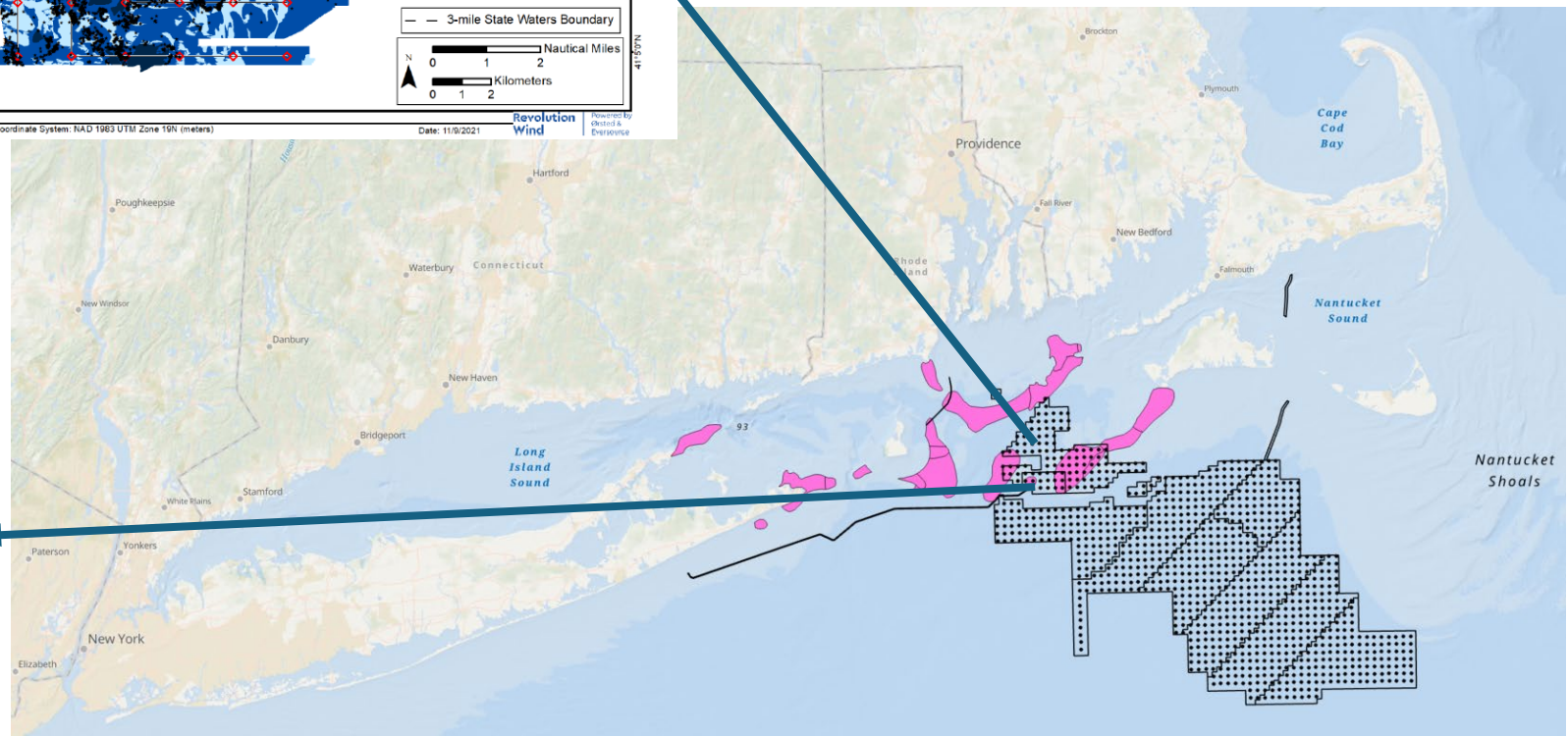


Revolution Wind DEIS
Figure 3.6-2





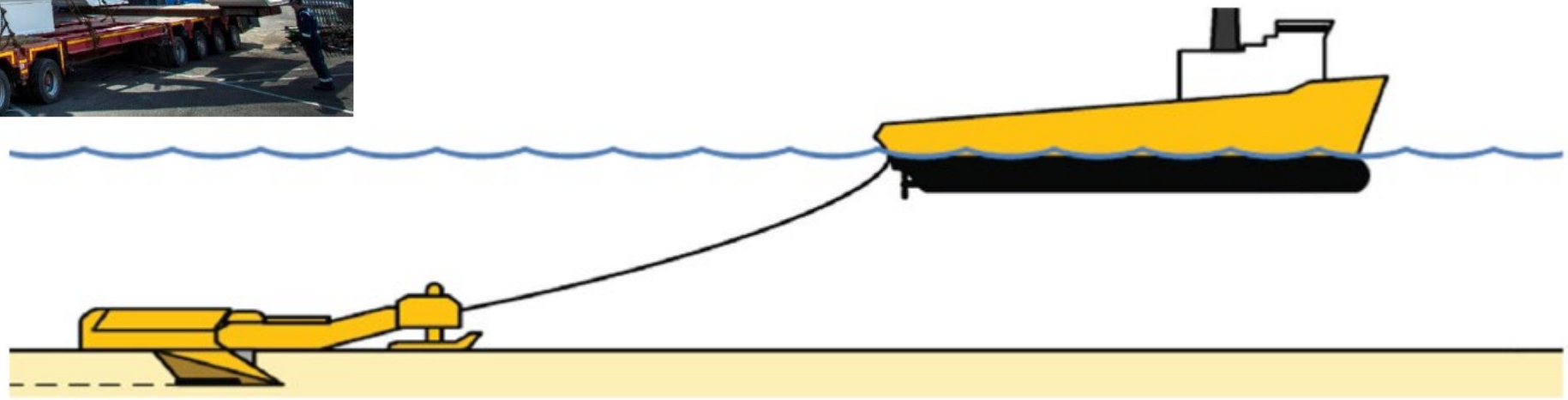
South Fork Wind DEIS Figure 3.4.2-1



Boulder relocation

Grab lift

Boulder plow

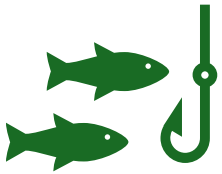


Figures from SouthCoast Wind COP and Sunrise Wind COP

Concerns raised by MA Fisheries Working Group

Safety

Creating new hangs



Fishing industry impacts

Gear damage

Loss of access

Habitat and stock impacts

Direct physical damage

Habitat conversion

Ecological changes

CZM developed a guidance document in response

Key Questions

For fishermen:

- What size boulder is a problem for what gear in what situations?
- How can impacts be minimized/mitigated?

For Offshore Wind developers:

- How/when/where are boulder moved?
- What options exist for beneficial reuse?

For fisheries managers and scientists:

- What studies have been done to understand impacts?

For regulators:

- What regulatory tools exist to address the above and are they working?

Potential boulder relocation impacts

Safety:

- New hangs pose a hazard to mobile gear

Other impacts to fisheries:

- Revenue loss due to reduction in fishable area
- Increased costs (e.g., gear damage or loss)
- Changes in stock levels due to displaced fishing
- Changes in stock levels due to habitat impacts

Potential boulder relocation impacts

Impacts to habitat and species (not limited to fisheries):

- Direct harm (e.g., crushing)
- Habitat conversion (sandy ←→ complex)
- Changes in predator/prey due to creation/loss of structure
- Invasive species spread (direct or indirect)
- Changes in habitat impacts from fisheries (e.g., if fishing is displaced)
- General impacts from seabed disturbance (not unique to boulders):
  - Sediment resuspension
  - Construction noise
  - Vessel strikes

Potential boulder relocation impacts

Location of impacts:

- Clearance area around foundations/scour protection (lease)
- Receiving areas distant from foundations (lease)
- Cleared/plowed cable corridors (easement)

Related impact producing factors:

- Scour protection
- Cable protection (e.g., concrete mattresses)
- Seabed disturbance (anchoring, jack-up, etc.)

Potential AMM

Avoid boulder relocation:

- Route cables away from boulder fields (sufficient surveys in the planning phase)
- Microsite cables around boulders

Minimize impacts when relocation is unavoidable:

- Minimize distance moved (habitat)
- Place boulders in groups or in existing boulder fields (safety and access)
- Individual relocation with grab vs plowing

Mitigate impacts when relocation is unavoidable:

- Beneficial reuse (scour protection, artificial reefs, etc.)
- Communication of final locations
- Consider boulder impacts when negotiating financial compensation agreements
- Note: Restoration not typically an option

Monitoring

- Before, during and after
- The right sampling modalities (photo/video/grab/DNA)
- Able to detect the key questions (e.g., presence of commercially important species, invasive species, etc.)
- MA CZM has guidance on best practices for monitoring, research, and mitigation: https://www.mass.gov/info-details/czm-offshore-wind-publications

Regulatory framework

Safety | Habitat

- BOEM COP approval Terms and Conditions
- NMFS Essential Fish Habitat consultation
- USACE
- State (e.g., MassDEP)

COP Terms & Conditions for Boulders and Berms

Avoid the relocation

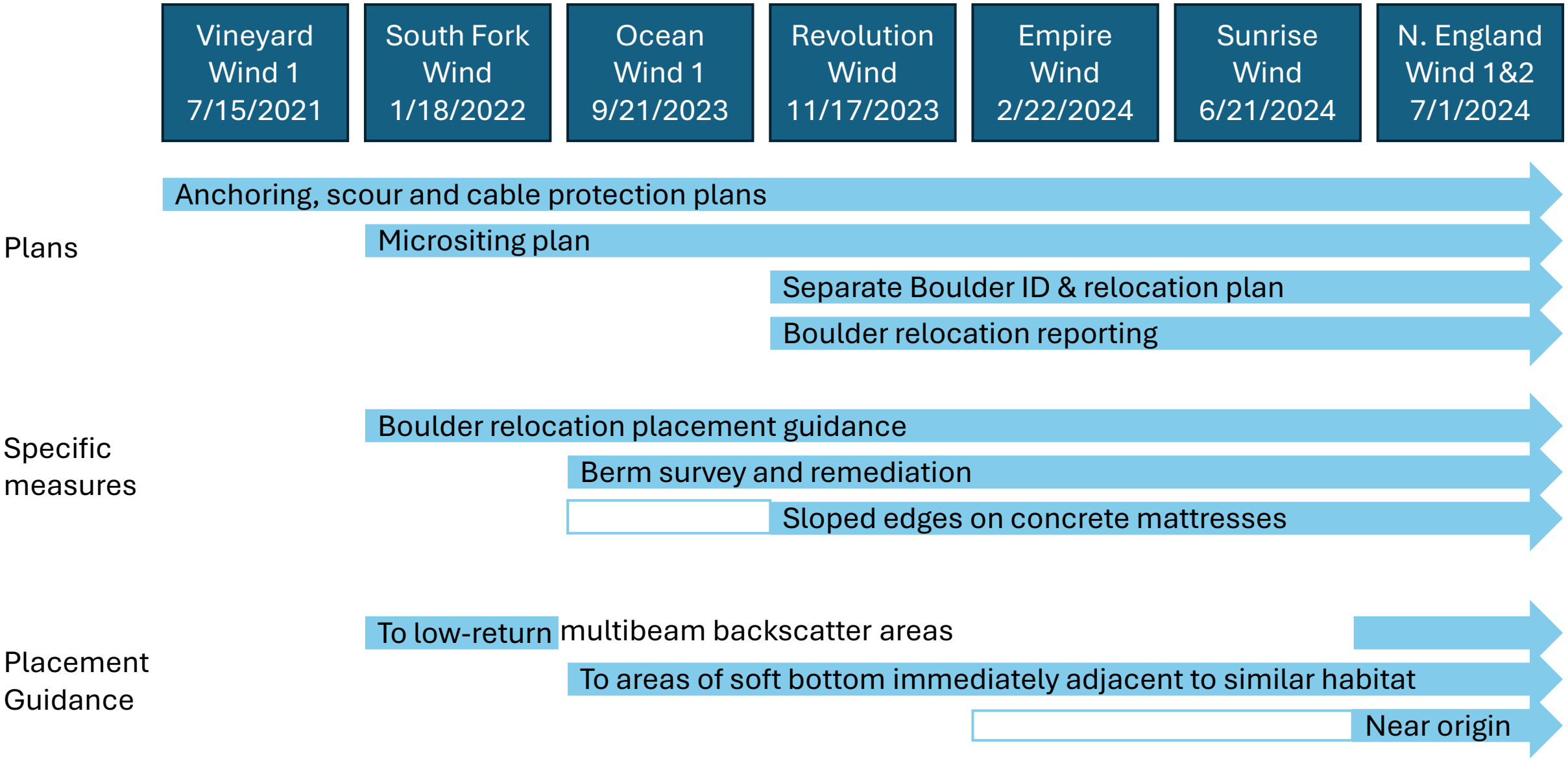
- Anchors, jack-ups, etc (must map boulders and try to avoid them)
- Cables, monopiles, etc (must try to microsite around boulders)

Minimize the impact if there is relocation

- Boulders required to stay inside lease/cable corridor
- Distance limits or “as close as practicable”
- Guidance on bottom type receiving the boulder
  - “in areas of soft bottom immediately adjacent to similar habitat”

Mitigate the impact that remains

- Berms remediated if they do not resolve
- Communicate new locations to agencies


Vineyard Wind 1 7/15/2021
South Fork Wind 1/18/2022
Ocean Wind 1 9/21/2023
Revolution Wind 11/17/2023
Empire Wind 2/22/2024
Sunrise Wind 6/21/2024
N. England Wind 1&2 7/1/2024
Plans
Anchoring, scour and cable protection plans
Micrositing plan
Separate Boulder ID & relocation plan
Boulder relocation reporting
Specific measures
Boulder relocation placement guidance
Berm survey and remediation
Sloped edges on concrete mattresses
Placement Guidance
To low-return multibeam backscatter areas
To areas of soft bottom immediately adjacent to similar habitat
Near origin

Boulder Reporting Requirements

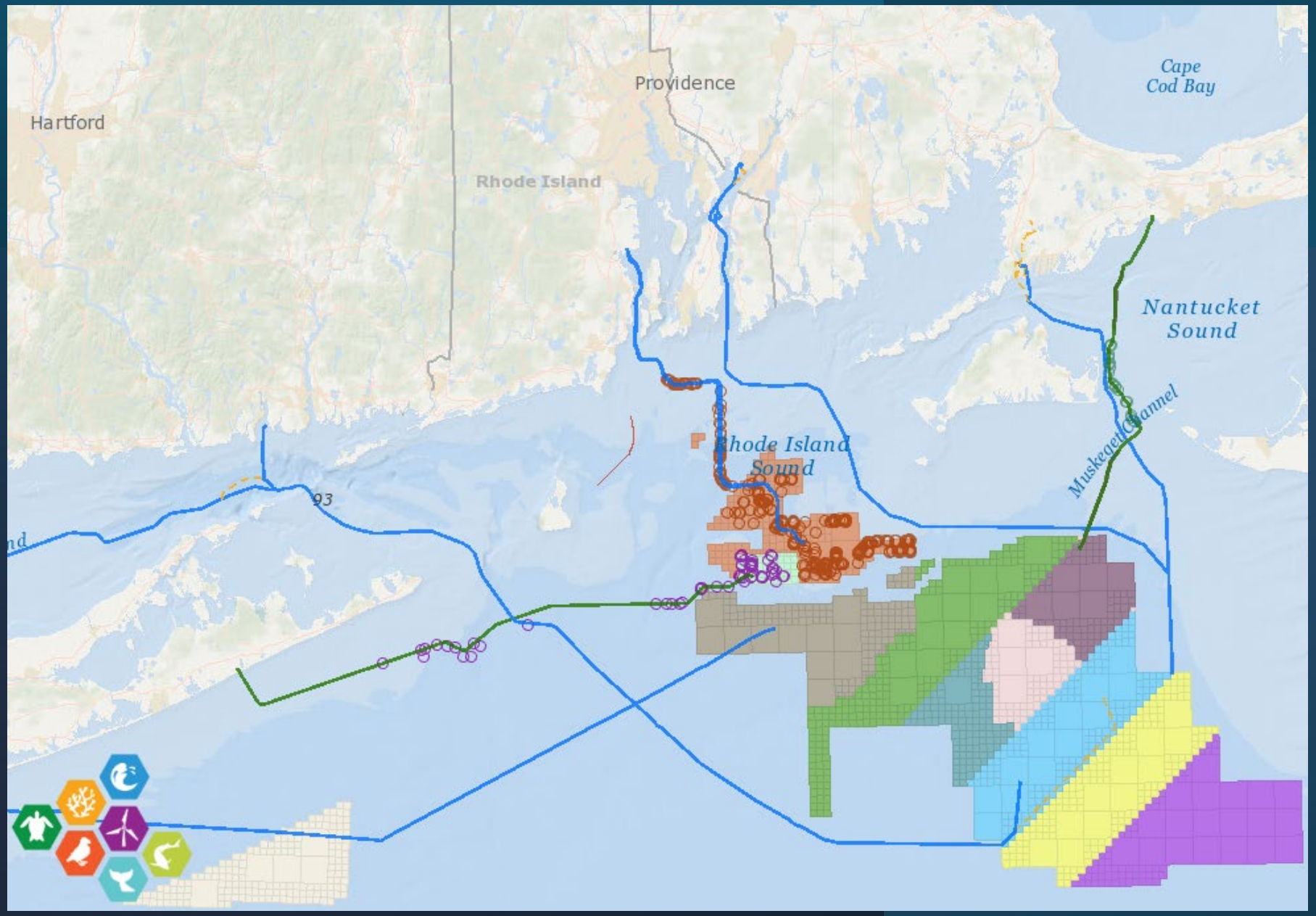
Boulder relocation report must be made to BOEM and BSEE at conclusion of boulder relocation: includes coordinates and dimensions of boulders as a shapefile

Coordinates (not dimensions) of largest boulders (> 2m) are to be reported to other federal and state agencies (and usually to the public) within 30 days of moving them

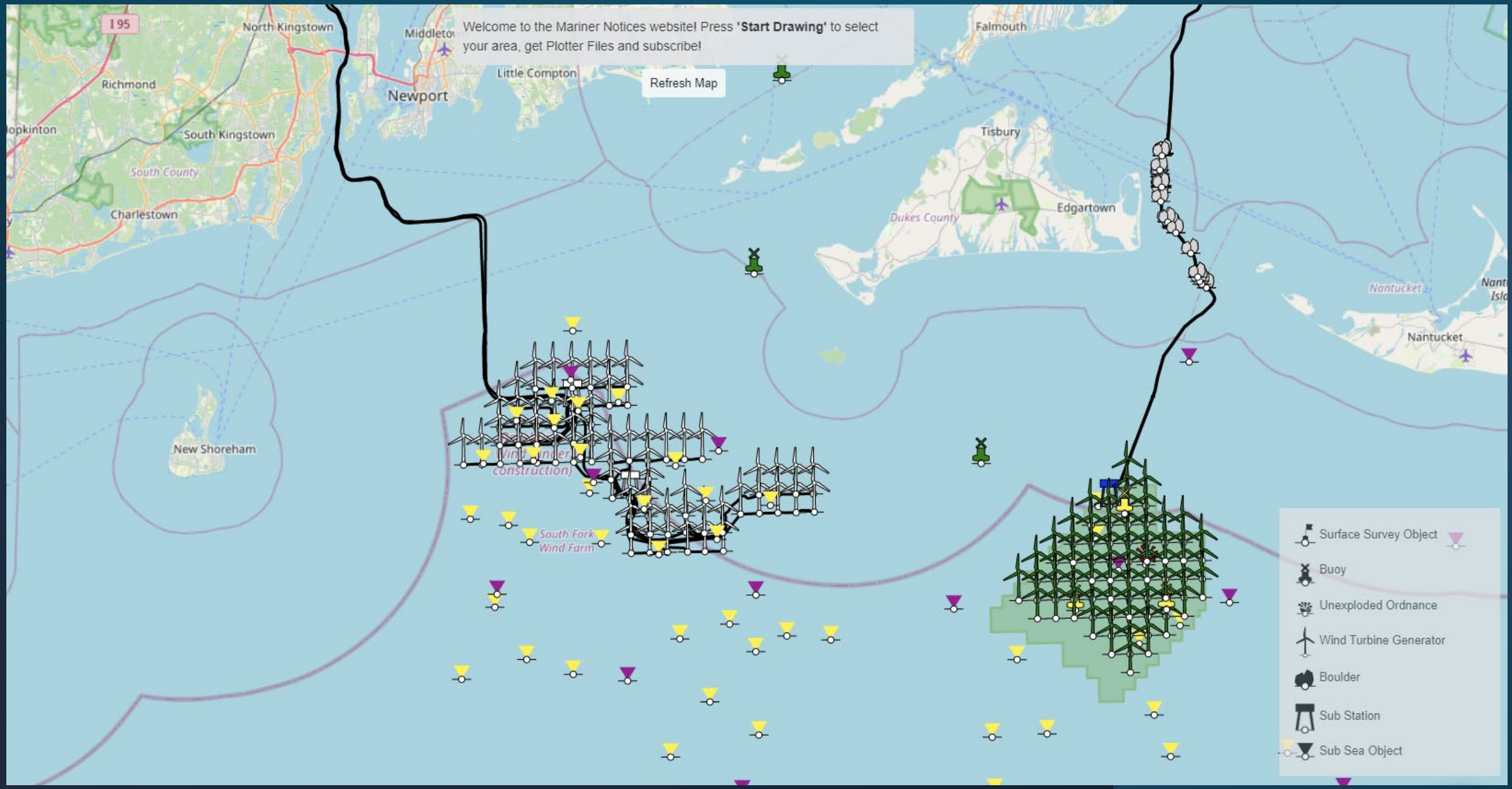
Boulder coordinates from Notices to Mariners

GIS layer available:

- RWSC Research Planning Map
- Northeast Ocean Data Portal



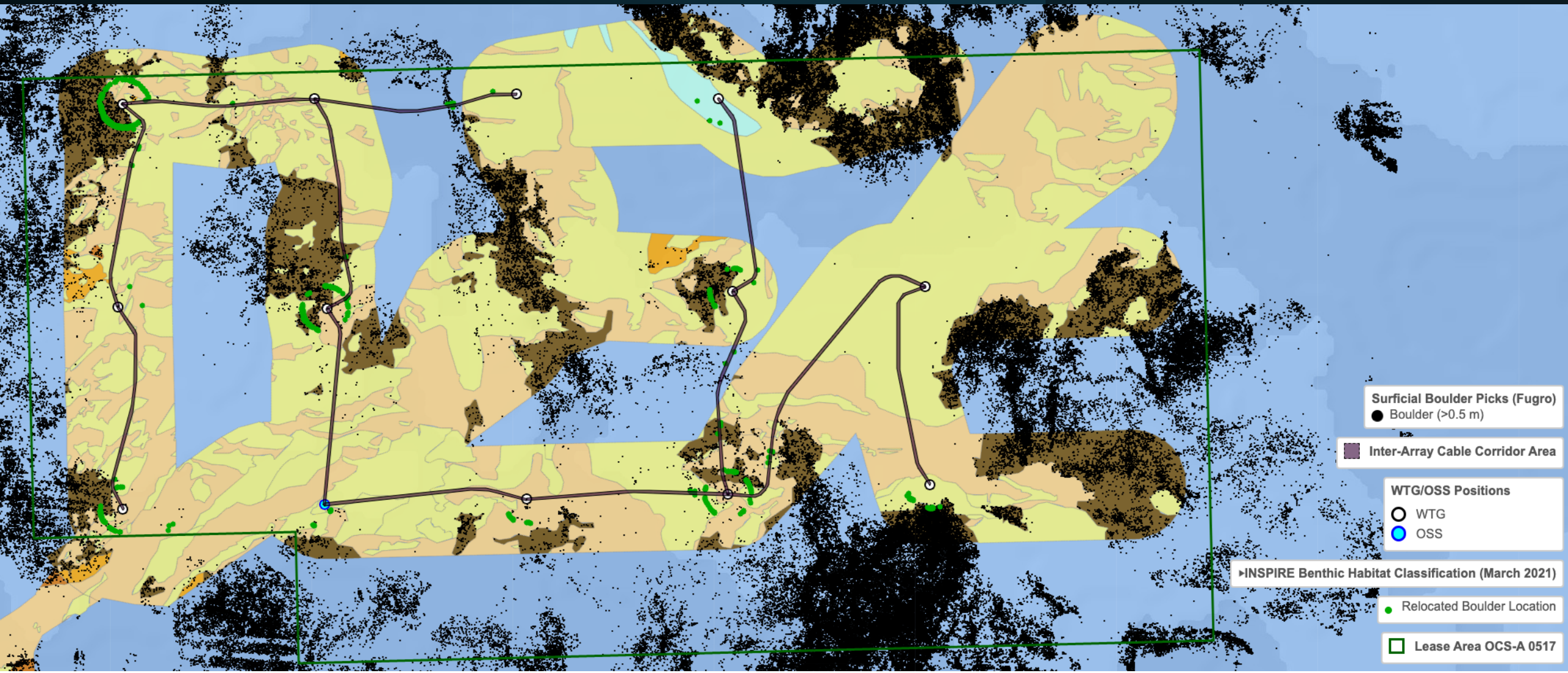
Quintham – provides plotter files



Boulder relocation

Image courtesy Annie Murphy

Black: original boulders
Green: relocated boulders



Boulder relocation

Image courtesy Annie Murphy

Black: original boulders
Green: relocated boulders

Future Directions

Actual impacts to habitat from boulder relocation are uncertain

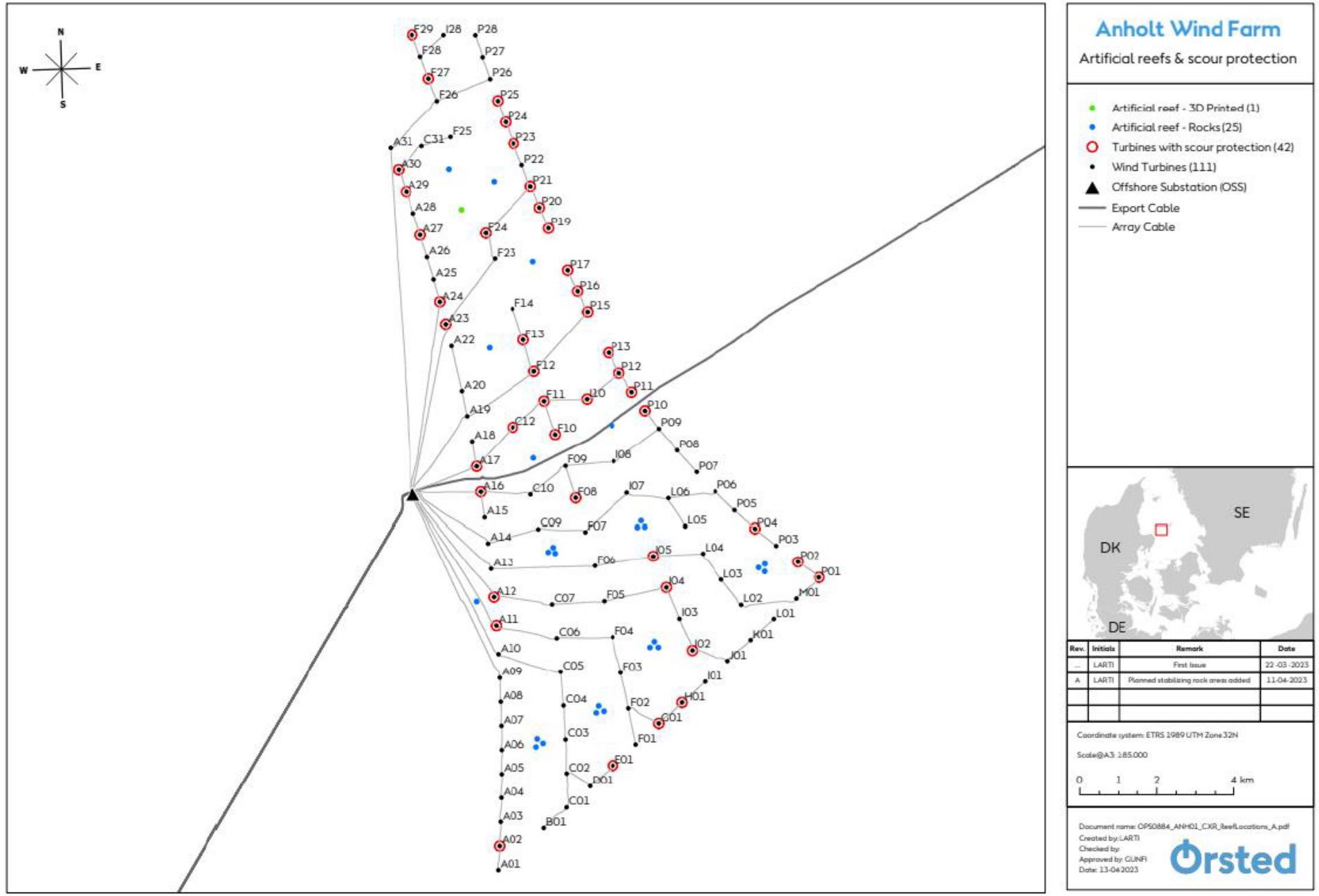
- Studies are underway

Actual impacts to fishing from offshore wind are uncertain

- Study is needed

Can communication of boulder locations be improved? How?

Options for beneficial reuse should be explored



Rev.	Initials	Remark	Date
...	LARTI	First issue	22-03-2023
A	LARTI	Planned stabilizing rock areas added	11-04-2023

Figure 2: Location of boulder reefs in Anholt Offshore Windfarm

Feedback?

https://www.mass.gov/info-details/czms-role-in-offshore-wind

hollie.e.emery@mass.gov

NOAA FISHERIES

GARFO
HESD
2024
MA FWG Meeting

Boulder Relocation

Gabriella DiPreta and Thomas Heimann

MA Fisheries Working Group
October 18, 2024

Boulder Relocation Concerns

- Habitat/ecosystem impacts
- Fisheries operational impacts
- Impacts/limited precision of Boulder Plow equipment
- Limited details provided during consultation

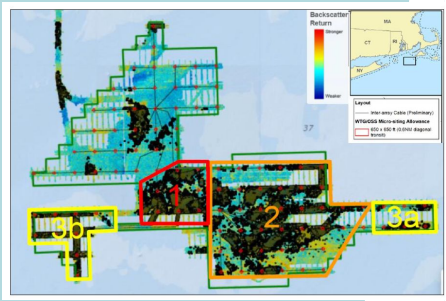
NOAA FISHERIES

NMFS Recommendations for Boulder Relocation

- Avoid complex habitat areas
- Avoid use of boulder plow
- Avoid/Minimize impacts to sensitive life stages through time of year restrictions
- Minimize impacts by relocating boulders:
  - immediately adjacent to existing complex habitats - resulting in marginal expansion of complex habitats;
  - outside of existing complex/sensitive habitats
  - in a manner that does not affect navigation/commercial fishing,
- Development of Boulder Relocation Plans
  - Lessees outline strategy for applying NMFS Recommendations
- Boulder Relocation Reports
  - Lessees outline how Plan was implemented

NOAA FISHERIES

Lessons Learned/Challenges



- Most projects require boulder relocation
- Limited details on methods/locations
- More information on feasibility constraints needed
- Limited seafloor sampling/groundtruthing create challenges for understanding impacts
- Boulder relocation plan development do not equal minimization of impacts
- Lessee's priority to relocate as close as possible to location may not be least impactful
- Post construction evaluation needed to understand impacts

NOAA FISHERIES

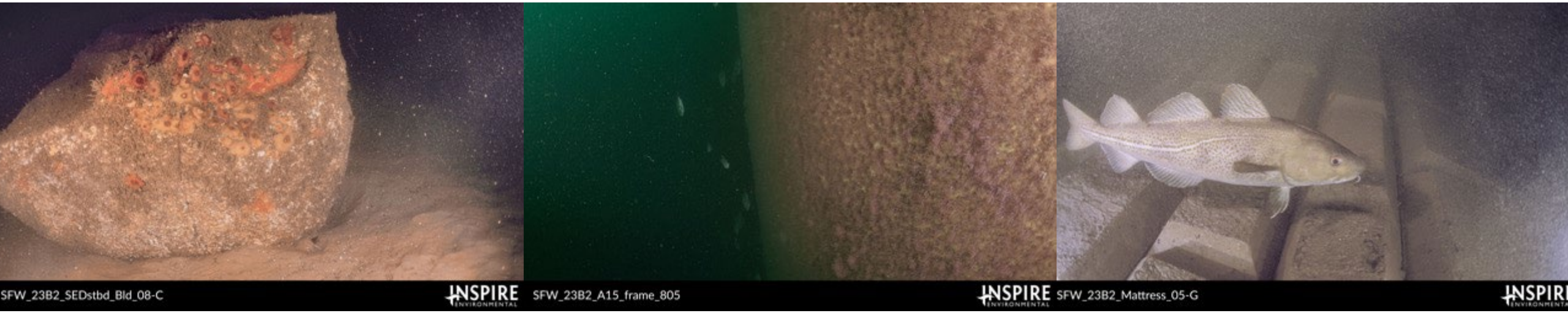
Thank you!

NOAA FISHERIES

South Fork Wind Boulder Relocation Benthic Monitoring

Annie Murphy

October 10 and 18, 2024



South Fork Wind | Powered by Ørsted & Eversource

annie@inspireenvironmental.com

INSPIRE ENVIRONMENTAL

Overview

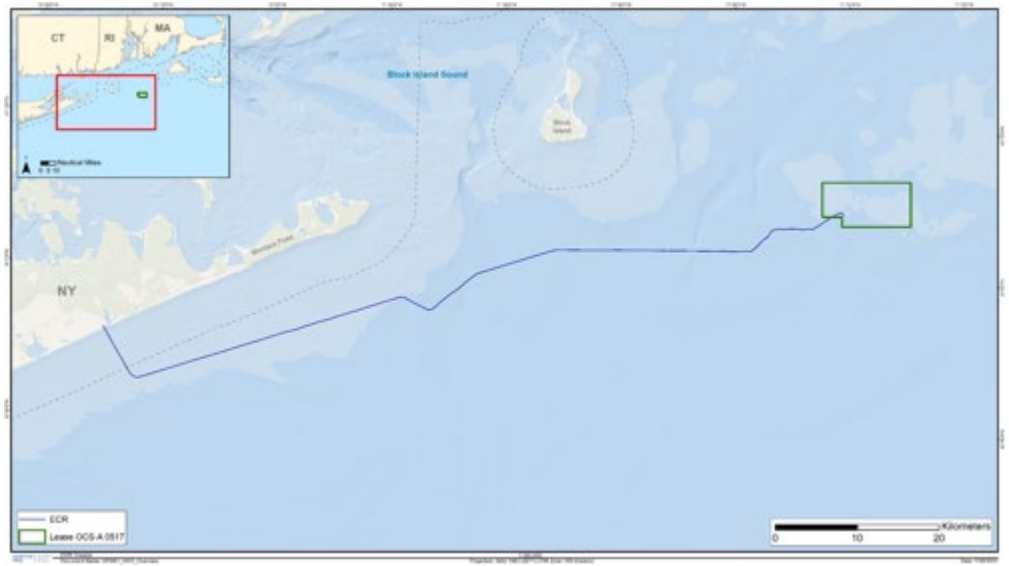
Monitoring plan
- Focused Benthic Studies
- Overview of Monitoring Schedules

Boulder Study
- Hypotheses
- Survey Design
- Methods

Results
- Image review
- Key results

Conclusions
- Implications
- Next steps

Visualization tools
- Popup
- Story Map



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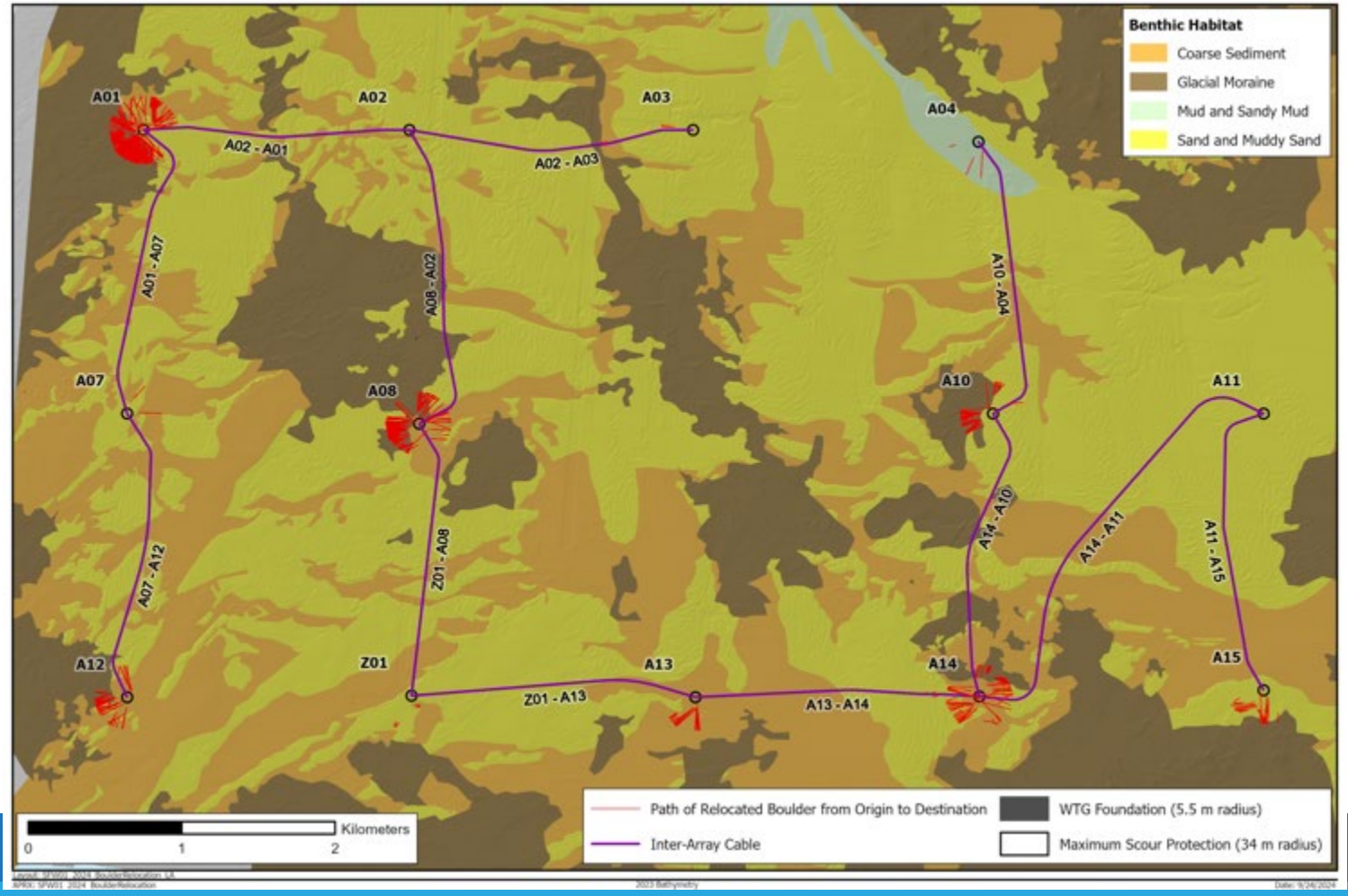
Monitoring Plan

	Native Boulder Habitat	Novel Surfaces	WTG Foundation-associated	Cable-associated
Hypothesis	Boulder relocation alters the physical habitat Physical characteristics determine community composition	Structure attracts taxa Community compositions vary in space and time	Structure-associated taxa affect sediment Effects on sediment and infauna depends on distance from	Structure disturbs the benthic community Benthic community returns to its initial condition
Approach	ROV-imagery	ROV-imagery	SPI/PV imagery	SPI/PV imagery
Design	Control-Impact	Time-series	Before-After-Gradient	Before-After-Gradient
Schedule	Y0 (2023), Y1, Y2, Y3+	Y0 (2023), Y1, Y2, Y3, Y5	Y0 (2023), Y1, Y3, Y5, 5+	Y0 (2023), Y1, Y3, Y5, 5+

Boulder Monitoring

Hypothesis

Relocation of existing natural hard bottom habitats (boulders) will alter physical habitat characteristics (rugosity, complexity, density) with potential for rapid colonization of relocated boulders

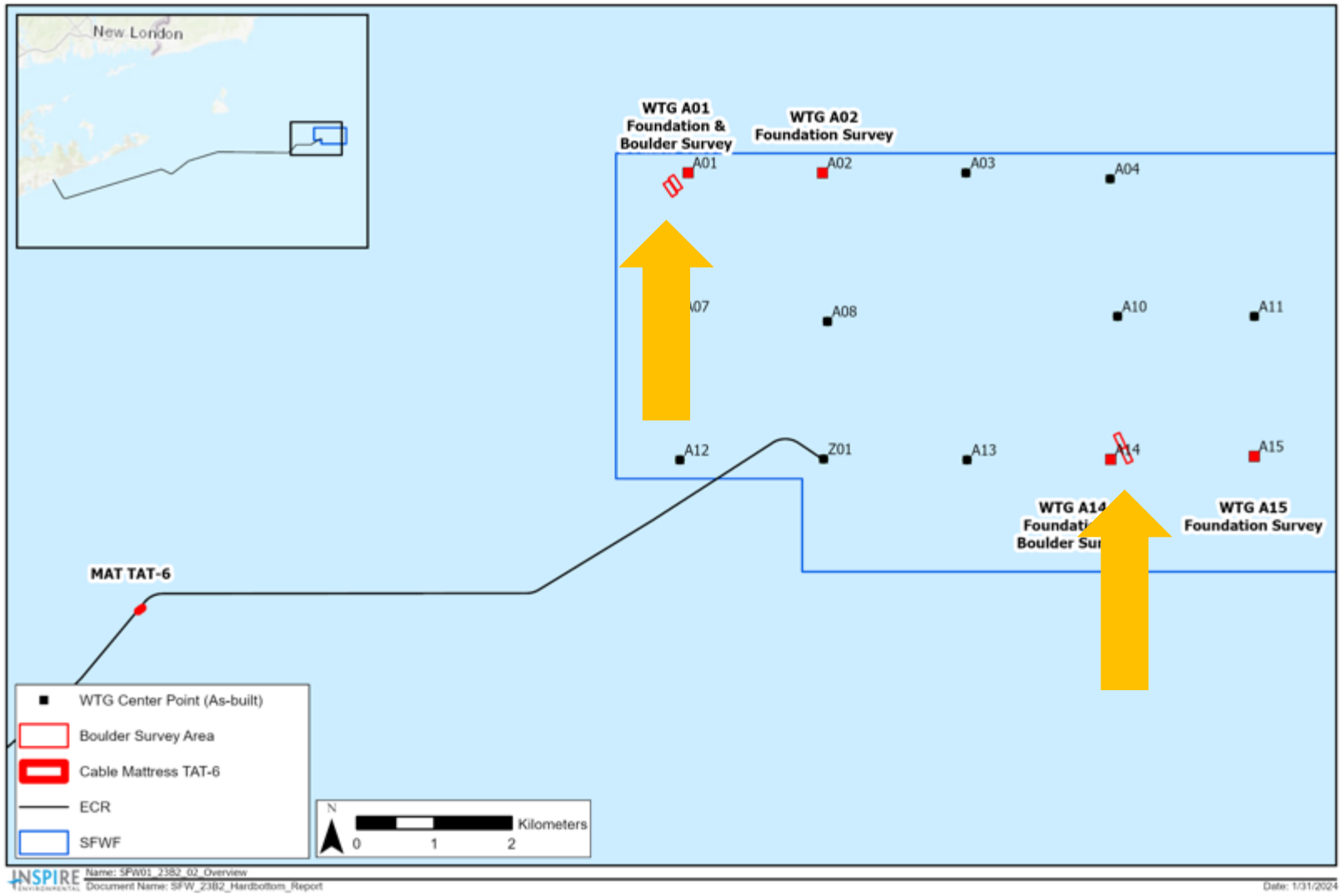


Objectives –

- Measure changes over time in the nature and extent of macrobiotic cover (% cover, relative abundances) of relocated boulders in comparison to undisturbed boulders
- Characterize larger-scale changes to the physical attributes of the benthic habitats

Survey Design

Do communities on relocated boulders differ from control boulders?

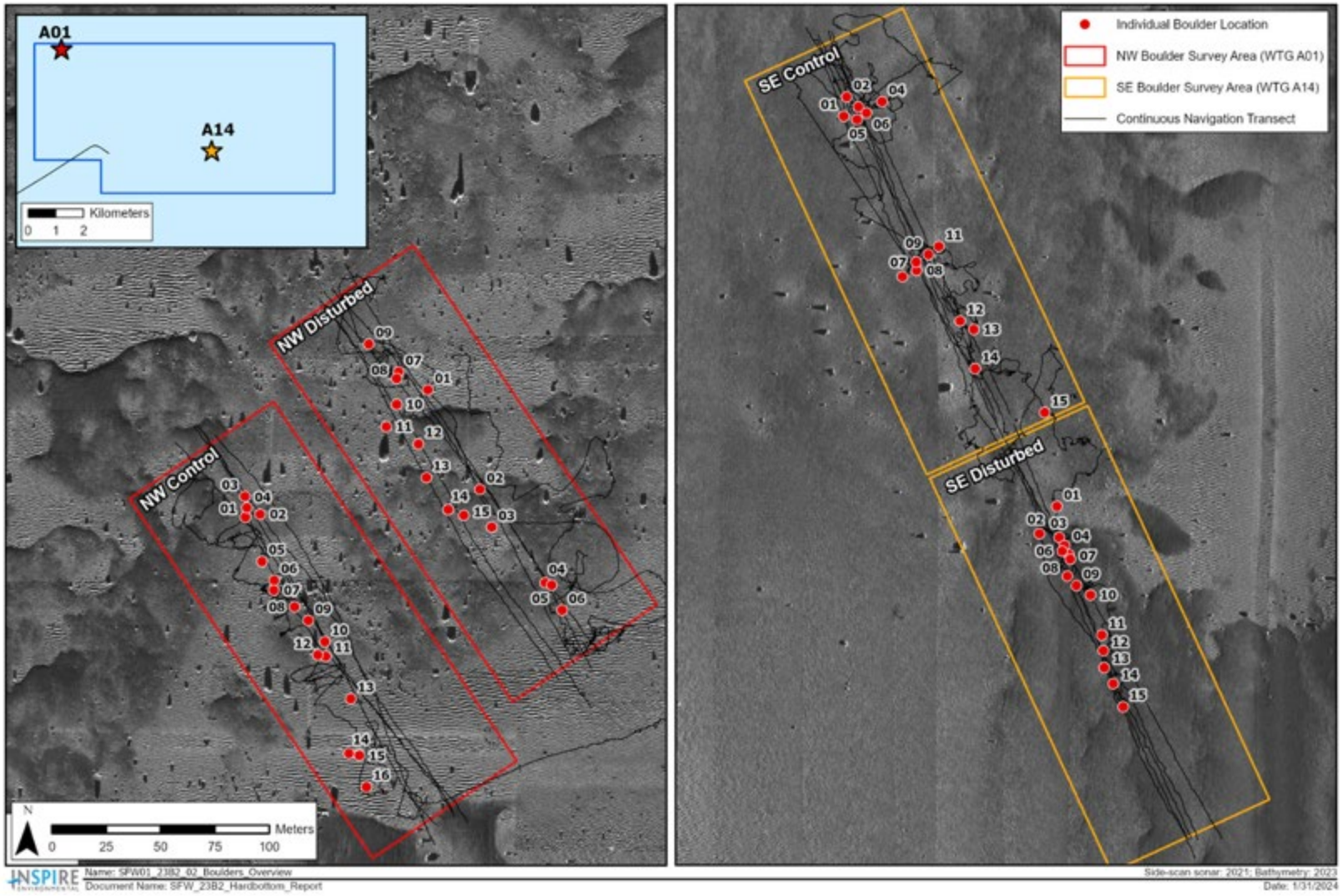


Two paired survey areas –

- Relocated boulders
- Control boulders

Survey Design

Do communities on relocated boulders differ from control boulders?



Two paired survey areas –

- Relocated boulders
- Control boulders

Boulders were relocated between October 2022-June 2023

This first survey was conducted October 2023

Sampling Methods

Marine Imaging Technologies
Evan Kovacs & David Ullman

Investigator 90
Observation Class ROV

Motion camera system
ZCam E2-S6
Continuous, RAW, 6K

Machine vision stereo camera
Lucid, 3D
3D, 4K, redundancy

Take Home Messages

2023 (Y0) Native Boulder Habitat

1. Relocated boulder communities resemble control boulders

- Invertebrate turf dominates all surfaces –
  - Hydrozoa, bryozoa, amphipods, and barnacles
- Taxa presence and abundance similar on controls and relocated boulders, in most cases
  - Black sea bass, anemones, sea stars

2. Encrusting pink/orange taxa cover a small percentage of boulder surfaces

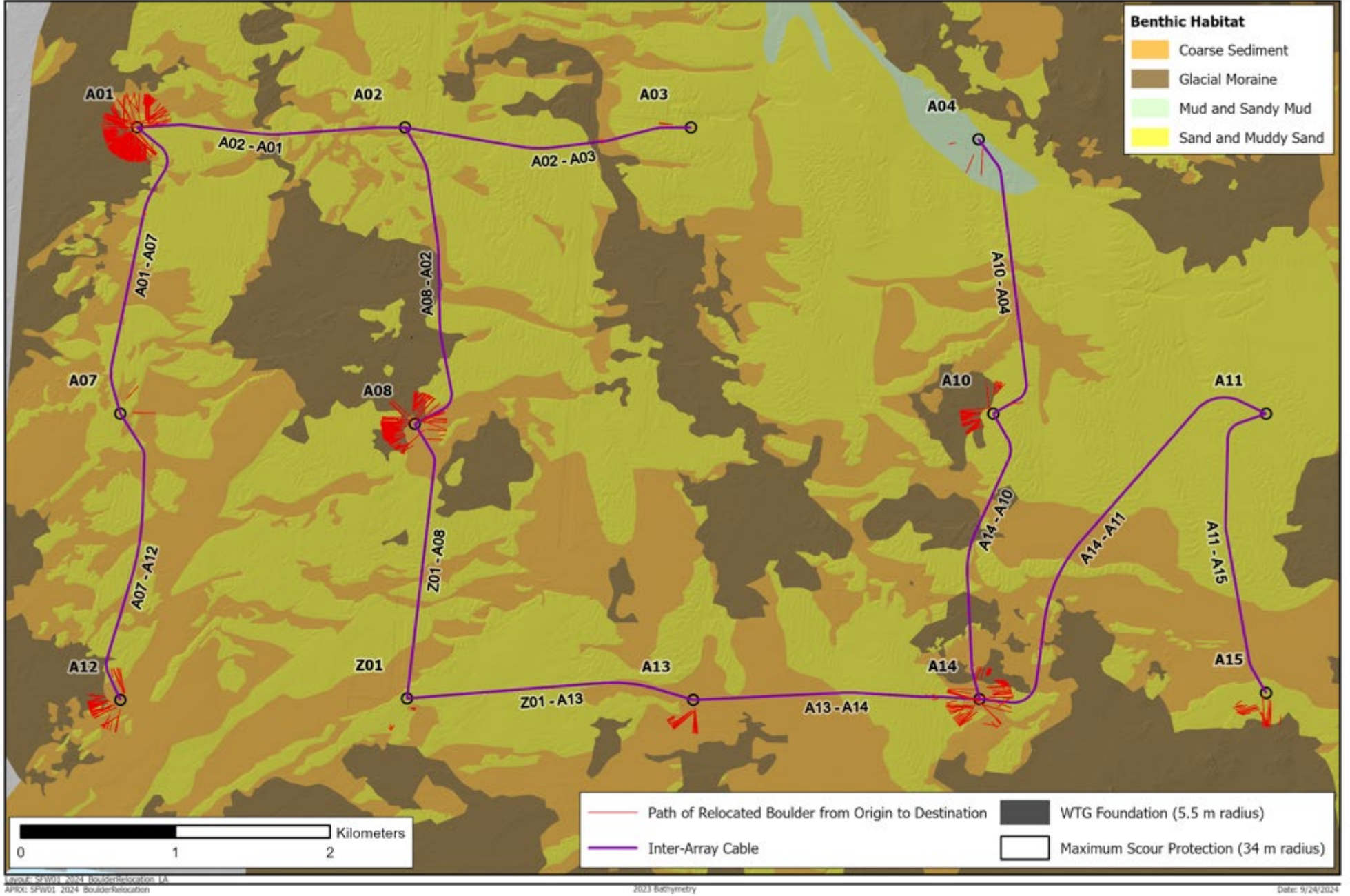
- Possibly non-native tunicate
- Higher cover on relocated boulders

3. Physical shift in boulder distributions

- Reduced complexity in some areas
- Increased complexity and boulder density in discrete areas

Landscape Level

- Boulder relocation focused near WTG foundations
- Boulders were not moved far (relatively)
- Boulders placed generally in similar habitat as their original location



Landscape Level

- Divots visible at original locations
- Boulders placed in centric-shaped arcs around the WTG foundation locations
- Potentially predictable, intuitive positioning using foundation as a landmark
- Distance between boulder arc and foundation is ~200-300 m

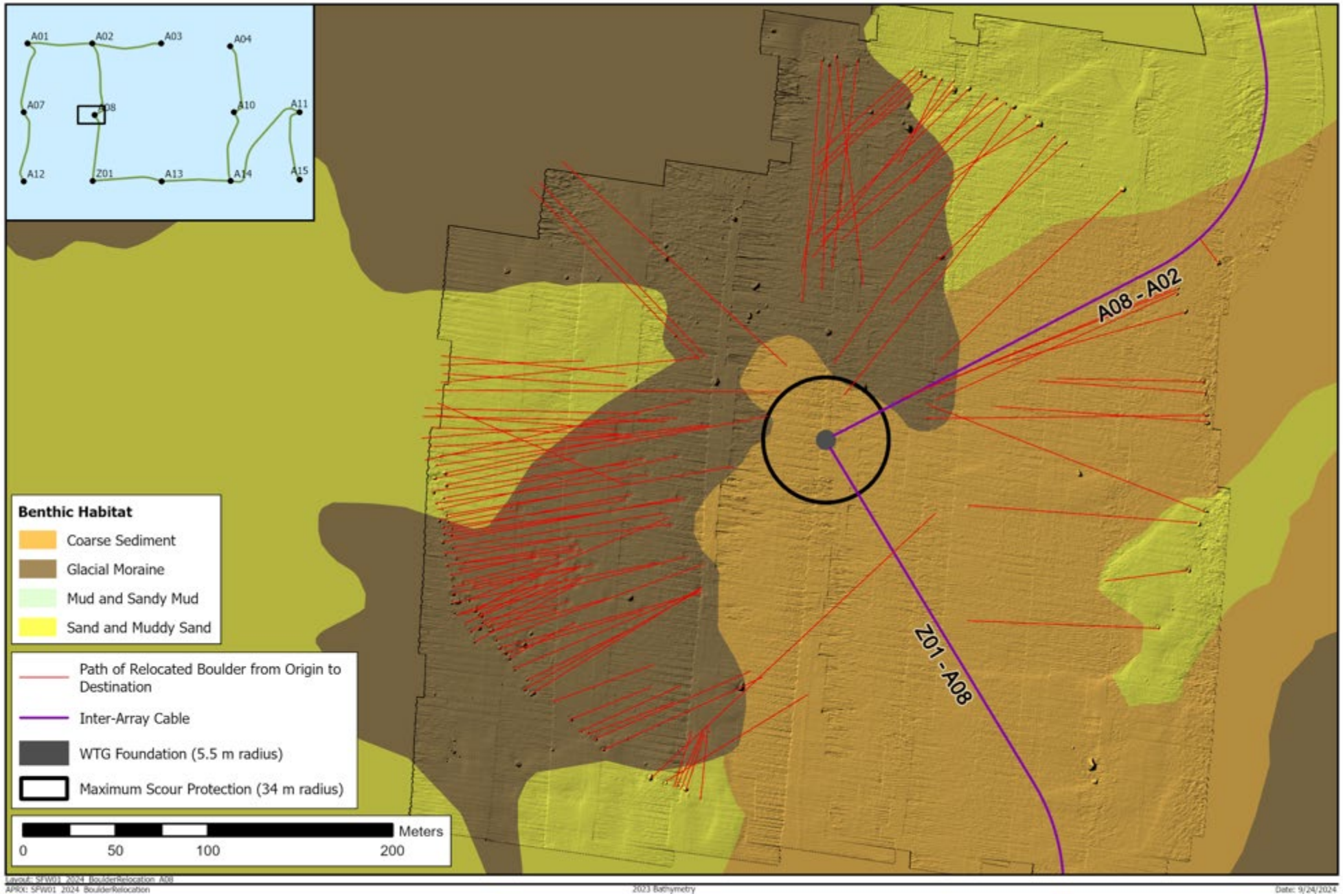
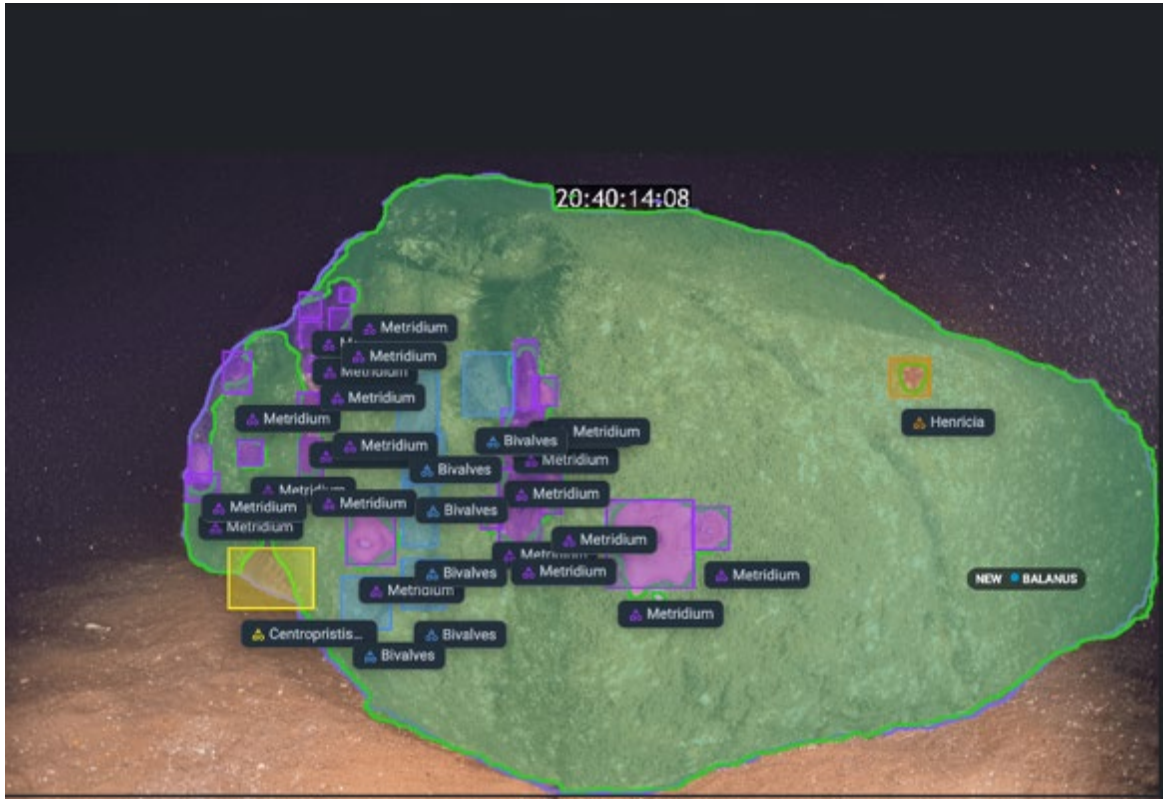
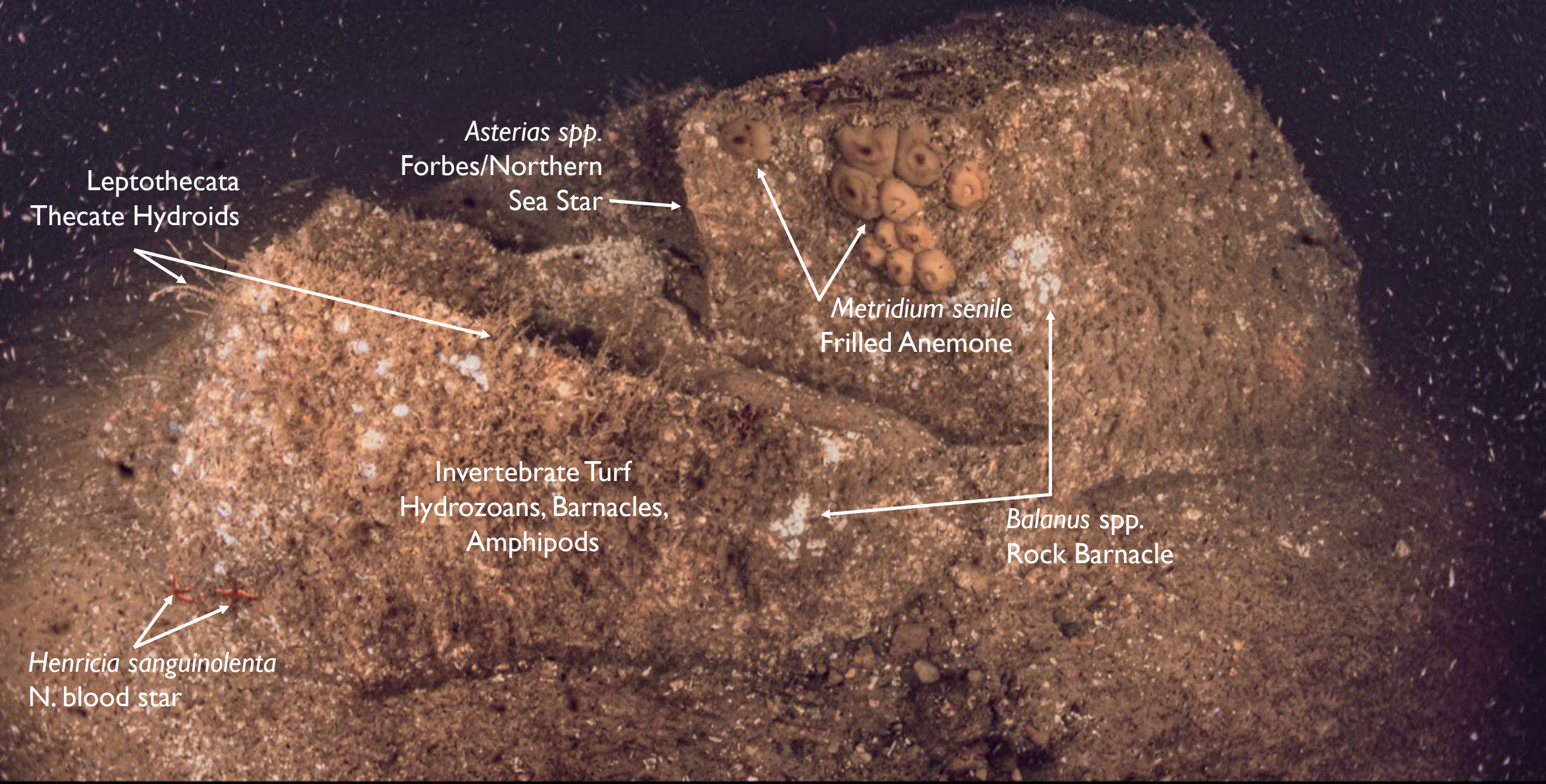


Image Analysis

Macrofaunal Community





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Undisturbed Boulder

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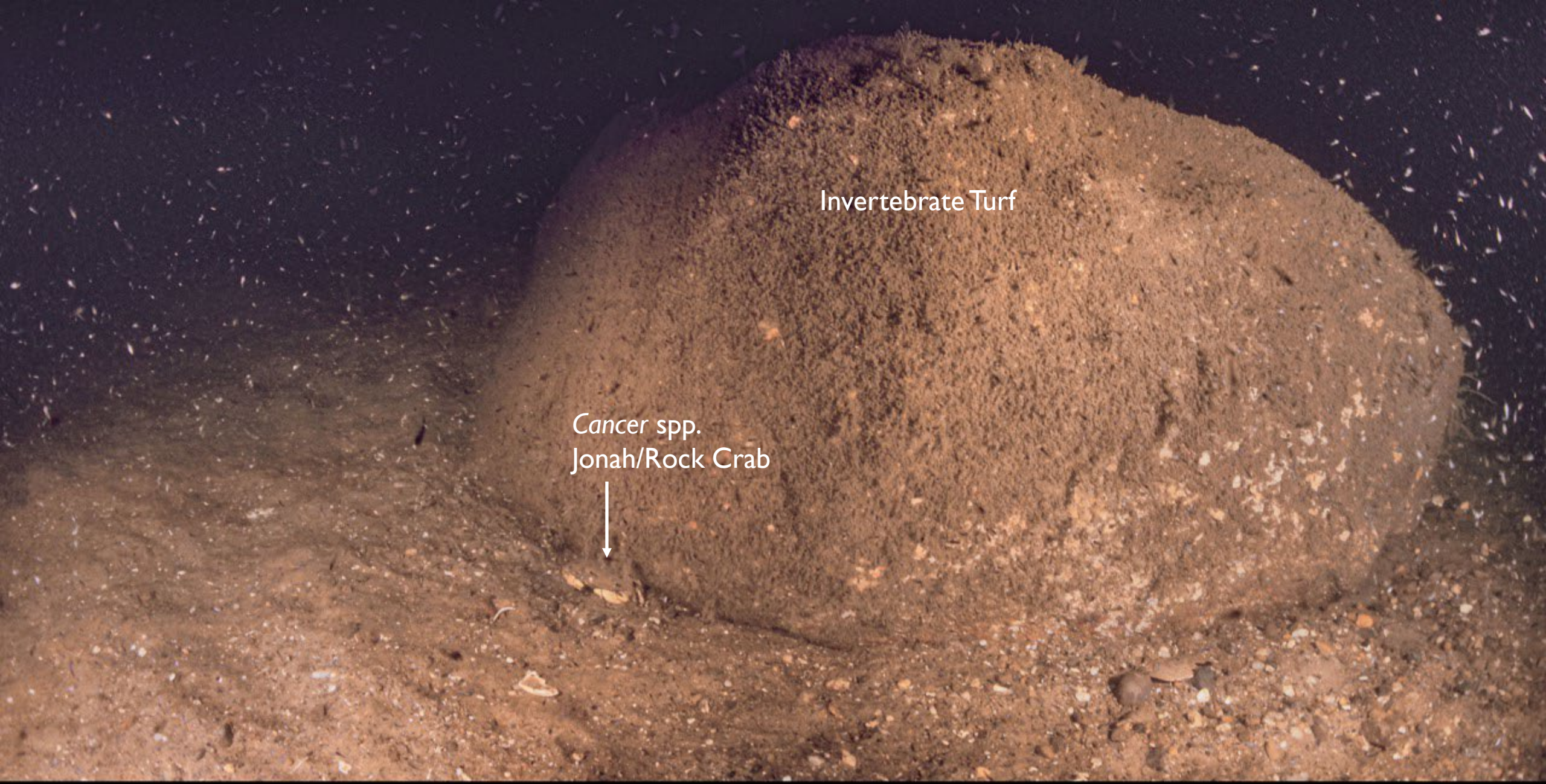

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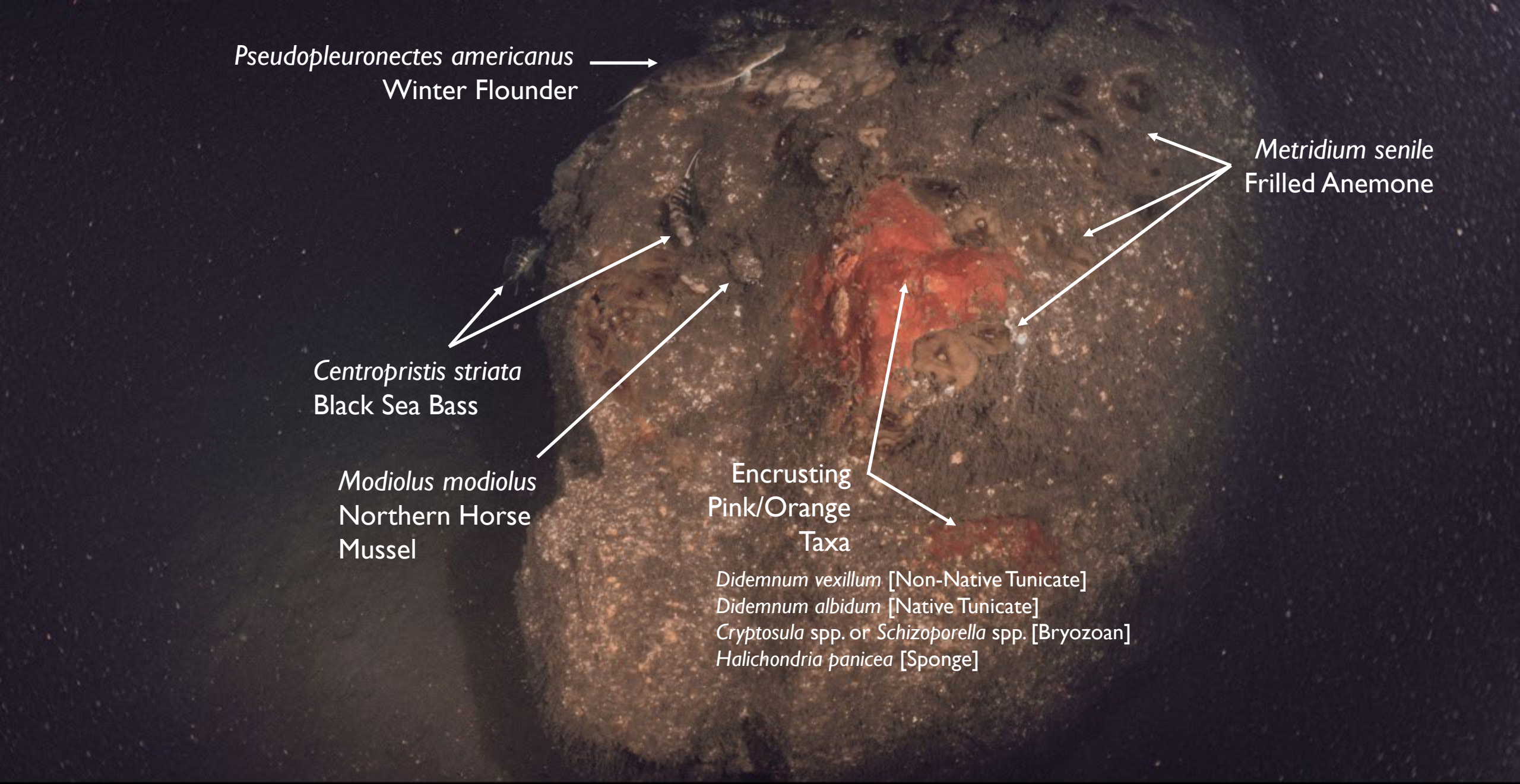
Undisturbed Boulder

INSPIRE ENVIRONMENTAL

SFW_23B2_NWCtrl_Bld_10-C

Undisturbed Boulder

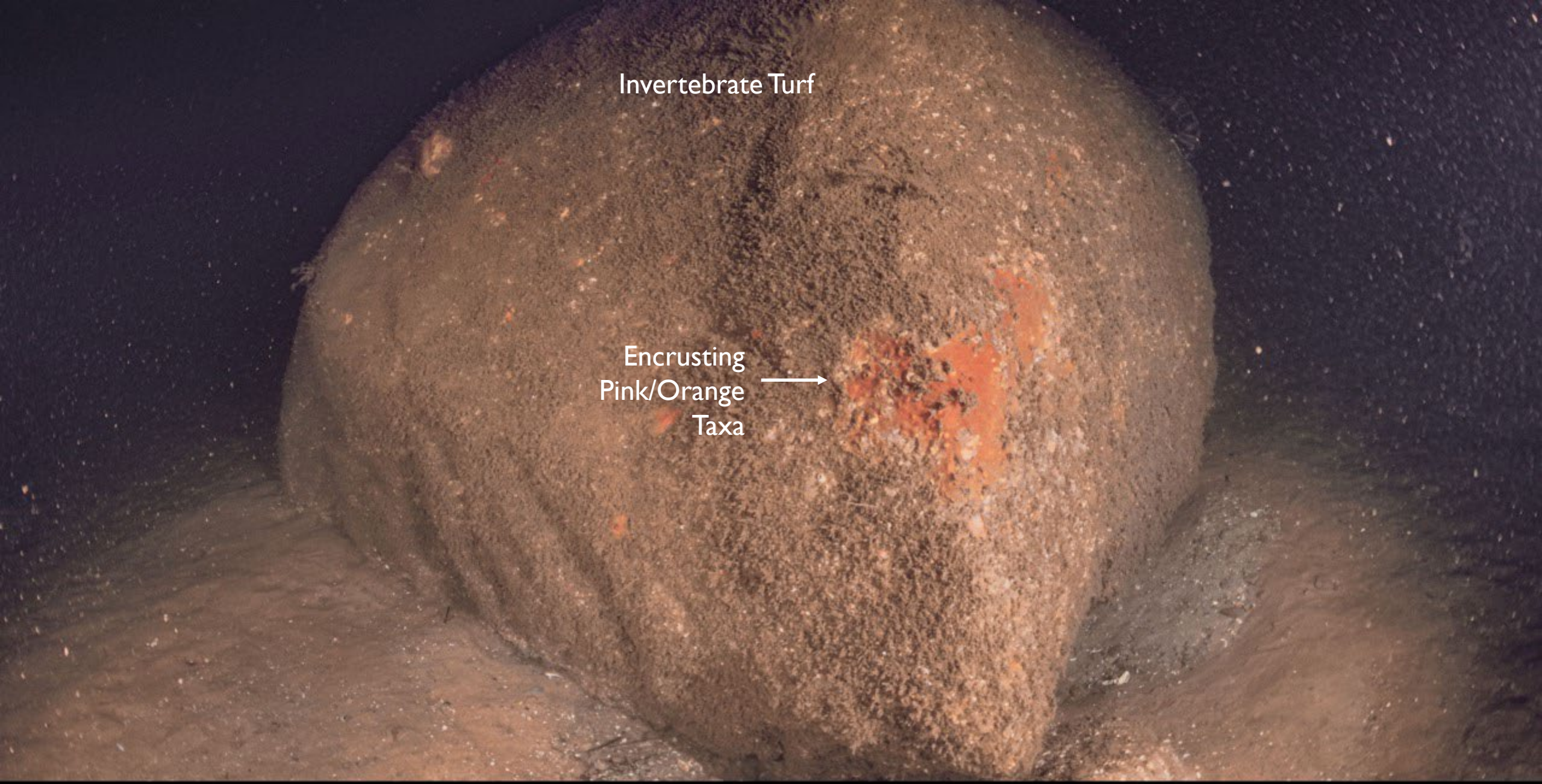
INSPIRE ENVIRONMENTAL



SFW_23B2_SEDstbd_Bld_03-D

Relocated Boulder

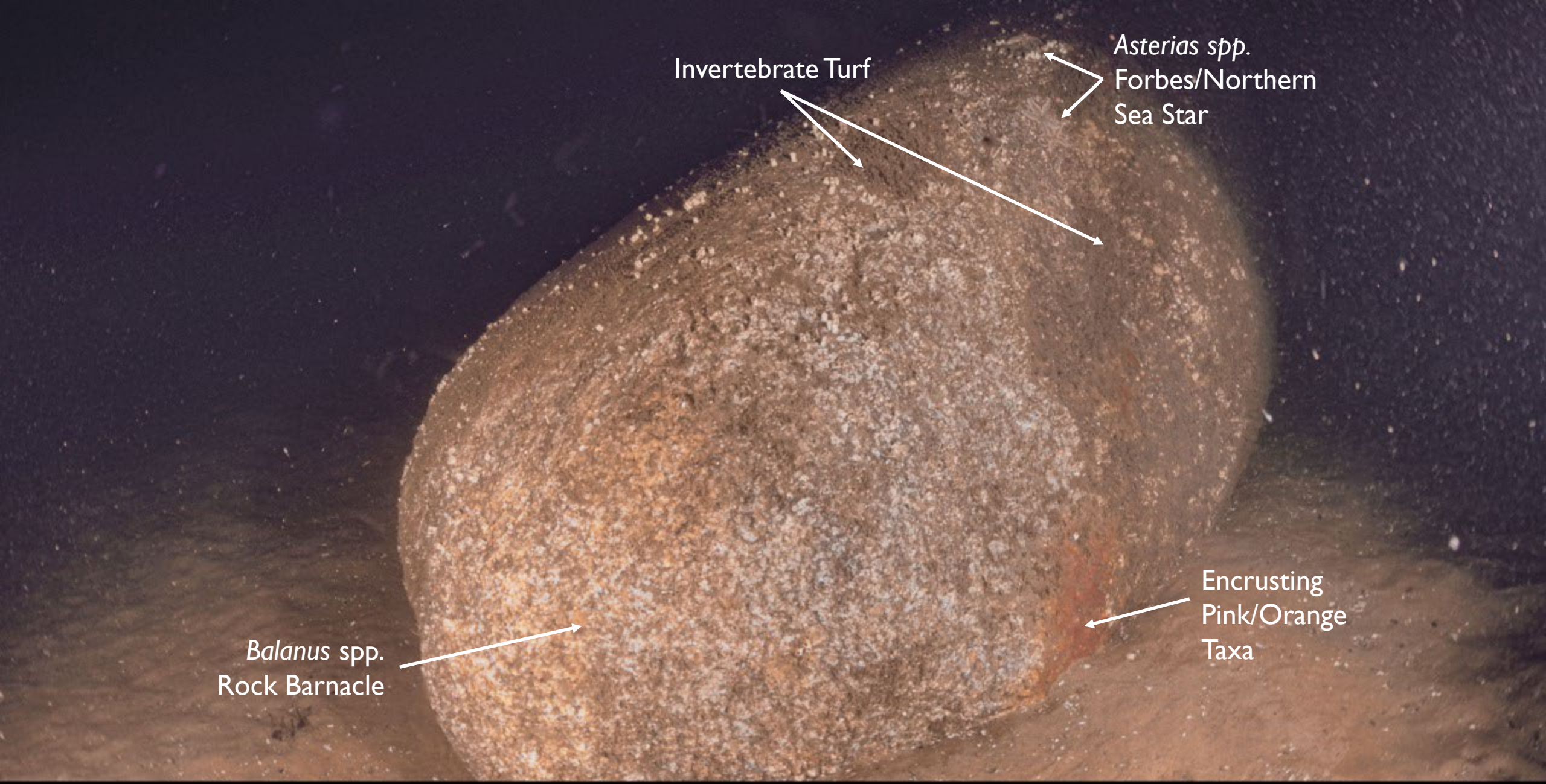
INSPIRE ENVIRONMENTAL



SFW_23B2_SEDstbd_Bld_02-A

Relocated Boulder

INSPIRE ENVIRONMENTAL

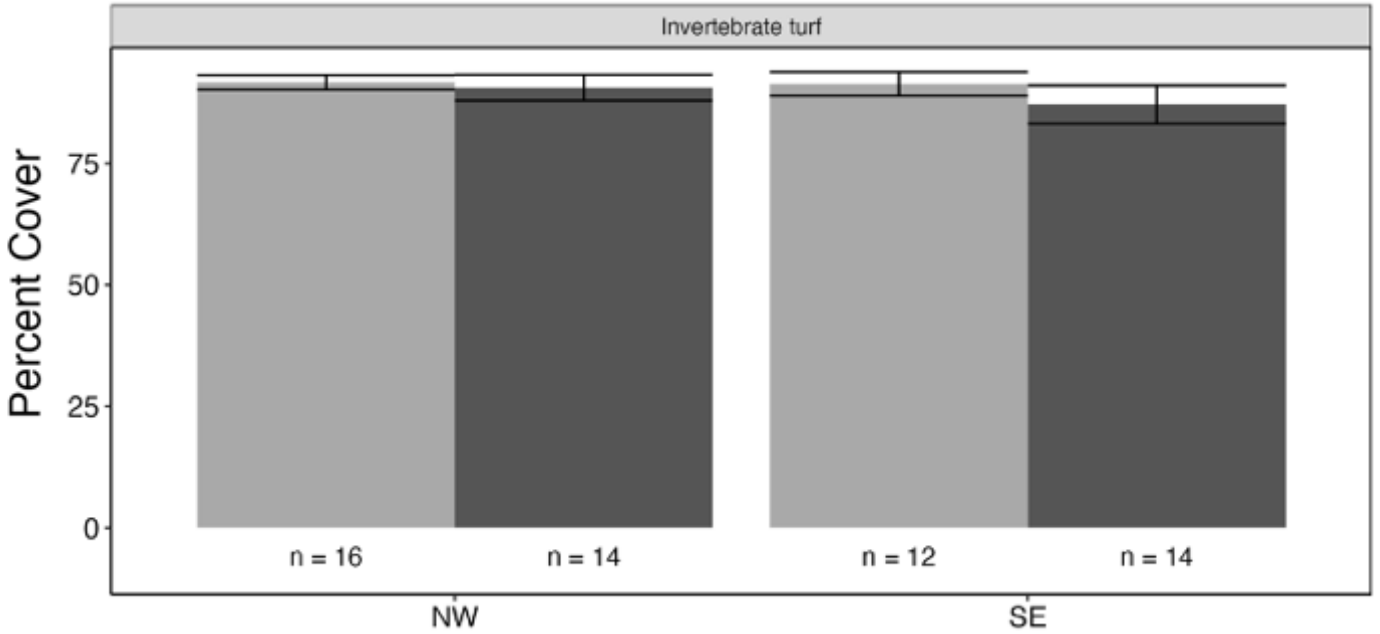


SFW_23B2_SEDstbd_Bld_09-A

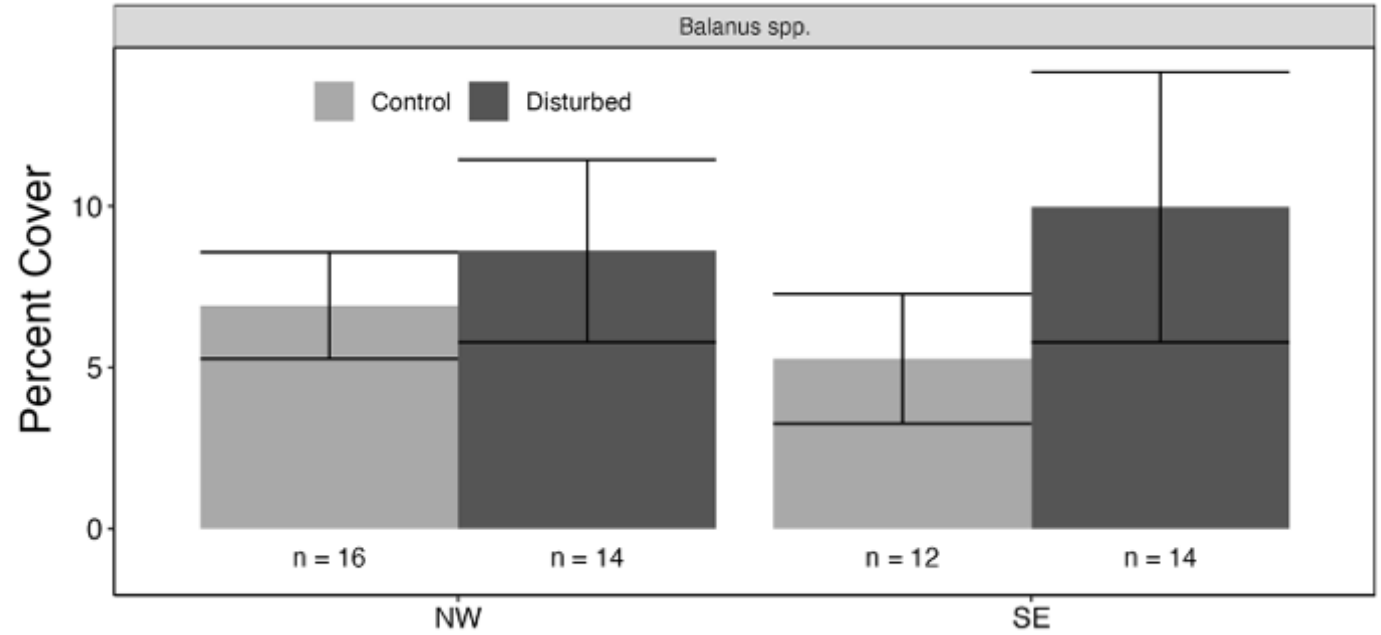
Relocated Boulder

INSPIRE ENVIRONMENTAL

Results

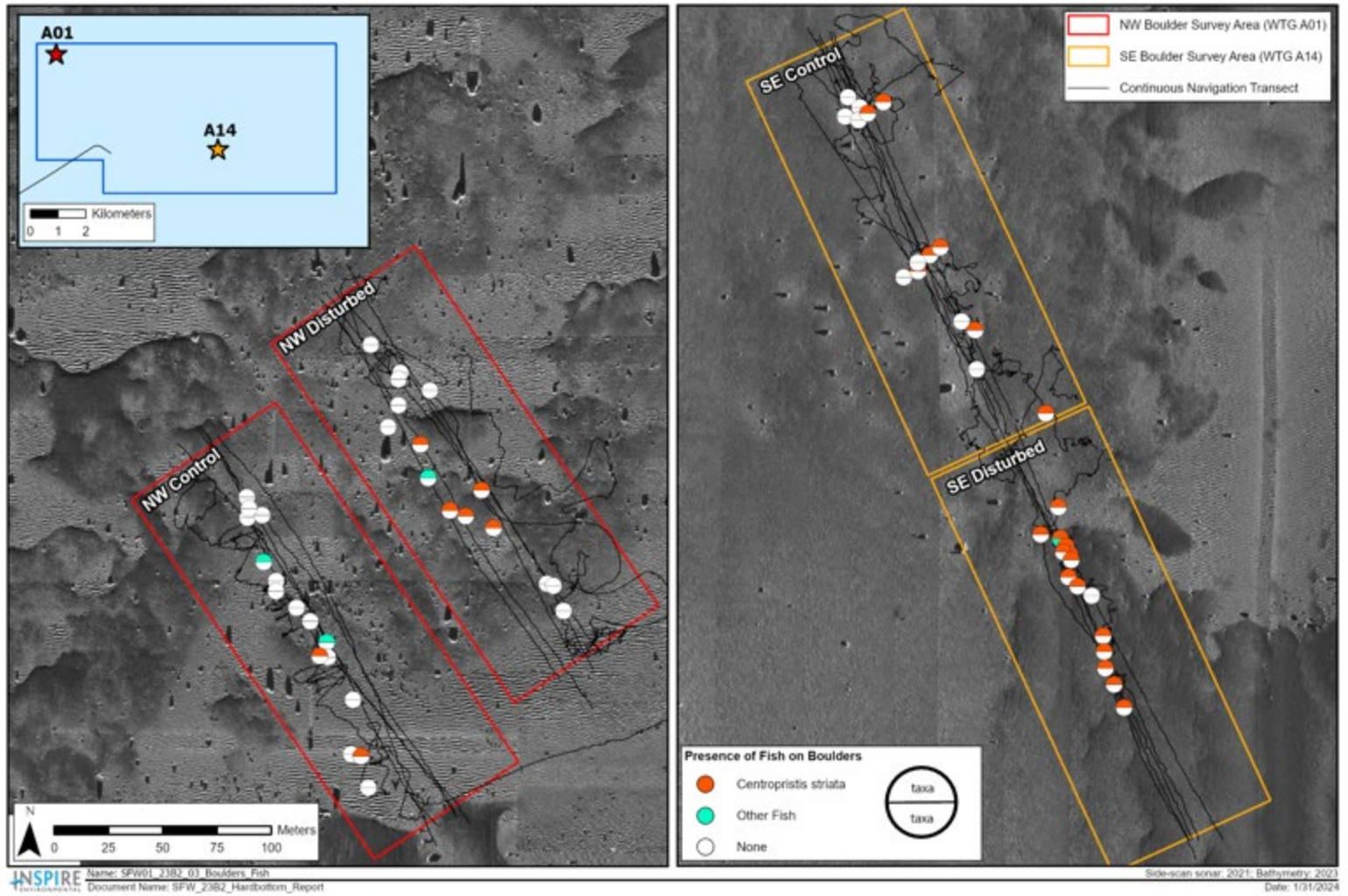

Invertebrate turf
Percent Cover
75
50
25
0
n = 16
n = 14
n = 12
n = 14
NW
SE


Invertebrate turf


Balanus spp.
Control
Disturbed
Percent Cover
10
5
0
n = 16
n = 14
n = 12
n = 14
NW
SE


Balanus spp.
Rock Barnacle

Results

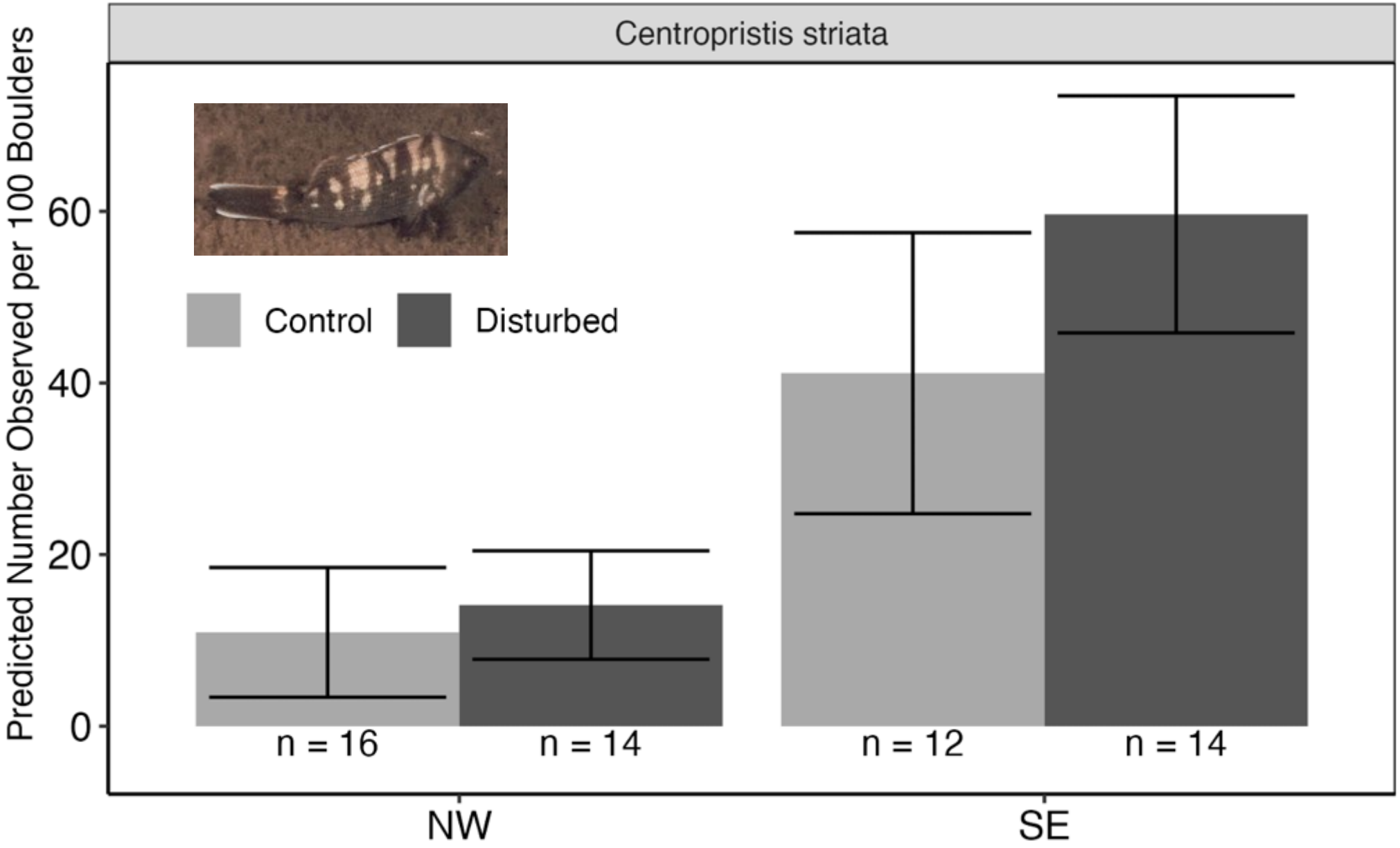

A01
A14
Kilometers
0 1 2
NW Control
NW Disturbed
SE Control
SE Disturbed
NW Boulder Survey Area (WTG A01)
SE Boulder Survey Area (WTG A14)
Continuous Navigation Transect
Presence of Fish on Boulders
Centropristis striata
Other Fish
None
taxa
taxa
N
0 25 50 75 100
Meters
INSPIRE
Name: SFW01_23B2_03_Boulders_Fish
Document Name: SFW_23B2_Hardbottom_Report
Side-scan sonar: 2021; Bathymetry: 2021
Date: 1/31/2024


Centropristis striata
Black Sea Bass

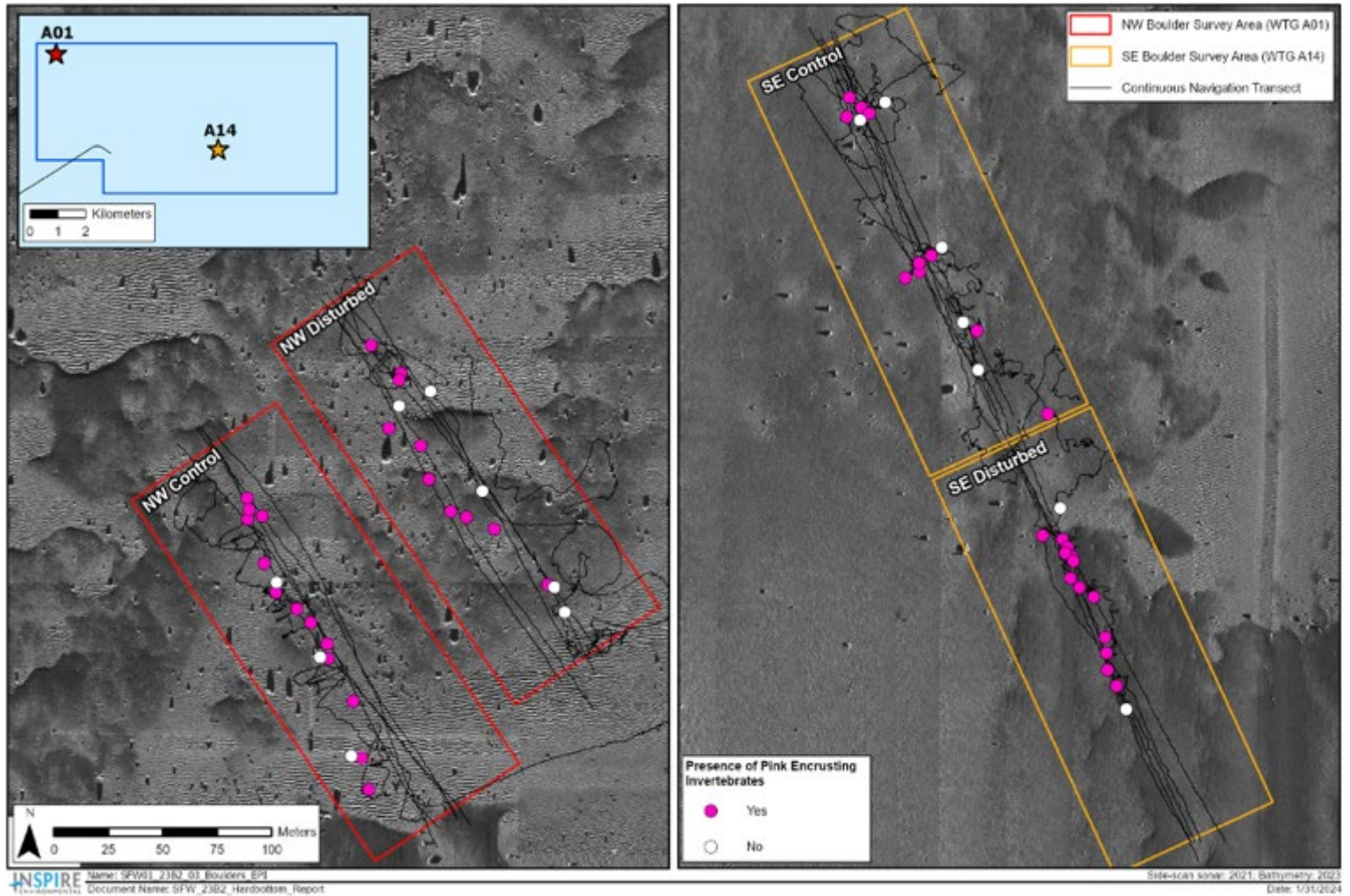

Leucoraja sp.
Little/Winter Skate

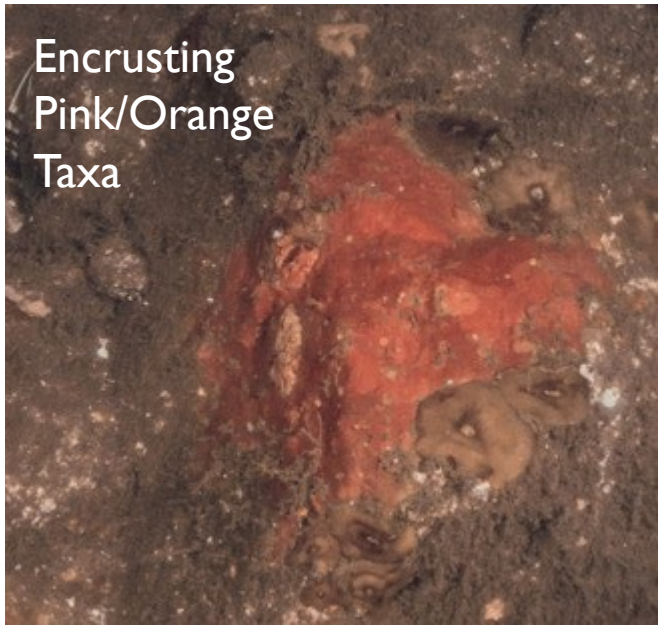

Pseudopleuronectes americanus
Winter Flounder

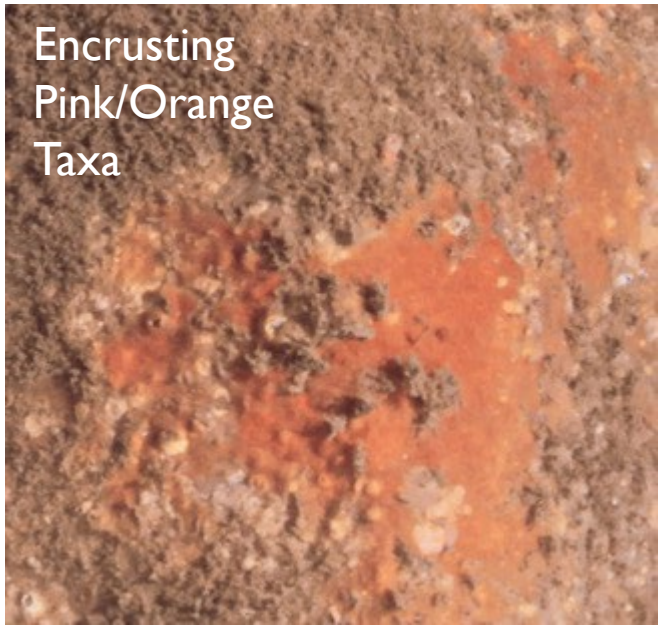
Results


Centropristis striata
Predicted Number Observed per 100 Boulders
0
20
40
60
Control
Disturbed
n = 16
n = 14
n = 12
n = 14
NW
SE

Results

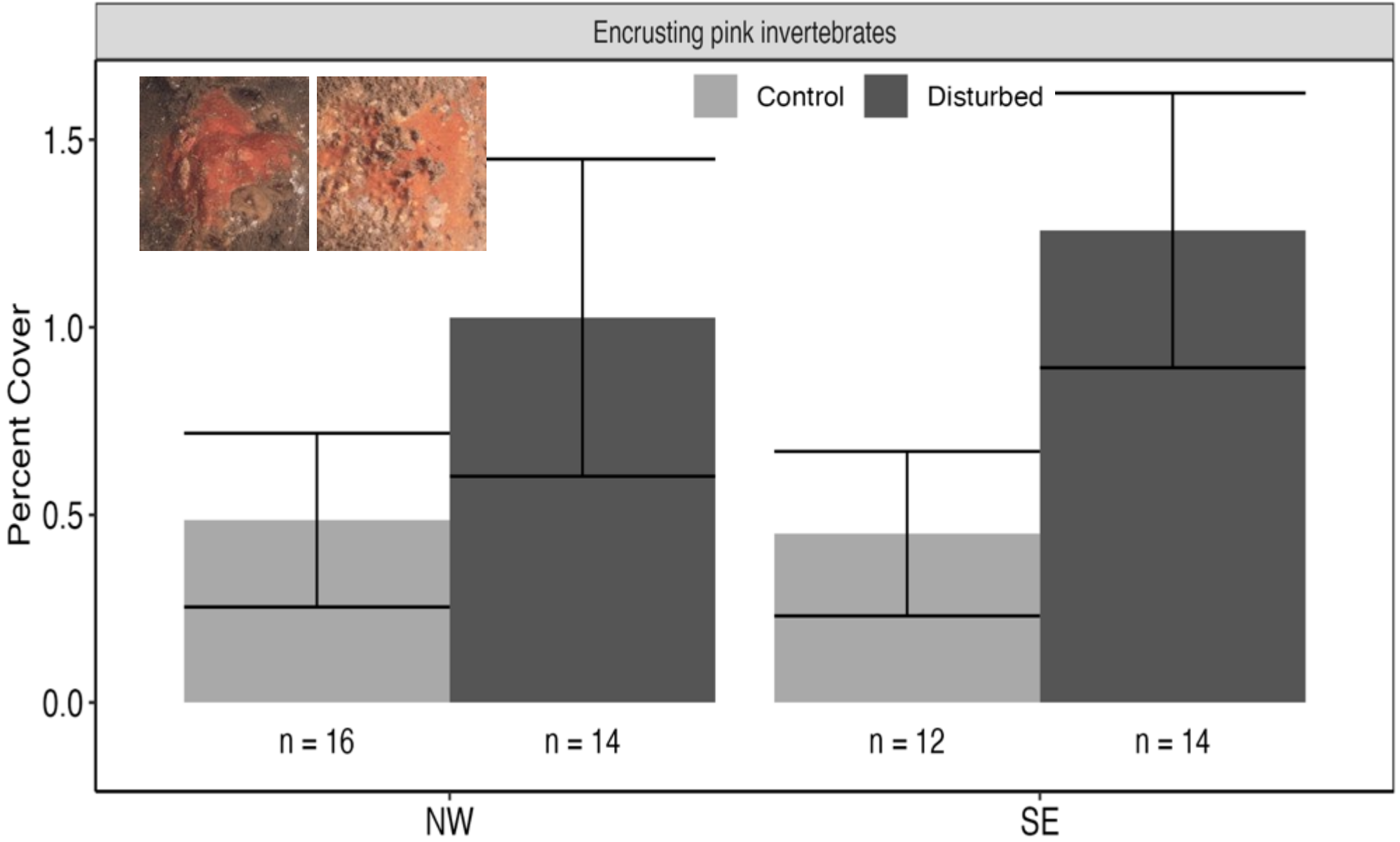






INSPIRE ENVIRONMENTAL

Results


Encrusting pink invertebrates
Control
Disturbed
Percent Cover
1.5
1.0
0.5
0.0
n = 16
n = 14
n = 12
n = 14
NW
SE

Conclusions

- Relocated boulder communities resemble control boulders
  - Invertebrate turf dominates all surfaces
  - Taxa presence and abundance similar on controls and relocated boulders, in most cases
- Encrusting pink/orange taxa cover a small percentage of boulder surfaces
  - Possibly non-native tunicate
  - Higher cover on relocated boulders
- Next surveys (2024, 2025…)
  - Confirm that relocated boulder communities continue to resemble control boulders
  - Track the distribution of encrusting pink invertebrate cover
- Research project
  - Paired visual survey (w/ AI) and physical samples (w/ eDNA)
  - Molecular samples to identify encrusting taxa – GMGI develop qPCR assay, additional amplicon sequencing (12S, COI)