Integrating New Jersey Community Science in Fisheries eDNA Monitoring of Offshore Wind

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New Jersey's Push for Clean Energy

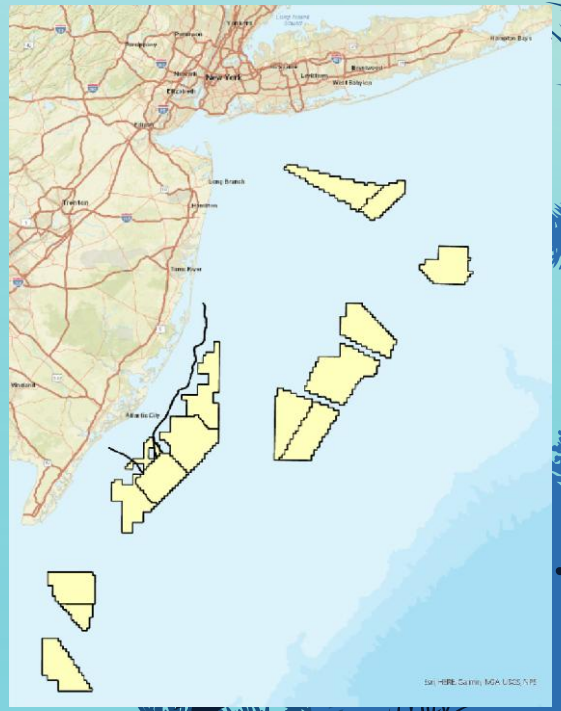
Biden-Harris

- 30 gigawatts OSW by 2030, 15 GW floating OSW by 2035 (BOEM)

NJ aims for 100% clean energy by 2050

Governor Phil Murphy order:

- 7500 MW offshore wind energy by 2035
- 3,742 MW awarded in Jan '24 second solicitation



Phase 1: Preconstruction | Phase 2: Construction | Phase 3: Operations | Phase 4: Decommissioning

The Research and Monitoring Initiative (RMI)

Addresses the need for regional research and monitoring of marine and coastal resources during offshore wind development, construction, operation and decommissioning as recommended in the New Jersey Offshore Wind Strategic Plan

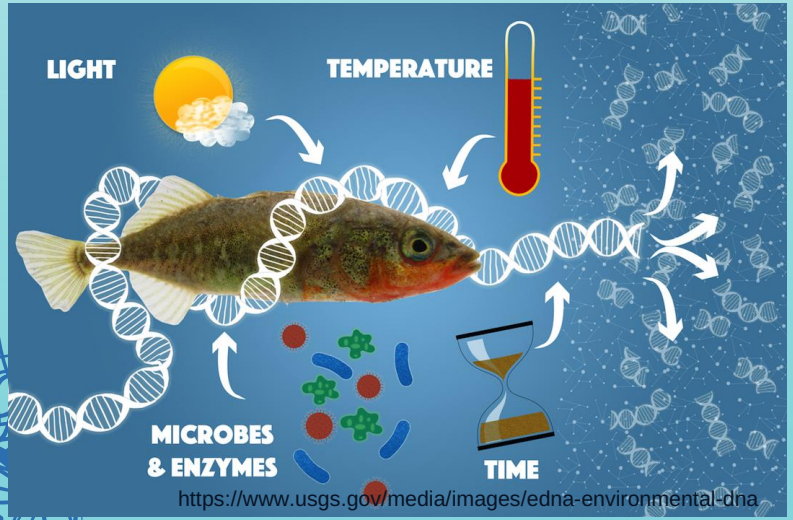
Colleen Brust and Caitlin McGarigal (NJDEP Managers)

Phase 1: Preconstruction | Phase 2: Construction | Phase 3: Operations | Phase 4: Decommissioning

Objectives

- Establish baseline conditions in surf zone adjacent to offshore wind development areas
- Establish relationship to offshore sites using the same methodology
- Compare community eDNA collection techniques to lab based eDNA collection techniques
- Engage the community

What is eDNA?



https://www.usgs.gov/media/images/edna-environmental-dna

- Cellular or extracellular material that is shed into surrounding water such as:
    - mucous
    - bodily fluids
    - skin cells
    - scales
    - other tissue
- This material can be extracted from the water and amplified to determine fish community composition

Sampling

- Sampling occurs once every season
- Sampling planning order:
    - Offshore (3 days)
    - Lab shoreline (1 day)
    - Community shoreline (1 week window)

Community Science Kits

Kit Contents

- Smith-Root Citizen Science eDNA sampler
- Smith-Root self-preserving eDNA filters (0.45 micron) in a container or bag / box that blocks light
- EXTECH model EC170 Salinity / Temperature Pen with calibration standard
- 2-gallon bucket
- Clipboard, datasheets, and pencil
- Shipping Labels and envelopes

*gear not included: Waders / seasonal appropriate gear

Community Science eDNA Shoreline Sampling Datasheet
Monmouth University / NJDEP RMI eDNA Monitoring Project

Sampler Names: _____

Date (Month, Day, Year)	Time	Location

- Latitude (xx.xxxxx): _____ Longitude (xx.xxxxx): _____
  Obtained through (please circle one): Handheld GPS Apple Compass Google Maps Other:_____

Atmospheric Conditions:

- Sky (please circle one):
  Clear/Sunny Overcast Rain (Intermittent) Rain (Steady) Rain (Heavy)
- Air temp (°F): _____
  Obtained through (please circle one): weather.com accuweather.com other:_____
- Wind Strength (please circle one): Light Moderate Heavy
- Wind direction (from): Please circle one direction→

Ocean conditions:

- Tide stage (please circle one): High Low Flooding Ebbing
- Wave roughness (please circle one): Light Moderate Heavy

Water quality

Salinity (ppt)	Temperature (°C)	Volume Filtered (mL)

ExTech Calibrated on: ___/___/___ by _____

Notes:_____

Sampler Initials / Date: _____ QA/QC Officer Initials / Date: _____

Thank you!

If you have any questions, please email Erin Conlon at econlon@monmouth.edu or call at (908)-331-4153

Lab vs Community Science Methodology

Community

Collect and Filter

Lab

Collect

Filter

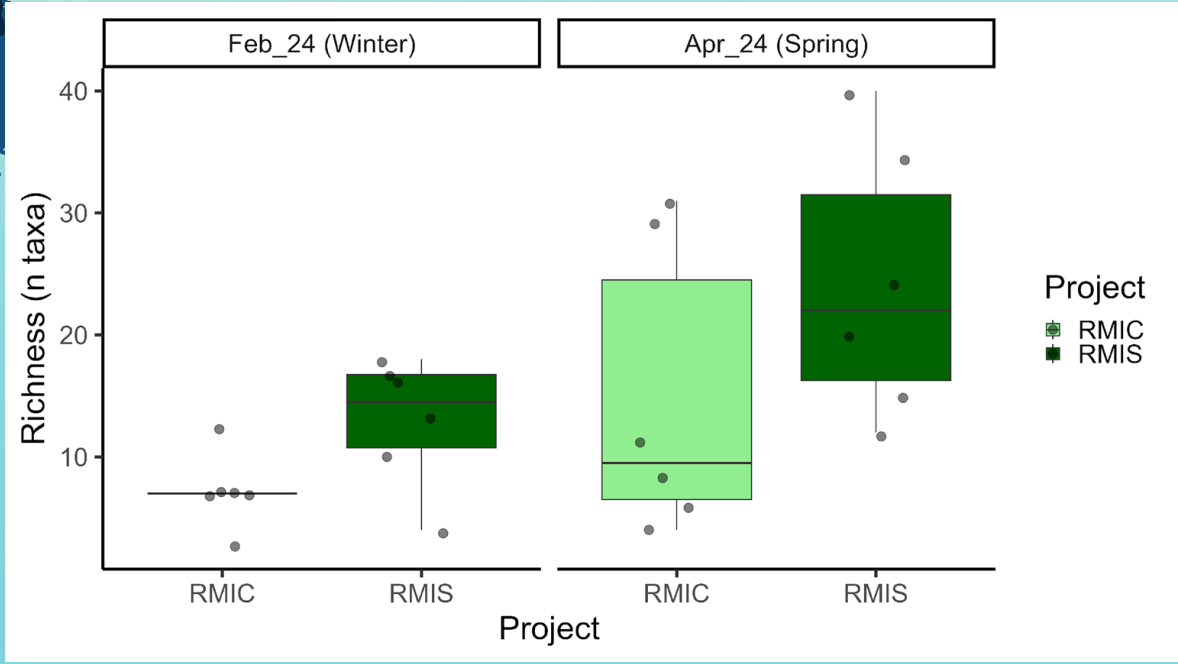
Extract

PCR

Sequence

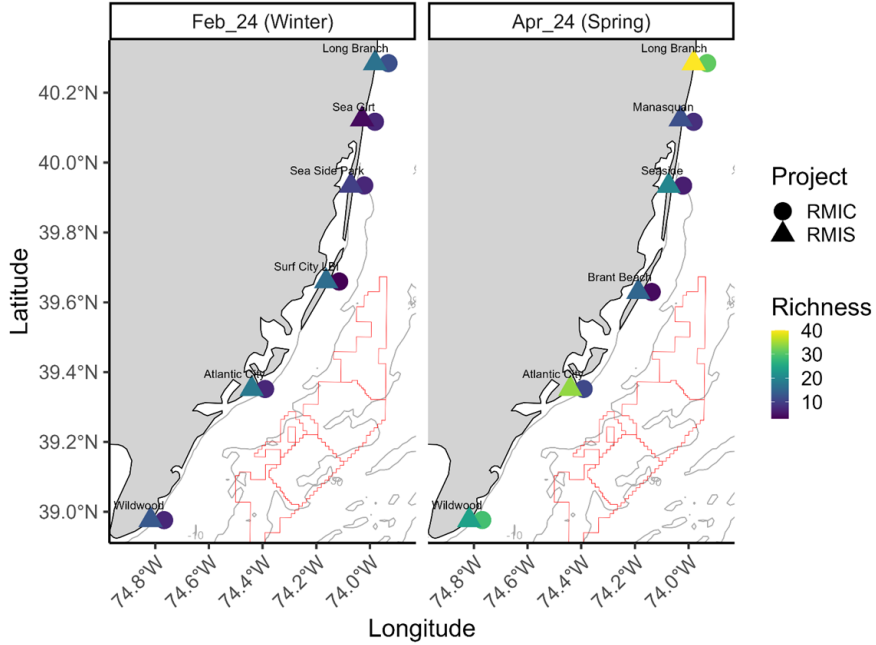
❄ Freeze / Thaw Cycle

Results



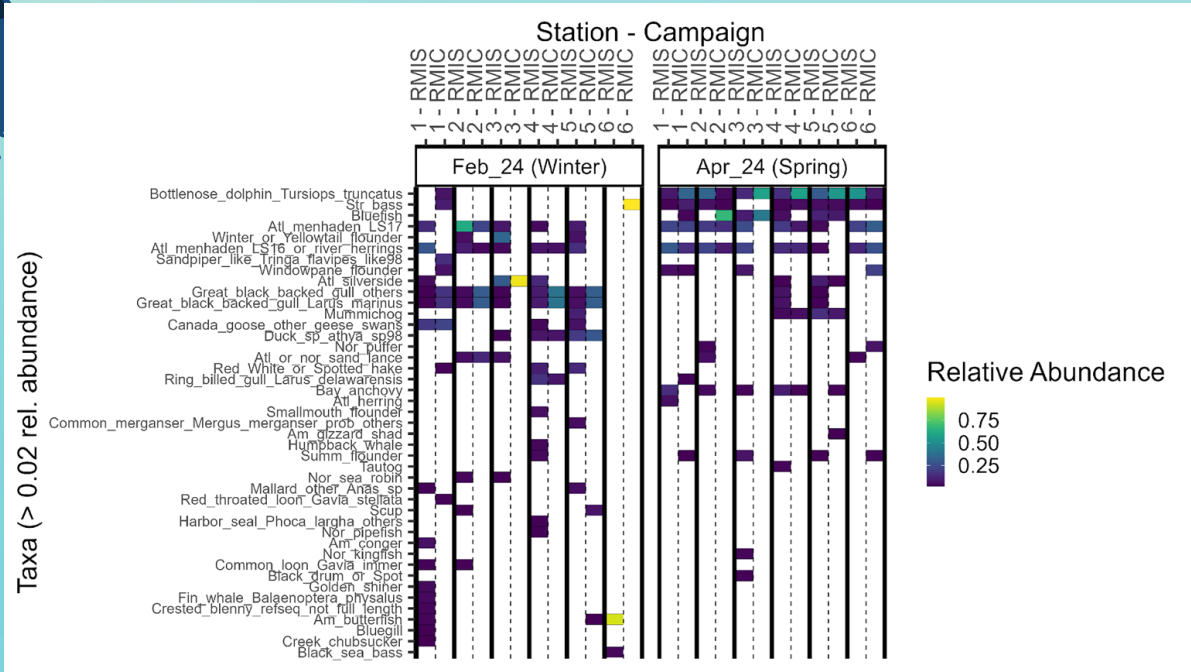
- Lab eDNA collection methods yielded higher species richness over community eDNA collection methods
- Winter sampling yielded on average 6 species for community and 14 for lab
- Spring sampling yielded on average 9 species for community and 22 for lab

Results



- Areas of high and low richness are observed at the same stations over both methods

Results



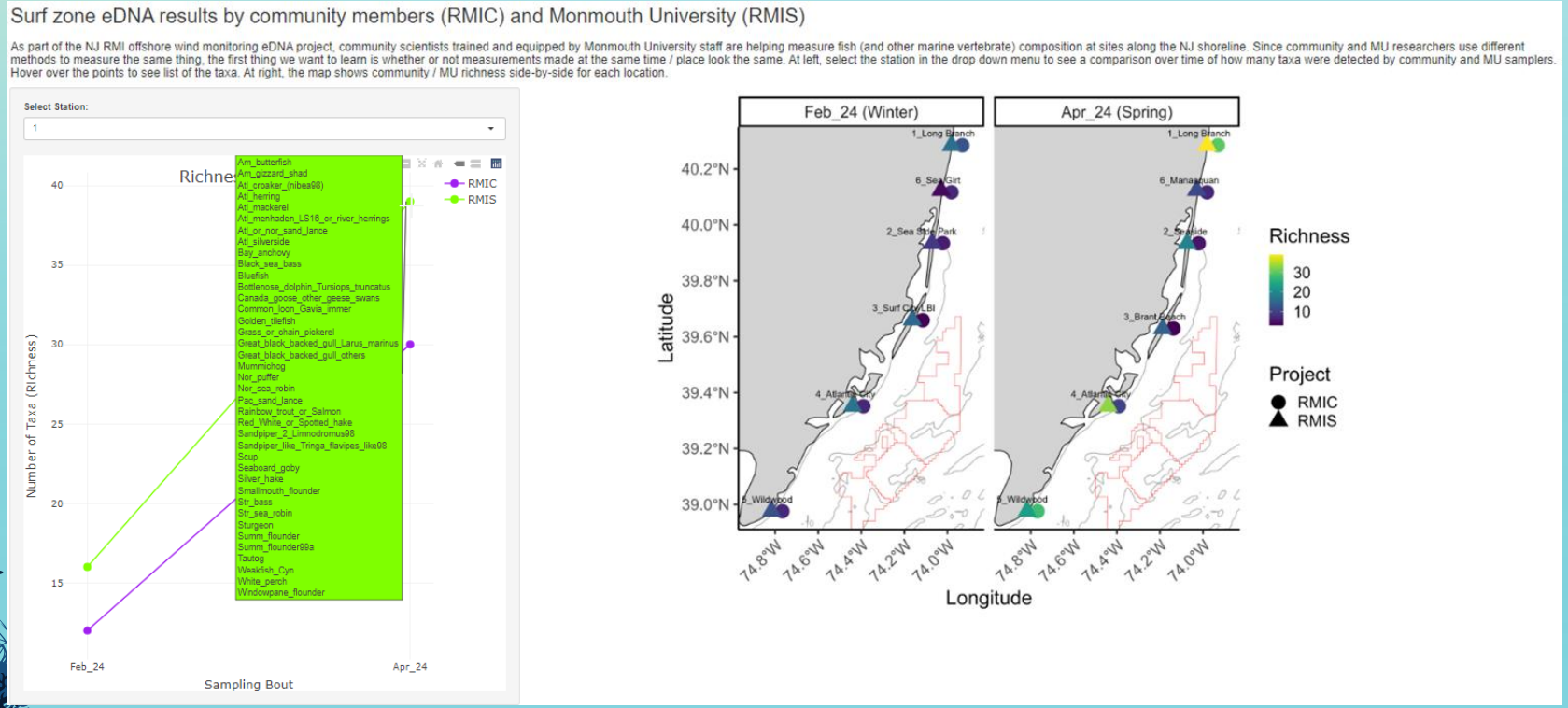
Common species detections over both methods:

- Striped Bass
- Bluefish
- Bottlenose Dolphin

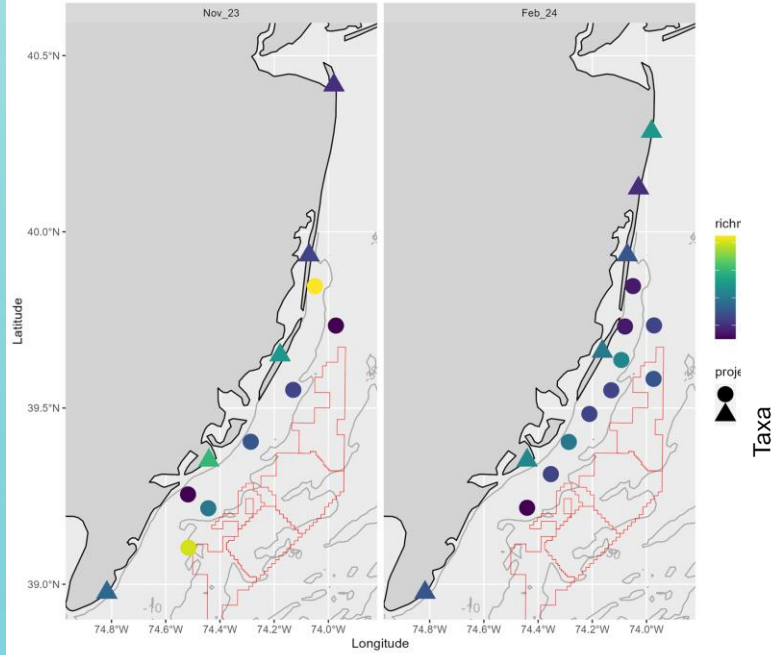
Species detected by only lab methods:

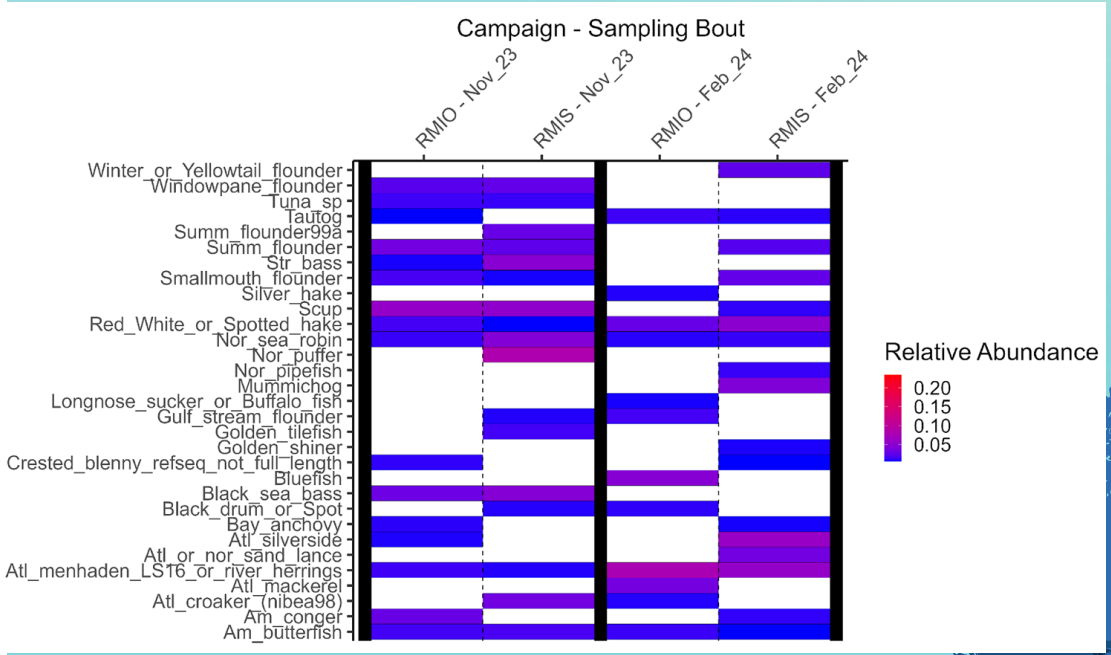
- Fin Whale
- American Conger Eel
- Bluegill

Shiny App!


Surf zone eDNA results by community members (RMIC) and Monmouth University (RMIS)
As part of the NJ RMI offshore wind monitoring eDNA project, community scientists trained and equipped by Monmouth University staff are helping measure fish (and other marine vertebrate) composition at sites along the NJ shoreline. Since community and MU researchers use different methods to measure the same thing, the first thing we want to learn is whether or not measurements made at the same time / place look the same. At left, select the station in the drop down menu to see a comparison over time of how many taxa were detected by community and MU samplers. Hover over the points to see list of the taxa. At right, the map shows community / MU richness side-by-side for each location.
Select Station:
1
Richnes
RMIC
RMIS
Number of Taxa (Richness)
Feb_24
Apr_24
Sampling Bout
Am_butterfish
Am_gizzard_shad
Atl_croaker_(nibea98)
Atl_herring
Atl_mackerel
Atl_menhaden_LS16_or_river_herrings
Atl_or_nor_sand_lance
Atl_silverside
Bay_anchovy
Black_sea_bass
Bluefish
Bottlenose_dolphin_Tursiops_truncatus
Canada_goose_other_geese_swans
Common_loon_Gavia_immer
Golden_tilefish
Grass_or_chain_pickerel
Great_black_backed_gull_Larus_marinus
Great_black_backed_gull_others
Mummichog
Nor_puffer
Nor_sea_robin
Pac_sand_lance
Rainbow_trout_or_Salmon
Red_White_or_Spotted_hake
Sandpiper_2_Limnodromus98
Sandpiper_like_Tringa_flavipes_like98
Scup
Seaboard_goby
Silver_hake
Smallmouth_flounder
Str_bass
Str_sea_robin
Sturgeon
Summ_flounder
Summ_flounder98a
Tautog
Weakfish_Cyn
White_perch
Windowpane_flounder
Feb_24 (Winter)
Apr_24 (Spring)
1_Long Branch
6_Sea Girt
2_Sea Girt Park
3_Surf City_BI
4_Atlantic City
5_Wildwood
6_Manasquan
2_Seaside
3_Brant Beach
Latitude
40.2°N
40.0°N
39.8°N
39.6°N
39.4°N
39.2°N
39.0°N
74.8°W
74.6°W
74.4°W
74.2°W
74.0°W
Longitude
Richness
30
20
10
Project
RMIC
RMIS

eDNA allows community comparisons between very different environments





Future Work

- Quarterly sampling through 2025
- Lab vs. community methods comparison experiment
- Further development of the shiny app
- Finding more volunteers for Atlantic City and Wildwood

Conclusions

- eDNA can be used to monitor fish community composition during offshore wind development
- We are piloting a program that engages the community in quality-assured eDNA monitoring
- Using eDNA helps avoid gear biases when sampling two different environments

Image by Arek Socha from Pixabay

Acknowledgements

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- Tak Waterman
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- Megan and Aiden Smith
- Emma Najarian
- Kiernan Bates

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