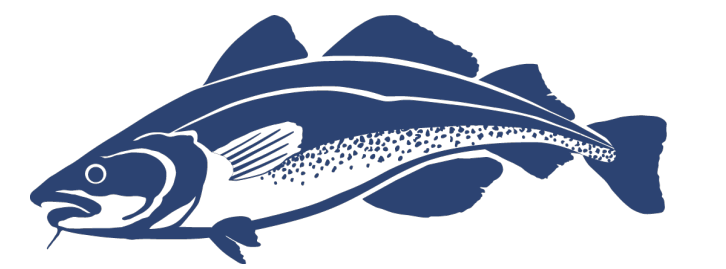


GLOUCESTER MARINE
GENOMICS INSTITUTE

Evaluating the effects of offshore wind development on fisheries biodiversity using environmental DNA (eDNA)

Marine Fisheries
Commonwealth of Massachusetts



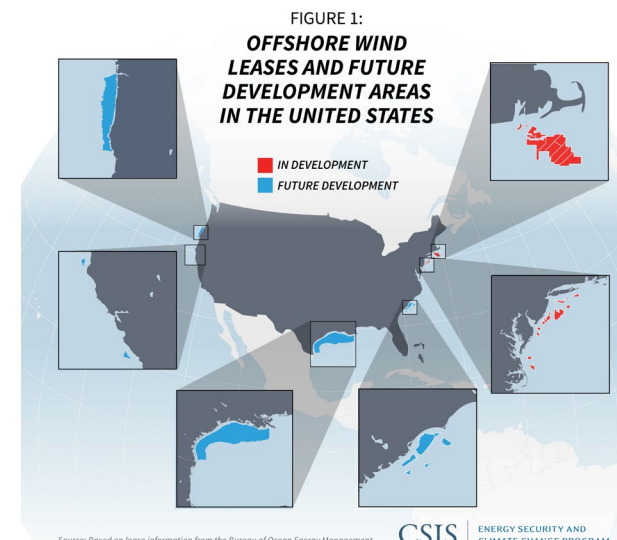
Dr. Emma Strand^{1*}, Dylan Comb¹, Dr. John Logan², Steve Voss², Amanda Davis², Tim O'Donnell¹

¹Gloucester Marine Genomics Institute, Gloucester, MA; ²Massachusetts Division of Marine Fisheries, New Bedford, MA

Objective

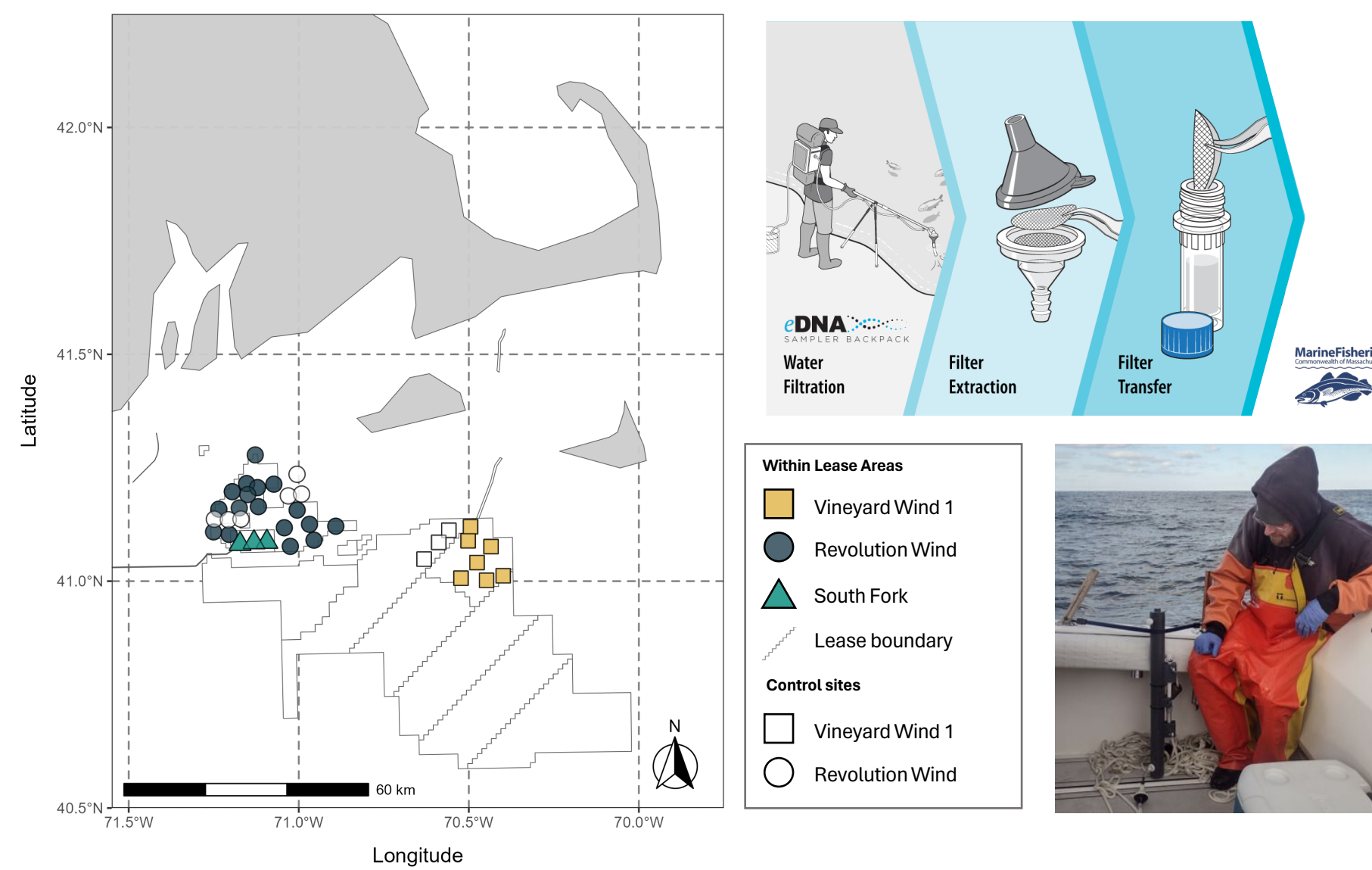
Large-scale offshore wind developments are expanding, particularly in Southern New England, and are likely to impact surrounding fisheries and ecosystems.

To fully understand the environmental impacts of wind development, we established an environmental DNA (eDNA) monitoring survey over 7 months to evaluate vertebrate biodiversity before, during, and after construction.

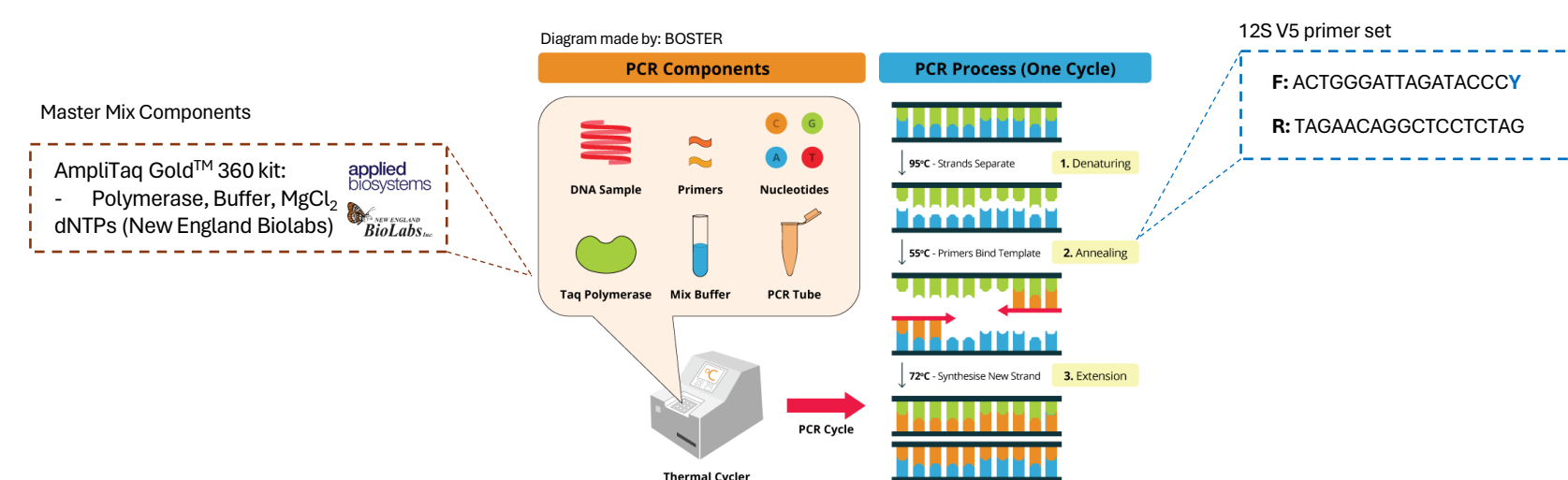


Methods

Sampling: 1.2L of bottom and surface water were sampled monthly (May – November 2023) using a Smith-Root eDNA backpack sampler and 1 µm cellulose nitrate filters.

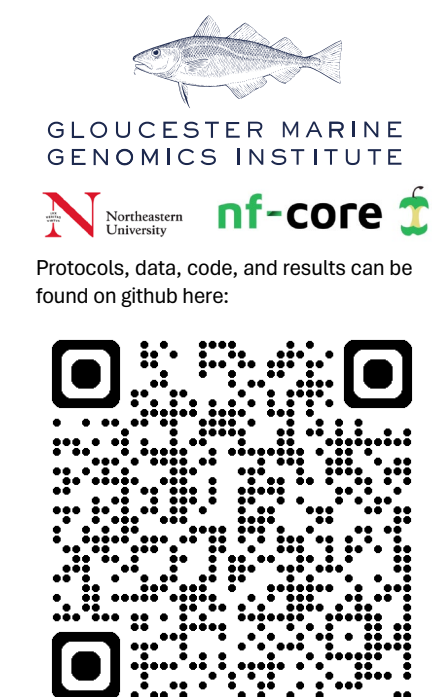


Laboratory work: All vertebrates were targeted with a custom 12S V5 primer set based on Riaz et al., 2011 that included a degenerate base Y at the 3' end of the forward primer.



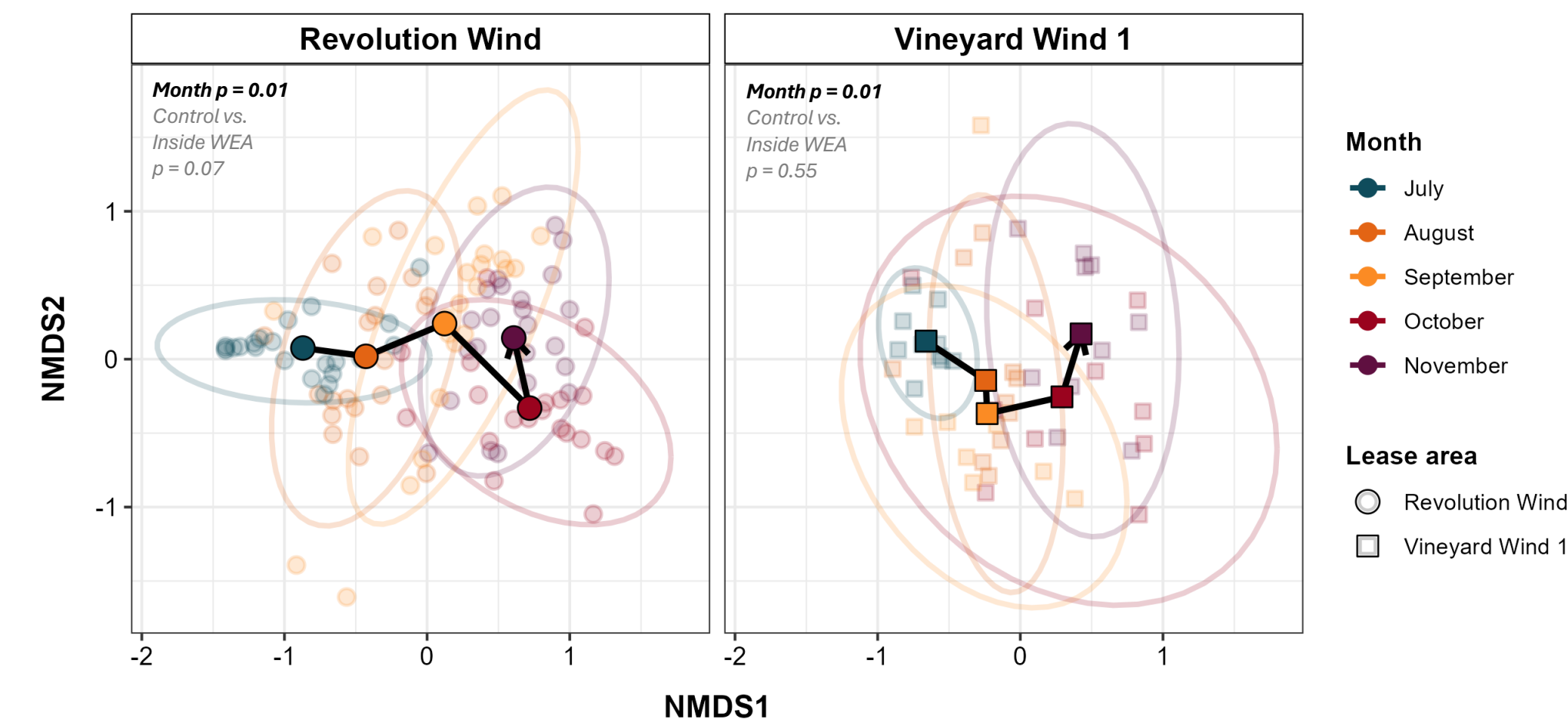
Data analysis:

- FastQ files were analyzed on Northeastern University's High Performance Discovery Cluster using nf-core/ampliseq pipeline (v2.8.0; Straub et al., 2020) and DADA2 (Callahan et al., 2016) to predict ASVs.
- ASVs were assigned taxonomy using three databases: 1.) GMGI's curated 12S database, 2.) Mitofish, and 3.) NCBI. This resulted in taxonomic identification of 92.3% of ASVs (99.5% of total reads).
- Significant effects of alpha diversity (species richness) were analyzed using a Type III ANOVA statistical test. Significant differences in community composition was determined using a PERMANOVA statistical test and visualized with NMDS.

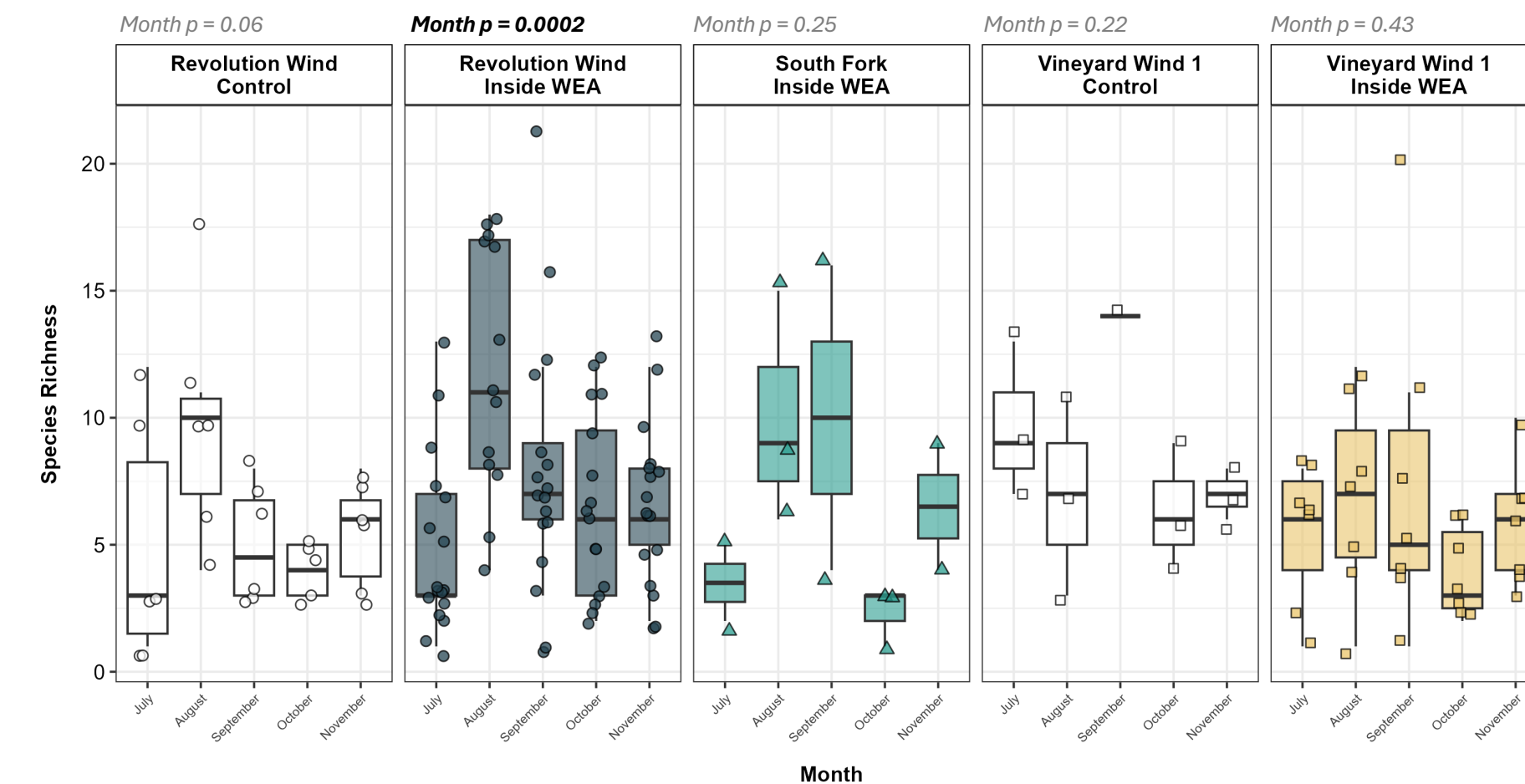


Results

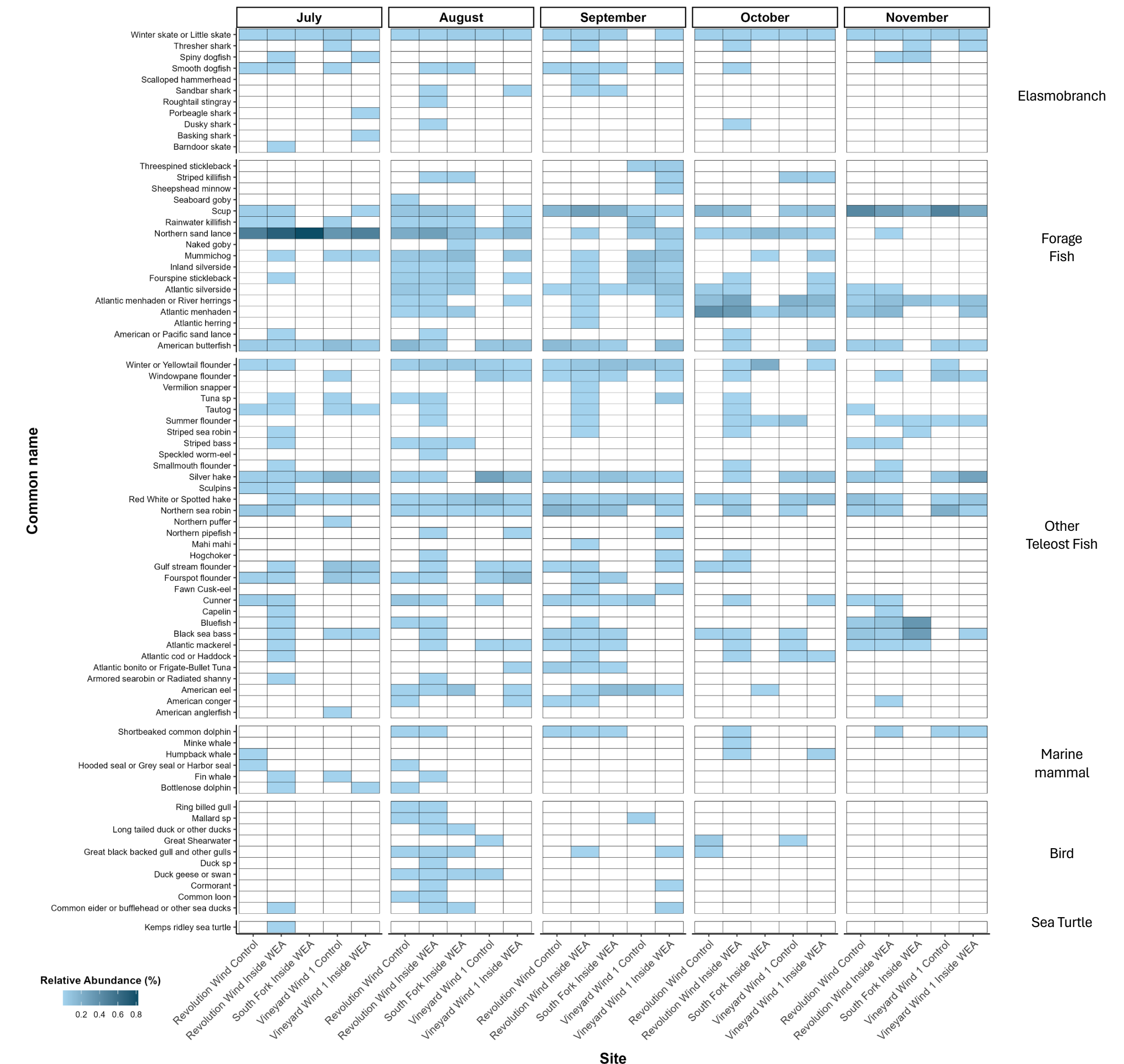
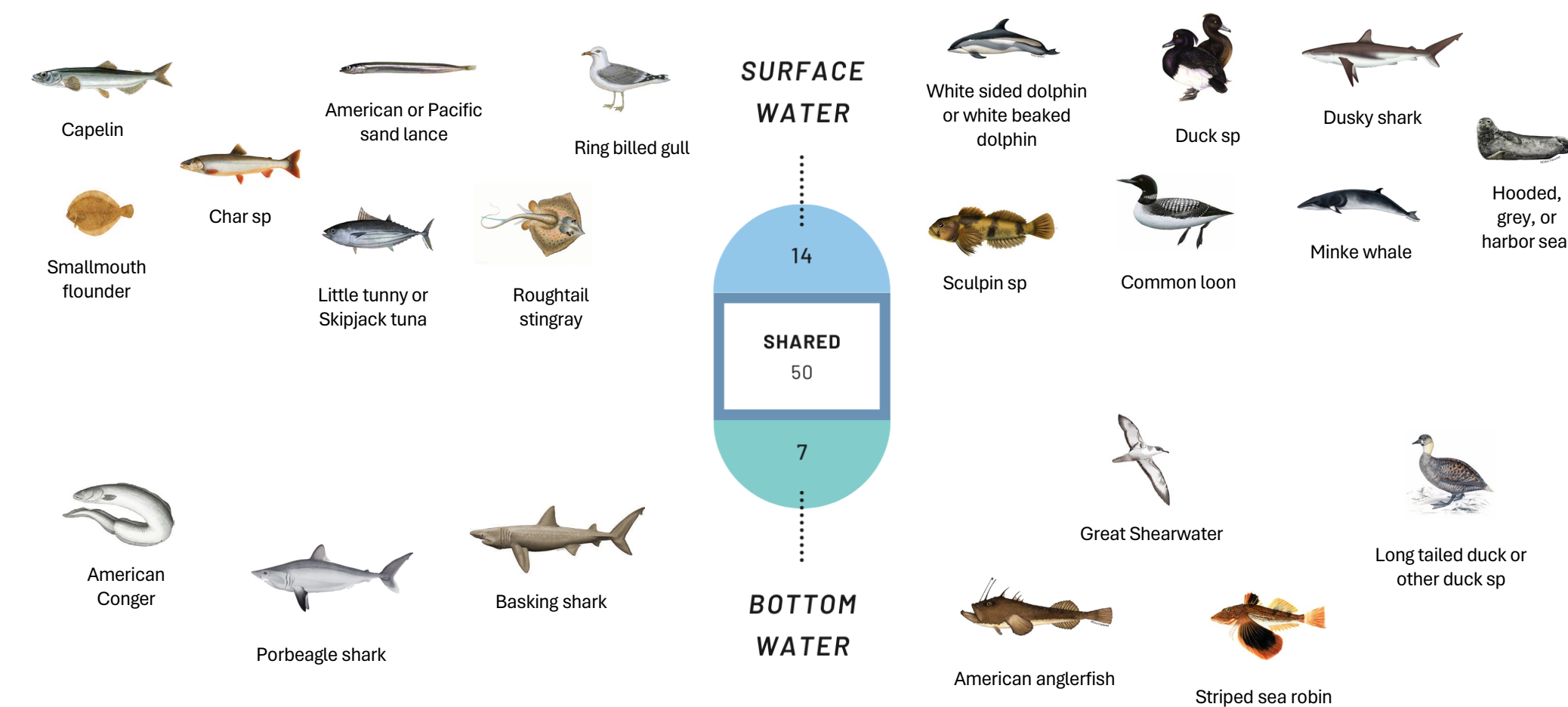
Lease areas exhibited a significant seasonal shift in community level biodiversity



Late summer through early Fall displays the highest levels of alpha diversity (species richness) within the Revolution Wind lease area



Most species can be found in either surface or bottom water sampling, but several are unique to sampling type



Conclusions

- The Southern New England offshore wind lease area exhibits large seasonal changes in biodiversity and community composition, which is driven primarily by forage fish and other teleost fish species.
- To effectively monitor biodiversity and species of interest (e.g., marine mammals), both surface and bottom water sampling may be important.

Next Steps:

Laboratory work: Incorporating an invertebrate specific primer set (e.g., COI).

Data analysis:

- Re-analyze including offshore wind farm development timelines.
- Combine data with acoustic telemetry data and ongoing traditional surveys.

