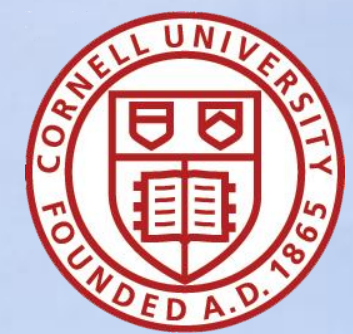


Soundscape of the Hudson River Estuary: NERRS Science Collaboration for Bioacoustics Research, Management, and Education

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Collaborative Research

The Hudson River National Estuarine Research Reserve (HRNERR) has diverse stakeholders including an engaged public and critical fisheries managers. Acoustic monitoring provides an exciting opportunity to engage key stakeholders and end users from the overlapping perspectives of education/outreach and data collection to inform fisheries management. Passive acoustic data collection surveys cover a broad region including HRNERR component sites and adjacent habitats. The project seeks to understand the dynamics of important migratory fishes and establish seasonal and spatial use patterns in protected habitats.

Project Objectives

- Record and characterize soundscapes using passive acoustic monitoring in the Hudson River Estuary.
- Develop a reference library of underwater sounds with field and captive recordings of fish.
- Increase temporal and spatial understanding of important managed species in Hudson River Estuary, including Atlantic Sturgeon, Shortnose Sturgeon, American Shad, River Herring, Freshwater Drum, and Striped Bass.



Education and Outreach

- Education and community engagement opportunities with student researchers collecting and analyzing their own biological acoustic data.
- Education modules and experiences for local high school and college students.
- Soundscape exhibit for members of the general public and school groups visiting the Norrie Point Environmental Center.
- New audiences reached through increased online accessibility of acoustic library and river soundscape experiences.
- Connection to other National Estuarine Research Reserves interested in biological acoustic monitoring.



Hudson River and Ecological Acoustics

- Hudson River Estuary is a diverse continuum of habitats in New York State extending from the Atlantic Ocean to the Federal Dam in Troy.
- HRNERR consists of four discrete component sites ranging from brackish to freshwater tidal habitats.
- There is a wide diversity of fishes in HRNERR sites, including marine, brackish, and freshwater species.
- There are many anthropogenic sounds, including vessels, cars, and trains near the river that may impact fish vocalizations.
- Passive acoustic research helps to establish this technology as a central strategic approach for aquatic habitat management and public engagement in the Hudson River Estuary.

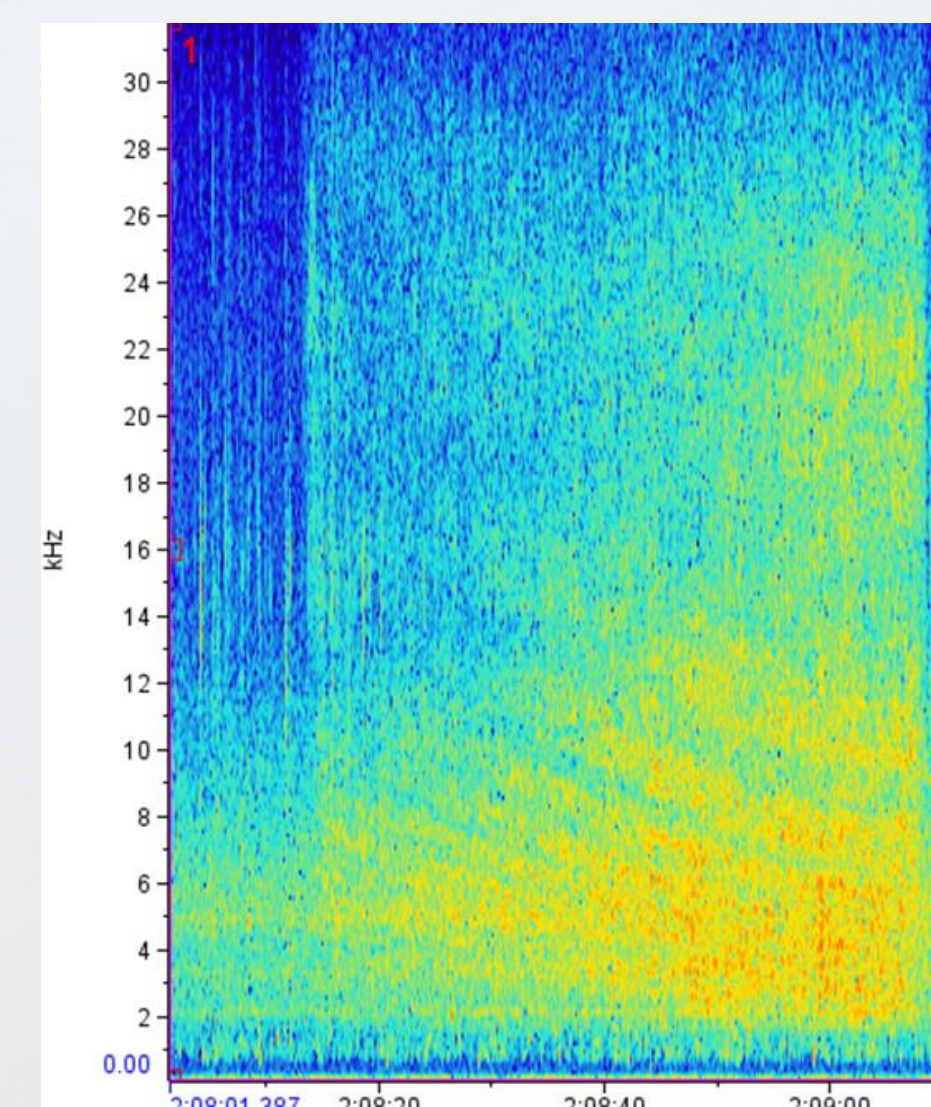


Figure 1: Spectrogram of anthropogenic noise (powerboat) recorded on the Hudson River Estuary.



Listen and Look

Passive aquatic biological acoustic recordings can be visualized by looking at spectrograms (below) or by listening to selected sound clips from the longer field recordings. The Freshwater Drum (*Aplodinotus grunniens*) is commonly heard in the Hudson River Estuary. Scan the QR code to hear a Freshwater Drum chorusing in the Hudson River.

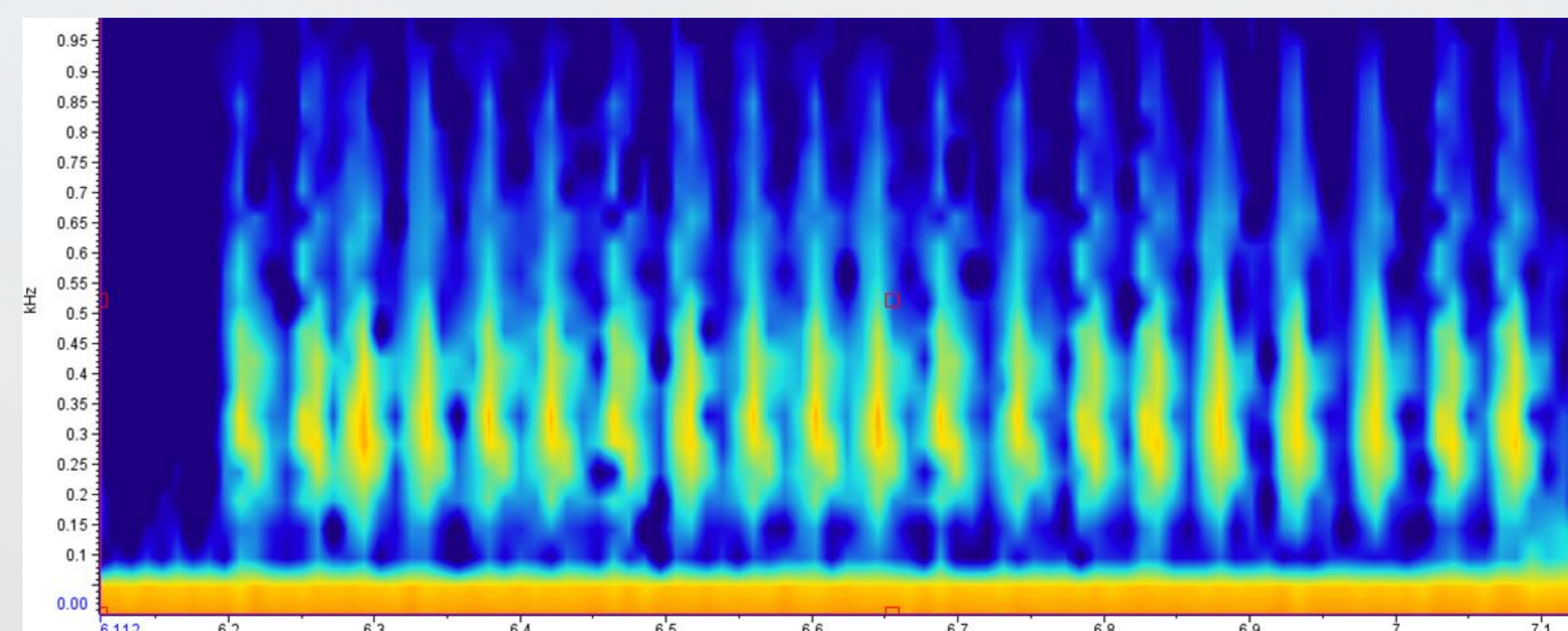
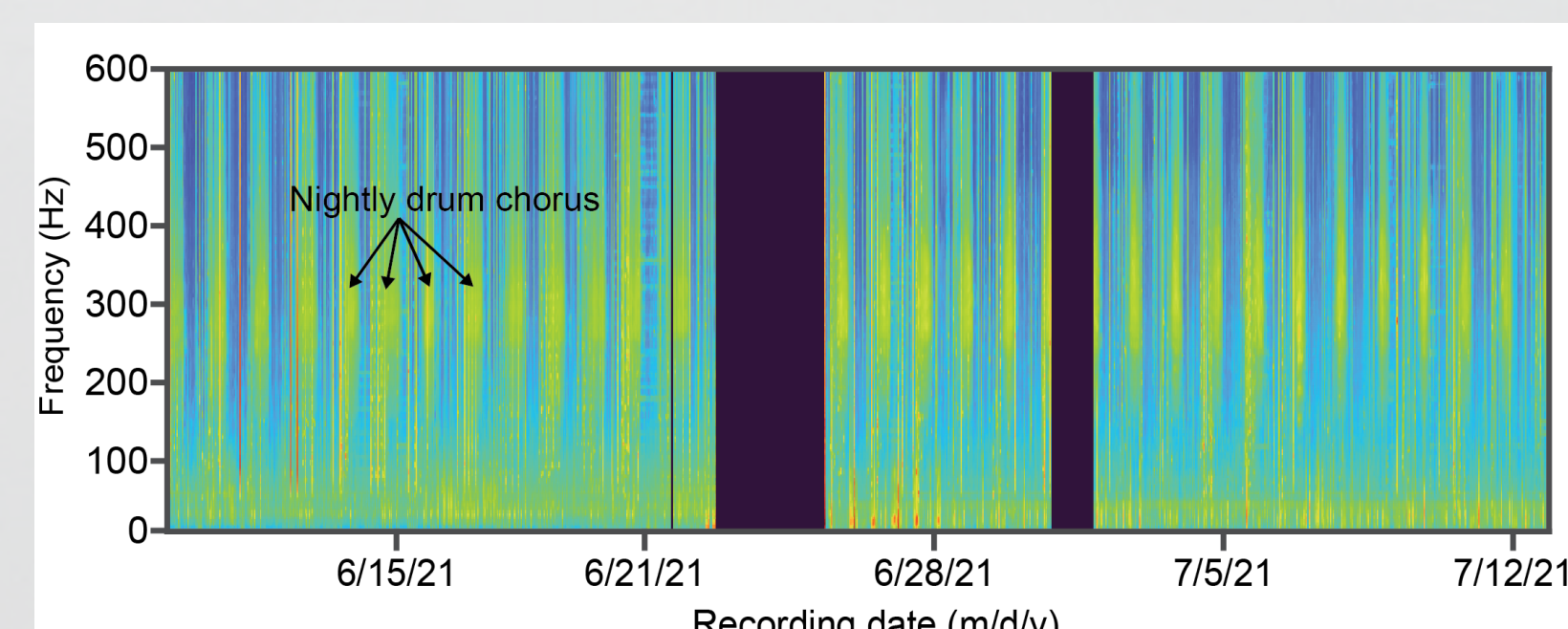


Figure 2 (left): Spectrogram of chorusing Freshwater Drum in Hudson River Estuary over a few seconds. Scan QR code to hear recording. Figure 3 (below): Long-term spectrogram of Freshwater Drum chorusing over a few weeks.



Field Recordings

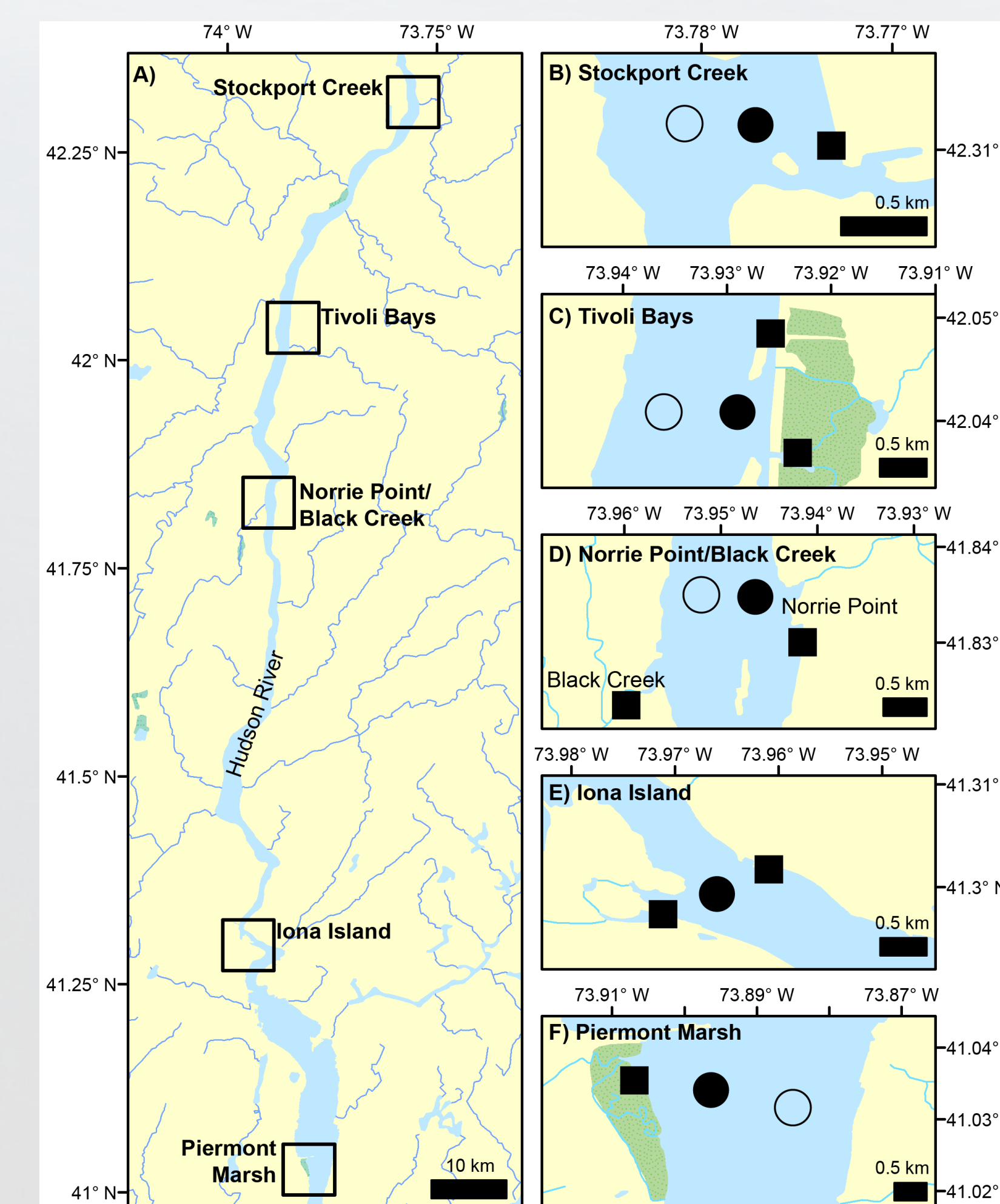


Figure 4: Map of hydrophone recording locations for NERRs Collaborative Grant funded 2022-2024 project. Each of the HRNERR component sites included in the study with tributary, wetland, and riverine recorders for each location.

- Locations at Hudson River National Estuarine Research Reserve Component sites including Stockport Creek, Tivoli Bays, Norrie Point Environmental Center, Iona Island, and Piermont Marsh.
- Hydrophone recorders at tributary, wetland, and river deployment locations respectively at each component site.
- Passive acoustic instruments used, including Cornell Swift recorders with hydrophones and SoundTraps (ST300 and ST600s).
- Fish species ground truthing through combination of NYSDEC fisheries data and tank recordings.

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