

1 Using passive acoustics for long-term, continuous measurements of fish biodiversity in estuarine
2 systems

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4 Olivia N. Caretti¹, David B. Eggleston^{1,2}, DelWayne R. Bohnenstiehl^{1,3}

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6 ¹ Department of Marine, Earth and Atmospheric Sciences, North Carolina State University,
7 Raleigh, NC, USA

8 ² Center for Marine Science and Technology, North Carolina State University, Morehead City,
9 NC, USA

10 ³ Center for Geospatial Analytics, North Carolina State University, Raleigh, NC, USA

11
12 Corresponding author:
13 Olivia N. Caretti¹

14
15 Email address: oncarett@ncsu.edu

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17 Assessing the biodiversity of underwater habitats can be challenging; traditional sampling
18 methods do not record all fish species, and are often conducted intermittently. As a result, fish
19 diversity, ecosystem health, and resulting conservation decisions are often inferred through
20 incomplete “snapshots” in time. Passive acoustic recordings can be conducted with high
21 spatiotemporal resolution, and can provide data on species of ecological and economic
22 importance that are missed by traditional sampling. This information is vital to understanding
23 fish behavior, including when and where certain species are spawning, which is key to habitat
24 conservation. We investigated the use of soundscapes as a tool to monitor fish biodiversity on
25 oyster reefs in Pamlico Sound, NC, by coupling soundscape surveys with traditional biodiversity
26 sampling. Fish vocalizations were detected in the soundscape especially at night when traditional
27 biodiversity sampling would not normally occur, and during short periods of activity which may
28 be missed by periodic sampling. In addition, soundscape composition changed over time, and
29 was related to changes in biological community composition. When coupled with traditional
30 biodiversity sampling methods, soundscape monitoring may provide a more complete
31 understanding of spatiotemporal patterns in fish biodiversity and ecosystem health, which will
32 inform future habitat conservation efforts in coastal ecosystems.

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34 **Keywords:** passive acoustics, soundscapes, biodiversity monitoring, fish diversity

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