

Assessing movement and feeding of Atlantic cod (*Gadus morhua*) in relation to environmental conditions and measures of marine biodiversity

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BACKGROUND

- Animal movement plays important role in ecosystem-level dynamics¹
- Understanding how the movement and feeding of top consumers such as Atlantic cod relate to biodiversity and environmental conditions is important for informing management efforts, particularly in a changing climate^{2,3}
- Acoustic telemetry, diet analysis, environmental DNA (eDNA), passive/active acoustics allow us investigate at how Atlantic cod movements and diets in the Gulf of Maine relate to **1)** environmental conditions and **2)** larger-scale marine biodiversity.

METHODS

- Acoustic tags were surgically implanted into Atlantic cod caught July-Aug 2023 and movements were tracked from July-December 2023.
- Stomach contents collected for diet analysis June-Sept 2023
- eDNA water samples collected monthly June-Sept 2023.
- Forthcoming data analyses will quantify movements and diets of individual tagged cod, looking at potential influence of environment (particularly temperature)⁴ and morphology, differences between sites, and how movements and diets of cod are linked to marine biodiversity.

DISCUSSION

- Preliminary results show a high degree of site fidelity. Movement within array increased in fall/early winter for some tagged cod (**Fig. 2**).
- Fish and crustaceans were dominant prey items.
- Ontogenetic shift of prey item category, with fish consumed more frequently by larger Atlantic cod (700-799 mm total length, **Fig. 4**).
- Temperatures at some sites approached cod thermal range thresholds^{4,5,6} (**Fig. 3**).
- 2024-2025 field seasons: Atlantic cod will be tagged with temperature and pressure-sensing tags.

RESULTS

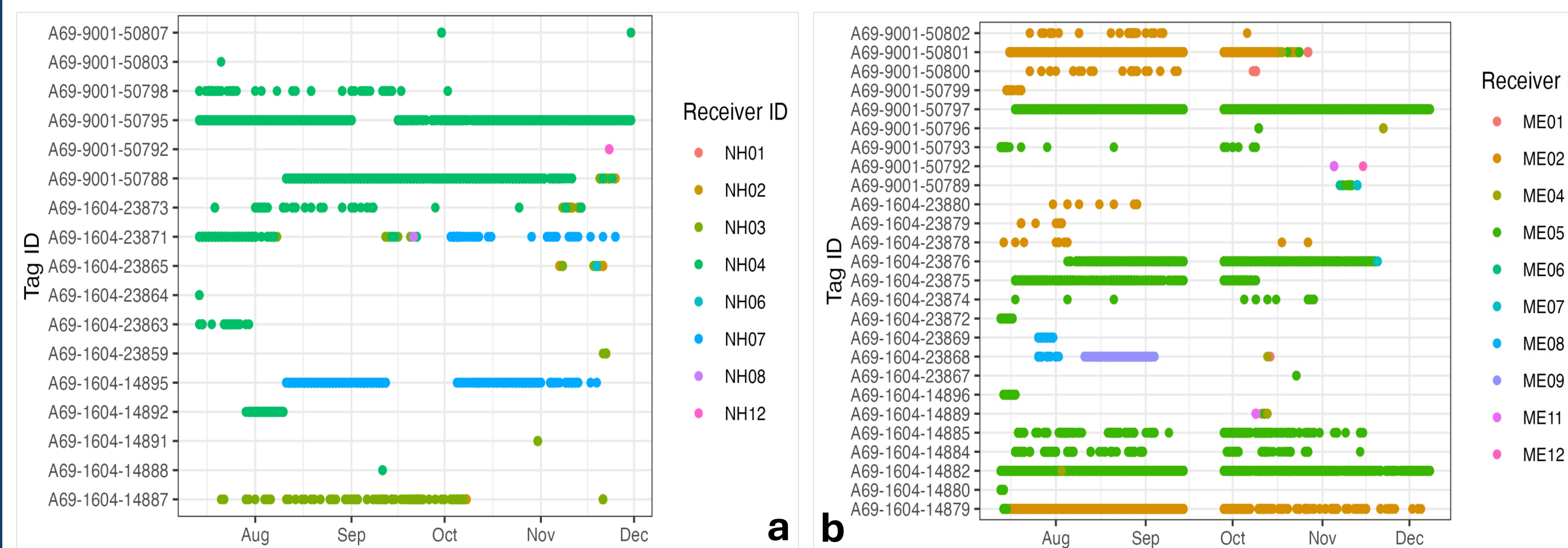


Figure 2. Detections of tagged Atlantic cod in New Hampshire (a) and Maine (b) arrays by tag ID and acoustic telemetry receiver site. 53% of tagged cod were detected in New Hampshire, 66% in Maine.

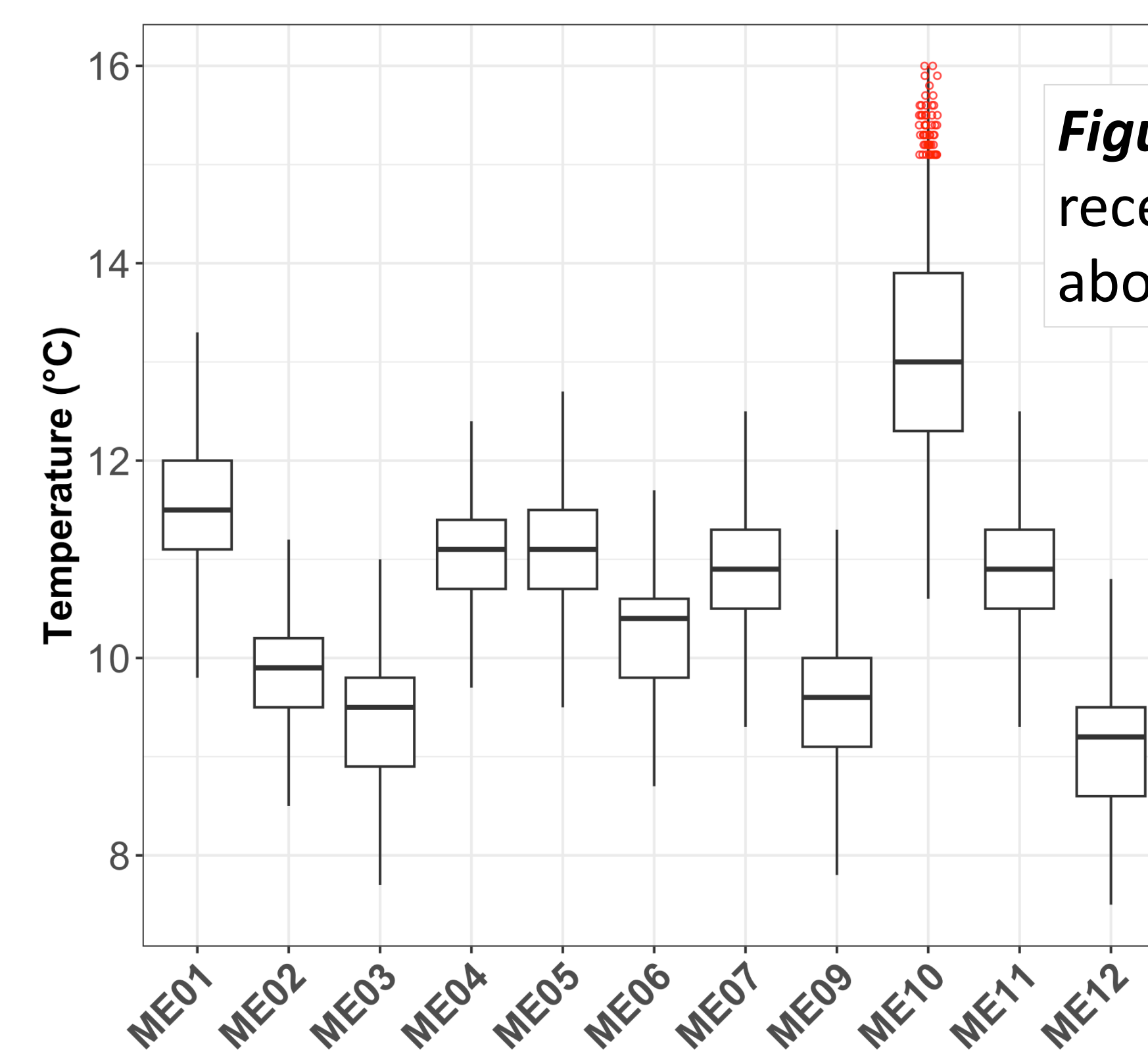


Figure 3. Average temperatures recorded by Maine receivers June-Sept. 2024. Red overlay indicate points above optimal^{4,5,6} temperature for cod.

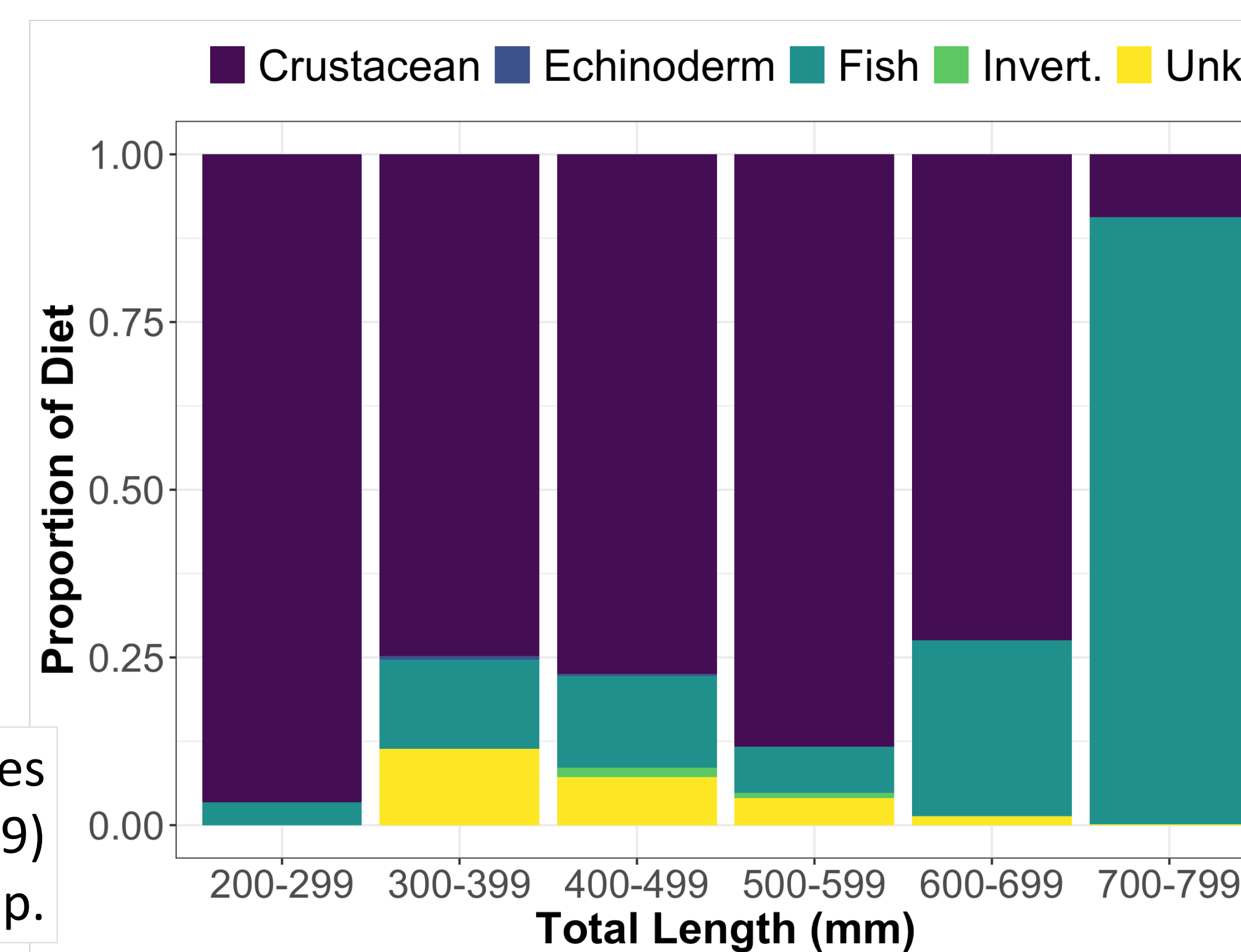


Figure 4. Predominant prey categories from diet analyses (Maine cod, n = 69) by size group.

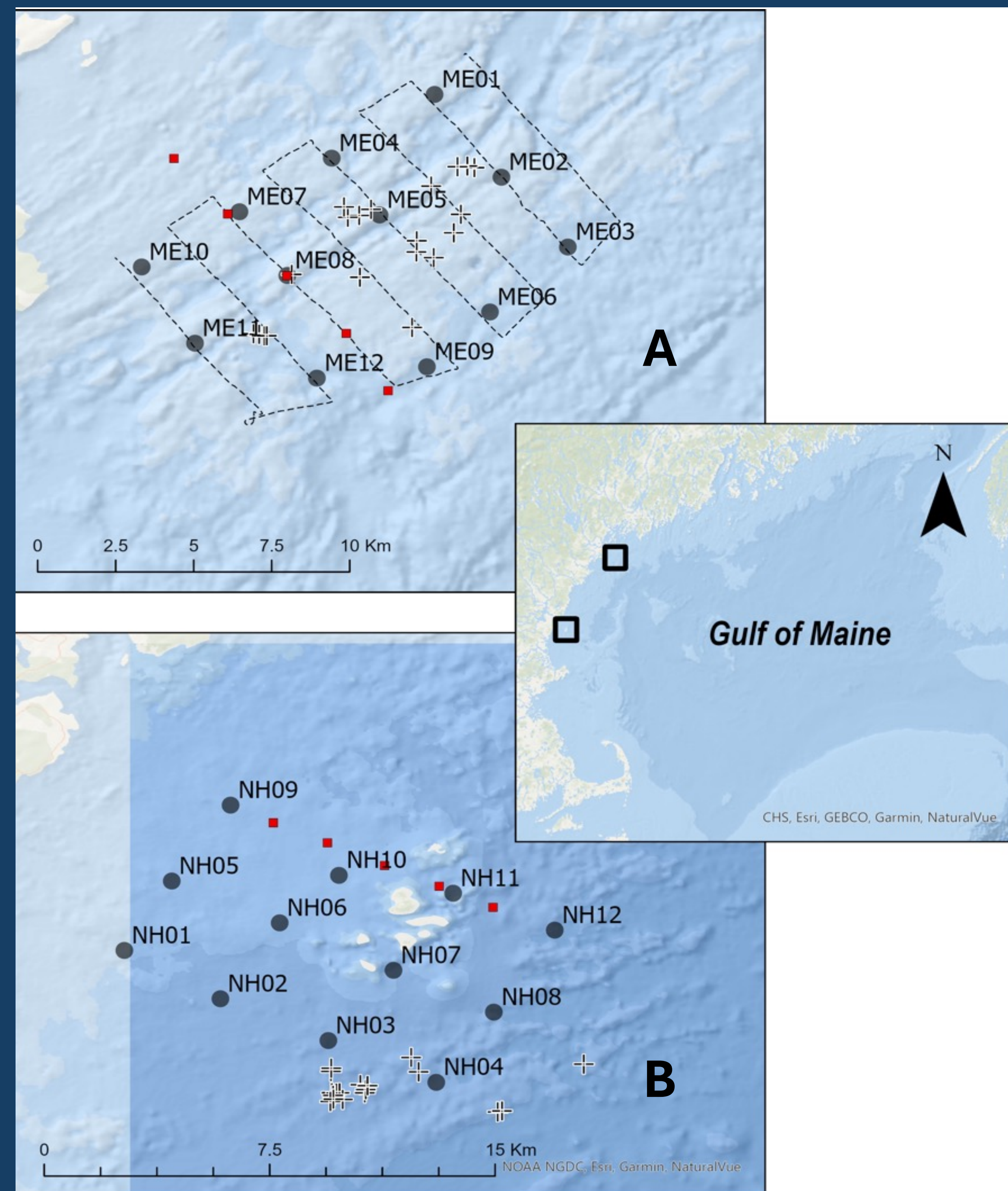


Figure 1. Location of acoustic receiver arrays in coastal waters of Maine (A) and New Hampshire (B). Blue points indicate receiver locations. Red points show eDNA sites. Crosses represent release sites for tagged Atlantic cod (Innovasea acoustic tags, NH = 32; ME = 38), dashed line represents active acoustics transect.



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