Notes to collaborators:

Hi team,

Just a heads up: QBC staff asked me to compile a coarse-grain QBC-CBASS 2024 wrap-up in early October. They already have less-detailed and QBC-specific versions of what I will discuss in my blurb. The thought was some of the information would be used in recruitment materials or social media posts (the internship application link goes live this month). I’ll also attach that to this email.  
  
I’ve included probably more information than is necessary. The background info is intended to bring non-experts like Pat into our line of thinking. I also know he loves data visualization. If only Isabelle reads this, I’m sure she’ll be bored. Feel free to adjust to the audience as needed.

Thanks,  
Katie

CBASS results 2024

Combined seining operations from both QBC and GMRI began June 6th and ran until October 9th (Fig. 1). This is a later extension into fall than previous years; this occurred in part because GMRI was unable to complete seining operations in August and most of September due to boat engine issues. Regardless, total 2024 sampling effort was similar to 2023 sampling effort. QBC interns participated in 11 weeks of operations, resulting in 66 seine samples, 198 eDNA water samples, and nearly 38 hours on the water. Dr. Lankowicz completed an additional week of sampling with QBC staff in September, bringing the total time spent on seine operations at QBC to 42 hours. GMRI staff and REUs completed 10 weeks of operations, resulting in 54 seine samples, 162 eDNA water samples, and 29 hours on the water.

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Figure 1. Time spent on the water each week of the 2024 field season by agency (QBC = green, GMRI = blue).

QBC interns collected, identified, and measured more than 5,500 fish representing 20 different species. The interns learned the basics of finfish anatomy and the use of dichotomous keys to aid in species identification. GMRI staff identified 11,300 fish representing 21 different species. Species composition was similar between the collections, with more representation of highly migratory pelagic species (Atlantic mackerel, Atlantic saury) near Harpswell and more representation of freshwater and anadromous species (Atlantic sturgeon, American eel, fallfish) near Portland. Notably, several “Gulf Stream orphans” (crevalle jack, permit) were caught by QBC in August and September, when GMRI was unable to sample. These “orphans” include several subtropical or tropical species that have native ranges entirely south of Cape Cod, but will occasionally be entrained in Gulf Stream eddies as larvae or juveniles. They will then be advected further north than typical adult distribution, grow through the summer season, and die when Gulf of Maine winter water temperatures decrease beyond their thermal tolerances. As in previous years, nearshore fish community assemblage was dominated by Atlantic herring early in the summer, but shifted to Atlantic silverside by August (Fig. 2).

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Figure 2. Weekly Casco Bay nearshore community assemblage, as determined by combined QBC and GMRI seine samples. Results are presented as species proportion (%) of weekly total catch. Notice how Atlantic herring (yellow bars, herring) catch declines from highs in early June until a sudden disappearance in early July. Conversely, Atlantic silverside (purple bars, slvrsd) catch increases over the summer and dominates weekly catch by late July. Other frequently caught species include green crab (blue bars, g.crab) and mummichog (dark green bars, mmichg). White mullet schools (light green bars, w.mllt) were notable in early August, but did not otherwise make up significant portions of catch.

Another notable result was an increase in Atlantic tomcod catch per unit effort (CPUE) from previous years (Fig. 3). Tomcod reach sexual maturity at 11 months and can live to 4 years, though there is evidence that few live past age 1 (Waldman 2006). They spend their entire lives near the bottom of shallow estuarine and nearshore areas, migrating to fresh upstream waters in the winter to spawn and returning to brackish environments in the spring. Though as estuarine residents they are resistant to seasonal temperature swings, they prefer colder temperatures. When water temperatures rapidly increase in the summer, tomcod move to slightly deeper, colder waters. Previous studies on temperature-linked distributions of juvenile tomcod have indicated both that they used to be abundant in nearshore Maine waters into July and that they are likely to avoid areas with bottom temperatures that exceed 22°C (Targett and McCleave 1974). Associations between environmental conditions and tomcod catch will be explored in the forthcoming Ecosystem Indicator Report. We expect to see positive associations between tomcod catch and a combination of colder winter water temperatures, delayed spring warming, and increased winter precipitation.

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Figure 3. Atlantic tomcod daily catch per unit effort (sum of fish caught divided by number of seine hauls) for all CBASS sampling years. Dots indicate observed daily CPUE, and blue lines are local regression (also known as moving average) models of summer CPUE. CPUE has historically been highest in late June. Note the decrease in CPUE from 2014 through 2023. Record catches of Atlantic tomcod in June 2024 drove a return to near time-series-high CPUE.

CBASS publication timelines

To support the initial Ecosystem Indicator Report, Dr. Lankowicz began analyzing links between summer water temperatures and growth rates for Atlantic silverside and Atlantic herring. These species are both common to Casco Bay but have dichotomous life histories. Herring use estuarine areas like Casco Bay as nursery grounds in winter and spring and move to offshore environments as nearshore water temperatures exceed their thermal tolerances. Silverside are year-round estuarine residents and can tolerate much warmer waters. Initial analyses indicated that warmer summer water temperatures lead to significantly faster growth for young-of-year Atlantic silverside, but likely decreases Atlantic herring young-of-year growth. In the summer of 2024, QBC intern Courtney Swenson developed an interest in the project and chose to collaborate on it with Dr. Lankowicz. She completed a part of the analysis to fulfill her intern research project responsibilities. She has since agreed to work with Dr. Lankowicz as a co-author on a peer-reviewed article that will include her work. We expect to complete a first draft by the end of February 2025 and submit a final draft to a peer-reviewed journal by July 2025.

References

Targett, T.E., and McCleave, J.D. 1974. Summer Abundance of Fishes in a Maine Tidal Cove with Special Reference to Temperature. Transactions of the American Fisheries Society **103**(2): 325–330. doi:10.1577/1548-8659(1974)103<325:SAOFIA>2.0.CO;2.

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