Green Crabs – Special Feature (SOOE Extended)

Question:
What is the abundance and distribution of green crabs in Great Bay Estuary temporally and spatially?

Short Answer
Green crabs, *Carcinus maenas*, are a non-indigenous, highly adaptable (Monteiro et al. 2021) and naturalized member of the Great Bay and Hampton Estuary ecosystems (Figure GC-1). They are considered a nuisance to the oyster aquaculture industry and a detriment to eelgrass beds and wild oysters (Pickering et al. 2017). Periodic monitoring through trapping helps us to understand the current situation of this invasive species and keep track of any increases or decreases in their abundance. Warmer waters associated with climate change have made it easier for green crab populations to grow and thrive nearly year-round (Monteiro et al. 2021). Consequently, it is increasingly more difficult for the habitats where they occur and the industries that they affect to remain healthy and sustainable.

Why We Track This Indicator
Spatial and temporal tracking of green crabs in the Great Bay Estuary helps us determine their densities, reproduction cycles, and molting periods, and sheds light on population expansion and how this species is changing the ecosystem. Green crab foraging behavior can affect the health of the Bay by altering important habitats, which in turn can negatively impact fish and wildlife, water quality, and recreational/commercial fisheries. Crab monitoring also provides critical information for seagrass restoration teams, oyster farmers, oyster restoration teams, living shoreline projects, residents, and management teams. For example, an oyster farmer may not want to apply for a new farm in an area that is heavily infested with green crabs year-round.

Figure GC-1. Green crabs captured in the Great Bay Estuary.

Explanation

Green crab trapping studies have been conducted in the past (Fulton et al. 2013, Goldstein et al. 2017) but not for almost 10 years and never investigating wild versus farmed oyster areas. From April through November in 2021 and 2022, replicates of three trapezoidal green crab traps (Figure GC-2) were set out at four sites throughout Great Bay Estuary (Figure GC-3); two wild reef sites, Nannie Island and Lamprey River, and two farmed sites, Fox Point and Cedar Point. Green crabs collected each week were weighed, measured, and sexed. Abundance of green crabs was converted into catch per unit effort (CPUE), which is the number of green crabs divided by how many hours the trap was submerged in the water (Figure GC-4).

Figure GC-2. Redeploying a trapezoidal green crab trap. Photo credit: Tim Briggs

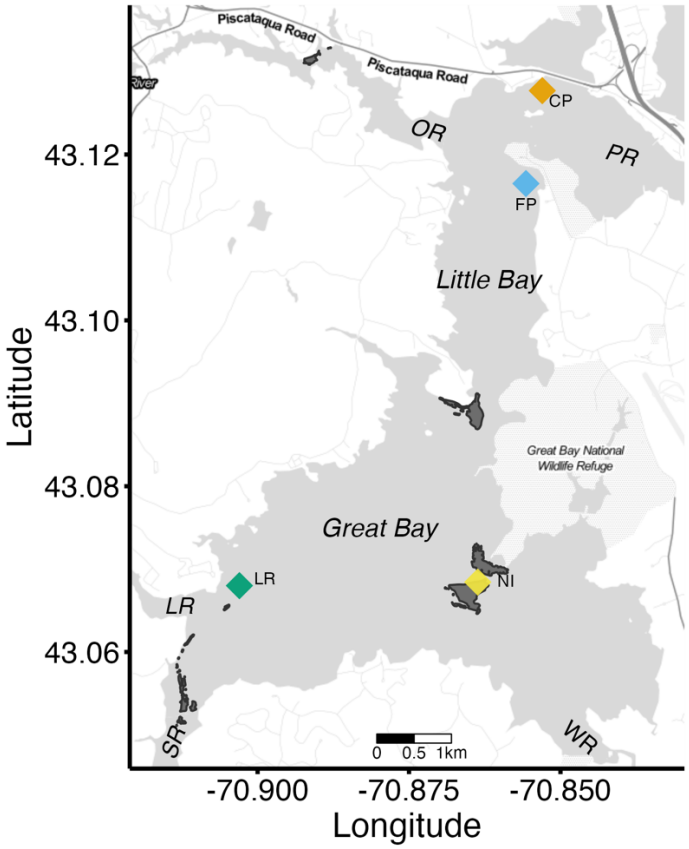

Figure GC-3. Map of Great Bay Estuary showing four sites (diamonds) where trapezoidal crab traps are deployed. Areas shaded in dark gray are natural reefs. There are two oyster farm sites, Cedar Point (CP, orange diamond) and Fox Point (FP, blue diamond), and two native oyster reef sites, Nannie Island (NI, yellow diamond) and Lamprey River (LR, green diamond). Squamscott River (SR), Lamprey River mouth (LR), Oyster River (OR), Piscataqua River (PR), and Winnicut River (WR) are shown on the map for reference.

In both years, male green crabs were captured in much greater numbers than female green crabs (Figures GC-4 and GC-5). The highest CPUE observed in 2021 (Figure GC-4) was at the farm near Cedar Point between late July to mid-August. Nannie Island, a reef site in the Great Bay proper, had the second highest CPUE. At Lamprey River, few green crabs were observed, and the first appearance did not occur until August. In 2022, Nannie Island had the highest CPUE throughout the season and Lamprey River exhibited crabs in April and yielded more green crabs compared to 2021 at that site (Figure GC-5). The low numbers of females captured appears to be due to a narrower range of movement than for male green crabs; better access to females will require deployment of more traps in many other locations around the Bay. The differences that occurred between 2021-2022 could be due to record differences in precipitation that could greatly affect the salinity gradient in Great Bay Estuary. Studies have shown salinity influences both catch and range of male and female green crabs (Monteiro et al. 2021, Fulton et al. 2013). Interestingly, beginning in September 2022, blue crabs (*Callinectes sapidus*) were found either exclusively in the traps or together with green crabs on many occasions throughout the remainder of the season.

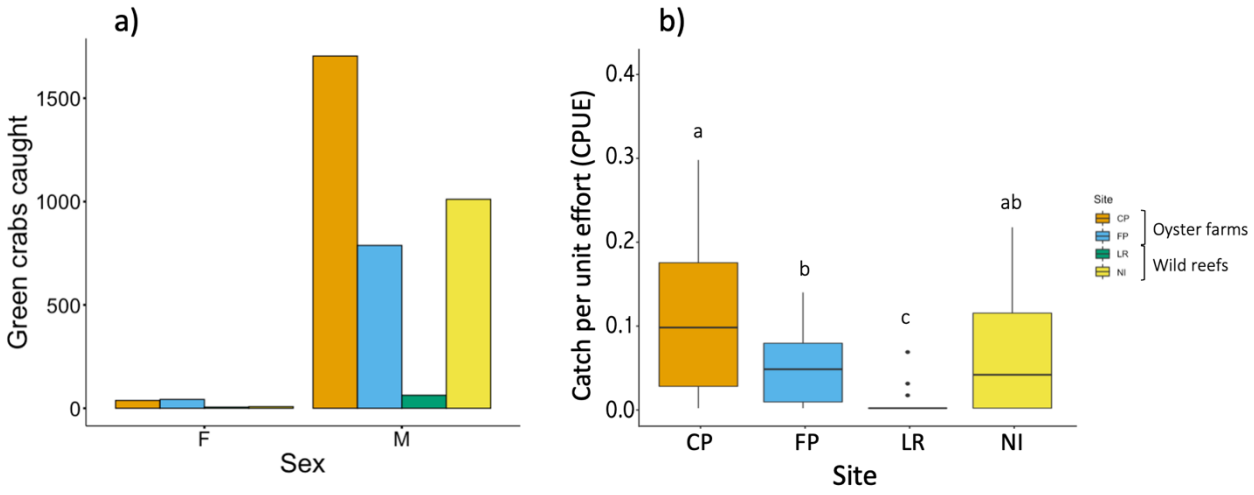

Figure GC-4. Plots showing a) the total numbers and b) the average CPUE of green crabs caught in GBE in 2021.Significant differences are denoted by different letters above each box. Site abbreviations as in Figure GC-1.

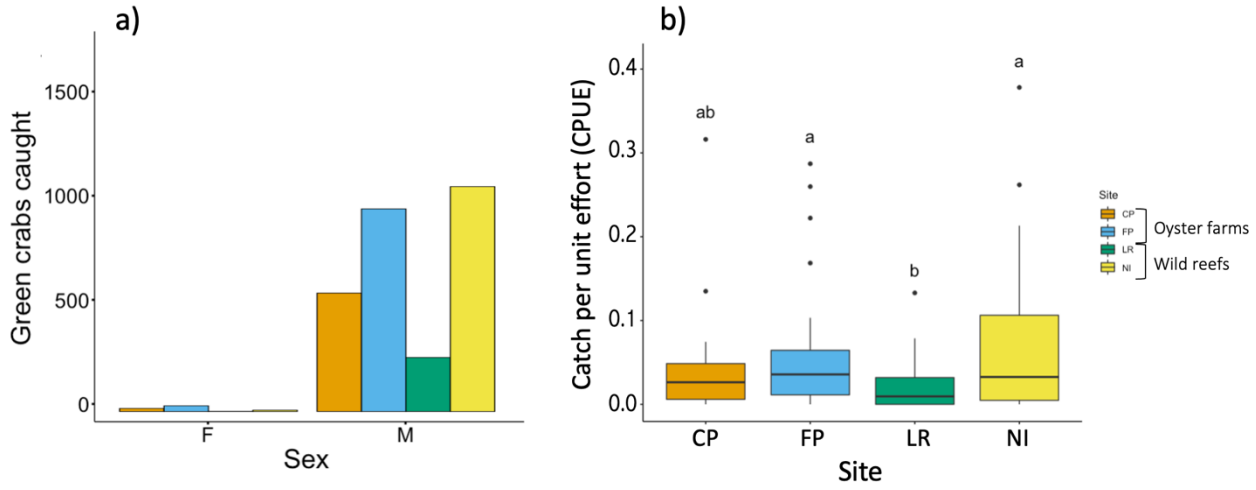

Figure 4. Plots showing a) the total numbers and b) the average CPUE of green crabs caught in GBE in 2022. Significant differences are denoted by different letters above each box. Site abbreviations as in Figure 1.

Work on this topic is relevant currently due to the lack of mitigation and population control methods of green crabs in this ecosystem. Modeling the abundance and distribution of green

crabs will provide information of where these green crabs are, what time of year and where they congregate, differences between male and female crabs, and their activities and interactions at oyster farms, wild oyster reefs, and eelgrass beds (e.g., at Nannie Island).

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