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Abundance of European Green Crabs in Different Substrates

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Abundance of European Green Crabs in Different Substrates

By Morgan D

Introduction:

The European green crab (*Carcinus maenas*) is an invasive species that was accidentally brought to the United States in the 1800's, and has since moved to the Maine coast (State of Maine Department of Marine Resources, 2013). These crabs have been spreading rapidly and taking over the coast for a long time. They eat all kinds of shellfish and will even eat other crabs. This means that, among many other problems, the shellfish industry has been greatly affected, and native crabs have become much more scarce.

I am investigating which substrates green crabs are found in the most. It will be much easier to deal with the crabs if we know where the majority of them can be found, and knowing their preferred habitat could help us learn more about them. Previous studies on this matter have found that green crabs in Maine tend to live in seaweed (specifically knotted wrack weed, *Ascophyllum nodosum*), rocks and ledges, and muddy areas (*Report by the Governor's Task Force on the Invasive European Green Crab*, 2014). This investigation is important to the field of science because green crabs are a danger to the shellfish industry and the biodiversity of our coasts. They're messing up the Maine coast's ecosystem, and feeding on plants that protect a lot of sealife.

Methods:

From 2019 to 2020, we at the Cornerspring Montessori Middle School have gone to the beach of Moose Point State Park once a month almost every month, except during the winter. We could only go this often because crabs are found in the intertidal zone, so we could only find them during low tide, and during the winter it's too cold for them to be found there. We measured a 100 meter transect, keeping it one meter away from the shoreline, and randomly sampled a position on the transect. We placed a square-meter quadrat at that location and searched for crabs in it. This was repeated multiple times each trip, always on the same transect.

Before we searched a quadrat, we wrote down what substrate it was in. The different substrates are as follows: mostly ledge, mostly movable rock, mostly mud, mostly seaweed, mostly shell pieces, and other. When we found a crab, we determined its species (green, asian shore, or native), its size in millimeters, its sex, whether it had

eggs, whether its shell was hard or soft, and the amount of claws it had. Multiple people double checked our answers, to make sure. We then placed it in a bin to make sure we wouldn't count the same one twice. After we completed the quadrat, we put the crabs back and moved on to the next quadrat. No changes were made to the procedure, although there may have been smaller crabs that were missed in camouflaged areas such as seaweed.

Results:

Figure 1

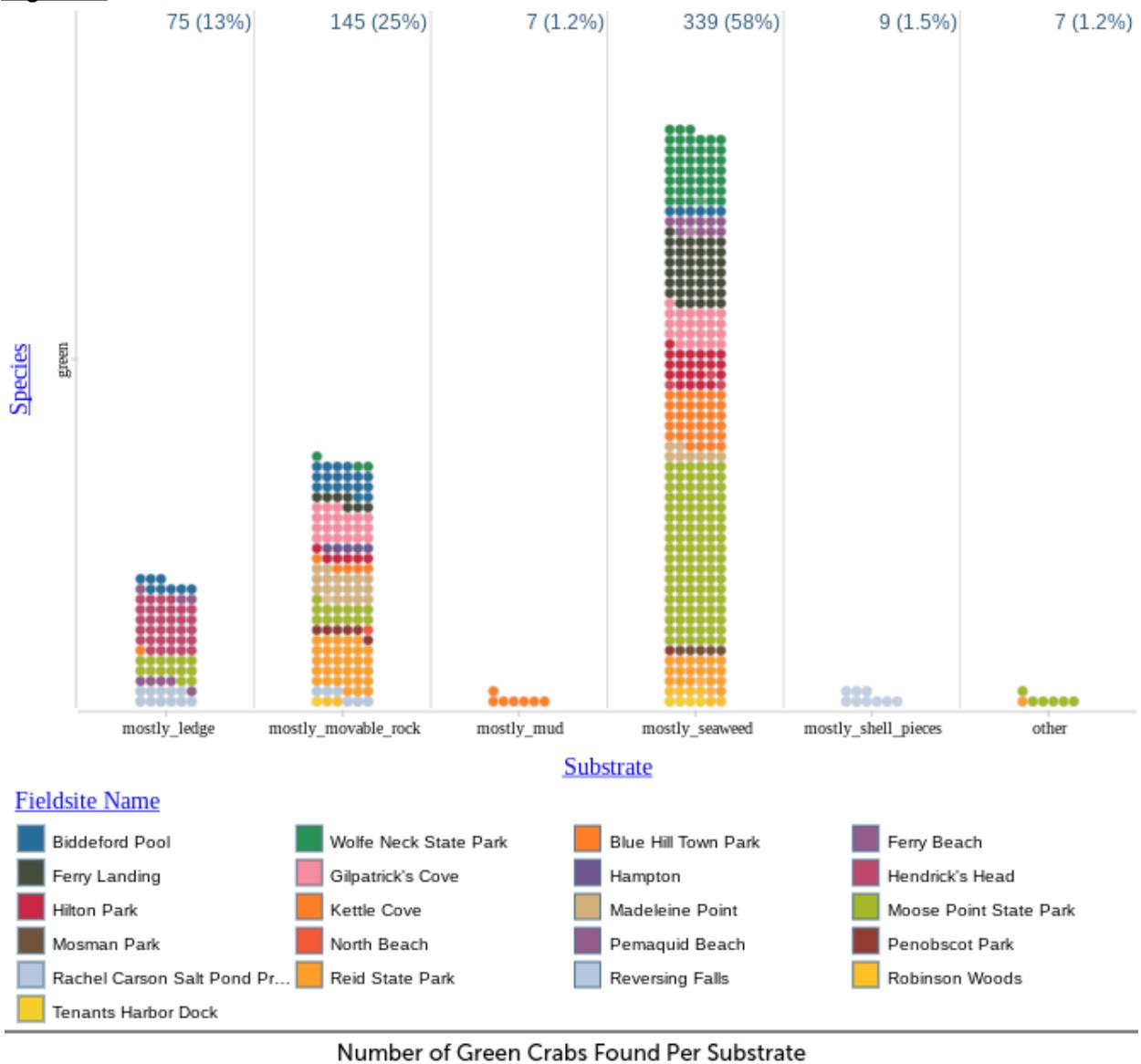


Figure 1 shows how many green crabs were found in different substrates along the coast of Maine and New Hampshire, color coded by which field site they were found

in. Green crabs were found the most in mostly seaweed, with 58% of them being found there. A quarter of them were found in mostly movable rock, and 13% were found in mostly ledge. Not including the “other” section, the least were found in mostly mud, with only 1.2% of cases being found there. Mostly shell pieces also had very few crabs, only 1.5%. There is probably a less frequent substrate in the “other” category, though.

Figure 2

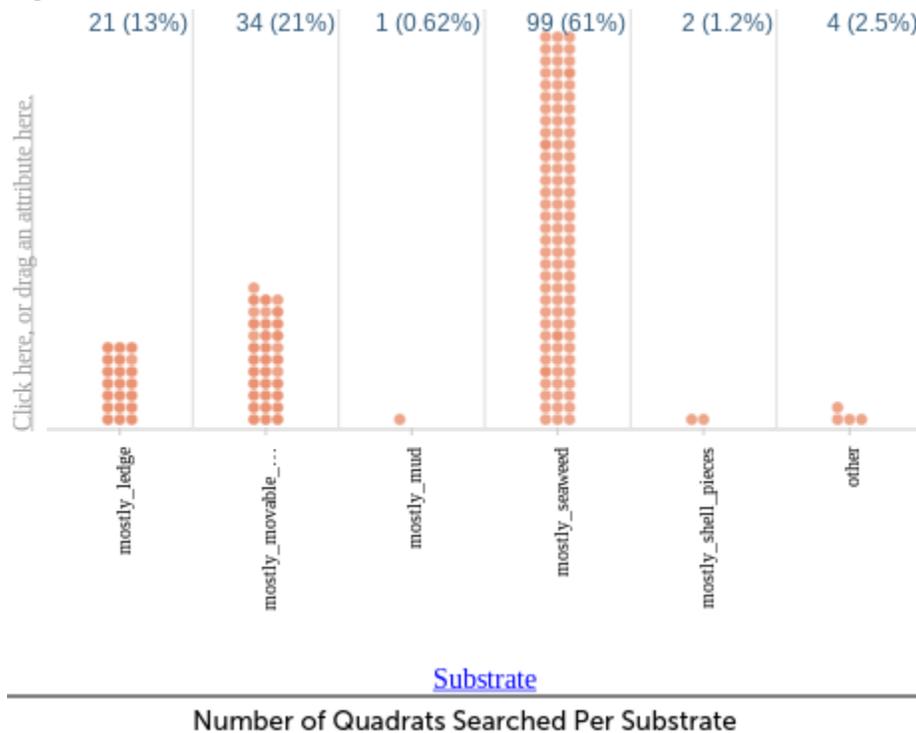


Figure 2 is the amount of quadrats that were laid out and searched in each substrate. Combining this with the amount of green crabs found in each substrate, we’re able to calculate the average number of crabs found in a quadrat for each substrate. The substrate with the most crabs found per quadrat was mostly mud, with seven green crabs per quadrat. This is from only one quadrat, though, so it could be classified as an outlier, along with mostly shell pieces, which had 4.5 average crabs but only had two quadrats. Therefore mostly movable rock, which had 4.26 crabs on average, would have the most. The substrates with the least crabs per quadrat were mostly seaweed and mostly ledge (unless you count “other”, with 1.75 crabs per quadrat), with 3.42 and 3.57 respectively. This is very interesting, because mostly seaweed had the most total green crabs found, and mostly mud had the least. Mostly movable rock and mostly shell pieces were in the middle, with 4.26 and 4.5 respectively. The range of number of green crabs found in a quadrat is 16 in mostly ledge, 26 in mostly movable rock, 11 in mostly seaweed, 7 in mostly shell pieces, and 4 in other. The quadrat with the most green

crabs found had 26 green crabs in it and was searched in mostly movable rock, while its closest successors only had 16.

Conclusions/Discussion:

The most green crabs, 58% of them, were found in mostly seaweed, and the least, 1.2%, were found in mostly mud. This divided by the number of quadrats searched in each substrate gives the average number of green crabs found in a one-meter area. This is a lot more helpful than the base amount of crabs, because there's a huge difference between how many quadrats were searched between substrates, so the data is far from reliable unless it's per quadrat. Excluding outliers, mostly movable rock had the highest average number of green crabs found in a quadrat, with 4.26, while mostly seaweed and mostly ledge had the least, with 3.42 and 3.57. Mostly mud had seven and mostly shell pieces had 4.5, but they each only had one or two quadrats total, so there isn't enough data for them to be accurate. Because of this, they will be considered as outliers. If we were to further this research, it would be good to collect more information about these substrates. To sum up, the most total green crabs were found in seaweed, but green crabs are most abundant around movable rock. This research also opens up the question of how the substrate preferences of green crabs compare to the ones of native crabs and Asian shore crabs.

Movable rock provides a lot of shelter, and can protect the crabs from many dangers. It would make for a very good home. Ledges, on the other hand, are very solid, without many cracks or crevices to hide in. They're also not easily traversable, so it's a less viable place to live. Seaweed is the same, not offering as much physical protection as solid rock. It hides them well, but they're otherwise out in the open. This is why I think the crab distribution is how it is. However, there aren't huge variations between frequencies, which makes sense, because every substrate has its benefits.

I think this claim is fairly accurate, but there are a few factors that could've affected it. A lot of this data was collected by other people. We don't know how thorough they were, or how close their procedure was to ours, or how reliable the data they had was. There are also probably many crabs that were missed in the searching process, despite our thoroughness. On top of that, there were times when we went out and searched for them, but there were barely any because it was near the winter and too cold. This brought our average down and probably a couple of other people's. Because of this, I'm fairly confident about which substrates have more green crabs, but I don't think the exact numbers are perfect.

References:

State of Maine Department of Marine Resources. (2013). Green Crabs in Maine.
maine.gov.

<https://www.maine.gov/dmr/science-research/species/invasives/greencrabs/index.html>

Report by the Governor's Task Force on the Invasive European Green Crab. (2014,
February 28). maine.gov.

<https://www.maine.gov/dmr/science-research/species/invasives/greencrabs/documents/taskforcereport2015.pdf>