The Populations of the Green Crabs at Phippsburg and Georgetown

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Abstract

The green crabs have been a problem for 200 years in the Maine fishing industry and have only now been a threat to our fishing community. We went to Todds Landing, Griffith's Head, and Ft. Popham to measure the population of green crabs over the past four years. We split the seventh grade into two groups so we could measure the population in Ft. Popham, Todds Landing, and Griffith's Head so we could be more efficient. We put the results of the data into graphs and compared the trendlines; therefore finding out that the population may have decimated the ecosystem where they were living. I ruled out other conclusions by looking at the trendlines and ruling out possible scenarios that could of had similar trendlines.

Introduction

The invasive green crab population has been a problem in Maine for years now, but why has the population suddenly exploded. Well according to Ruby Nash the author of *Invasive green crabs inundate area waters, decimate clam flats* "green crab females carry at least 165,000 eggs per mating cycle. With the influx of warm waters, more and more of the larvae are reaching maturity." This is important because of the warming waters green crabs have been surviving through juvenile age and have been growing to maturity and spawning more and more eggs which is bad for the economy. In Maine there are a lot of towns that revolve around the fishing/clamming industry and if there's a lack of resources from the green crabs there won't be as many fish or clams to sell. Green crabs have affected the local Maine economy and not for the better.

Green crabs arrived in North America in the ballasts of ships in the early 1800's and ever since then their population has been growing significantly due to climate change and warming waters. Green crabs thrive in warm waters which is why they are populating Maine. For example NASA Earth Observatory states "Over the past 15 years, the basin has warmed at seven times the global average. The Gulf has warmed faster than 99 percent of the global ocean", which is why green crabs have had such a devastating impact to our ecosystems in Maine. In the search of food green crabs have ripped up almost all the eelgrass in the Marine ecosystems. By doing that the green crabs have increased the water turbidity and increased the pH of the water making shellfish softer and more vulnerable for the green crabs to eat.

Even though we think we know a lot about green crabs there's still so much we don't know about them. Scientists are still trying to figure out when the green crabs molt and become soft shell so we can start a green crab season and eat them without as much difficulty. Scientists also don't know how many green crabs are at, which is why we are conducting research on green crabs and the environment in order to Todds Landing, Griffith's Head, and Ft. Popham in order to help the scientists compriend the green crab situation and how to stop it.

We went to Todds Landing, Reid State Park, and Ft. Popham because we wanted to study the population of the invasive species in these areas. We went to areas that no one else has researched before in order to bring new data to the table and help out scientists with no history of these areas.

Methods

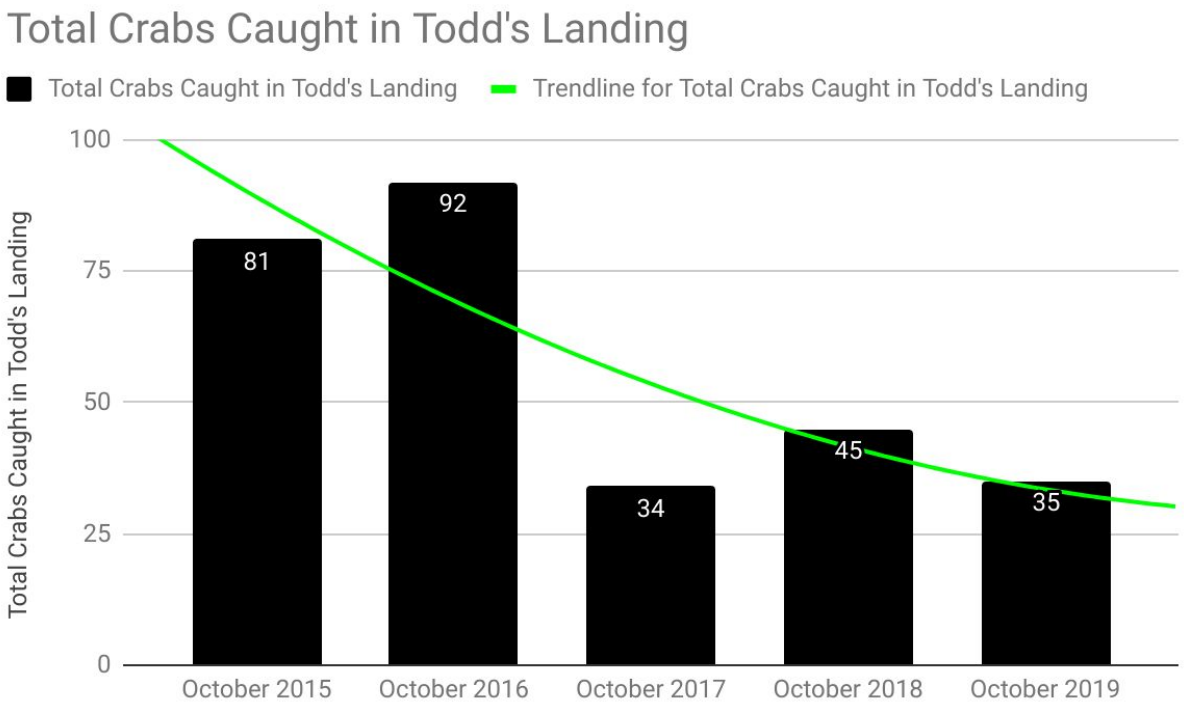
Multiple groups of 7th graders from Bath Middle School went to Todds Point, Reid State Park, and Ft. Popham on Oct. 21, 22, and 24 in 2019 to study the population of green crabs. All traps we used were set a day before the research so they had a full 24 hour cycle of the tides. We used barrel and trapezoid crab traps. For bait we used canned sardines that were preserved with sunflower oil so the fish smell wouldn't mix with the water and the smell would be more fragrant for the crabs. We poked multiple tiny holes in the cans so we could preserve the smell for the whole 24 hours. When we pulled out the crab traps we quickly recorded the by-catch and put them back in the water. We measured the crab carapace and marked them so that if we caught them the next day we would know. The crabs were put back in the same spot where they were found so the next day there wouldn't be any unfair data.

It was important that we split up the seventh grade because it was a faster and more efficient way to collect the data. The past groups along with us were careful to go in October every year so we could compare the past data to the data we collected this year.To make it fair we all went at low-tide every time we went so we could compare each others data from past years.

While we were collecting our data, we realized we could see the trap poking up out of the water so because of that we had to add more rope to the trap to throw it out farther so the crabs don't have to climb out of the water to enter the trap. One day it was pouring out so we decided to postpone the collecting of data which left the crabs out for 48 hours instead of 24 and because of that there was more time for the crabs to accumulate in the trap. When we were adding our bate the holes we poked weren't consistent which for some meant more bait/more crabs or another day it was less bait/less crabs. When we were taking the crabs out of the trap we had to amputate a claw or leg in order to remove them from the trap or to stop them from hurting other crabs. This procedure only happened once and did not affect measuring the crabs.

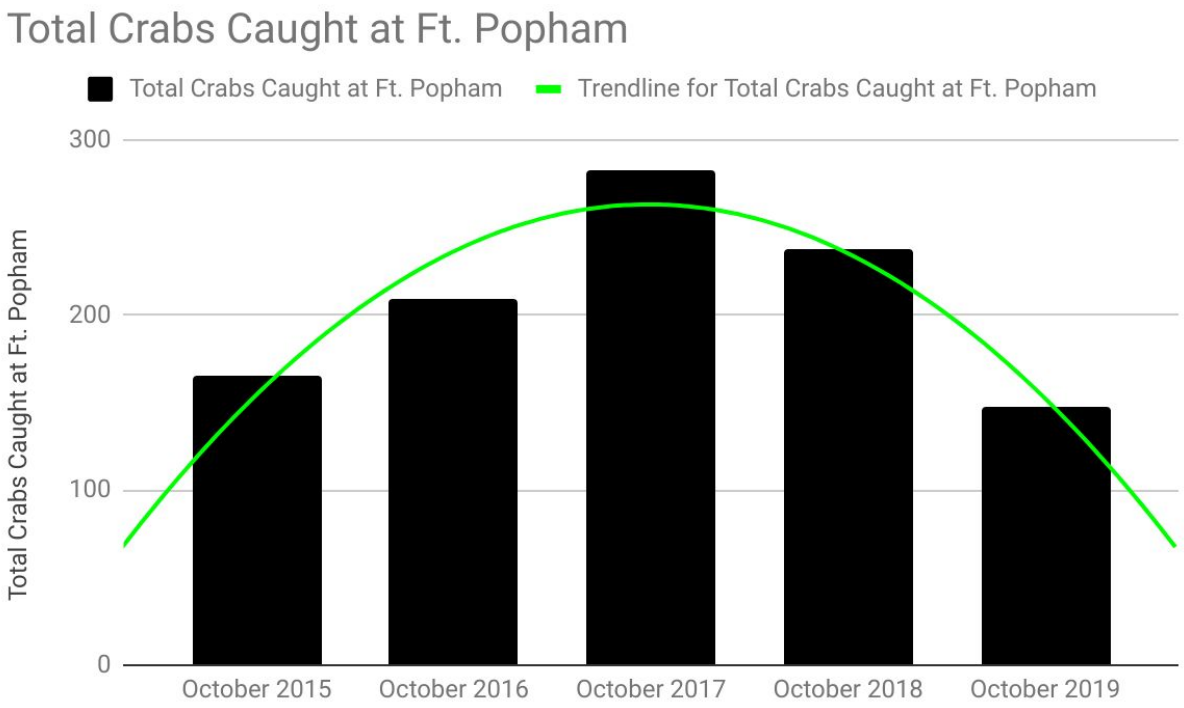
Results

These are the results of the crabs caught at Todd’s landing, Georgetown, Maine.



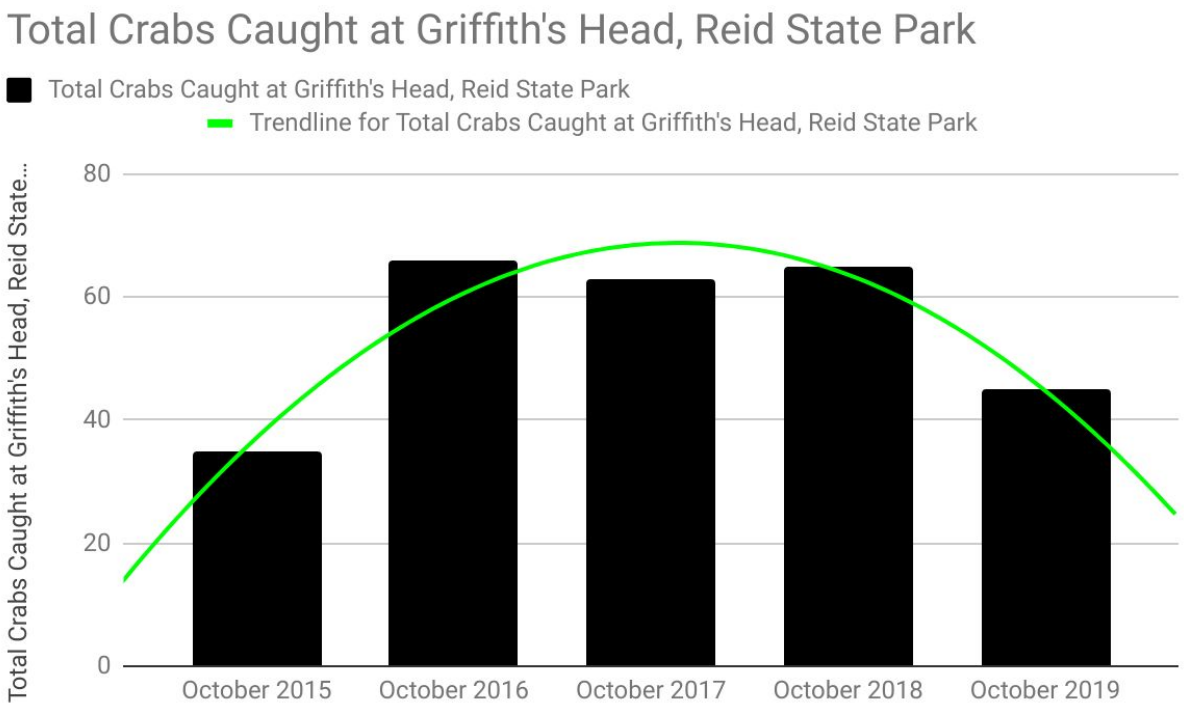
As you can see the crab population gets larger until it suddenly declines in 2017. In 2018 there was a slight increase of crabs in. Then the population fell back down in 2019 back to where it was in 2017 with a one crab difference.

These are the results of our findings from Ft. Popham, Phippsburg,Maine.



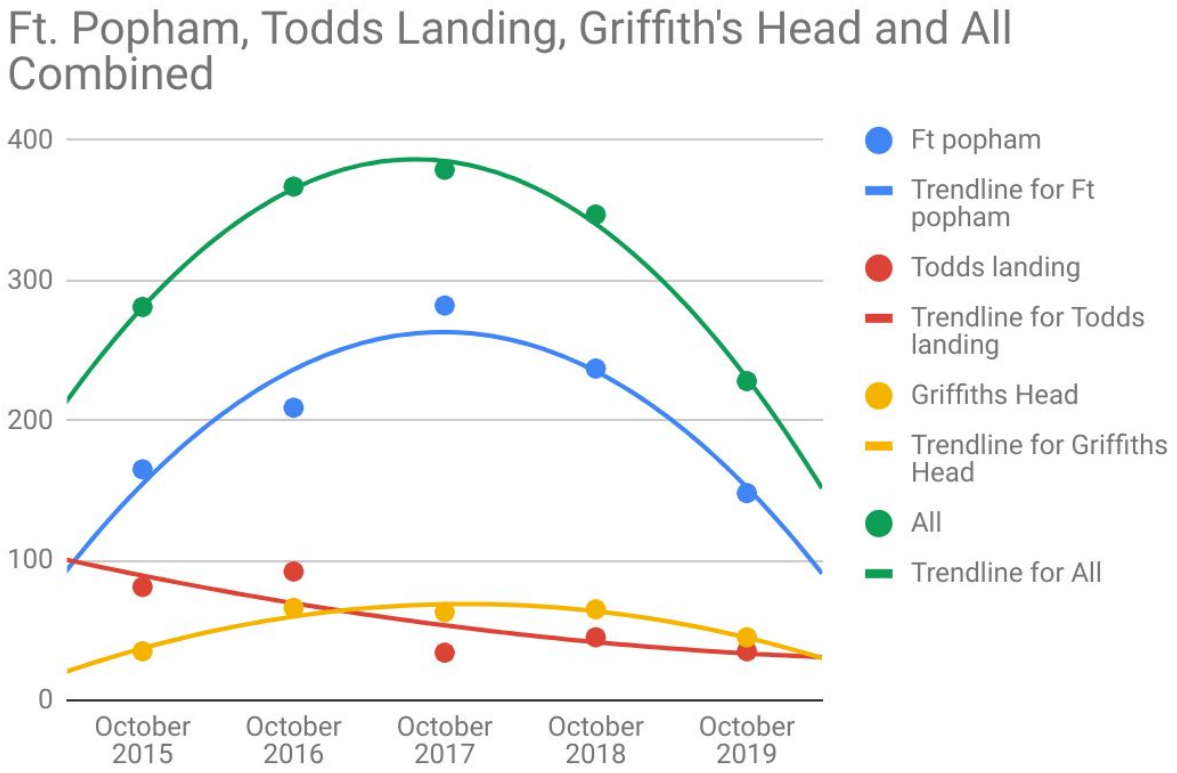
This graph shows the slight increase in population Through 3 years, then after reaching the peak of which the ecosystem can't handle the crabs the population started decreasing at the same rate at which is was rising. If you look at the Polynomial trend line you will see the resemblance of a semicircle which gradually increases than decreases just the same.

These are the findings from Griffith's Head, Georgetown, Maine.



The graph of Griffith's Head kind of like the graph of Ft. popham has the same trendline for how the population of crabs increase and decrease through the years. Except the Griffiths head graph is based on a smaller scale of counting by 20s instead of the Ft. Popham graph which is counting by 100s which is a larger scale but still saying the same thing.

These are all the findings compared on a scatter plot.



In this scatterplot of all the locations you can see that Todds landing and Griffith's Head are both alike this may be because of how close they are in location compared to Ft. Popham which is going the opposite direction from Reid State Park. Put on the same graph now you can compare how much crabs were caught at Ft. Popham compared to the other places. If you look at all the crabs collected on 2017 the number of crabs caught is almost 400 crabs caught in only 3 days.

Discussion and Conclusion

Through my investigation I have found that whenever the green crab population would increase to the max that the ecosystem can handle. We would experience a sudden drop in the population continuing in a semi-circle pattern until the ecosystem has recovered enough to regain the population. Though with Todd's Landing the data follows the same process in decreasing just like the other areas except that instead of semi-circle it drops drastically and starts into a loop that rises and falls to about the same order every year.

My claim is based on the following evidence of how every time in the year 2016-2018 the data would reach its climax and decline to how it roughly started. I observed that my Todd's landing even though it follows the same rule. It's different because it starts really high and drops drastically than stays between 45 and 34.

This evidence suggests that the green crabs kept populating until the ecosystem couldn't handle the green crabs and in return the crab population started declining from lack of resources. I ruled out other conclusions by looking at the rate of change of which the population declined. If you look at the scatter plot you can see that it rises and drops in a way that if it was just the crabs moving in and out of the sites it would be too complex and there would need to be coordination in how many crabs left that year and how many came back which would seem difficult for green crabs to accomplish. I also ruled out the idea that the green crabs got smarter because if you look at the beginning of the graphs the amount

caught rises for a few years until it starts declining. It would be unrealistic to say the crabs got smarter, because the growth in crabs caught kept rising to almost double what was caught in the first year

Some factors that may have impacted my data are how every year there were new kids taking the data with different attitudes towards the subject. I don't have enough evidence to make a clear conclusion because I don't have access to how the weather was when we were collecting the data and that may have driven away the crabs causing a different result then years before.

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