Crabs

LEVİ, LEXİ, GEM

Research Question:

Which beach (Marine Park, Boulevard Park, or Locust Beach) has the largest crab population?

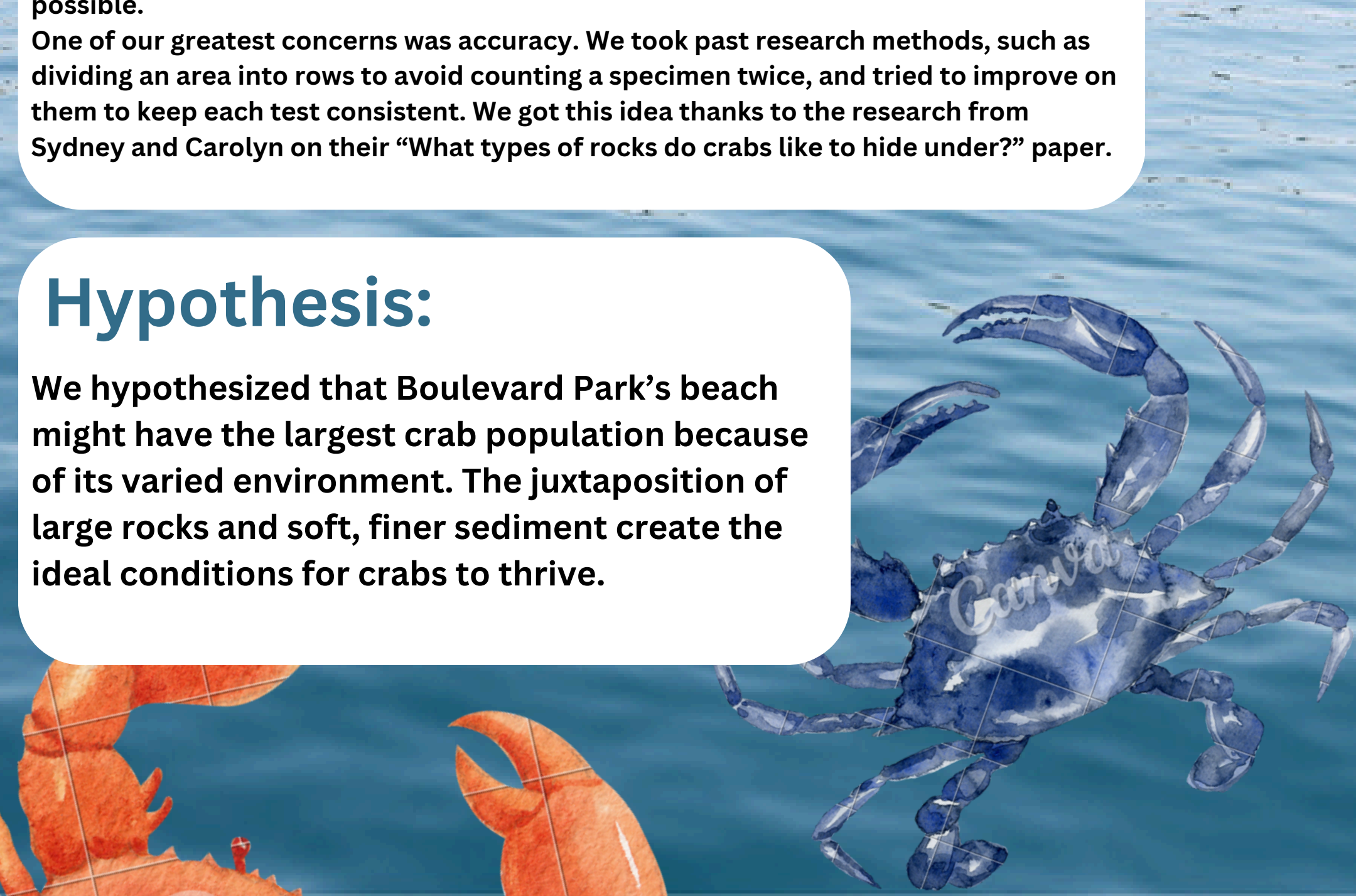
Background Research:

In the past, other students have done research projects on crabs, asking such questions as “What types of rocks do crabs like to hide under?” and “What effect does dissolved oxygen have on crab population and shoreline health?” We wanted to expand on that research by measuring a more general statistic - crab population by beach location. By learning from these presentations, as well as a professional team organized by the Sea Grant Participatory Science Network, we were able to devise and refine our methodology to ensure that our data was recorded as accurately as possible.

One of our greatest concerns was accuracy. We took past research methods, such as dividing an area into rows to avoid counting a specimen twice, and tried to improve on them to keep each test consistent. We got this idea thanks to the research from Sydney and Carolyn on their “What types of rocks do crabs like to hide under?” paper.

Hypothesis:

We hypothesized that Boulevard Park’s beach might have the largest crab population because of its varied environment. The juxtaposition of large rocks and soft, finer sediment create the ideal conditions for crabs to thrive.



Photos of Environment:

Boulevard Park

The environment of Boulevard Park's shoreline is extremely varied. At low tide, there is an abundance of large rocks that harbor crab shelters, surrounded by pebbles and gravel, softer, grainier sediment, and crushed up pieces of shells. Besides the crabs we came to record, most of which were identified as yellow shore crabs (Hemigrapsus oregonensis) there were numerous other species as well, such as glaucous-winged gulls, barnacles and limpets, beach isopods, clams, and oysters (see Fig. 2)

(Fig. 1: Overview of the shoreline.)

(Fig. 2: A closer look at the sediment, including oyster shell.)

(Fig. 3: Specimen goes in for the kill.)

Locust Beach

Locust Beach had a very dramatic shift from rocky beach to sandy shore. At low tide, this sandy shore is very visible (see Fig. 4) As a result of this environment, there is only a very thin strip of land that crabs like to be in, if its too close, its all sandy, if its too high up, its too rocky.

(Fig. 4: Shoreline half-an-hour after low tide.)

(Fig. 5: The environment is very rocky when compared to the other two locations.)

(Fig. 6: There is rumored to be a specimen in this photo.)

Marine Park

Marine Park’s beach was a mud flat. The sediment was very fine and wet, with a scattering of large rocks for crabs to hide under. We also recorded an abundance of what we identified as aggregating anemones (Anthopleura elegantissima). There were so many that it was very easy to accidentally step on them. (see Fig. 9)

(Fig. 7: An enraged specimen glares menacingly into the camera whilst pinching researcher's finger.)

(Fig. 8: Overview of Marine Park Shoreline.)

(Fig. 9: Close-up of sediment, including several anemones.)

Method of Data Collection:

- The main goal of our method was to thoroughly isolate as many variables as possible to ensure the most accurate results. We chose to visit our respective beaches at low tide, between 12:00 pm and 3:00 pm.

- Our first step was to measure out an area of 3x3 square meters, close to the water and with enough large rocks for crabs to take shelter under. To record the number of crabs without miscounting or counting an individual twice, we separated the square area into rows. By starting at one corner and moving across and down, (include a diagram of our physical process here) we were able to thoroughly sweep the area, picking up rocks, counting crabs, and placing the rocks back where we found them with a minimal chance of error.

- We repeated this process for a total of two tests per beach, making sure that our second 3x3 meter area closely matched the environment and conditions of the first.

- We sorted our findings into a series of tables detailing the data collected, including the results of both tests, the total number of crabs recorded, and the average number of crabs determined by adding the results of both tests together and dividing them by the number of tests performed. (population total/2=population average)

Number of Crabs in the Area

Boulevard Park -

Plot #1: 104
Plot #2: 113
Population Total: 217
Population Average: 109 (rounded up)

Locust Beach -

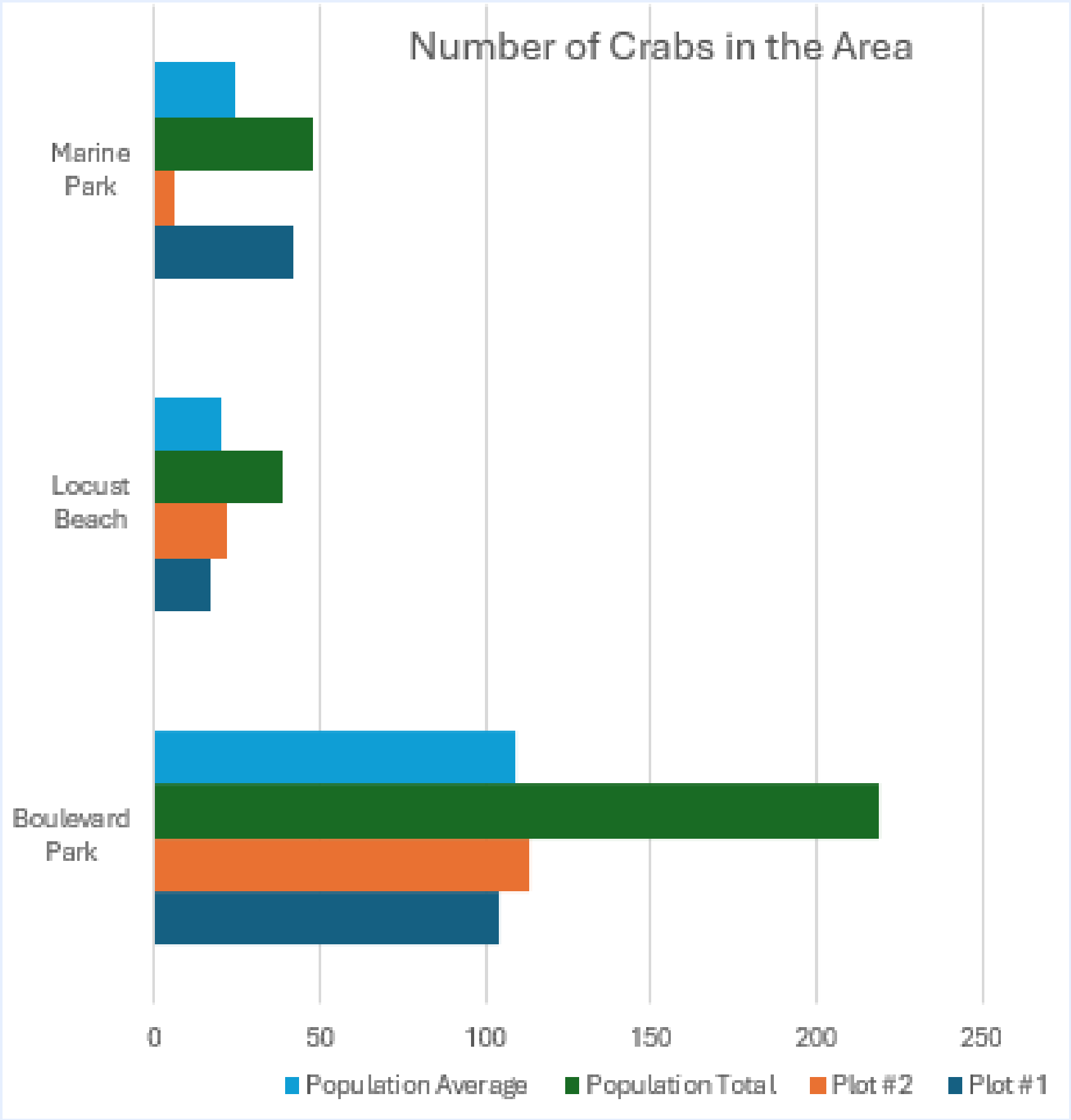
Plot #1: 17
Plot #2: 22
Population Total: 39
Population Average: 20 (rounded up)

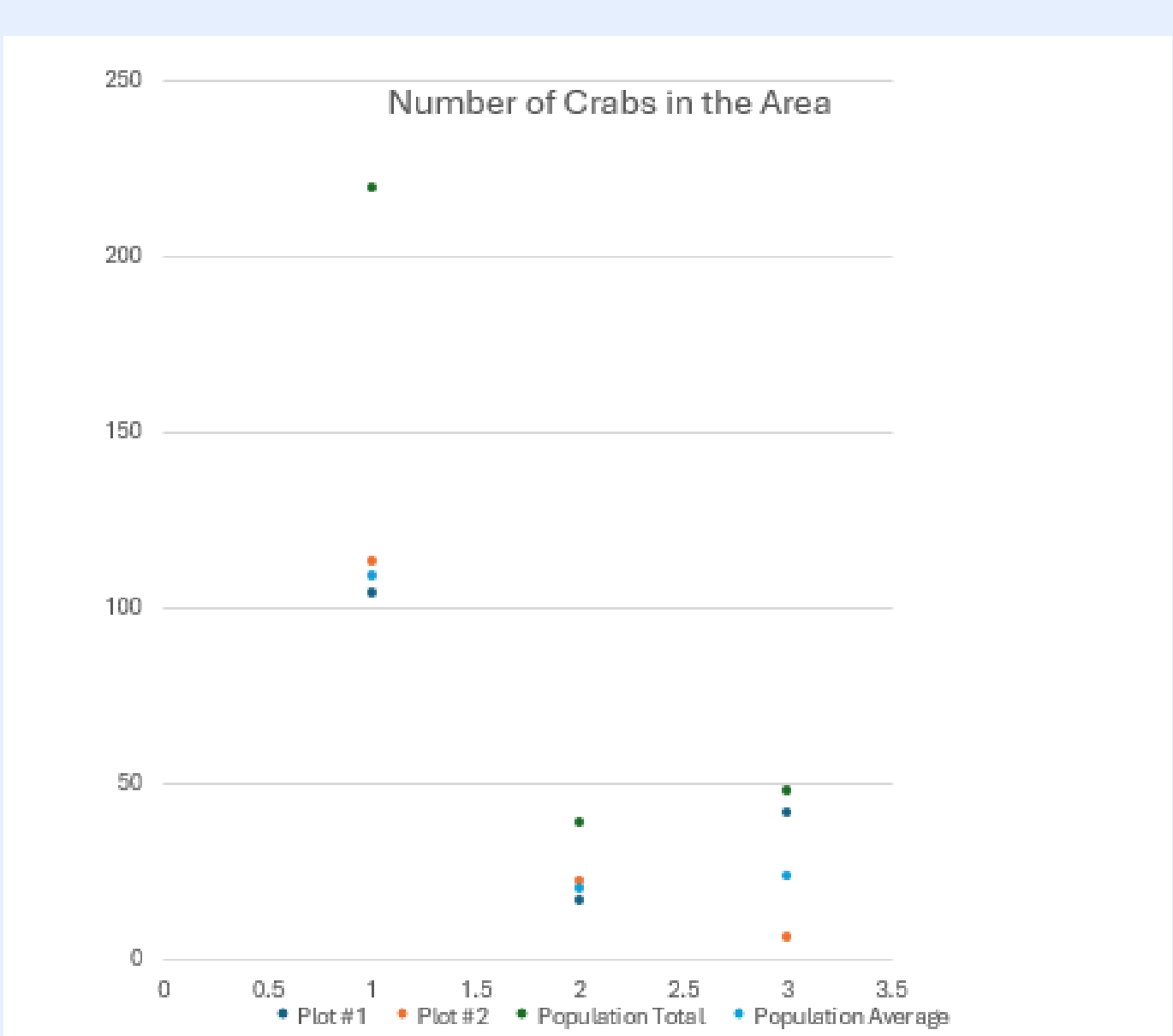
Marine Park -

Plot #1: 42
Plot #2: 6
Population Total: 48
Population Average: 24

Graphing the Data

To give a visual example of the differences in crab population between beaches, we provided two graphs as seen below.





Analysis

From the data recorded, we found that our original hypothesis was indeed correct. Boulevard Park's unique shoreline environment yielded the highest number of crabs by a landslide, with 217 individual specimens recorded in total.

Our reasoning for our hypothesis was that the area's habitat and sediment properties were most preferable to our arthropodal friends, and population numbers do seem to indicate that this is the case. Boulevard Park's beach has a mixed variety of sediment sizes and textures, and a substantial amount of large rocks that would be suitable for sheltering a great number of different organisms, including crabs.

In contrast, Marine Park lacked that variety in its sediment properties, and did not provide as many rocks. Locust Beach was largely constructed of smaller rocks and gravel, which don't offer the quality hiding places that larger rocks and boulders do.

Our forays into the field uncovered more than just crustaceans, however. We also noted a number of other species sharing their habitat with the crabs we came to record. In the future, it could be worth our while to document which organisms can be found where, and what their relation to crabs is in the complex food web of the Salish Sea. This could help us determine where other organisms are likely to be, such as predators, producers, and other kinds of crabs.

Reflection

One major blemish on our ability to isolate variables is the wildly differing results from the two tests we did at Marine Park. We believe that this happened because the first 3x3 area we tested in had a much greater number of rocks for crabs to hide under than the second. To prevent this from happening in the future, we implemented ‘test area similarity’ as a controlled variable, but the result is that our data may not be entirely accurate. To get the best, most in-depth results, we recommend a much higher level of planning and consideration than is usually required for a college-level group project.

At Locust Beach, because it was so sandy there was only a very thin strip of land where you could flip rocks and see the crabs. The ones closest to the water would fill with muddy brown water with next to zero visibility, so we may have missed some crabs that were in them. If you got too high up the beach you would run into dry land that they don't like. If we could do it again we would search more areas and they would all be in different parts of the beach for a more accurate number.

Boulevard Park was very successful in terms of finding crabs, but one major difficulty we ran into was accurately measuring the 3x3 plots. Getting precise measurements is much easier to do if you are working in a team, and we were gathering data alone. Next time, we think it would be wise to bring an extra pair of hands. Not only would it make the collection process much more efficient, but it would also help boost the potential accuracy of our results if there are more people keeping track of the set guidelines we established.

Additional Sources & Bonus Content:

- Sydney and Carolyn (2016) What Makes a Good Habitat for Shore Crabs?. Accessed 27 Feb, 2025
- Jerry, Ava, and Brian (2017) Crab Populations Relative to the Health of a Shoreline. Accessed 27 Feb, 2025
- “Crab Team.” Crab Team | Sea Grant Community Science, seagrantcommunityscience.msi.ucsb.edu/projects/crab-team. Accessed 21 Mar. 2025.

(Fig. 10: Specimen attempts to 'cute' its way out of being researched.)

(Fig. 11: Specimen displays its pincer in a manner which can only be described as the invertebrate's middle finger.)

(Fig. 12: Specimen contemplates the meaning of life.)

(Fig. 13: Anemone attempting to eat the leg of a much larger crab, to a questionable degree of success.)