

Anthropogenic impacts on the territoriality of the Atlantic Ghost Crab, *Ocypode quadrata*, along the Grand Strand, South Carolina.

Meredith G. LaLumia

Marine Science Department, Coastal Carolina University

Faculty Mentor: Eric Rosch

Abstract

Research has shown that anthropogenic impact can irrevocably change our world's environments, including ecosystems and animal behavior. The Atlantic Ghost Crab, *Ocypode quadrata*, is no exception. This study aims to evaluate how territoriality and aggression levels are influenced by human activity level. The objective of this research was to assess two beaches, one remote and one reasonably populated. The density and characteristics of crab burrows would then be compared to each other. The two locations that are utilized in this study are Waties Island, a remote barrier island located in Horry County, South Carolina, and Huntington Beach State Park, also located in Horry County. Territoriality presented itself via burrow density and diameter and depths of adjacent burrows. It was hypothesized that ghost crab burrows would be spatially less dense in more frequently visited beaches, and behaviors would tend to be more territorial and aggressive.

Introduction

On sandy beaches, the Atlantic Ghost Crab has proven to be a bio-indicator with regard to anthropogenic impact (Güll 2018). The purpose of this study is to investigate the territoriality of the *Ocypode quadrata* through the measurement of distance between the primary burrow and the surrounding burrows within five meters. Two locations were utilized in order to represent different levels of human activity, and to be able to investigate hypothesized impacts on territorial behaviors. It was hypothesized that the bigger the diameter of a burrow, the larger the crab would be, and that more space between burrows would suggest higher levels of territoriality. With higher levels of human populations on beaches, the ability of this species to maintain territoriality may be limited.

Methodology

Two locations of varying human population will be surveyed in order to provide a contrast in anthropogenic impact and show comparison in burrow placement.

Waties Island- remote barrier island, represents very low human population.

Huntington Beach State Park- represents medium human population and impact.

Surfside Beach – represents high impacts (study ongoing)

At each location, burrows were surveyed, and the following data was recorded: weather conditions, diameter of primary burrow, depth of primary burrow, and number of burrows within five meters from the primary burrow. The three closest surrounding burrows to the primary were also measured for their diameter and depth. Not all primary burrows had three surrounding burrows.

Results

Based on the assessment of data between Waties Island and Huntington Beach State Park, there is clear correlation between the primary burrow and the second closest burrow to the primary. This suggests that the Primary burrow may be influencing the second closest burrow and affecting its distance and/or territorial behaviors.

Results from Waties Island show that there is a linear relationship between the primary burrow and surrounding burrows which suggests that with more space, there is more opportunity for territorial and/or aggressive behaviors to present themselves.

Results from Huntington Beach State Park illustrate a more random placement and distance between the primary burrow and surrounding burrows. These burrows are not spaced as far apart as the ones surveyed at Waties Island. This suggests that there is less space for the species to execute territorial practices with more space between burrows due to human disruption to its territorial behaviors.

Surfside Beach was surveyed multiple times and no burrows were found. Data collection at this site will continue, but scarcity of burrows suggests that high human population levels significantly impact the species' behaviors.

Conclusion

Although this study is ongoing and impacts of COVID-19 temporarily halted data collection, the analysis of data collected thus far supports my hypothesis that beaches with higher human populations makes it less likely for the *Ocypode quadrata* to adhere to its intrinsic behaviors, suggesting an anthropogenic impact on the species. This is supported due to the decrease in space between burrows, and subsequently, the inability to maintain territoriality.

Future Direction

Moving forward with this study, I plan to continue to investigate Surfside Beach, to represent a high volume of people. I also intend to categorize burrows by size class to identify further trends. Another direction for this study would be to determine any correlations between territoriality and beach zones by splitting the surveys into dune, mid-beach, and high tide line zones.

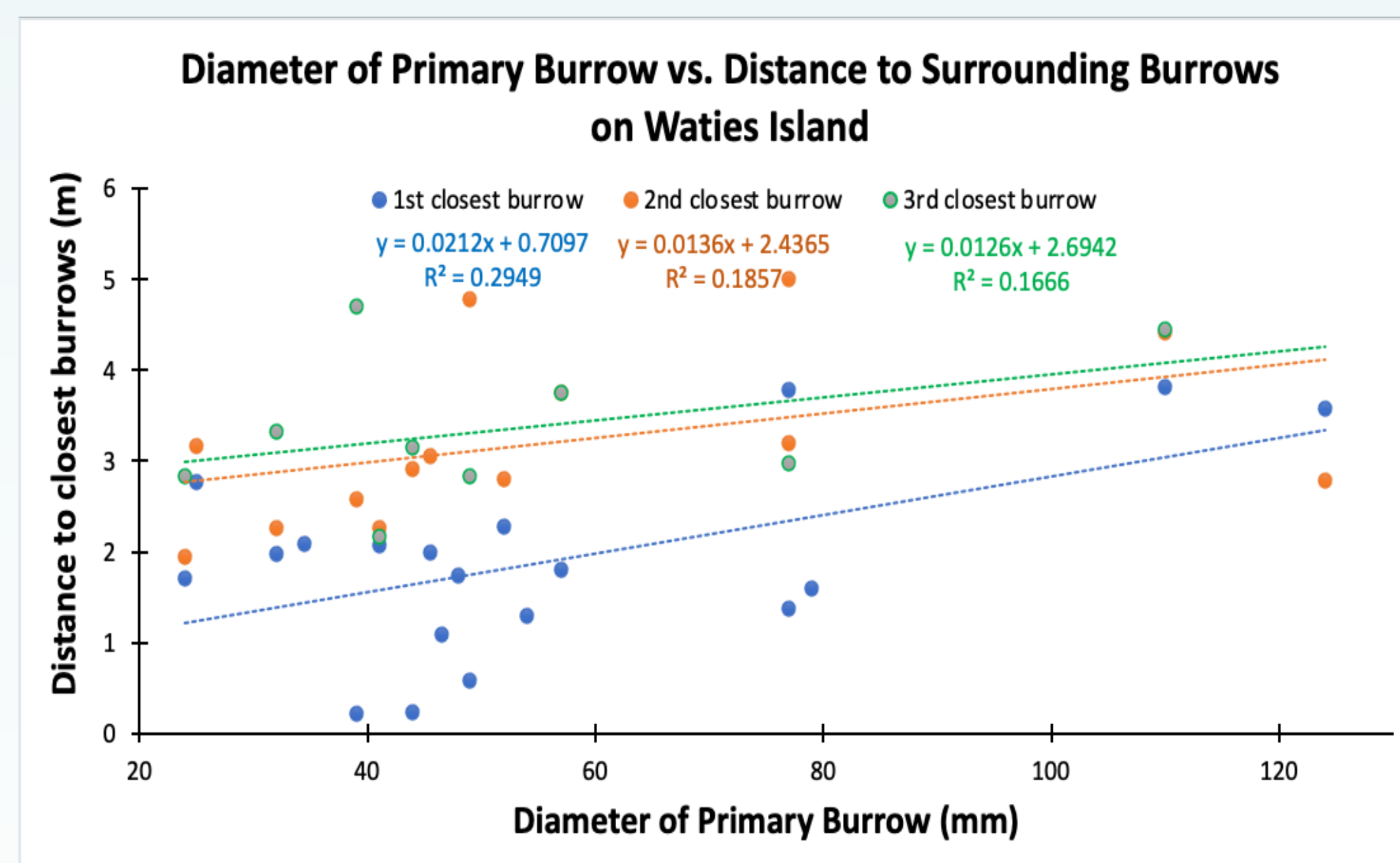


Figure 2. Significant evidence supporting intentional space between burrows supports healthy territoriality at Waties Island.

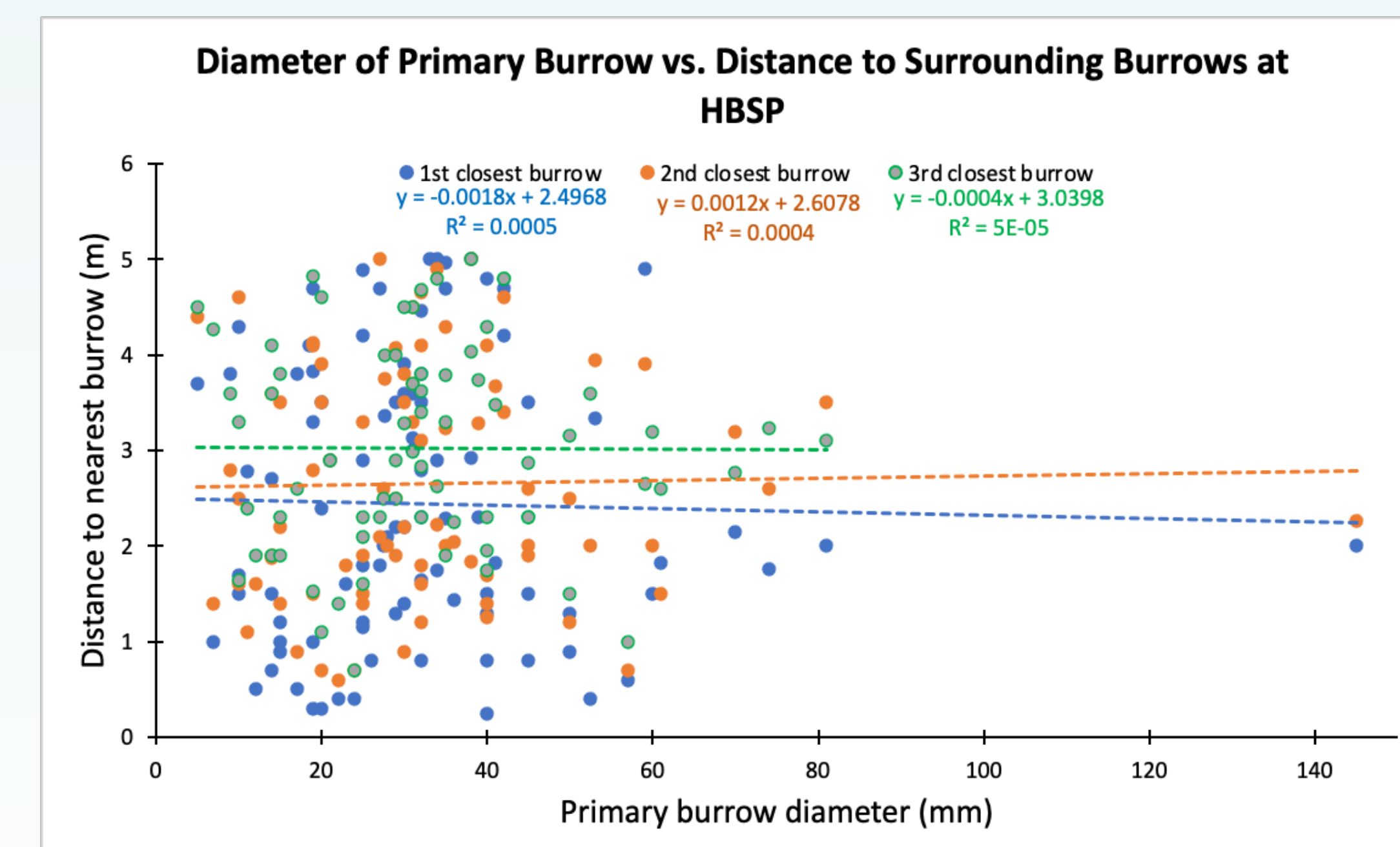


Figure 4. Significant evidence that when the beach is more populated, the more random burrow placement becomes, and intentional spacing is not as evident.

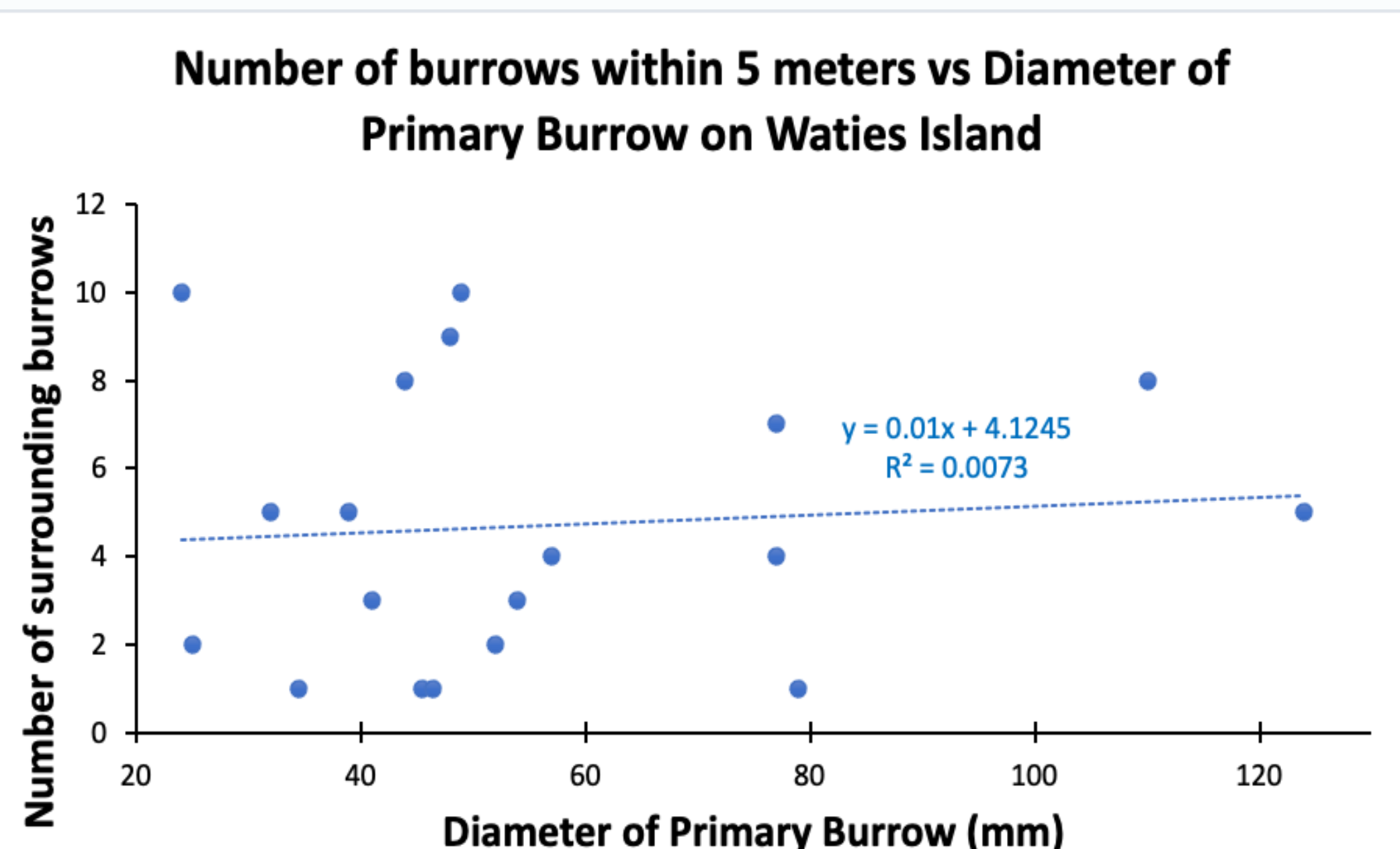


Figure 1. A linear correlation between primary burrow and surrounding burrows at Waties Island.

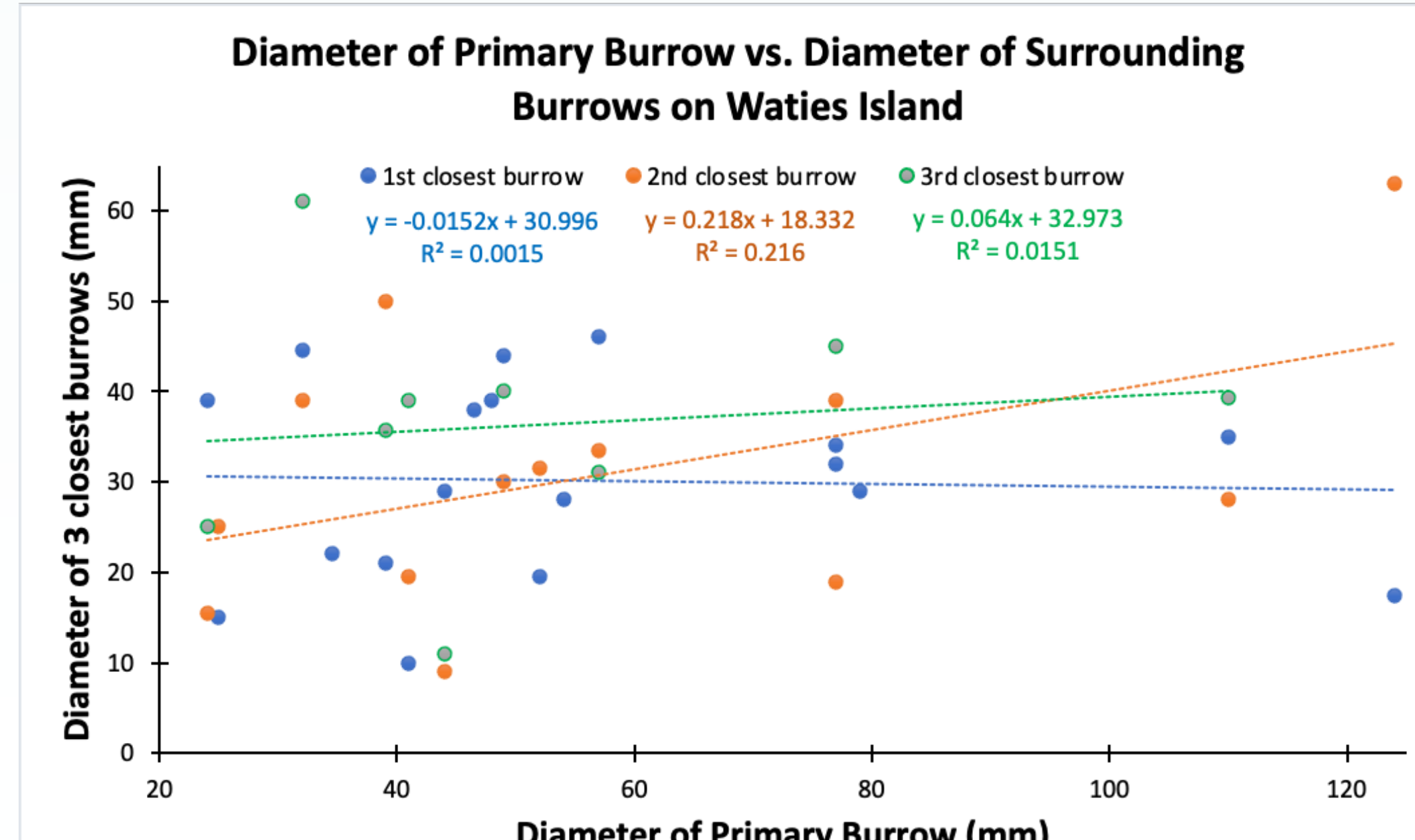


Figure 3. This data suggests that the larger the primary burrow, the larger the second closest burrow is.

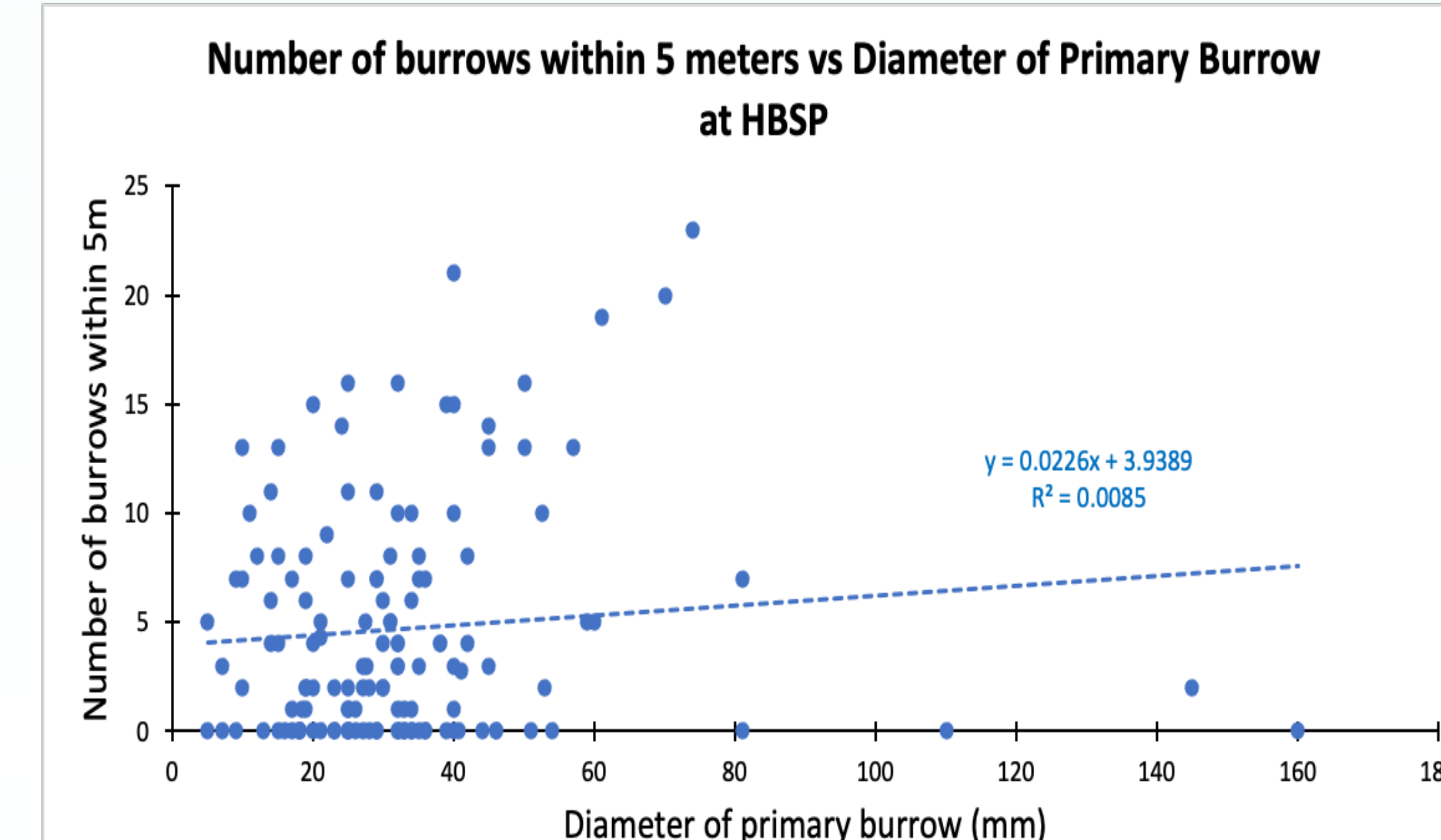


Figure 5. Burrows are placed closer together rather than intentionally leaving more space between burrows, likely due to higher human population, interfering with traditional territorial behaviors.

References

- Güll, Mustafa R., and Blaine D. Griffen. "Impacts of Human Disturbance on Ghost Crab Burrow Morphology and Distribution on Sandy Shores." *PLOS ONE*, Public Library of Science 2018 [journals.plos.org/plosone/article?id=10.1371/journal.pone.0209977](https://doi.org/10.1371/journal.pone.0209977) :~:text=Ghost%20crabs%20have%20been%20widely,decline%20dramatically%20under%20human%20pressure.
- Knott, David South Carolina Department of Natural Resources, Atlantic Ghost Crab 2005 <https://www.dnr.sc.gov/cwcs/pdf/Ghostcrab.pdf>