

Impacts of Arsenic Exposure on The Behavior of Chinese Mystery Snails

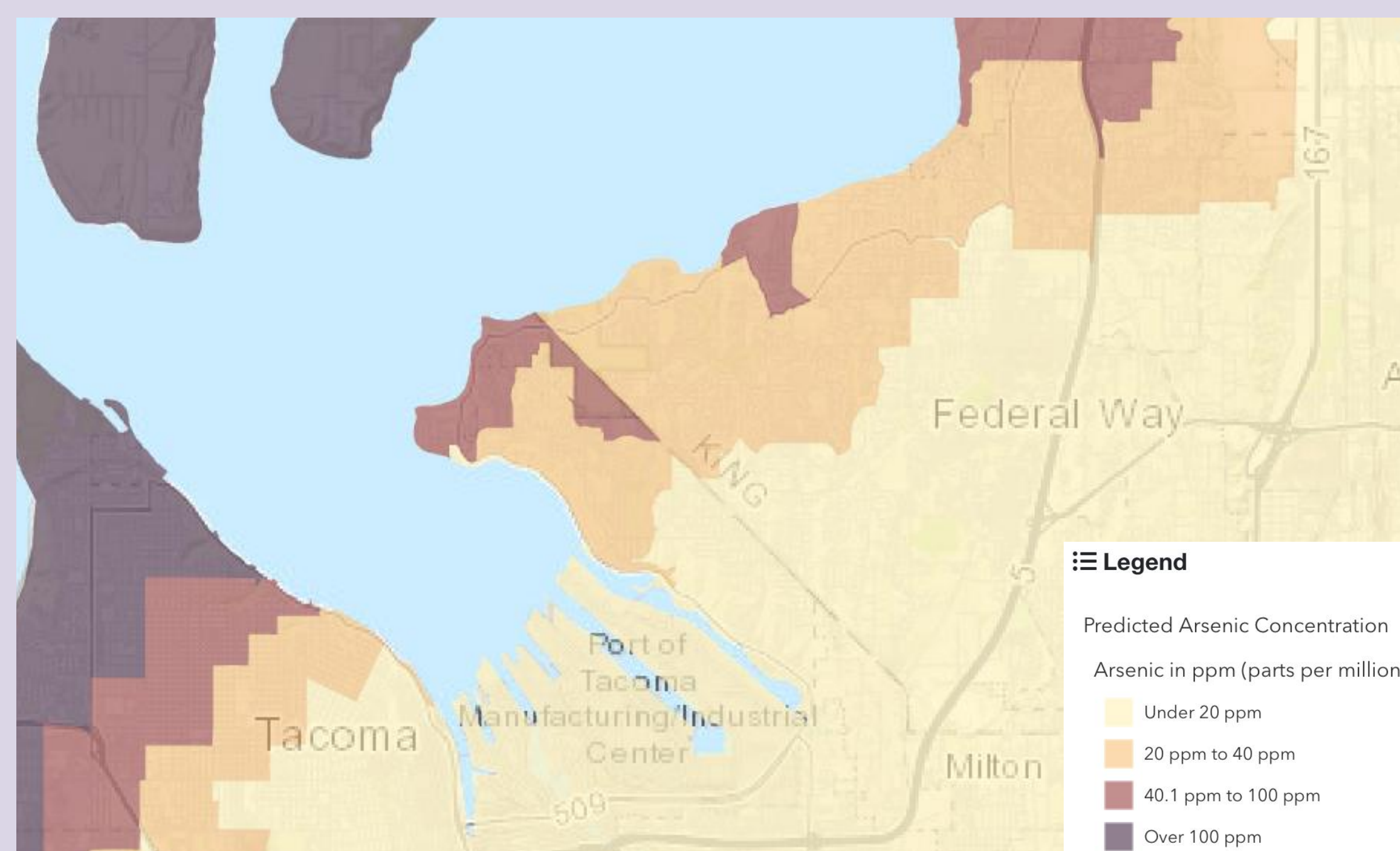
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Abstract

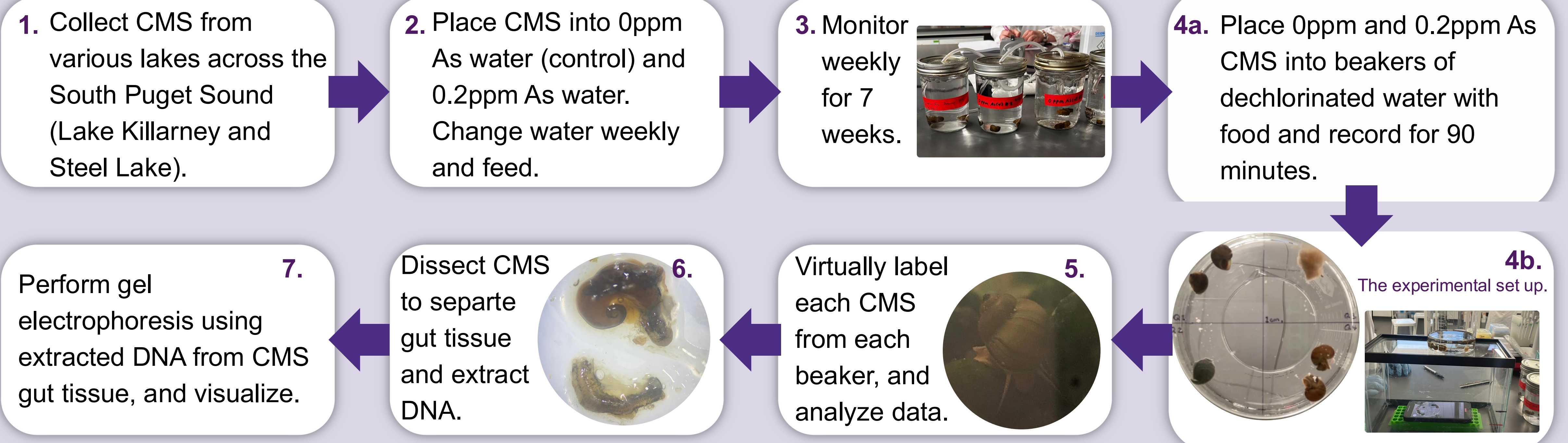
Chinese Mystery Snails (CMS) are an invasive species found in freshwater lakes across Washington, where environmental contaminants such as inorganic arsenic (As) are present. Within South Puget Sound lakes like, Steel Lake and Lake Killarney, As accumulates in the bacteria and algae on which CMS feed. Previous studies demonstrated that As exposure in vertebrate and invertebrates can cause microbiota dysbiosis, leading to altered neural activity, oxidative stress, and disrupted metabolic pathways. We hypothesize that increased As exposure will alter the CMS-microbiome, resulting in detectable changes of movement and feeding habits. To test this, we obtained 96 CMS and exposed half to 0.2ppm As for ~7 weeks, while the other half remained in 0ppm As water. We assessed feeding behavior and movement, by measuring time spent in contact with the food sources and time spent out of shell. We then placed the 0ppm As and 0.2ppm As snails into their appropriate beakers where we observed the snails for the anticipated behavioral changes. We found that 0.2ppm As exposed CMS spent significantly less time in contact with food but did not significantly differ in their time out of shell. These results suggest that As exposure impacts normal neuronal behavior in CMS. To further investigate this relationship, we dissected the CMS and attempted to extract DNA to assess potential bioaccumulation. Future directions include 16s sequencing to determine differences between microbiome of As exposed vs non-exposed CMS; alongside additional behavioral testing to determine whether sensory functions are affected by As exposure.

Introduction

- The demolition of the ASARCO copper smelter in 1993 (Ruston, WA), resulted in long-term arsenic (As) contamination within the South Puget Sound.
- By studying the impacts of As exposure, we can determine how CMS behavior and microbiome are affected.



Methodology



Results

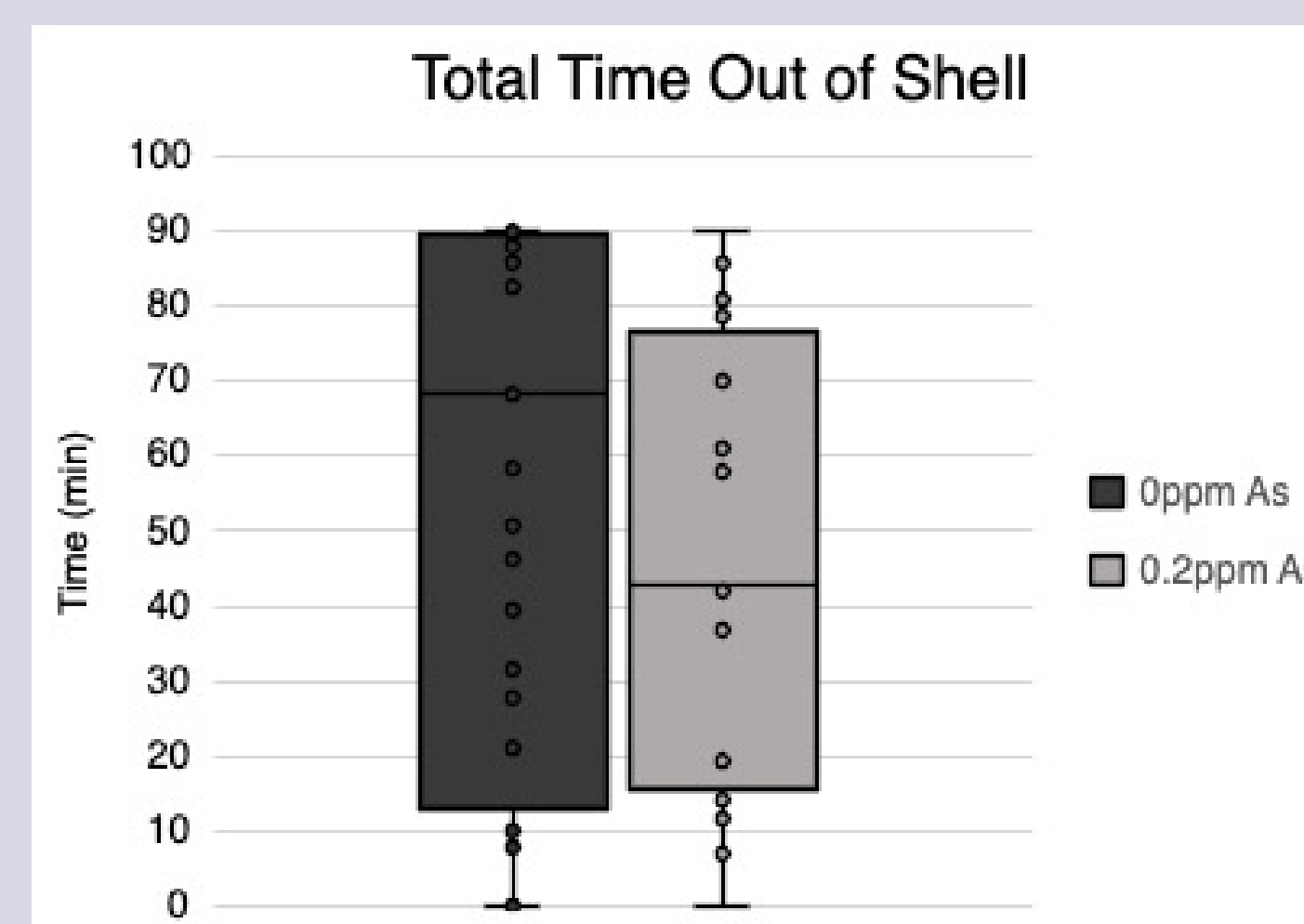


Figure 1. Total Time Spent Out of Shell. Average recorded time of 0ppm As exposed CMS (left bar) and 0.2ppm As exposed CMS (right bar). Data recorded for 90 minutes using student phone cameras. 0ppm As, N=33. 0.2ppm As, N=16.

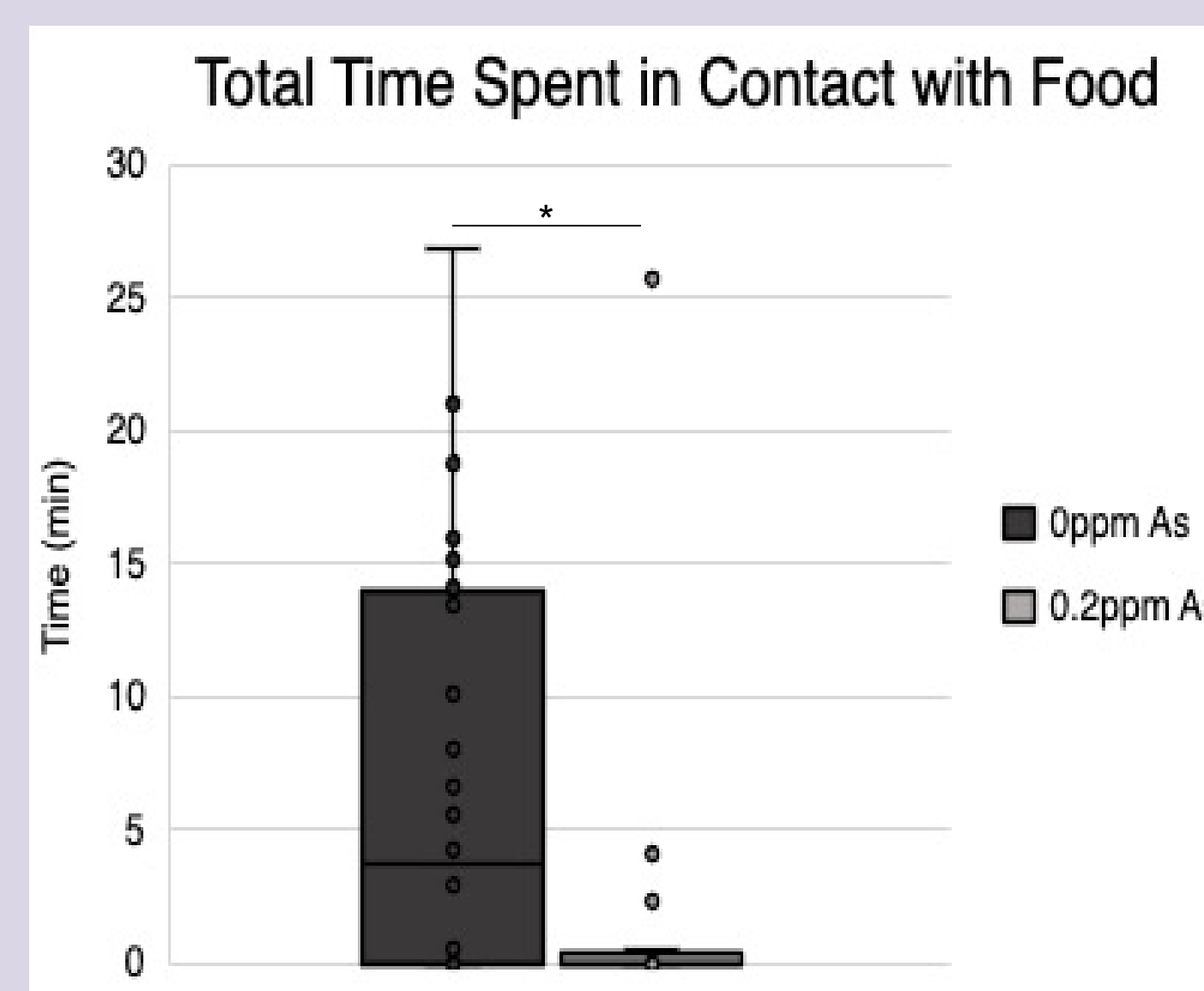


Figure 2. Total Time Spent in Contact with Food. Average recorded time in contact with at least 1 of the provided food sources (snello or algae wafer) of 0ppm As exposed CMS (left bar) and 0.2ppm As exposed CMS (right bar). Data recorded for 90 minutes using student phone cameras. 0ppm As, N=24. 0.2ppm As, N=16.

Conclusion & Discussion

- After collecting and analyzing the data, a two-tailed U-Test indicated statistical significance (p-value <0.05) between 0ppm As and 0.2ppm As exposed CMS when comparing the average time spent in contact with food.
- No statistical difference between 0ppm As and 0.2ppm As exposed CMS when comparing total time out of shell.
- Overall, CMS that are not exposed to As tend to spend more time in contact with a food source than CMS that are exposed to As. This is important because it shows that increased As exposure could lead to altered CMS-microbiome, resulting in decreased sensory skills, like olfaction.
- Future directions include additional behavioral testing to determine whether sensory functions are affected by As exposure. This could involve changing the type and/or amount of light exposure within the CMS enclosure alongside the addition of substrates in their environment.

Acknowledgements & References

- Thank you Dr. Nahmani and Dr. Alaei for hosting this TBIOMD 495 research project. Also, I'd like to thank all other class/lab mates who I was able to collaborate with and work alongside.
- Please scan the QR code to view the full list of references used for this research and poster presentation.

