TESC 495

A Spatial and Temporal Analysis of New Zealand Mudsnails Feeding on Aquatic Vegetation in Spirit Lake, Mt St Helens National Volcanic Monument

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Figure 1: A locator map showing the location of Spirit Lake within Washington State (Mapcreator).

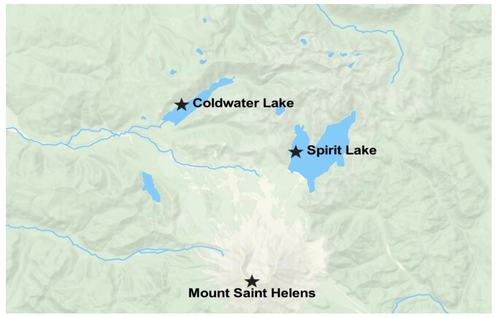


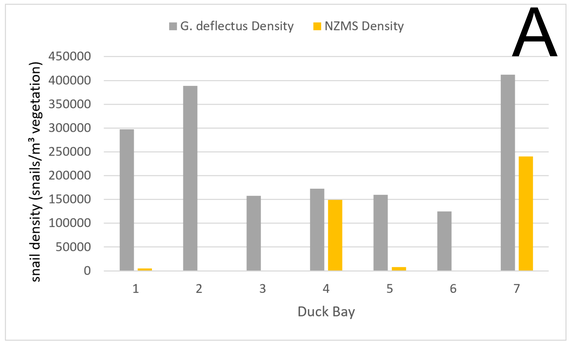
Figure 2: A map showing the location of Spirit Lake relative to Mount St. Helens and outlet to Coldwater Creek (Mapcreator).

Introduction

- New Zealand mudsnails (NZMS) reproduce rapidly and can outcompete other native snail species for food (Myers et al. 2024)
- NZMS are very small ranging in size from 4-6 mm (Figure 3)
- NZMS were first found in fish intestines along the southern shore of Spirit Lake in 2015 (Myers et al. 2024)
- Initial sampling of snail density conducted in 2021-22 (Myers et al. 2024)
- Our study measured changes in NZMS and native snail species abundance over time and space to see if NZMS have spread and to look for evidence of interspecies competition

Figure 3: A picture of all species of snails identified within the study *P. antipodarum* (middle), *G. deflectus* (right), and *Lymnaea sp.* (left)

Results



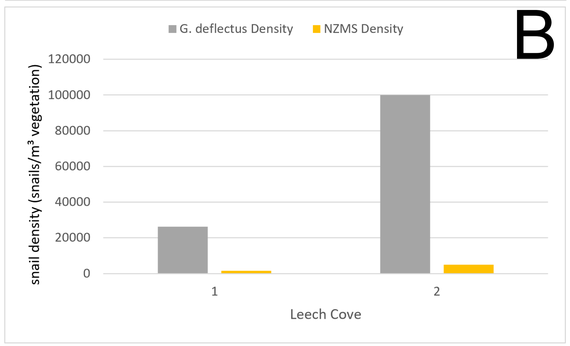


Figure 4: NZMS vs *G. deflectus* mean density (# of snails/m³ vegetation) at locations in (A) Duck Bay and (B) Leech Cove; error bars are one standard deviation from the mean.

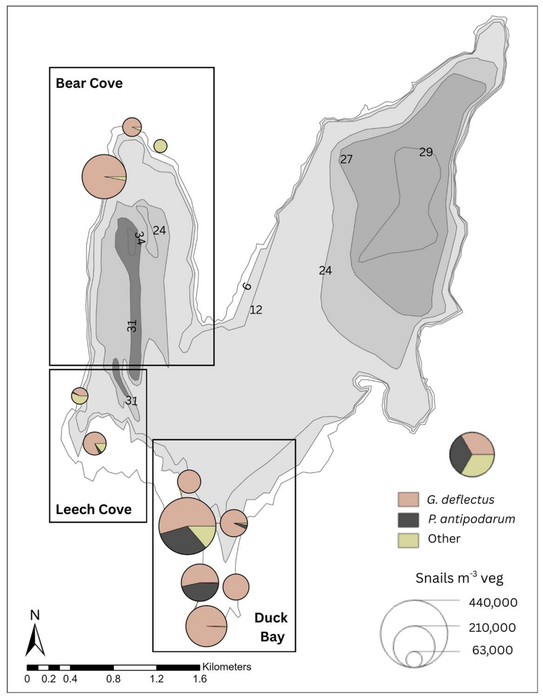


Figure 5: Spatial distribution of snail density (# of snails/m³) collected on vegetation samples

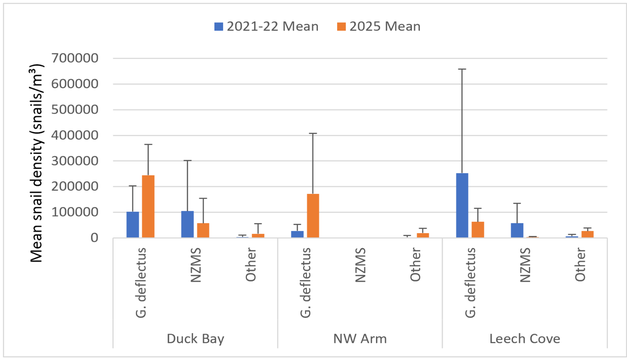


Figure 6: Mean snail density (snails/m³) for *G. deflectus*, NZMS, and *Lymnaea sp.* in Duck Bay, NW Arm (Bear Cove), and Leech Cove during the 2021–22 and 2025 sampling periods; error bars are one standard deviation from the mean.

Methods

Lake Sample Collection:

- Samples were collected from Spirit Lake from a boat using a double-sided rake on a rope
- Collected samples were placed in a plastic bin and agitated for 1 minute in water to remove snails (Figure 7)
- Vegetation volume was measured in a graduated beaker after agitation
- Snails were sieved from water in bin and stored on ice for transport to the lab

Lab Sorting/Counting:

- Snails were separated from remaining debris using 4 mm – 710 µm sieves
- Snails were identified and counted under a dissecting microscope

Figure 7: Vegetation sample collection using a double-sided rake to place within a plastic bin for vegetation agitation (Photo credit: Hailey Germeau)

Discussion

- Only *G. deflectus* density went up significantly (t-test $p<0.05$) from 2021-22 to 2025, and only in Duck Bay (Figure 6).
- No significant change in spread of NZMS, and NZMS density (# of snails/m³) decreased in both Duck Bay Leech Cove (Figures 5 and 6).
- NZMS has not appeared in the NW Arm yet, possibly due to lack of continuous aquatic vegetation between Leech Cove and Bear Cove due to steep bathymetry.
- The density of the native species, *G. deflectus,* was higher than NZMS at every location (Figure 4), providing evidence that NZMS are not currently outcompeting the native invertebrate snail species in Spirit Lake.
- Taken together the lack of further spread of NZMS and the fact that native snail densities have increased while NZMS has decreased suggests that NZMS may be not be a strong invader in Spirit Lake.

Acknowledgements

I would like to thank Dr. Jim Gawel for advising me and providing the opportunity to work on this important project. I would also like to thank UW Tacoma and the Mary Cline Undergraduate Research Award in Natural Sciences for their funding and support. I would additionally like to thank Kayla Mitchell for her assistance in creating figures for this research. Lastly, I would like to thank all my fellow students during the research, making it a truly memorable experience.

We acknowledge that this research was conducted on the ancestral and traditional lands of the Stl'pulmsh (Cowlitz) tribes and the Confederated Tribes, the original stewards of Lawetlat'la (Mount St. Helens).

References

Myers SR, Germeau HE, McCann M, Cranston W, Crisafulli CM, Fox-Dobbs K, Gawel JE. 2024. Establishment and ecological integration of the New Zealand mud snail in Spirit Lake, Mount St. Helens, Washington State, USA. Aquatic Invasions. 19(3):287-307. doi:https://doi.org/10.3391/ai.2024.19.3.134082.

Mapcreator. (n.d.). *Locator*. Retrieved June 2026, from https://locator.mapcreator.io/