Size Distribution of Muddy Intertidal Snails in Sunshine and Echo Cove

Austin Couvillion, Andrew Flick, Erica Lyles, Anne Weaver
Dept. of Biological Sciences, Louisiana State University, Baton Rouge, LA 70803

Abstract

We assessed snail size and distribution of *Littorina sitkana* at Echo and Sunshine Coves, AK during July 2017 at times which aligned with low tides. We measured snails to determine if there was any correlation between snail size and distance from the high tide. We measured distance (m) from the high tide line and snails (mm) with a caliper. We found that snails increase in size the lower they are in the intertidal zone. This size variability may be caused by either biotic stressors, abiotic stressors, or both.

Introduction

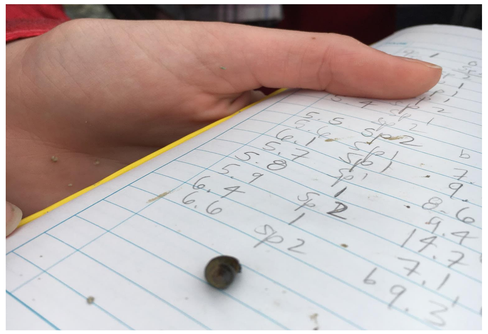
- Species distribution is determined by
  - competition for resources[3]
  - habitat[4]
  - predation pressure[3]
- Adaptive traits for tolerating stressors in specific environments[1]
- Snails on muddy shores have[2]
  - smaller shells
  - wider openings
  - larger feet
- Snails in intertidal areas have[2]
  - thick shells for protection
- Littorina sitkana[5]
  - commonly called Sitka periwinkle
  - Pacific northwest
  - rocky, protected shores and beaches

Hypothesis:
Snail size varies along intertidal height; we suspect that snails will be smaller along the lower and larger at the higher regions of the intertidal zone.

Materials and Methods

We measured 686 *Littorina sitkana* (Figure 2) snails along 67 meters of the muddy intertidal zone at low tide in July 2017 at Sunshine Cove and Echo Cove, AK.

Transect tape delineated the distance from the high tide line in meters. We collected location information in meters from the high tide line and measured snails with a caliper in millimeters. We analyzed our data using a linear regression in MS Excel.



Littorina sitkana

Echo Cove

Results

Results suggest there was a significant correlation between snail width and intertidal height along the muddy intertidal region. As distance from the high tide increase by 1m, snail size decreased by 0.03mm ($F_{1,683} = 99.13$, $p<0.001$, $R^2=0.13$, Figure 1).

Littorina sitkana

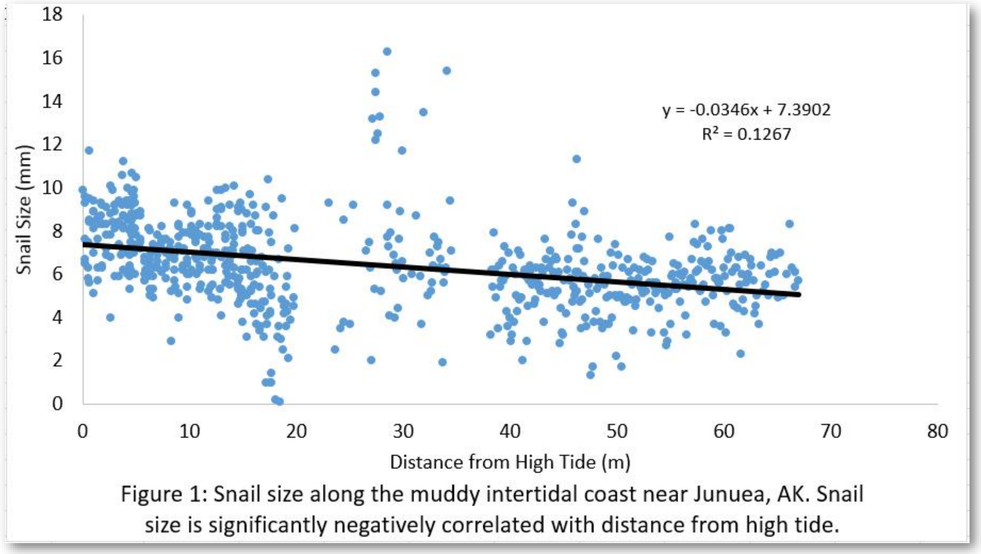


Figure 1: Snail size along the muddy intertidal coast near Junuea, AK. Snail size is significantly negatively correlated with distance from high tide.

Conclusions

According to the results, *Littorina sitkana* shell length decreased as the distance away from the high tide line increased. Snails were larger closer to the shoreline. It is possible that larger snails can tolerate stressors such as habitat type, temperature, competition and predation[2].

Rochette et al. found that along rocky intertidal area snail size increased as height along the intertidal zone increased[4]. In contrast, our results showed that snail size decreased as height increased along the intertidal zone.

We suspect that our results differed because we studied *L. sitkana* in a muddy habitat and not in the rocky intertidal. In order to fully understand the ecological importance of these snails, more research needs to be implemented.

References

1. Blanchard, A, Feder, H, Hoberg, M, Knowlton, A. 2017. Abiotic/Biological Interactions in Coastal Marine Communities: Insights from an Alaskan Fjord. Estuaries and Coasts. 40.5: 1398-1417.
2. Boulding, E, Van Alstyne, K. 1993. Mechanisms of differential survival and growth of two species of *Littorina* on wave-exposed and on protected shores. Journal of Experimental Marine Biology and Ecology. 169.2:139-166.
3. Connell, J. H.1961. The influence of intra-specific competition and other factors on the distribution of the barnacle *Chthamalus stellatus*. *Ecology*, 42: 710-723.
4. Rochette, R, Dunmall, K, Dill, L. 2003. The effect of life-history variation on the population size structure of a rocky intertidal snail (*Littorina sitkana*). Journal of Sea Research 49: 119-132.
5. University of Alaska Southeast, 2016. *Littorina sitkana*, The Sitka Periwinkle.http://www.uas.alaska.edu/arts_sciences/naturalsciences/biology/tamone/catalog/mollusca/littorina_sitkana/index.htm.

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