

EFFECT OF DENSITY ON GROWTH AND SURVIVAL OF JUVENILE WOODLICE, *ARMADILLIDIUM VULGARE*, A TERRESTRIAL ISOPOD

Aysha Alani, Calvin Harris, and Bonnie J. Ripley
Grossmont College, El Cajon CA

INTRODUCTION

The species *Armadillidium vulgare*, commonly known as woodlice, pill-bugs or roly-polys, are a common terrestrial isopod found in damp soils. We are investigating the metapopulation dynamics of this species on the Grossmont College campus. Previous (unpublished) work in our lab suggested that juveniles might grow more slowly at high densities. Higher density has been shown to decrease growth but not mortality based on field samples of *A. vulgare* populations^[1] and decrease resource allocation to offspring by females^[2]. Thus density could have important repercussions on population growth rates among habitat patches. The goal of this experiment was to determine the effect of density on growth and survival of juvenile male and female woodlice in a controlled laboratory experiment.

METHODS

Juvenile woodlice used in this experiment were born to four mothers cultured in captivity between October 7 and October 20 2017. At the beginning of the experiment woodlice were 4.5 to 5 months old. Individuals were measured, sexed and randomly assigned to treatments March 9, 2018. Size was measured as ventral length (while relaxed) to the nearest 0.05 cm using a mm ruler and viewed at 10x on a dissecting microscope. Low density treatments were assigned two females and two males (4 individuals total) while high density treatments had four females and four males (8 individuals total). Treatments were established in small plastic lunch containers (9.5x6x3mm) with four 1-mm holes drilled on the sides. Sterile potting soil were added to each box making a depth of approximately 1 cm. Food was added as 2 1-cm cube carrot pieces and shelter as one-half of a craft cork. Soil was spritzed with tap water until moist. Boxes were randomly assigned an order on a plastic lunch tray with adjustments made to alternate high and low treatments in the pattern. The tray holding the boxes was placed on a countertop in a greenhouse with natural light and natural day/night cycle. Boxes were checked weekly. Carrot cubes were replaced and soil was spritzed with tap water until moist. All wood lice were measured to the nearest 0.05 cm. Any dead individuals were replaced with reserved individuals of the same sex until week 8 when no more individuals were available for replacements. Once pregnant females were noticed, all females were also checked for pregnancy each week. If babies were born, they were counted and removed from the box. Soil was replaced at week 6. The experiment was terminated at week 11. Data was analyzed at week 9 using Excel and R software.

LITERATURE CITED

1. Hassall, M. and J. M. Dangerfield (19 90) *J. Anim. Ecol.* **59**: 941-58.
2. Hassall, M. et al. (2005) *Oecologia* **143**: 51-60.
3. Kight, S. L. and M. Hashemi (2003) *Entomol. News* **114**: 61-68.

ACKNOWLEDGEMENTS

This project was supported by the Grossmont College Biology Department, the Grossmont-Cuyamaca Community College District Foundation and the Associated Students of Grossmont College. The work described here and this poster were completed with the help of Cami Yonally, Katie Leonard, Sharon Farley, Selene Miles and the other students who participated in the summer and fall 2018 Roly Poly Research Project, including B. Ventura, S. Tran, M. Nguyen, S. Al-Azzawi, and S. Al-Ahwerdi.



Above Left: Experiment in progress. Above Right: Close up of one experimental container.

RESULTS: GROWTH

The size of woodlice at the beginning of the experiment was 0.639 cm \pm 0.024 (95% CI) and at the end of the experiment it was 0.782 cm \pm 0.026 (Figure 1). Analysis of variance (two factor with container nested within density) on size at week 9 showed a significant effect of sex ($p=0.017$) but not of density ($p=0.76$) and a significant interaction (0.133). Follow-up comparison t-test revealed that male and female sizes in the high density treatment differed significantly ($p=0.011$).

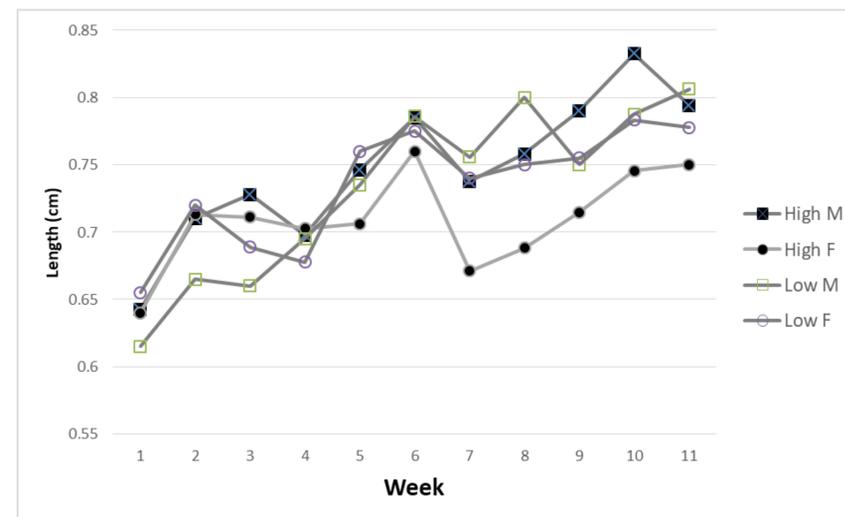


Figure 1. Size of male and female woodlice in low and high density treatments. Standard deviations ranged from 0.05 to 0.11 and are not shown for clarity.

RESULTS: SURVIVAL

Survival to the end of the experiment was 85% (Figure 2). There was not a significant difference in proportion surviving to week 9 either due to density (z-test, $z= 2.065$, two-tailed $p = 0.095$) or due to sex (z-test, $z= 1.054$, two-tailed $p = 0.458$).

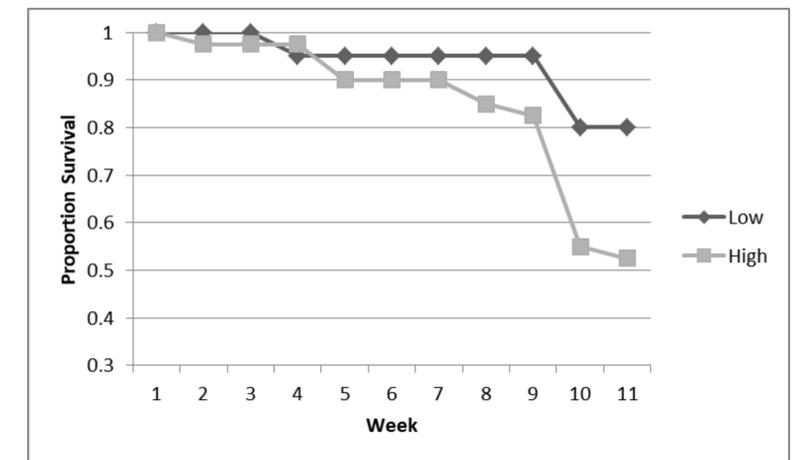


Figure 2. Survival of woodlice in low and high density treatments.

RESULTS: REPRODUCTION

Pregnant females were first noticed at week 3. The average size of pregnant females (at detection) was 0.74 cm \pm 0.04 (95% CI). The number of pregnant females increased weekly (up to 16/30) to week 7 and then declined. However few offspring (<10 in any box) were observed and only in three containers, so fecundity and survival of newborns under these circumstances was very low—which can occur in starved females^[3].

CONCLUSIONS

- Woodlice grew an average of 0.14 cm. There was a detectable effect of sex and an interaction between density and sex, with females in the high density treatment significantly smaller than males. Since most of them were pregnant, the females seem to have a trade-off between reproduction and growth
- Survival was not significantly different between low and high density treatments at week 9 although if the experiment had continued longer the results suggest there may have been a larger effect.
- The size of females at sexual maturity in this experiment was 0.74 cm \pm 0.04 (95% CI), which is approximately 75% of average adult size.
- Future experiments are planned with a longer experiment duration, more precise measuring techniques, larger difference in density treatments, and with pregnant versus non-pregnant female treatments.