

# Effects of Crayfish Presence and Substrate Size on Benthic Populations in Little Niagara Creek

Danielle Mares, Troy Wesley, Fatou Kebbeh and Lee Vang  
Faculty mentor: Dr. Todd Wellnitz, Biology



## INTRODUCTION

A current concern for many freshwater bodies is the rising number of invasive Rusty Crayfish (*Orocoenectes rusticus*) an aggressive species that can potentially harm the freshwater ecosystem they inhabit. This can be done by directly preying upon microorganisms, (Charlebois & Lamberti 1996, Keller & Ruman 1998) or by competing for resources necessary to other species. In our study we aimed to assess whether there is an inverse relationship between crayfish presence and the abundance of streambed (benthic) organisms in Little Niagara Creek, specifically in relation to substrate size.

We hypothesized that the greater interstitial space among large-sized substrate would allow crayfish better access to prey, lowering the amount of specimens in the benthic community.

## METHODS

**Step 1:** Using a 2x2 factorial design with each treatment replicated 4 times, we built 16 nylon mesh cages and filled them with equal amounts of either small or large gravel substrate.



**Step 2:** Two crayfish were placed in half of the cages for each substrate type (4 small gravel and 4 large gravel cages).

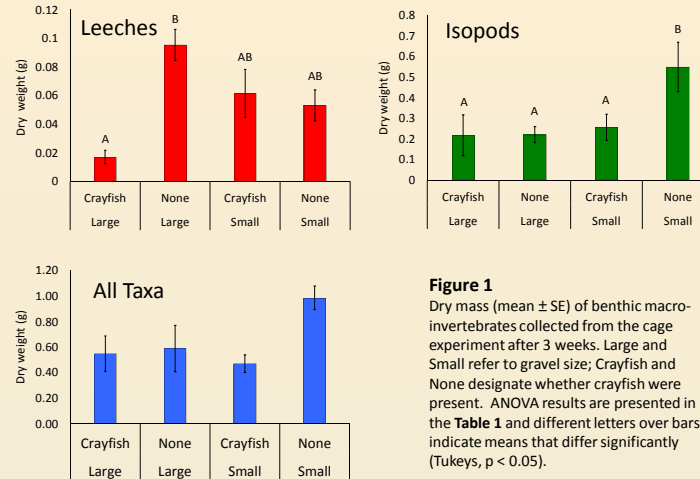
**Step 3:** Cages were placed in 4 locations in Little Niagara Creek upstream of the UWEC campus, and left for 3 weeks (Oct. 30 - Nov. 20) to allow time for macroinvertebrates to colonize the substrates.



**Step 4:** Cages were sampled, and their contents were screened to separate macroinvertebrates, which were preserved in 70% ethyl alcohol. In the laboratory, organisms were identified, counted, dried and weighed.

**Step 5:** Data were examined using two-way Analysis of Variance (ANOVA) tests with Tukeys post-hoc comparison tests were used to determine significant differences among the 4 treatments.

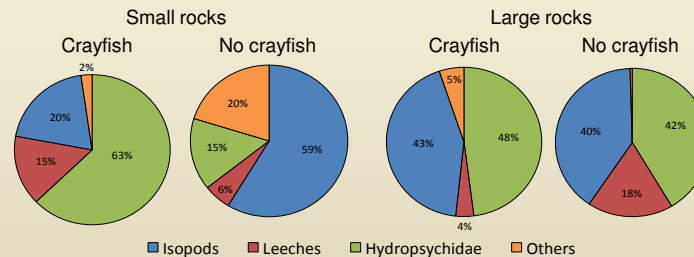
## RESULTS



**Figure 1**  
Dry mass (mean ± SE) of benthic macroinvertebrates collected from the cage experiment after 3 weeks. Large and Small refer to gravel size; Crayfish and None designate whether crayfish were present. ANOVA results are presented in the **Table 1** and different letters over bars indicate means that differ significantly (Tukeys,  $p < 0.05$ ).

Taxa	Factor	F-value	P-value
Isopods	Substrate	15.74	0.003
	Crayfish	10.20	0.01
	Substrate*Crayfish	9.73	0.01
Leeches	Substrate	0.01	0.93
	Crayfish	8.40	0.02
	Substrate*Crayfish	12.92	0.005

**Table 1**  
Results of the ANOVA test on the isopod and leech data. Overall ANOVA results are shown beneath each taxa. Main factor effects for Substrate size (small/large) and Crayfish treatment (present/absent), and their interaction, are also given.



**Figure 2:** Most abundant taxa in this study included Isopods, Leeches, and Hydropsychidae. These pie graphs show the relative abundance of each by weight in comparison to each other and other remaining taxa. On small rocks it seems Hydropsychidae and Isopods are inversely related regardless of crayfish treatment, however on large rocks they seem more balanced.

## INTERPRETATION OF RESULTS



**All Taxa** combined showed a near-significant trend ( $F = 3.19$ ;  $p = 0.07$ ) for greater macroinvertebrate biomass on small-sized gravel without crayfish.

**Leeches** responded to crayfish and the interaction between crayfish and substrate, such that their biomass was greatest on large-sized gravel where crayfish were absent.

**Isopods** were influenced by substrate size, crayfish treatment, and the interaction between these factors. There were more Isopods on small-sized gravel and fewer in crayfish treatments. The interaction indicated that crayfish reduced Isopod biomass on small-sized, but not large-sized gravel.

## DISCUSSION



- Our results showed that crayfish could effect the benthic macroinvertebrate community in Little Niagara Creek, and our data provide partial support for our hypothesis that larger substrates may allow crayfish greater access to prey.
- Total macroinvertebrate biomass was not different between treatments, but isopods and leeches showed clear and significant trends.
- Isopods were more abundant on small gravel, and may have been more vulnerable to crayfish there, because crayfish significantly reduced their abundance. This may have been because small gravel provided insufficient hiding places for the isopods.
- Leeches, by contrast, were more vulnerable to crayfish on large gravel. Leeches are less mobile than Isopods, and the larger interstitial spaces may have made it easier for crayfish to reach in and grab them, which is what we hypothesized.

## ACKNOWLEDGEMENTS & REFERENCES

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