

The impacts of parasite prevalence on the diet of the host

Ingle, M.E.^{1,2}, Dunbar, S.G.², Bartsch, J.L.¹, Guffey, K.R.¹, Knox, C.J.¹, Nolan, A.N.¹, Rowlands, C.E.¹, Trigg, E.C.¹, and Vasser, M.M.¹

¹ Department of Science and Mathematics. College of Arts and Sciences. Cedarville University.

² Department of Earth and Biological Sciences. School of Public Health, Loma Linda University.

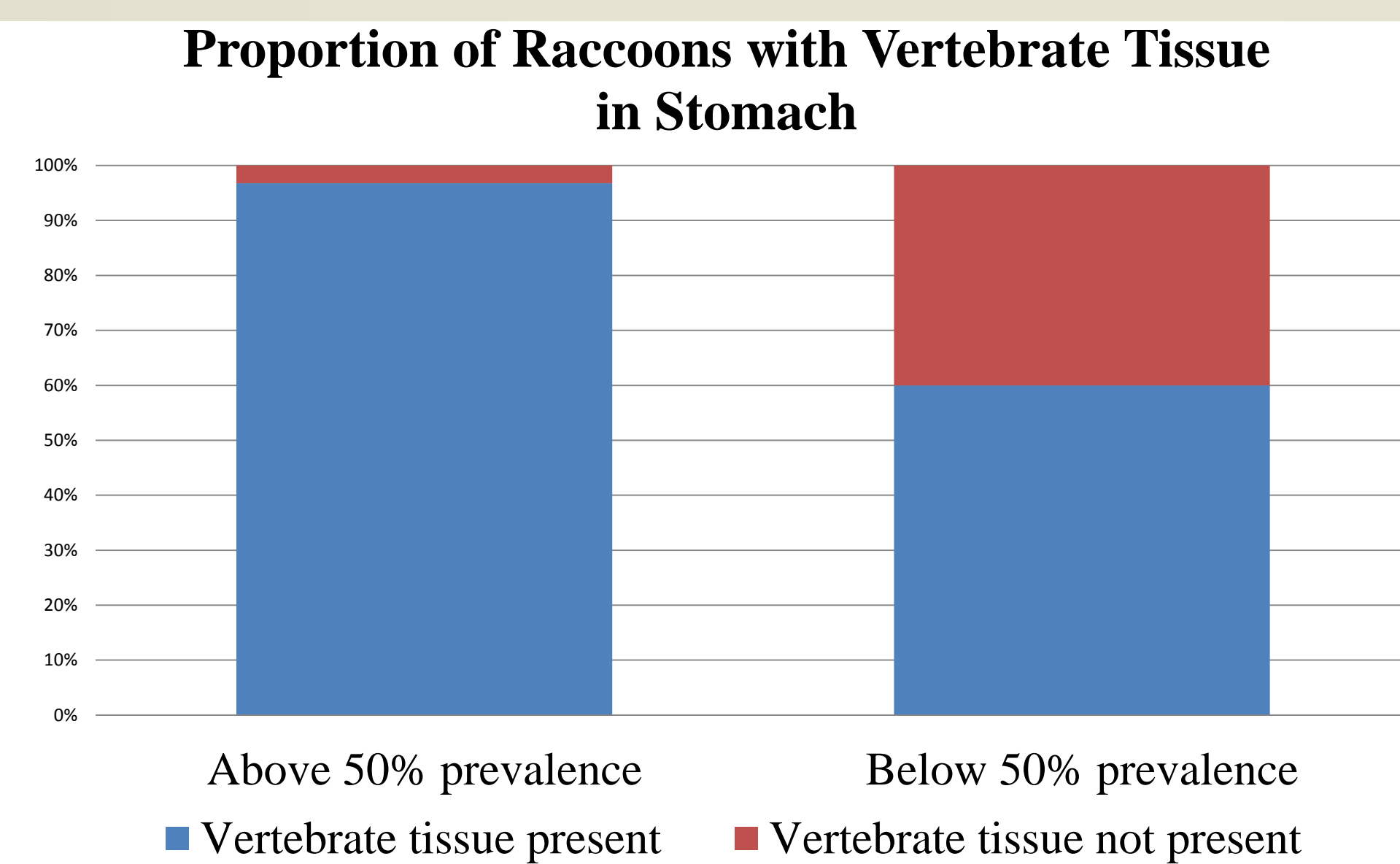
Introduction:

Raccoons (*Procyon lotor*) are the final host for raccoon roundworms (*Baylisascaris procyonis*) (Page et al., 2005). Raccoon roundworm is the leading cause of a dangerous neurological disease, known as larva migrans encephalopathy (Blizzard et al., 2010). Raccoons are omnivorous animals, and rely on various food items. Page et al. (2011) found that raccoons eat whatever food resource is most convenient and abundant. Raccoons in similar habitats have similar diets, regardless of the geographical closeness of the habitats (Rulison et al., 2012).

Methods:

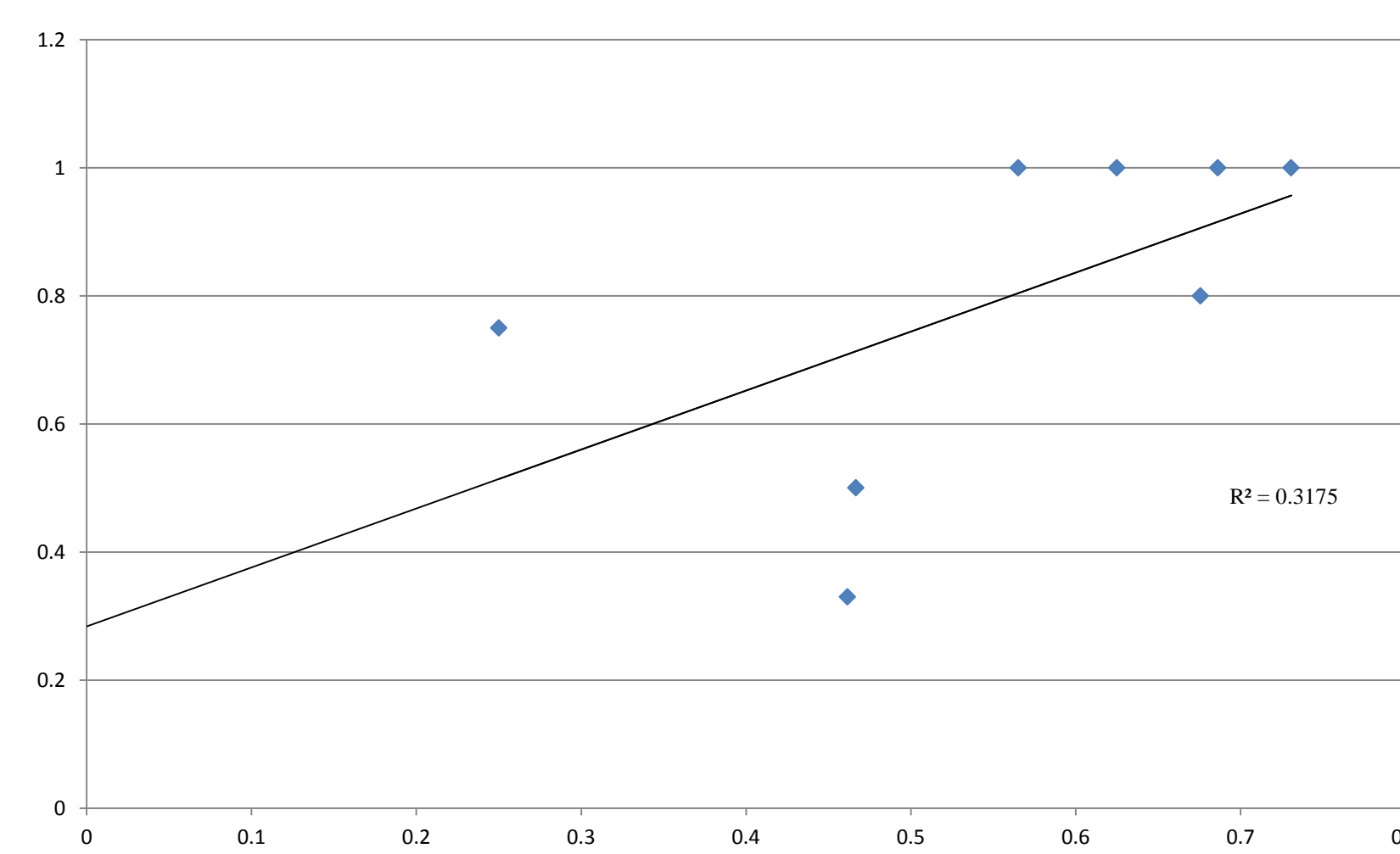
We analyzed the diets of necropsied raccoons from ten townships of Clark and Greene Counties. We massed the stomachs, and removed their contents. We analyzed the contents to determine whether or not there were vertebrate, invertebrate and plant tissues in the stomach. We recorded these data and classified the material according to class, order and family, when possible. We ran a linear regression model to determine whether or not parasite prevalence is a valuable factor to predict raccoon diet.

Results:



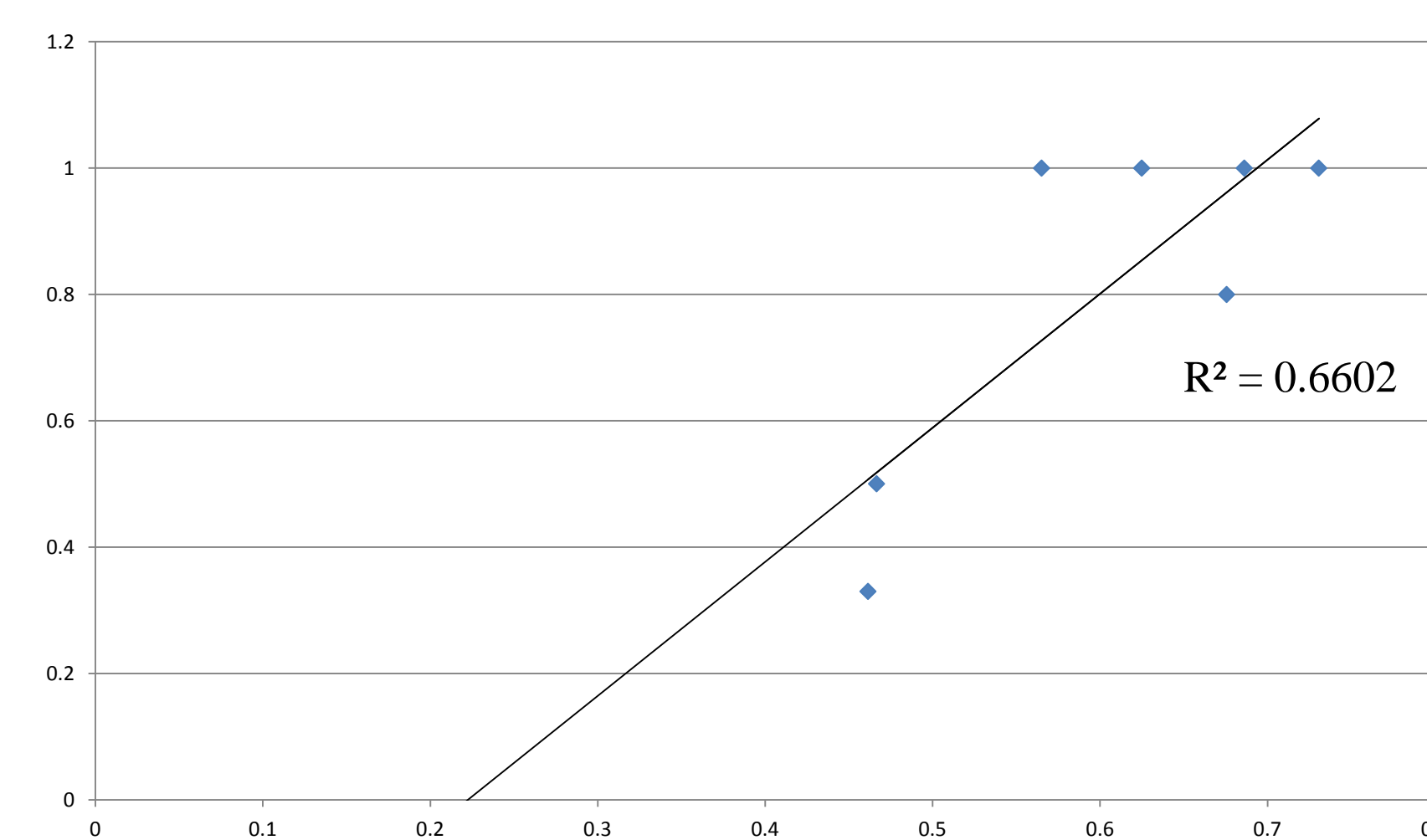
Bar graph displaying the percentage of trapped raccoons with vertebrate tissues in the stomach at necropsy. We placed the townships into two categories: those with parasite prevalence below 50%, and those with prevalence above 50%.

Prevalence of Vertebrate Tissue vs Parasite Prevalence



Scatterplot that uses parasite prevalence as the independent variable and prevalence of vertebrate tissue as the dependent variable.

Prevalence of Vertebrate Tissue vs Parasite Prevalence



Scatterplot that uses parasite prevalence as the independent variable and prevalence of vertebrate tissue as the dependent variable. Beavercreek township has been removed.

| SUMMARY OUTPUT | | | | | |
|-----------------------|-------------|-------------|-------------|-------------|----------------|
| Regression Statistics | | | | | |
| Multiple R | 0.563479105 | | | | |
| R Square | 0.317508701 | | | | |
| Adjusted R Square | 0.203760151 | | | | |
| Standard Error | 0.232040678 | | | | |
| Observations | 8 | | | | |
| ANOVA | | | | | |
| | df | SS | MS | F | Significance F |
| Regression | 1 | 0.150292744 | 0.150292744 | 2.791320872 | 0.145811579 |

Regression analysis using parasite prevalence as the independent variable and prevalence of vertebrate tissue as the dependent variable.

| SUMMARY OUTPUT | | | | | |
|-----------------------|----------|----------|----------|----------|----------------|
| Regression Statistics | | | | | |
| Multiple R | 0.812539 | | | | |
| R Square | 0.66022 | | | | |
| Adjusted R Square | 0.592264 | | | | |
| Standard Error | 0.178862 | | | | |
| Observations | 7 | | | | |
| ANOVA | | | | | |
| | df | SS | MS | F | Significance F |
| Regression | 1 | 0.310813 | 0.310813 | 9.715419 | 0.026343 |

Regression analysis using parasite prevalence as the independent variable and prevalence of vertebrate tissue as the dependent variable. We removed Beavercreek from the analysis.

Conclusions:

We found vertebrate tissues had higher prevalence in townships with higher parasite prevalence. We do not have enough data to run a Chi-squared test for equality of distributions yet, but the differences are noticeable. We also determined that some of the variation in prevalence of diet item was accounted for by the variation in parasite prevalence. This was clearly seen with respect to vertebrate tissues. Because, raccoons contract raccoon roundworm by consuming vertebrates that are intermediate hosts for the parasite, these data should help us understand the impacts of the parasite on its host better and to develop management strategies for the parasite.

References:

Blizzard, E. L., Yabsley, M. J., Beck, M. F., & Harsch, S. (2010). Geographic Expansion of *Baylisascaris procyonis* Roundworms, Florida, USA. *Emerging Infectious Diseases*, 16(11), 1803-1804.

Page, K. L., Beasley, J. C., Olson, Z. H., Smyser, T. J., Downey, M., Kellner, K. F., . . . Rhodes Jr., O. E. (2011). Reducing *Baylisascaris procyonis* Roundworm Larvae in Raccoon Latrines. *Emerging Infectious Diseases*, 17(1), 90-93.

Page, K. L., Gehrt, S. D., Titcombe, K. K., & Robinson, N. P. (2005). Measuring prevalence of raccoon roundworm (*Baylisascaris procyonis*): a comparison of common techniques. *Wildlife Society Bulletin*, 33(4), 1406-1412.

Rulison, E. L., Luiselli, L., & Burke, R. L. (2012). Relative Impacts of Habitat and Geography on Raccoon Diets. *The American Midland Naturalist*, 168(2), 231-246.