METHODS

The purpose of our analysis was to look at the predicted ash-free dry mass (AFDM) as an indicator of interspecific competition between tadpoles and mayflies and intraspecific competition among the individual species. The tadpole samples were collected to serve as a model for ash free dry mass. The lengths of the tadpoles were measured and the gut contents of the tadpoles were removed in order to be inspected. We placed the remains in foil boats and weighed the unit before combustion. The boats were then placed in a drying oven set at 105° C for 24 hours. After that period, we reweighed the boats and placed them in a combustion oven at 500° C for one hour.  Once the samples were weighed in their boats, we discarded of the remains and weighed the foil boats by themselves. When we subtracted this weight from the unit, we were able to measure AFDM for each specimen, which was calculated to the nearest 0.1 mg.

The ADFM values from the non-experimental tadpoles from the field were used in conjunction with the lengths of the tadpoles to construct a linear regression with a best fit line. Thirty ADFM values from the tadpoles were graphed against their respective Gosner stages to produce a length-mass relationship. The line best fit to describe the data was a power function that showed an upward trend. We then applied this function to a set of Gosner stages in order to output a set of predicted ADFM values. These values, based on the power function, were associated with Gosner stages of tadpoles taken from the field. The corresponding predicted AFDM was used to find means and standard deviations of each lake from each date.

ANALYSIS

Our analysis focused on using predicted AFDM to indicate interspecific and intraspecific competition by looking at statistical significance in the data. This was done using R Version 0.98.978. Based on the different densities of mayflies and tadpoles, we conducted tests for normality in our data using a Shapiro-Wilk normality test on tadpole and mayfly density as well as examining it graphically to determine its resemblance to a bell curve.  We created our plots using residuals, which allowed us to look at the differences between the obtained and predicted values of predicted AFDM. We also tested for heterogeneity of variance by visually assessing a box plot of residuals against tadpole densities in order to determine its distribution of variances. These were tested both as individual lakes and as a whole.

In order to analyze the relevance of the sample dates, we isolated two variables, one with sample dates as a factor and one without. Using ANOVA, we compared the p-values of both variables to determine their relevance in predicted weights based on mayfly and tadpole density.

RESULTS

The tadpoles of Lake 10102 that were isolated from mayflies showed the strongest correlation of larger body size to increased density (p > 0.001), so larger tadpoles were generally found in higher densities. The mayflies in isolation had a weaker relationship than the tadpoles (p > 0.08) and showed a more fluctuating trend in terms of weight to density. In the cages of both mayflies and tadpoles, mayflies did tend to increase in size when tadpole density increased (p > 0.048), while tadpoles decreased in size with the increase of mayfly density.  Lake 10475 showed no significant correlation between tadpoles alone (p > 0.45), mayflies alone (p > 0.89), or both species together (p > 0.70).