

Bio 1B Field Section Abstract Fa14

Assessment and Analysis of the Distribution of Two Invasive Crayfish Species, *P. leniusculus* and *P. clarkii*, in the Two Forks of Strawberry Creek That Run Through the UC Berkeley Campus

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ABSTRACT

Procambarus clarkii and *Pacifastacus leniusculus* are two invasive species of crayfish in Northern California. Both are found in Strawberry Creek, a small stream originating in the Berkeley hills and emptying into the San Francisco Bay. Their distribution within Strawberry Creek is concentrated mainly on the UC Berkeley campus, with either species inhabiting separate forks, *P. clarkii* in the Northern Fork, and *P. leniusculus* in the Southern. These species' natural ranges vary geographically and display different abiotic characteristics that coincide with difference in climate. The infiltration of invasive species can have detrimental effects on the native species and ecosystem health. In order to better understand the effect of these invaders in Strawberry Creek, we evaluated the correlation of crayfish species distribution and density with abiotic environmental factors. We sampled several sites on both forks of Strawberry Creek within the UC Berkeley campus to evaluate those environmental factors, and attempt to find a relationship between those factors and crayfish density and distribution. The variation of individual sites with respect to temperature and conductivity strongly correlated with crayfish density. *P. clarkii* exclusively inhabits the warmer sites. Overall, *P. clarkii* was found in significantly higher numbers than *P. leniusculus*. This may imply competition between the two species. The data collected from this study could assist with management of the invasive species and ongoing restoration projects of Strawberry Creek in the future.

Water Characteristics and Their Effect on Biodiversity and Algal Growth in the South Fork of Strawberry Creek

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ABSTRACT

We were interested in investigating water characteristics and their effect on biodiversity and algal growth in the South Fork of Strawberry Creek (SFSC). We defined "biodiversity" as a function of species abundance and species richness. Based on our observations and peer-reviewed literature, we hypothesized that there would be higher overall biodiversity in areas of the South Fork located in the Berkeley Hills. We utilized the following metrics for water characteristics: Dissolved Oxygen (DO), pH, water temperature, conductivity, nitrate levels, and phosphate levels. We measured water quality among four different sites: two on the University of California–Berkeley campus, and two in the Berkeley Hills. As a measure of biodiversity we placed three tiles in each of our four sites to observe for any algal or plant growth. At every site, we counted morphospecies as a way to test for biodiversity within a given site. We utilized ANOVA and Tukey HSD post-hoc statistical tests. We found that pH, water temperature, conductivity, nitrate and phosphate levels in on-campus sites and Berkeley Hill sites of the SFSC are significantly different. Algal growth in both on-campus sites had significant growth in comparison to Berkeley Hills sites. Our data supports our hypothesis; biodiversity in SFSC is higher in areas with little to no urban development.

An Ecological Study on the Intraspecific and Interspecific Behavior of *Cyanocitta stelleri* and *Alphelocoma californica* in Tilden Regional Park

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ABSTRACT

This study examined the difference in the distribution of *Cyanocitta stelleri* and *Alphelocoma californica* within Tilden Regional Park near Berkeley, California using a continuous line transect to calculate population densities within four microhabitats: riparian zone, eucalyptus grove, scrubland, and oak woodland. We also investigated interspecific and intraspecific aggression among these two species through a systematized artificial vocalization playback procedure. We analyzed interspecific interactions between *C. stelleri* and *A. californica* due to a lack of literature addressing such behavior in the habitats where the two corvid species co-occur, thus hoping to contribute to the study of jay natural history. Based on our pilot study, we hypothesized that there would be considerable overlap of the two species in the riparian zone and oak woodland due to an abundance of acorns while the scrubland would be predominated by *A. californica* and the eucalyptus grove by *C. stelleri*. We also hypothesized that there would be greater evidence of intraspecific, as opposed to interspecific, aggression because each species occupied different habitat gradients as apparent during the pilot study. Our findings supported these hypotheses, as the respective population densities differed among the four different habitats: *C. stelleri* predominated in the eucalyptus grove as did *A. californica* in the scrubland, while both species co-occurred in the oak woodland and riparian zone. Ultimately, we were unable to define any differences in interspecific or intraspecific behavior between the two corvid species between the microhabitats, largely due to limited data. However, we were able to conclude that intraspecific behavior was more common in both corvid species; in particular, *A. californica* was more responsive than *C. stelleri* to both artificial vocalizations.

Ecological Roles of Coyote Brush and Scotch Broom Based on Supported Invertebrate Communities and Surrounding Soil Characteristics

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ABSTRACT

In the coastal grasslands of California, the invasive Scotch broom has demonstrated aggressive and widespread invasion to the detriment of native species through competitive displacement and habitat disruption. This study examined the invertebrate assemblages supported by Scotch broom, an invasive woody plant introduced in the 19th century, and coyote brush, a corresponding shrub native to California across four sites in Bay Area California in order to determine whether native coyote brush and non-native invasive broom perform common or distinct ecological roles to organisms of a third party. Invertebrate communities were characterized by abundance and diversity (accounting for richness and evenness) under the prediction that native coyote brush supported a more diverse and abundant population of invertebrates. Invertebrates were classified to the taxonomic level of "morphospecies" and analyzed by univariate organism count, morphospecies richness, and Shannon Indices for evenness. Student T-tests were conducted as statistical analysis for significance. A Jaccard Index for presence/absence of morphospecies across sample sites and host plant species was computed for similarity in composition of invertebrate assemblages. Invertebrate abundance between the two morphospecies was not significantly different. However, morphospecies diversity measured in differences in species richness and Shannon Indices was statistically significant upon removal of the outlier. An auxiliary survey of

surrounding soil properties in nitrogen, phosphorus, potassium, and pH content was conducted to further distinguish the ecological roles of the nitrogen-fixing invasive and native plants. Overall, coyote brush supported higher invertebrate species diversity across morphospecies richness and evenness at a significant difference from Scotch broom. The Jaccard Index for similarity concludes that it cannot be said that the invertebrate assemblages are compositionally different to significance between coyote brush and broom. Based on these results, invasive Scotch broom has an ecological role distinct from that of native coyote brush, suggesting that broom's mechanism of invasion contributes to alterations to biodiversity on the surrounding environment.

Comparing and Contrasting Soil Environments: a Study of Soil Effects on Areas Occupied by Native and Invasive Species within East Bay Urban Forest Ecosystems

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ABSTRACT

As an invasive species, *Eucalyptus globulus* is successful within the Eastern Bay region of the San Francisco Bay Area. The mechanisms behind its integration into the urban forest landscape dominated mostly by oak woodlands and redwood forests are not well understood. Aware that redwood and eucalyptus trees exhibit allelopathic behavior, we became interested in whether or not another mechanism shaped these woodlands, driving us to include oak woodlands within our study. We hypothesized that the spread of eucalyptus stands into these areas may be attributed to the ability of eucalyptus to thrive in soil environments unsuitable for other native woodlands and sought out to test this through taking multiple soil samples from the aforementioned forests in two regional parks (Tilden Regional Park and Redwood Regional Park). We tested these samples for consistently differing levels of nitrogen, phosphorous, potassium, soil pH, and understory cover. Through our investigations, we discovered a consistent lack of nitrogen within all three woodlands. In eucalyptus groves we found that the invasive species survived in soil with depleted potassium, indicating that it may in fact need fewer macronutrients to grow, supporting our hypothesis. However we do not have enough data at this point in time to determine whether these trends are significant, so we cannot ensure the significance of our trends in the larger scheme of soil analysis.

Spider Density and Distribution across Varying Levels of Development and Disturbance in Berkeley Ecosystems

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ABSTRACT

Research suggests that resource-rich habitats and niche partitioning allow for higher spider density. However, the effect of human-mediated development and disturbance on resource availability and spider niche partitioning remains unclear. Our study investigated the size distribution and density of spiders across a gradient of development. Along this gradient we evaluated three microhabitat zones in disturbed and undisturbed sites as a means of looking at these effects. We hypothesized that evenness of spider size across different microhabitats would serve as an indicator of niche partitioning between spiders of the same size. More evenness across microhabitats would indicate more competition, as spiders can no longer coexist within the same niche. We hypothesize that disturbance and development increase available resources, reducing competition, and consequently niche partitioning. Larger spiders might be less abundant across the gradient, due to greater needs for space and resources. We found no overarching pattern in density across the gradient as a whole. We found no pattern comparing the evenness of spread across

microhabitats in disturbed versus undisturbed areas. Little differences were found when comparing size distribution along the gradient, from disturbed to undisturbed, or from zone to zone. Though our findings did support our hypothesis on relative abundance of size across the gradient, we failed to reject the null in how that abundance changes. It appears there is little difference in spider density across the gradient, and varying disturbance or levels of development seem to have little effect on the distribution of spiders across microhabitats, and consequently, niche partitioning.