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Foraging Preference by Wild Deer on Toyon (*Heteromeles arbutifolia*) from Santa Catalina Island versus Malibu



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Deer eating Catalina *H. Arbutifolia*

Abstract:

Our group collected samples of *Heteromeles Arbutifolia* from both Santa Catalina Island and Pepperdine University's campus in Malibu, CA in order to compare the morphological differences and deer preference between them. In our experiment, we planted the *H. Arbutifolia* from both locations side by side on a hillside overlooked by the Thorton Administration Center building on Pepperdine's campus. In the first trial the deer did not consume either of the samples; we believe this was due to the length of time from when the branches were collected from the island to when they were introduced to the deer on campus. However, after receiving fresh samples of *H. Arbutifolia* from the island, we immediately counted the leaves and introduced the branches to the same feeding site. The results from the second trial confirmed our hypothesis that deer have a preference for the *H. Arbutifolia* grown on Catalina Island over that grown in Malibu. The spine length on the leaves from both samples showed a significant difference; the spines from *H. Arbutifolia* grown on Pepperdine's campus were consistently longer than those measured from the Catalina leaves. Overall, there was a clear difference in the morphological characteristics and herbivore preference for the *H. Arbutifolia* grown in Catalina over that found in Malibu.

Introduction:

Evolution has led to vast variations in plant morphology. Toyon (*Heteromeles arbutifolia*), is a drought-adapted chaparral shrub native to southwestern California. There is a clear difference seen in the morphological characteristics of *H. arbutifolia* that grow on Catalina Island in comparison to *H. arbutifolia* that grow on Pepperdine's campus in Malibu, CA. *H. arbutifolia* on campus have a larger leaf area, spine length, and darker color than their relatives grown on Catalina Island. Since deer were introduced to Catalina Island fairly recently, it is evident that the *H. arbutifolia* on Catalina have not fully developed the same herbivory deterrents (spine length, color variation, and leaf area) as *H. arbutifolia* on Pepperdine's campus. We hypothesized that the deer on Pepperdine's Campus will have a preference for *H. arbutifolia* grown on Catalina Island because they lack the defense mechanisms that *H. arbutifolia* grown on campus have to protect them from herbivores. To test this hypothesis, we brought multiple samples of *H. arbutifolia* from Catalina Island, and planted them on Pepperdine's Campus in an area daily browsed by deer. By planting *H. arbutifolia* alongside those native to Pepperdine's Campus, we will be able to determine whether deer will have a preference for one over the other.

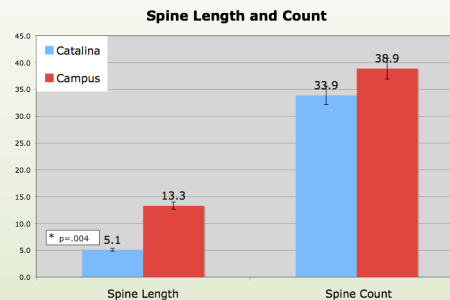
The purpose of this investigation is to see how evolutionary changes in plant morphology affect deer herbivory. Knowledge and data gathered from this experiment will further our understanding of mammalian foraging behavior, as well as to document the morphological differences found in *H. arbutifolia* grown in two separate locations.



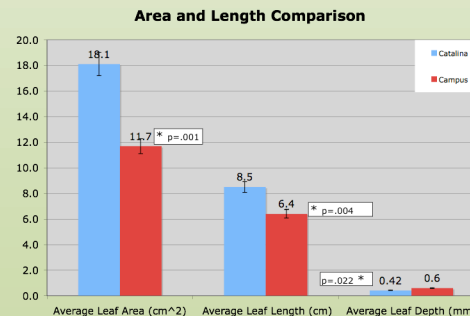
Comparison of *H. arbutifolia* spines. Top: Santa Catalina Island Bottom: Malibu, CA



Study site outside of Charles B. Thornton Administration Center (TAC) on Pepperdine's Campus



Amount of Spines and Length of Spines comparison between Santa Catalina *H. arbutifolia* and Malibu *H. arbutifolia*



Leaf Area, Length, and Depth comparison between Santa Catalina *H. arbutifolia* and Malibu *H. arbutifolia*

Methods:

Dr. Davis helped our group collect samples of *H. arbutifolia* from Pepperdine's Campus and Catalina Island. Leaves on each sample were counted, tagged, and planted on our selected study site on campus. 10 leaves were selected from each location to measure spine length, leaf area, and spine count. An Olympus Precision Microscope® was used to measure the spine lengths of individual leaves, along with a vernier caliper to measure the thickness of each leaf, and a standard ruler to measure the length and width. The Li-3100 was used to measure the leaf area. The use of a leaf press was necessary to flatten the leaves in order to obtain optimum results for spine length measurements, and spine count. Dr. Davis took pictures capturing the morphological differences between both plant samples. For our second trial, a Cuddeback® digital scouting camera was installed at our study site to photographically document the deer's response to our planted samples from Catalina.

Conclusion:

- 9.7% of Santa Catalina Island *H. arbutifolia* leaves were eaten by deer, whereas 0% from Malibu were consumed.
- Noticeable and measurable morphological differences between *H. arbutifolia* leaves from Santa Catalina Island and those from Pepperdine's Malibu campus
- Santa Catalina Island *H. arbutifolia* have a smaller spine length and are thinner than those found on Pepperdine's Campus.
- Many years in isolation on an island habitat have caused *H. arbutifolia* from Catalina to weaken its herbivory deterrents

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