

1-1-2011

A Preliminary Study of *Heteromeles Arbutifolia* Fruit Morphology at Ballona Wetlands and Temescal Canyon, Los Angeles, California

Victor D. Carmona

Loyola Marymount University, vcarmona@lmu.edu

Phil Simmons

Elise Vo

Elizabeth Wight

Repository Citation

Carmona, Victor D.; Simmons, Phil; Vo, Elise; and Wight, Elizabeth, "A Preliminary Study of *Heteromeles Arbutifolia* Fruit Morphology at Ballona Wetlands and Temescal Canyon, Los Angeles, California" (2011). *Biology Faculty Works*. 13.
http://digitalcommons.lmu.edu/bio_fac/13

This Article is brought to you for free and open access by the Biology at Digital Commons @ Loyola Marymount University and Loyola Law School. It has been accepted for inclusion in Biology Faculty Works by an authorized administrator of Digital Commons@ Loyola Marymount University and Loyola Law School. For more information, please contact digitalcommons@lmu.edu.

A Preliminary Study of *Heteromeles arbutifolia* Fruit Morphology at Ballona Wetlands and Temescal Canyon, Los Angeles, California

Author(s): Phil Simmons, Elise Vo, Elizabeth Wight, and Víctor D. Carmona-Galindo

Source: BIOS, 82(4):117-119. 2011.

Published By: Beta Beta Beta Biological Society

DOI: <http://dx.doi.org/10.1893/011.082.0403>

URL: <http://www.bioone.org/doi/full/10.1893/011.082.0403>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

Preliminary Report

A preliminary study of *Heteromeles arbutifolia* fruit morphology at Ballona Wetlands and Temescal Canyon, Los Angeles, California

Phil Simmons, Elise Vo, Elizabeth Wight, and Víctor D. Carmona-Galindo

Loyola Marymount University, Los Angeles, CA 90045

Abstract. *Heteromeles arbutifolia*, the California holly, is an evergreen shrub native to chaparral habitats of Southern California that fruits from November to January. Fruit species morphology has been shown to be a good indicator of habitat quality among other plants. The variation in fruit morphology was examined for the native plant at two diverse Southern California sites, a wetland and a canyon. California Holly fruits had a significantly greater volume in Ballona Wetlands than at Temescal Canyon ($Z=4.367$, $P<0.001$), as well as a significantly greater variance in Ballona Wetlands than at Temescal Canyon ($F=2.357$, $P=0.02$). The production of fruits with larger and more variable volumes in Ballona Wetlands may be a response to the presence of urban influences and environmental contaminants. As the reproductive structure, fruit morphology may be a good indicator of how habitat stress influences reproductive success.

Introduction

The California holly, *Heteromeles arbutifolia*, is an evergreen shrub that inhabits coastal chaparral habitats in California. The plant exhibits durability that allows it to grow in well-drained soils, and in both direct sunlight and partial shade. (Fischer, 1998). The peak season for fruit production of scarlet-colored berries is from November to January. Fruit morphology has been evaluated as an indicator of plant stress and habitat quality in other species (Martins and Johnson, 2009). In previous studies, habitats with high levels of disturbance or poor agricultural practices were correlated with reduced fruit set (Martins and Johnson,

2009). In this preliminary study, fruit production in the California Holly was examined to determine fruit morphology variation. Ballona Wetlands are located along the coast in Marina Del Rey, California and nestled between business and residential areas. The effects of urbanization in Ballona include the presence of contaminants and pollutants (Park and Stenstrom, 2006) and the presence of an irrigation system utilizing recycled water, from the Los Angeles, CA area, that provides consistent watering throughout the habitat. Temescal Canyon is a preserve in Pacific Palisades, California and most of the park is not directly exposed to outside urban influences. While it contains running trails, it is not managed regularly and lacks an irrigation system. The hypothesis was that California Holly fruit morphology in the Ballona Wetlands would have greater variability than fruit morphology in Temescal Canyon based on the effects of urbanization.

Correspondence to: Víctor D. Carmona-Galindo, Department of Biology, Loyola Marymount University, 1 LMU Dr., MS 8220, Los Angeles, CA 90045; phone: (310) 338-1968; fax (310) 338-4479; email: vcarmona@lmu.edu.

Materials and Methods

This study was conducted at Ballona Wetlands and Temescal Canyon in Los Angeles, California on November 17, 2009. Samples were varied and included at least 20 berries from 60 California Holly shrubs each at Ballona Wetlands and 20 shrubs at Temescal Canyon. Mean fruit volume was calculated by the following equation:

$$\text{MeanFruitVolume}(\text{cm}^3) = \frac{V_{\text{water}}}{N_f} \quad (1)$$

Where V_{water} was equal to the volume of water (ml) displaced by a given number of fruits and N_f was equal to the number of fruits measured. Fruit volume distribution was tested for normality using a Shapiro-Wilk test in Statistica (v.9.1). The mean difference of mean fruit volume was tested using a Mann-Whitney U Test in Statistica (v.9.1). The difference in fruit volume variance between sites was tested using F test in Microsoft Excel (2007).

Results and Discussion

Sixty plants from Ballona Wetlands and 20 from Temescal Canyon were sampled. Fruit

volumes were not normally distributed across both sites ($W=0.919$, $P<0.001$). Average California Holly fruit volume from Ballona Wetlands (0.305 cm^3) was significantly greater than that at Temescal Canyon (0.200 cm^3) ($Z = 4.367$, $P < 0.001$) (Figure 1). There was significantly greater variance in fruit volume at Ballona Wetlands than at Temescal Canyon ($F = 2.357$, $P = 0.02$).

There was a skewed distribution toward lower volumes between the two sites indicating the abundance of smaller fruit volumes relative to the mean. Ballona Wetlands fruit morphology showed larger mean volumes and a greater variability (Figure 1). Previous studies show that habitat quality translates into variability in fruit morphology (Martins and Johnson, 2009), suggesting that the differences between Ballona Wetlands and Temescal Canyon present different environmental stresses.

The effects of urbanization have led to environmental contamination in Ballona Wetlands (Buffleben et al., 2002). Ballona Wetlands is polluted with high levels of hazardous metals such as cadmium, chromium, copper, lead, and nickel (Buffleben et al., 2002). It is possible that the use of treated sewage discharge in the irrigation system and the abundance of contaminants increased variability in fruit morphology

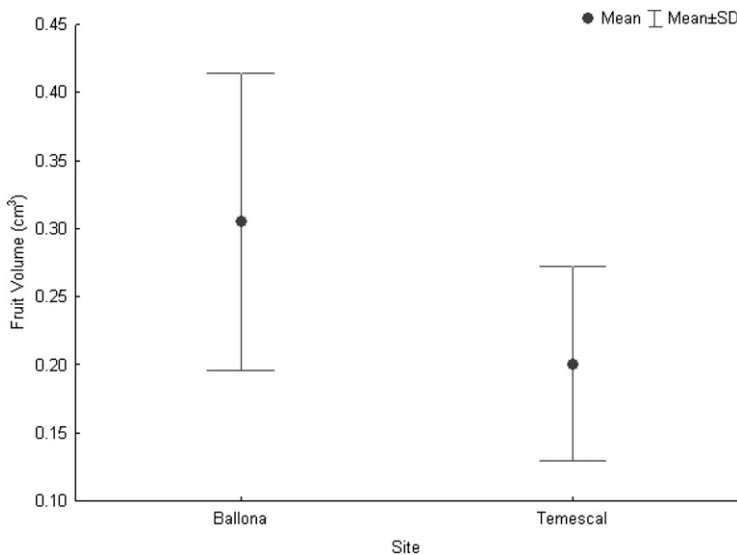


Figure 1. Average fruit volume (cm^3) at Ballona Wetlands and Temescal Canyon. See text for details.

that created more stressors for seed dispersers (Costanza et al., 1993).

Future studies might examine urbanized sites to determine the effect of stress on seed dispersal and ultimately seed viability. By assessing fruit morphology in relationship to environmental stress it will be possible to determine the specific functions that habitat quality has on plant dispersal.

Literature Cited

- Buffleben, M., Zayeed, K., Kimbrough D., Stenstrom, M., and I. Suffet. 2002. Evaluation of urban non-point source runoff of hazardous metals entering Santa Monica Bay, California. *Water and Science Technology*. **45(9)**:263–268.
- Costanza, W., Kemp, M. and W. Boynton. 1993. Predictability, Scale, and Biodiversity in Coastal and Estuarine Ecosystems: Implications for Management. *Ambio*. **22(2)**: 88–96.
- Fischer, T. 1998. Toyon *heteromeles arbutifolia*. *Horticulture*. **95(9)**:48.
- Martins, D. and S. Johnson. 2009. Distance and quality of natural habitat influence hawkmoth pollination of cultivated papaya. *International Journal of tropical Insect Science*. **29(3)**:114–123.
- Park, M. and M. Stenstrom. 2006. Spatial Estimates of Stormwater-Pollutant Loading Using Bayesian Networks and Geographic Information Systems. *Water Environment Research*. **78(4)**:421–429.
- StatSoft, Inc. (2010). STATISTICA (data analysis software system), version 9.1. www.statsoft.com.

Received 29 April 2010; accepted 21 February 2011.