



Complexity in the city:
Effects of urban environmental
heterogeneity on the life history traits of
Centaurea melitensis across California

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Urban evolution comes into its own: Emerging themes and future directions of a burgeoning field

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Abstract

Urbanization has recently emerged as an exciting new direction for evolutionary research founded on our growing understanding of rapid evolution paired with the expansion of novel urban habitats. Urbanization can influence adaptive and nonadaptive evolution in urban-dwelling species, but generalized patterns and the predictability of urban evolutionary responses within populations remain unclear. This editorial introduces the special feature "Evolution in Urban Environments" and addresses four major emerging themes, which include: (a) adaptive evolution and phenotypic plasticity via physiological responses to urban climate, (b) **adaptive evolution via phenotype–environment relationships in urban habitats**, (c) population connectivity and genetic drift in urban landscapes, and (d) human–wildlife interactions in urban spaces. Here, we present the 16 articles (12 empirical, 3 review, 1 capstone) within this issue and how they represent each of these four emerging themes in urban evolutionary biology. Finally, we discuss how these articles address previous questions and have now raised new ones, highlighting important new directions for the field.

SPECIAL ISSUE PERSPECTIVE

Evolutionary Applications

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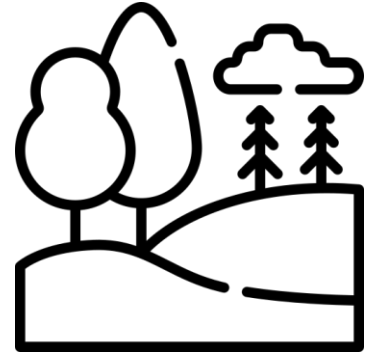
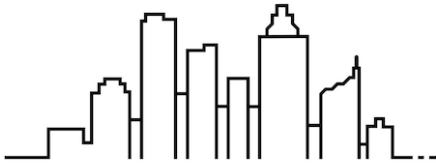
Socio-eco-evolutionary dynamics in cities

Simone Des Roches¹  | Kristien I. Brans²  | Max R. Lambert³  | L. Ruth Rivkin^{4,5,6}  |
Amy Marie Savage⁷  | Christopher J. Schell⁸  | Cristian Correa^{9,10}  |
Luc De Meester^{2,11,12}  | Sarah E. Diamond¹³  | Nancy B. Grimm¹⁴  |
Nyeema C. Harris¹⁵  | Lynn Govaert^{16,17}  | Andrew P. Hendry¹⁸  |
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Abstract

Cities are uniquely complex systems regulated by interactions and feedbacks between nature and human society. **Characteristics of human society—including culture, economics, technology and politics—underlie social patterns and activity, creating a heterogeneous environment that can influence and be influenced by both ecological and evolutionary processes.** Increasing research on urban ecology and evolutionary



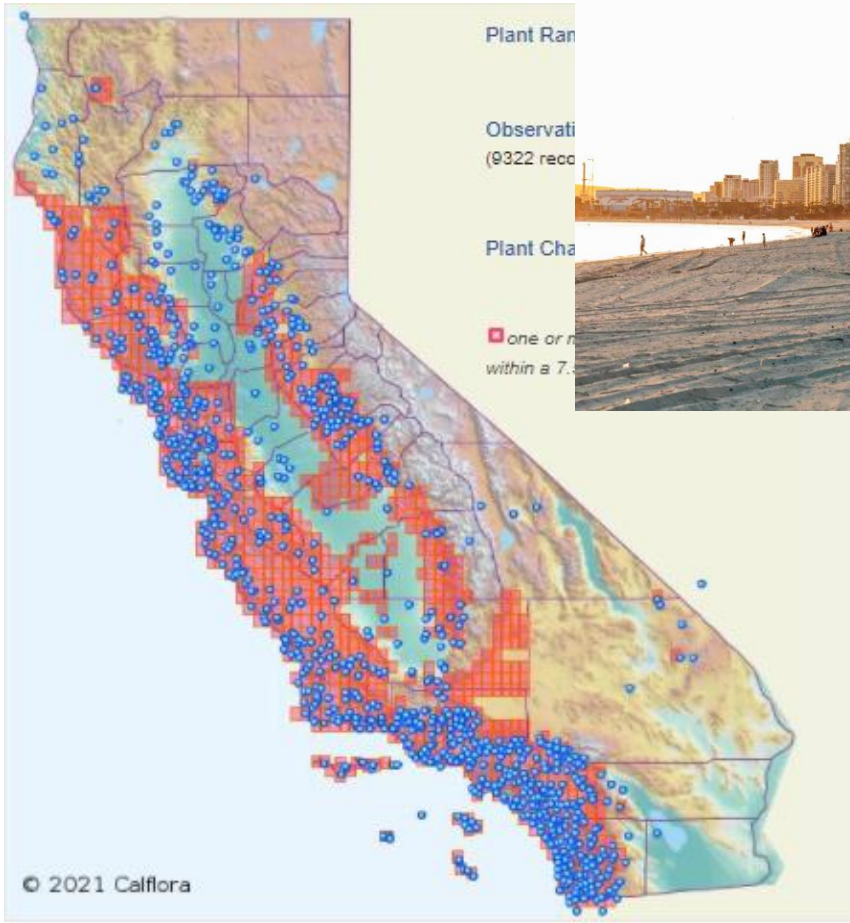


Which specific urban environmental variables lead to trait change?



Species of interest: *Centaurea melitensis*

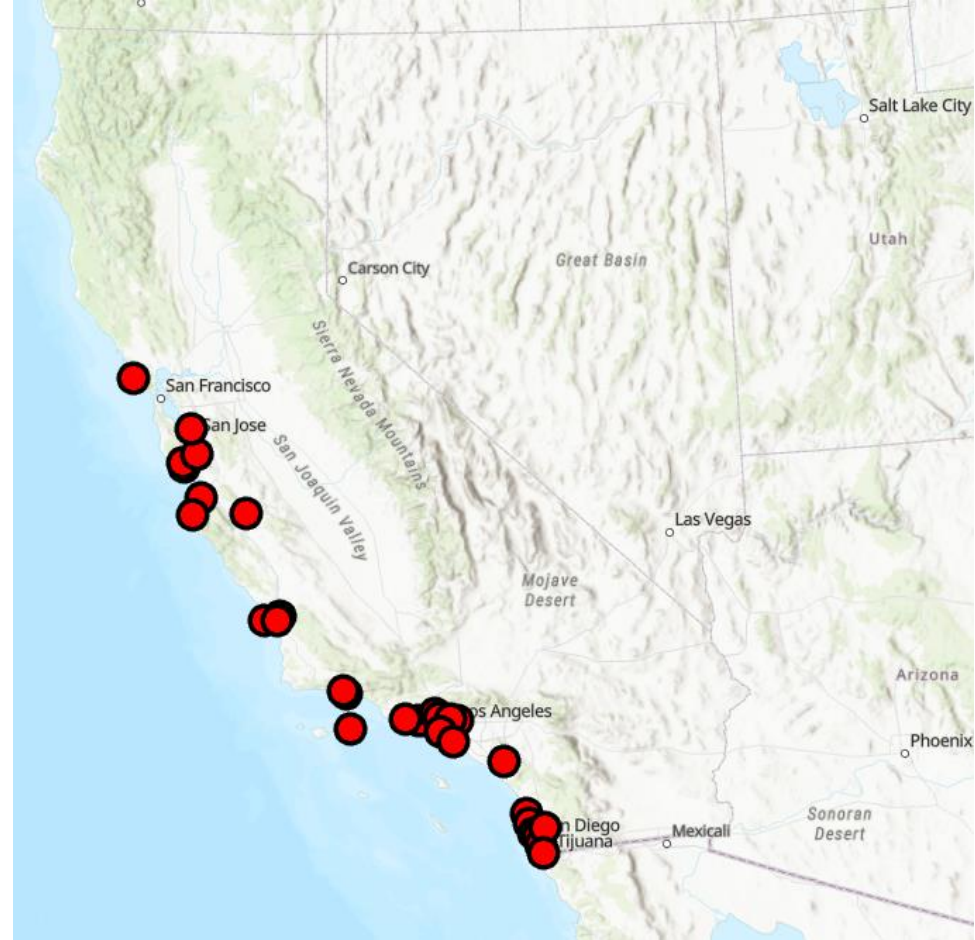




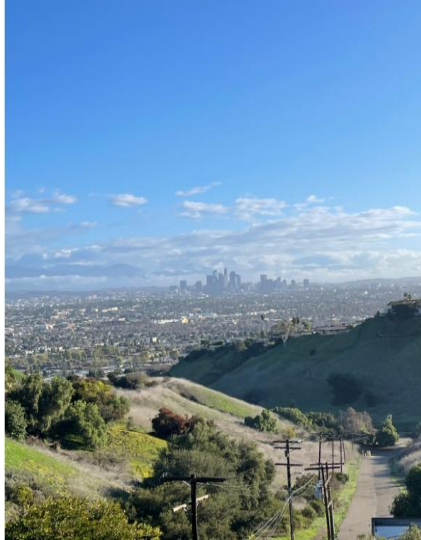
Predictions

- Life history traits within *Centaurea melitensis* will be associated with urban environmental variables beyond impervious surfaces

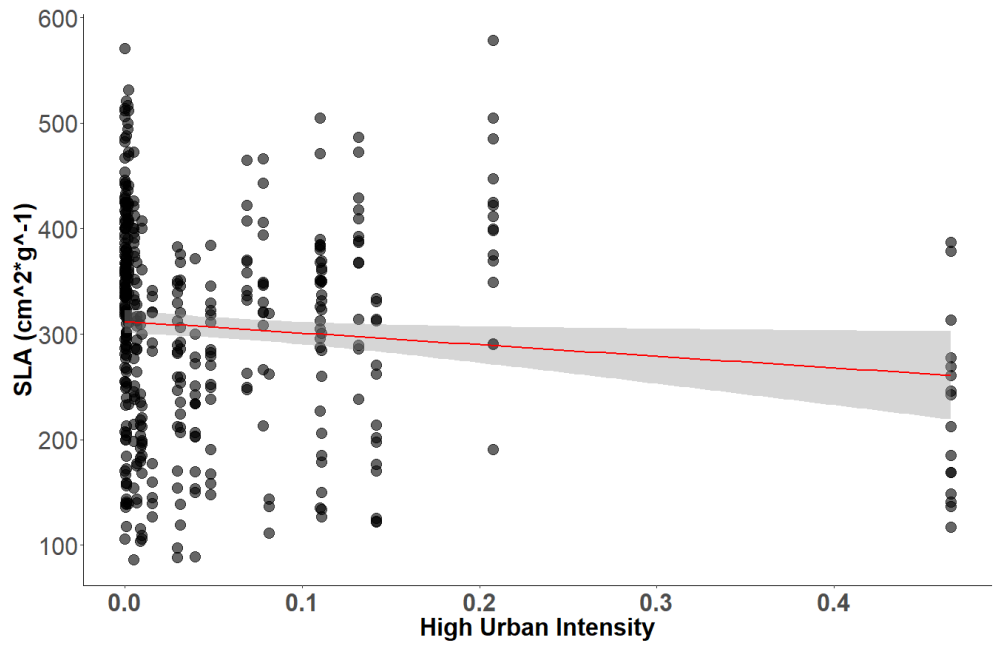
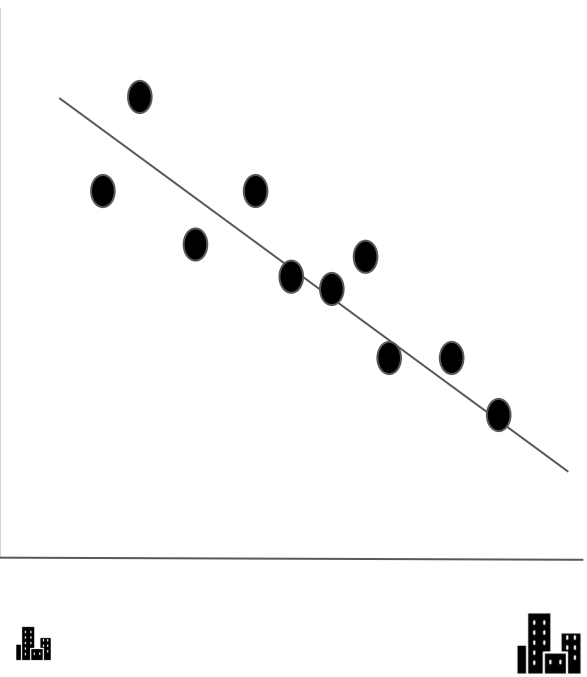


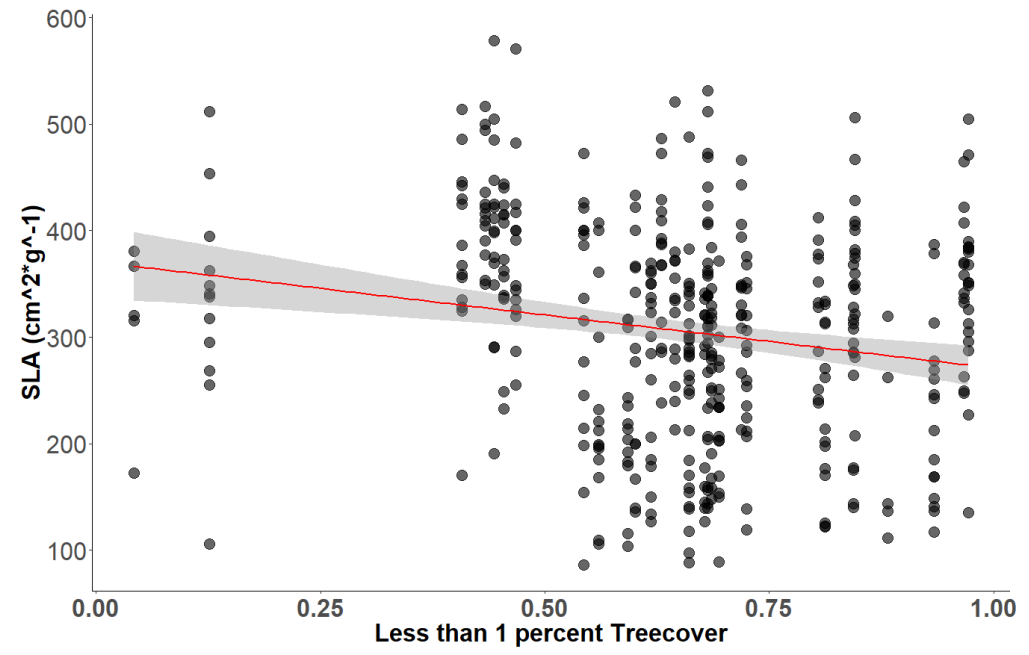
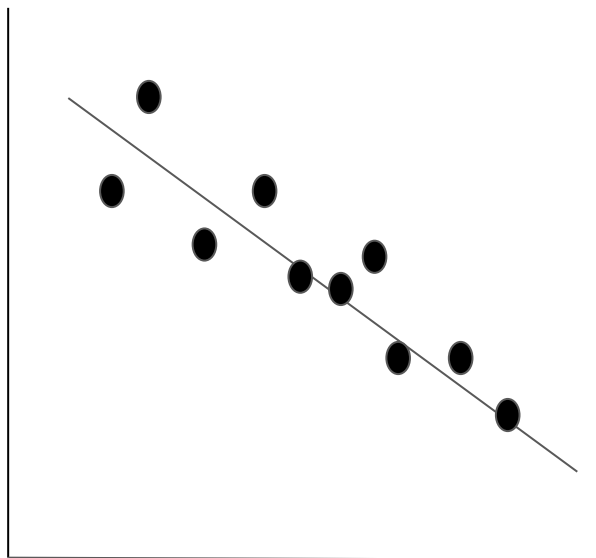


31 Populations, $n = 500$









$F_{1, 419.2} = 6.895, P = 0.009$

Conclusions

- There is evidence for trait diversity for *C. melitensis* in response to urbanization
- Urban development did not predict trait variation while treecover did



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