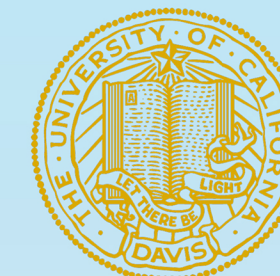


# Get Off My Lawn!

# The effects of interspecific competition on owl limpet territory size and behavior

Adri Penix, Samuel A. Walkes, Eric Sanford  
Bodega Marine Laboratory, University of California, Davis



## Introduction

- Ecological theory suggests that territorial animals reduce territory size in response to increasing competitor density and costs of defense (Adams 2001).
- The intertidal owl limpet (*Lottia gigantea*) grazes on and defends a territory on the rock.



**Figure 1: A)** An owl limpet in its territory covered in diatoms and radula marks and **B)** an owl limpet in the lab displaying territorial shoving behavior.

- We tested whether *L. gigantea* would reduce its territory size in response to allospecific competitors, particularly the chiton *Nuttallina californica*.

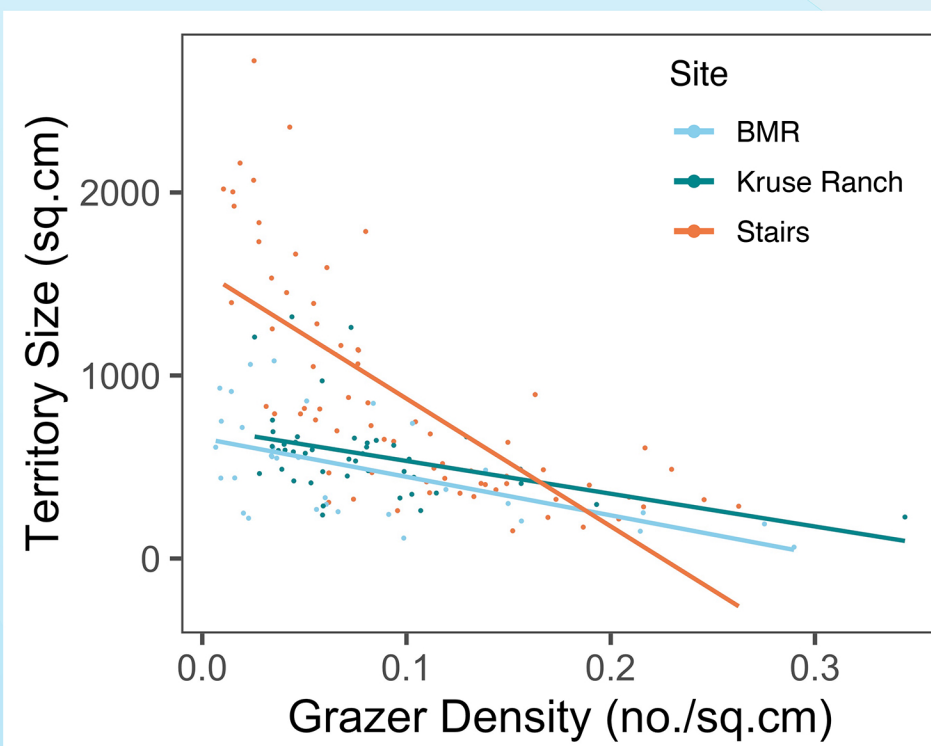


## Questions

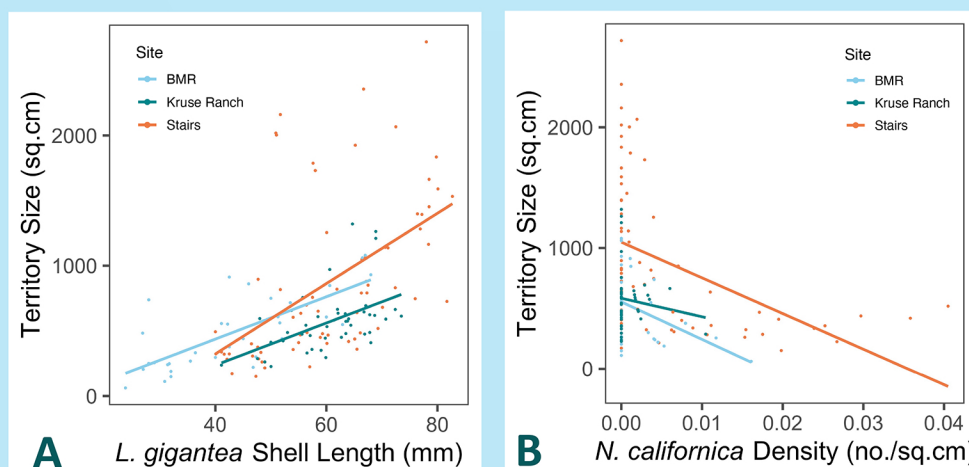
- How does competitor density affect the relationship between *L. gigantea* size and territory size?
- How does competitor density affect *L. gigantea* territory size?
- How does competitor density affect *L. gigantea* behavior?

## How does competitor density affect the relationship between *L. gigantea* size and territory size?

- We conducted field surveys at three sites, Bodega Marine Reserve (BMR), Kruse Ranch near Salt Point, CA, and Stairs in Lompoc, CA.
- In the field, we counted and identified the grazers (limpets, chitons, and snails) in and within 10 cm of each territory, and measured *L. gigantea* territory size using ImageJ.
- Based on earlier studies, we expected to see a positive relationship between *L. gigantea* size and territory size (Stimson 1973).



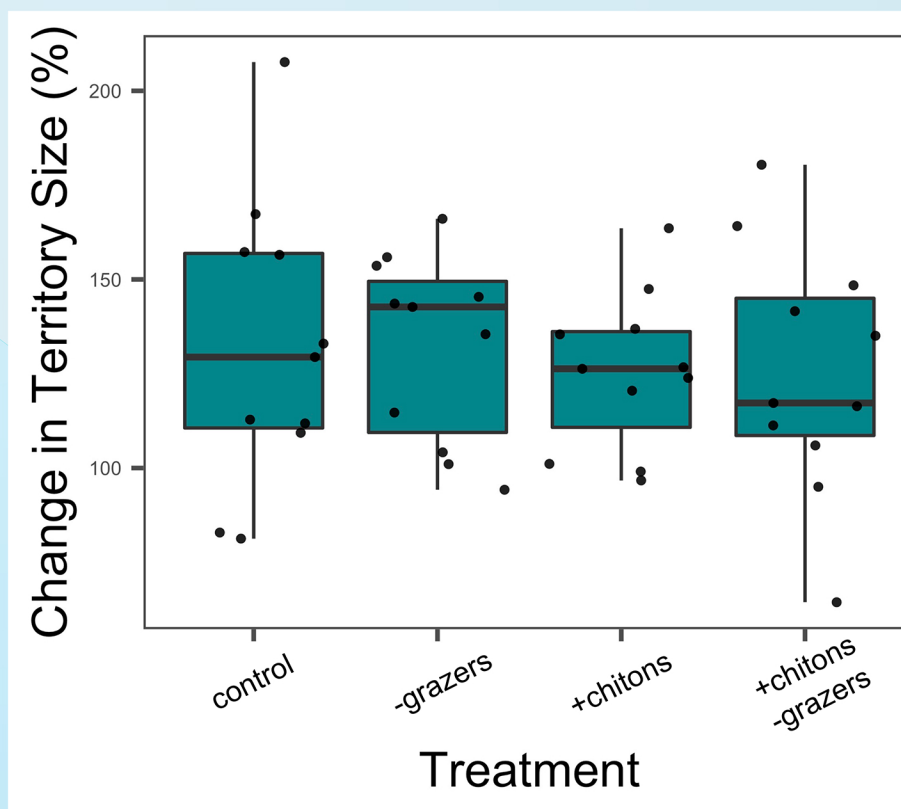
**Figure 2: Territory size decreased as a function of grazer density ( $p = 0.0066$ ,  $R^2 = 0.7215$ ).**



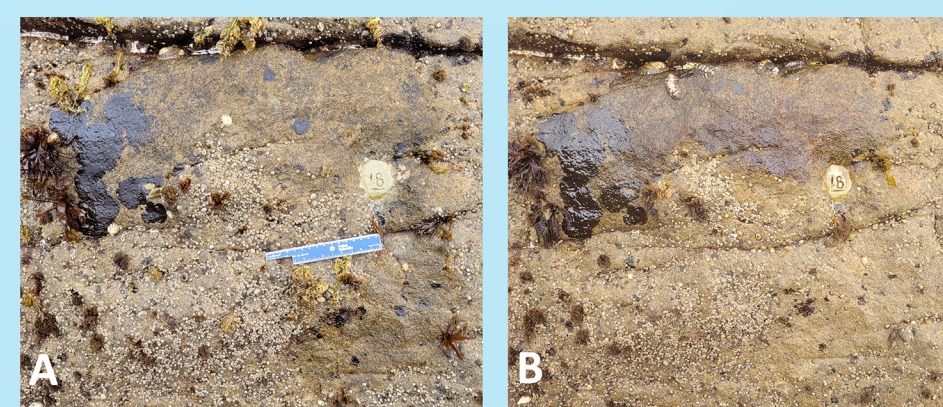
**Figure 3: Territory size A) increased as a function of *L. gigantea* shell length ( $p < 0.001$ ), and B) decreased as a function of chiton (*N. californica*) density ( $p = 0.0361$ ).**

## How does competitor density affect *L. gigantea* territory size?

- We experimentally altered the densities of *N. californica* and other grazers and measured changes in territory size among four treatment groups:
  - Control, nothing altered
  - Remove all grazers (-grazers)
  - Add five *N. californica* (+chitons)
  - Add five *N. californica*, remove other grazers (+chitons -grazers)



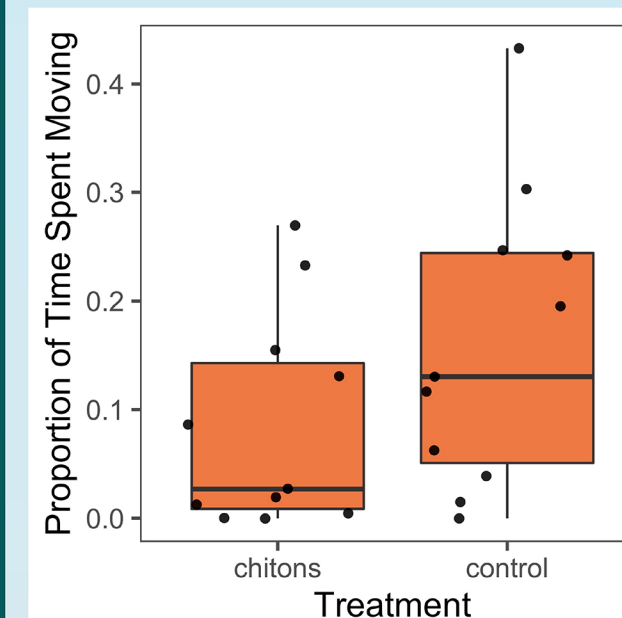
**Figure 4: Percent change in territory size by treatment. Though the effect was not significant, some territories with chiton additions increased in area more slowly ( $F_{3,44} = 0.288$ ,  $p = 0.833$ ).**



**Figure 5: A)** A territory in the chiton addition and grazer removal treatment group on day zero next to **B)** the same (now smaller) territory on day 58.

## How does competitor density affect *L. gigantea* behavior?

- In the lab, we tracked *L. gigantea* movement on experimental tiles with two treatments:
  - Chitons (five chitons added to the tile)
  - Control (no chitons)



**Figure 6: Proportion of time spent moving for both treatment groups. On average, limpets moved less with chitons present. ( $F_{1,11} = 3.522$ ,  $p = 0.09$ ).**

**Figure 7: Mesocosm set up with three owl limpets on tiles and a splash system. Cameras took pictures once a minute for several hours per trial.**



## Conclusions

- Increasing competitor density causes *L. gigantea* to decrease activity and slow territory growth, likely due to increased costs of defense (Adams 2001).
- Our studies add empirical support for the predicted negative correlation between competitor density and territory size.

## Acknowledgements

This study was funded by the Kendra Chan Fellowship and Vicki Moore, and NSF grant OCE-2023297. Thank you to Dr. Eric Sanford and Sam Walkes for advising and support. Thank you to Jackie Sones for access to BMR. Thank you to the BML Aquatic Resource Group, and to Jacqueline Rajerison, Keira Monuki, Karolina Zabinski, Mimi Chavez, Anna Lee, Emma Deen, and Lara Hsia.

## References

Adams, E.S. (2001). Approaches to the Study of Territory Size and Shape. *Annual Review of Ecology and Systematics*. 32:1, 277-303.  
Stimson, J. (1973). The Role of the Territory in the Ecology of the Intertidal Limpet *Lottia gigantea*. *Ecology*. 54:5, 1020-1030.