

# Revisiting the Reproductive Behaviors of Blackspotted Stickleback

Cassidy Constant<sup>1</sup>, Megan Tucker<sup>2</sup>, Colby Behrens<sup>3</sup>, and Dr. Alison M. Bell<sup>3,4</sup>

<sup>1</sup>Lincoln Land Community College, Springfield, Illinois

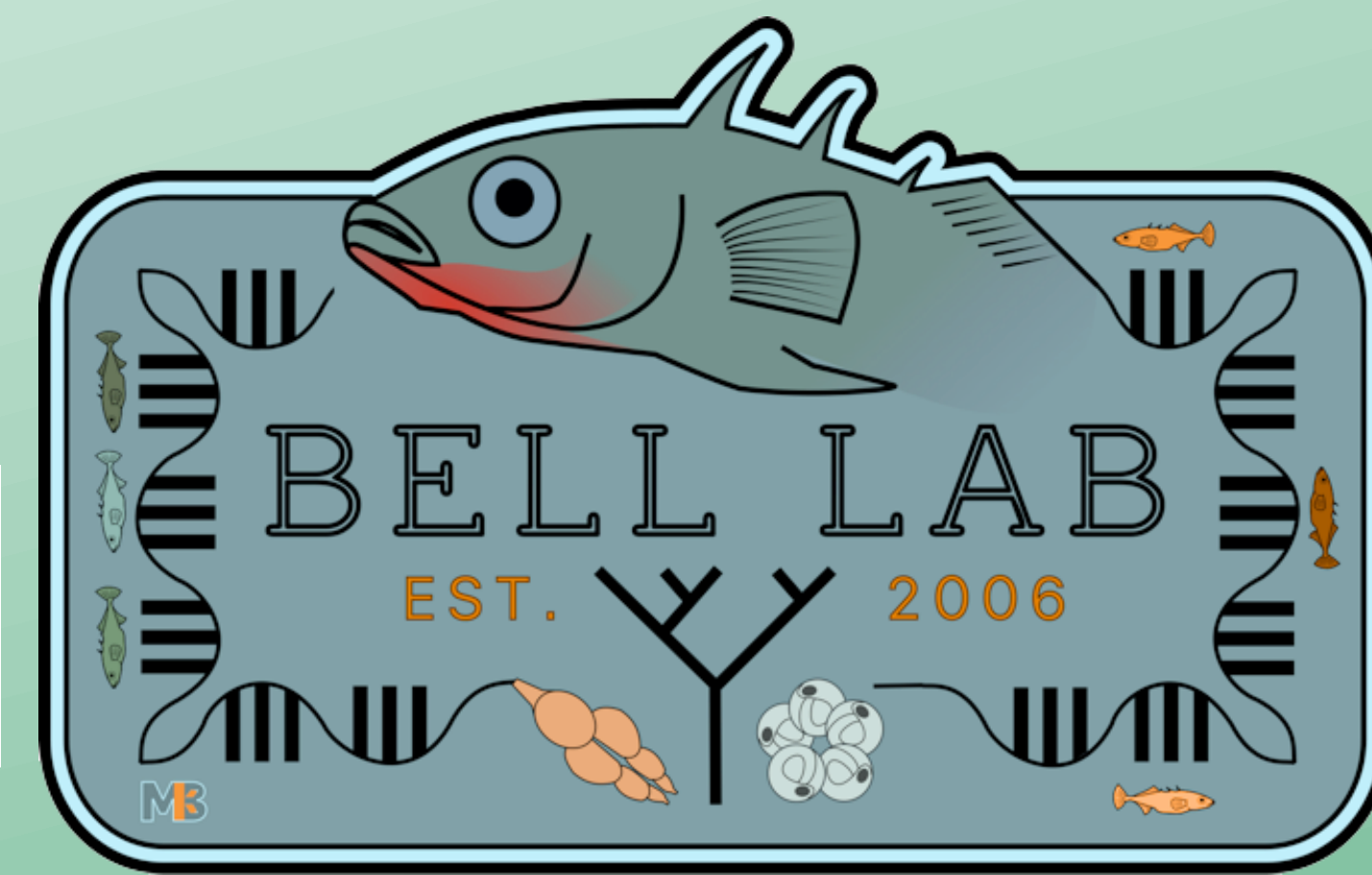
<sup>2</sup>Parkland College, Champaign, Illinois

<sup>3</sup>Department of Evolution, Ecology, and Behavior, School of Integrative Biology, University of Illinois at Urbana-Champaign

<sup>4</sup>Carl R. Woese Institute for Genomic Biology, University of Illinois at Urbana-Champaign



Phenotypic Plasticity Research Experience for Community College Students



## Why Blackspotted Stickleback?

### How Behaviors Evolve

Comparing closely related species can give insights into how behavior evolves.

### Well studied: Three-spined Stickleback

(*Gasterosteus aculeatus*)

- Model organism for natural variation in behavioral evolution<sup>1</sup>.
- Divergence in parental care in two ecotypes<sup>1,2</sup>.
- White and common ecotypes recently diverged<sup>2</sup>.

### Lesser studied: Blackspotted Stickleback

(*Gasterosteus wheatlandi*)

- Three-spined's closest living relative.
- Possible behavioral intermediate of commons & whites.
- Blackspotted egg dispersal is similar to white three-spined<sup>3</sup>.



fig 1 male commons retain high levels of parental care (fanning = oxygen, O<sub>2</sub>)  
 fig 2 male whites lost parental care completely (disperse eggs from nest)  
 fig 3 male blackspotted possibly intermediate in behavior?

## Comparisons of Behavior:

How do blackspotted behaviors compare to their three-spined relatives of the common and white ecotypes?

1. Courtship
2. Parenting

## Behavioral Trials:

Data was collected on male (♂) fish during two different assays:

### Courtship:

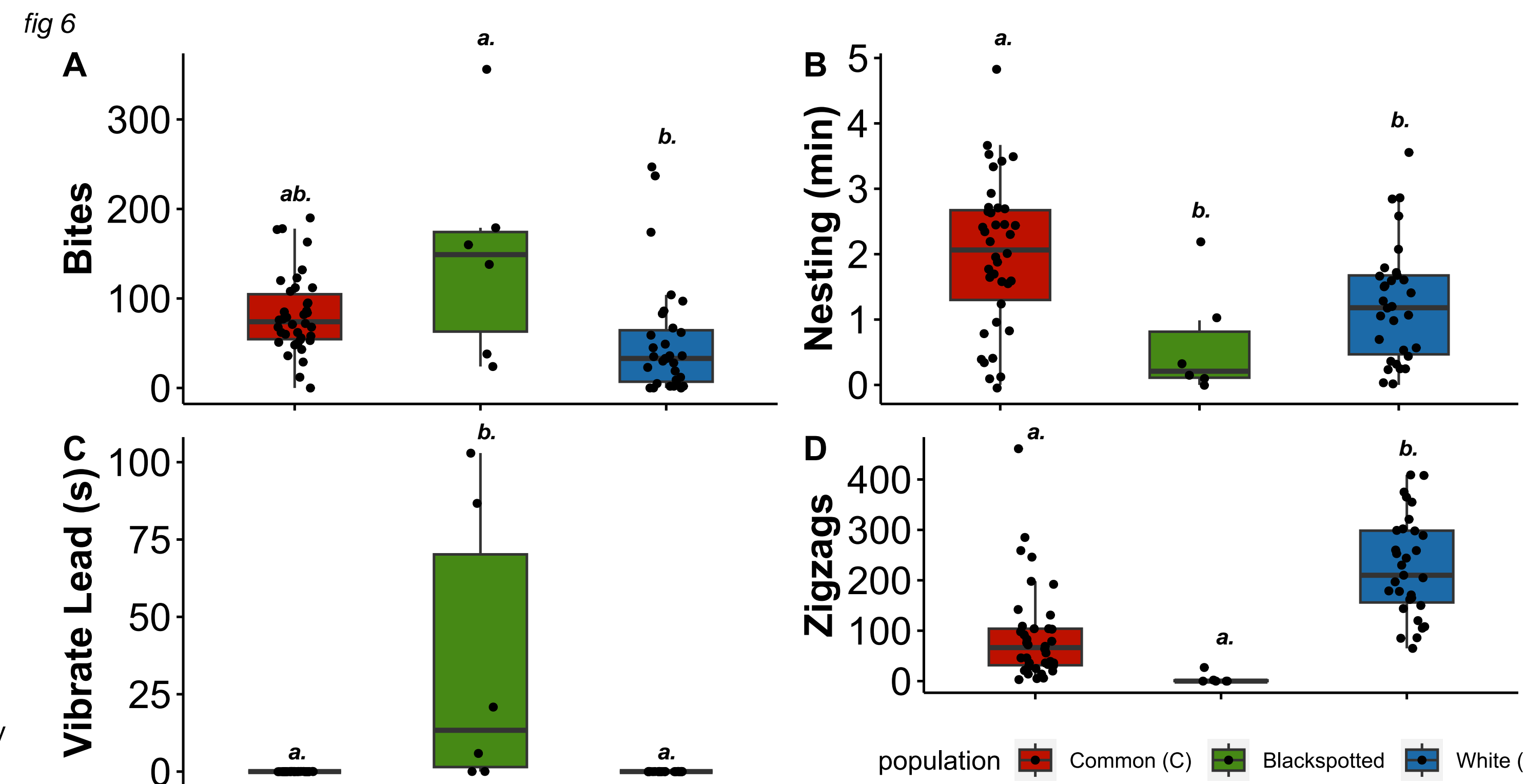
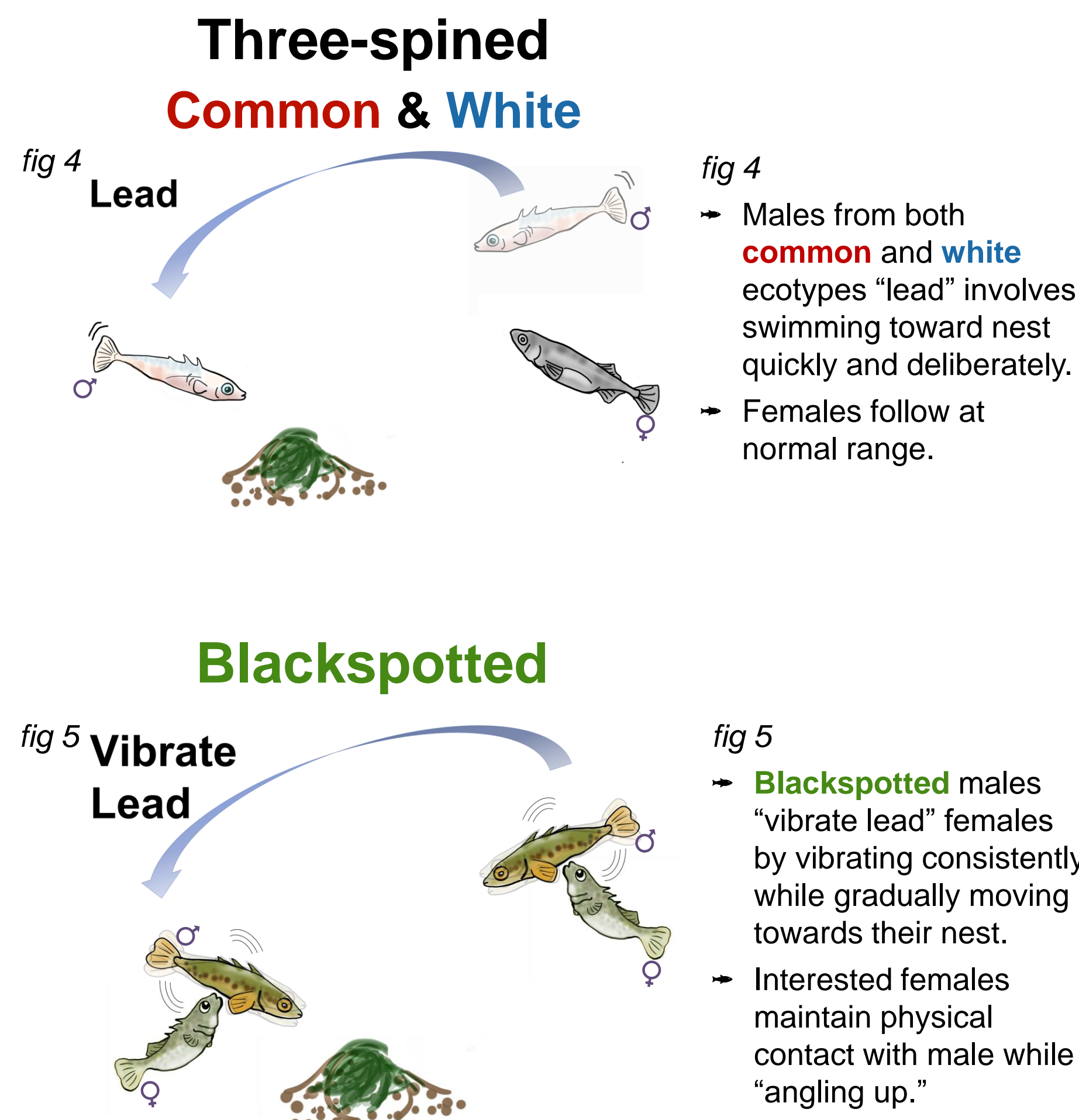
- Measured behaviors in individual ♂ blackspotted:
  - ♀-directed: biting, chasing, dorsal pricking, leading, vibrate leading, & zigzagging
  - Nest-directed: nesting, fanning, gluing, poking, quivering, & showing
- 15 min trials (n = 55 trials on n = 7 ♂s)

### Parenting:

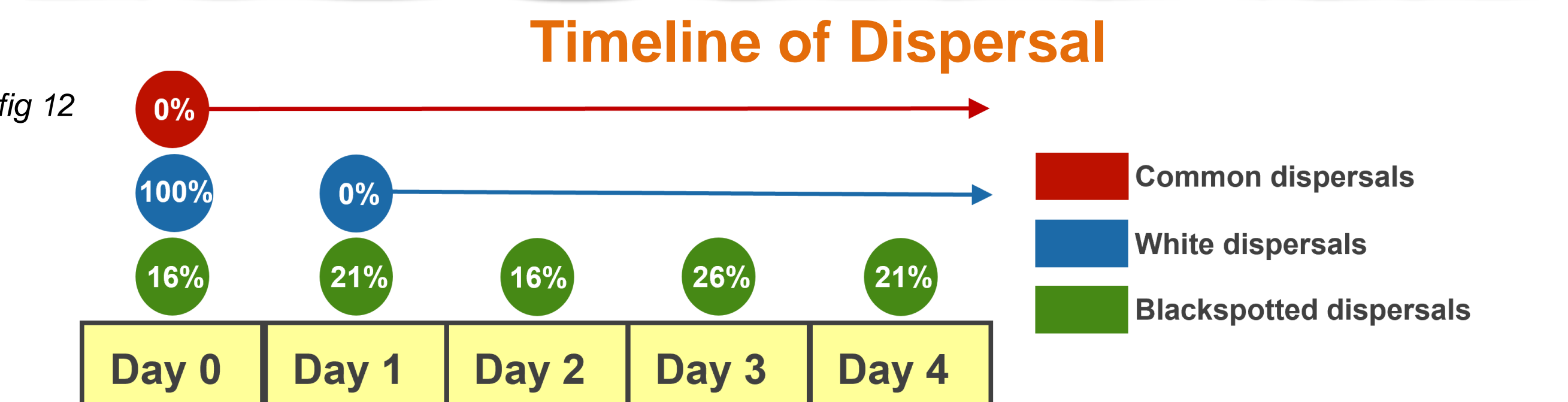
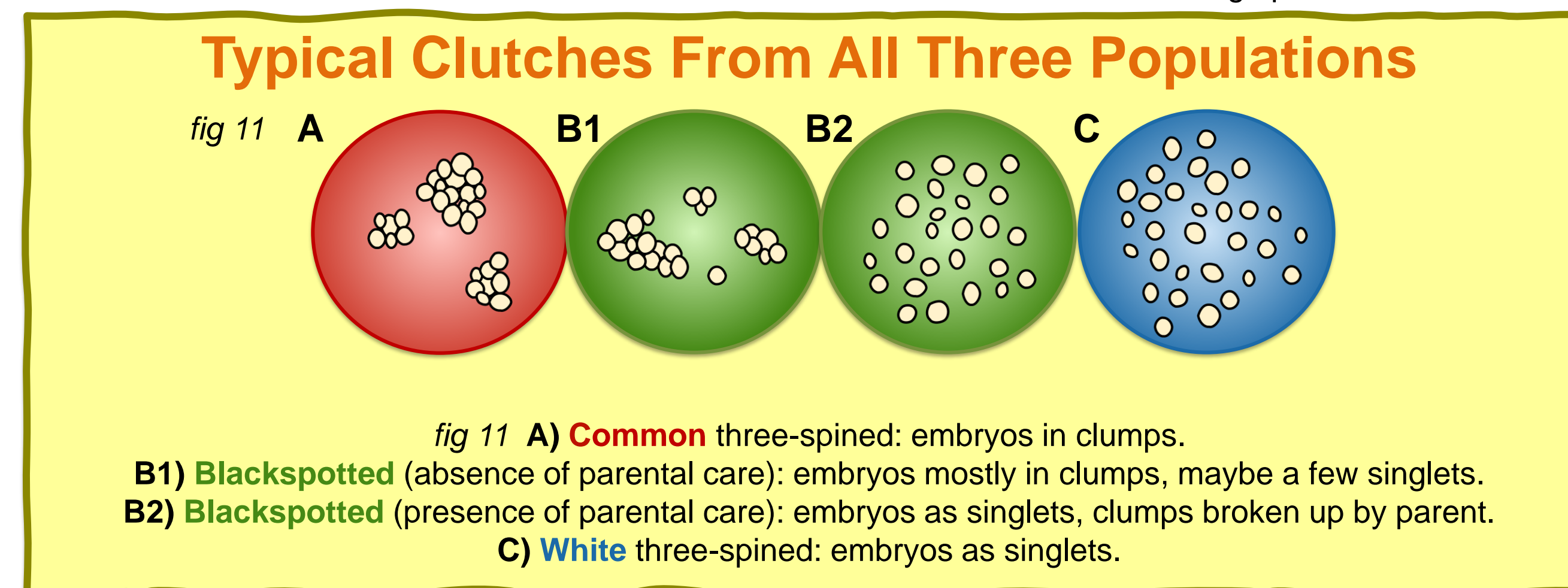
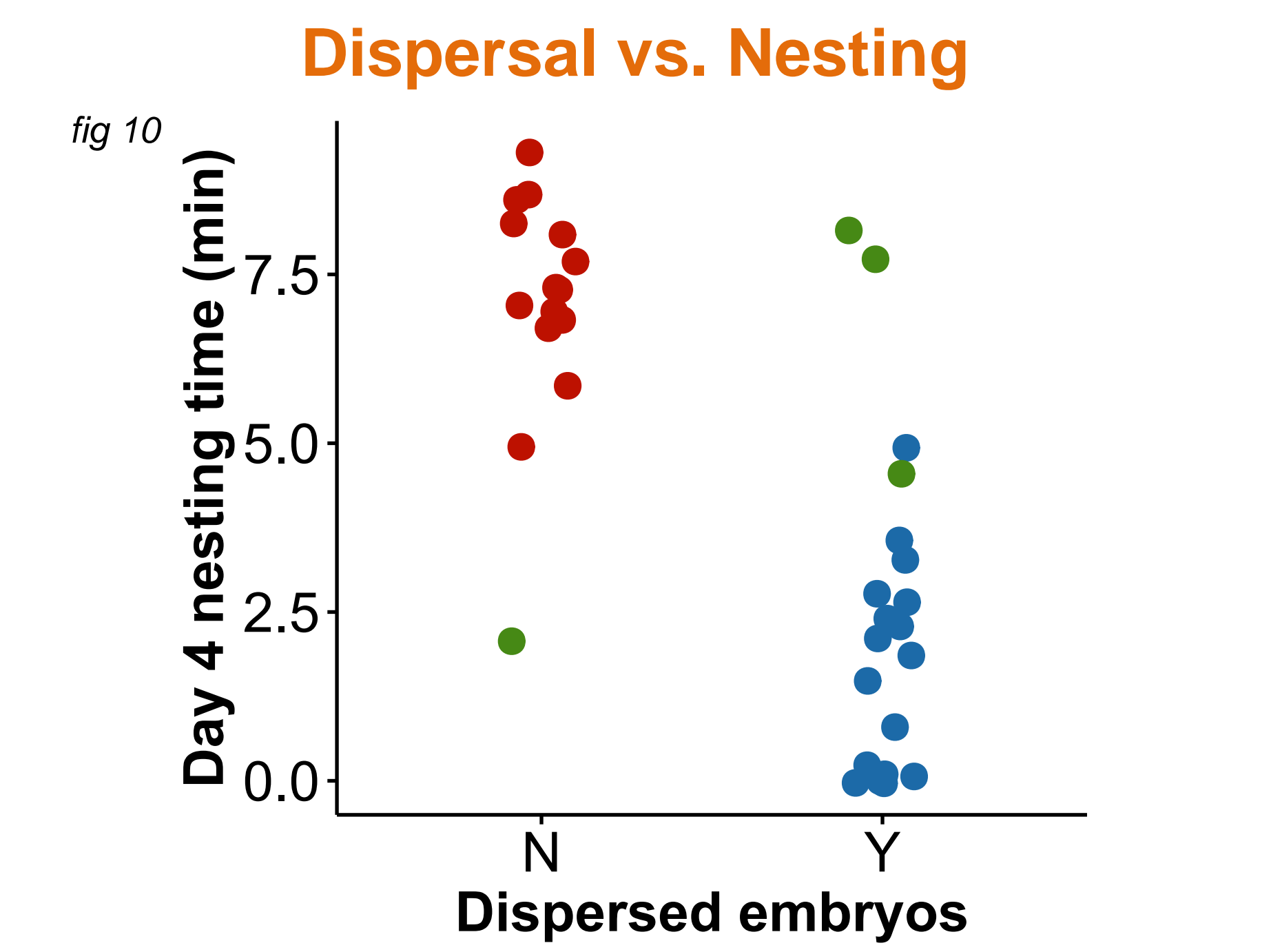
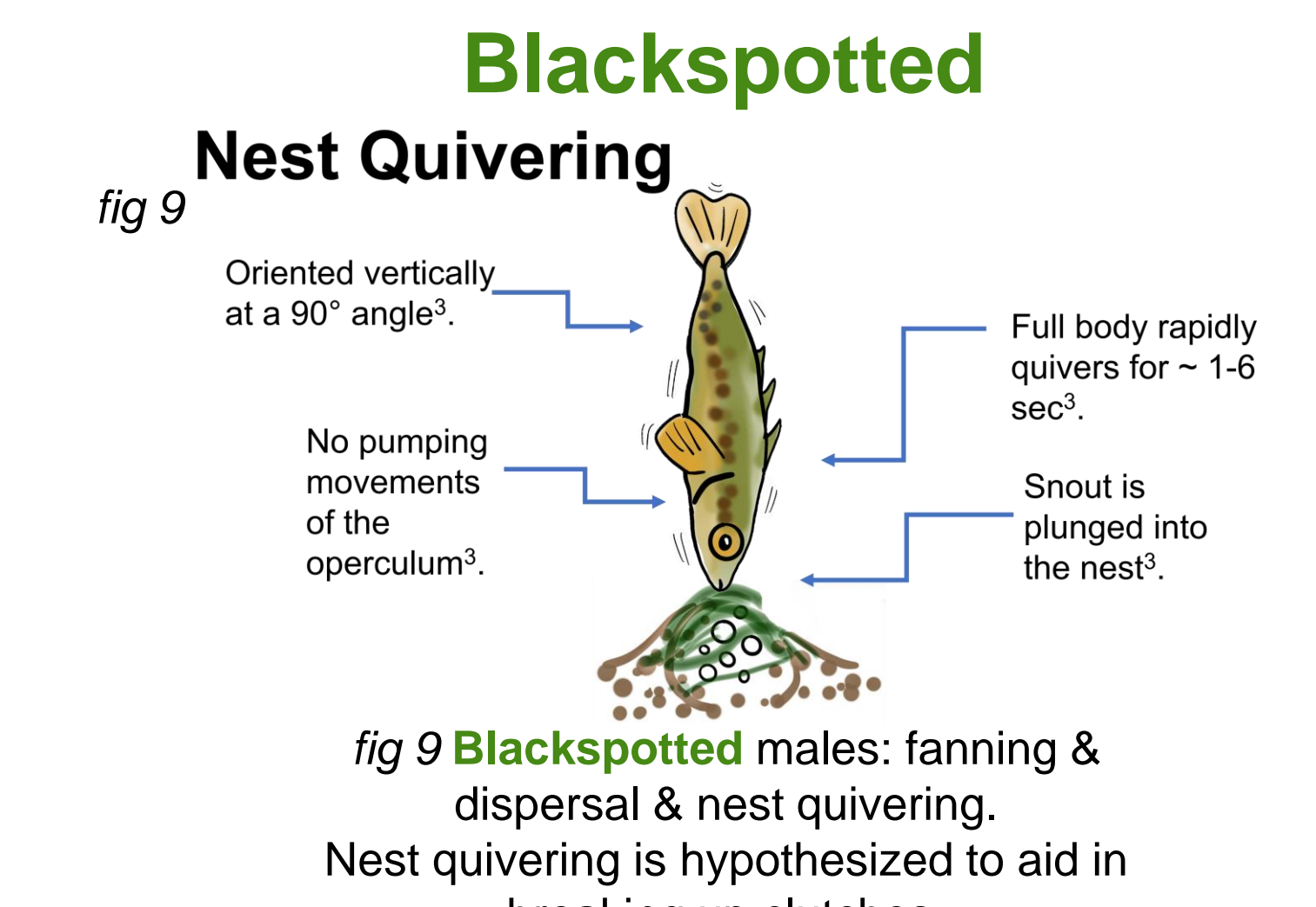
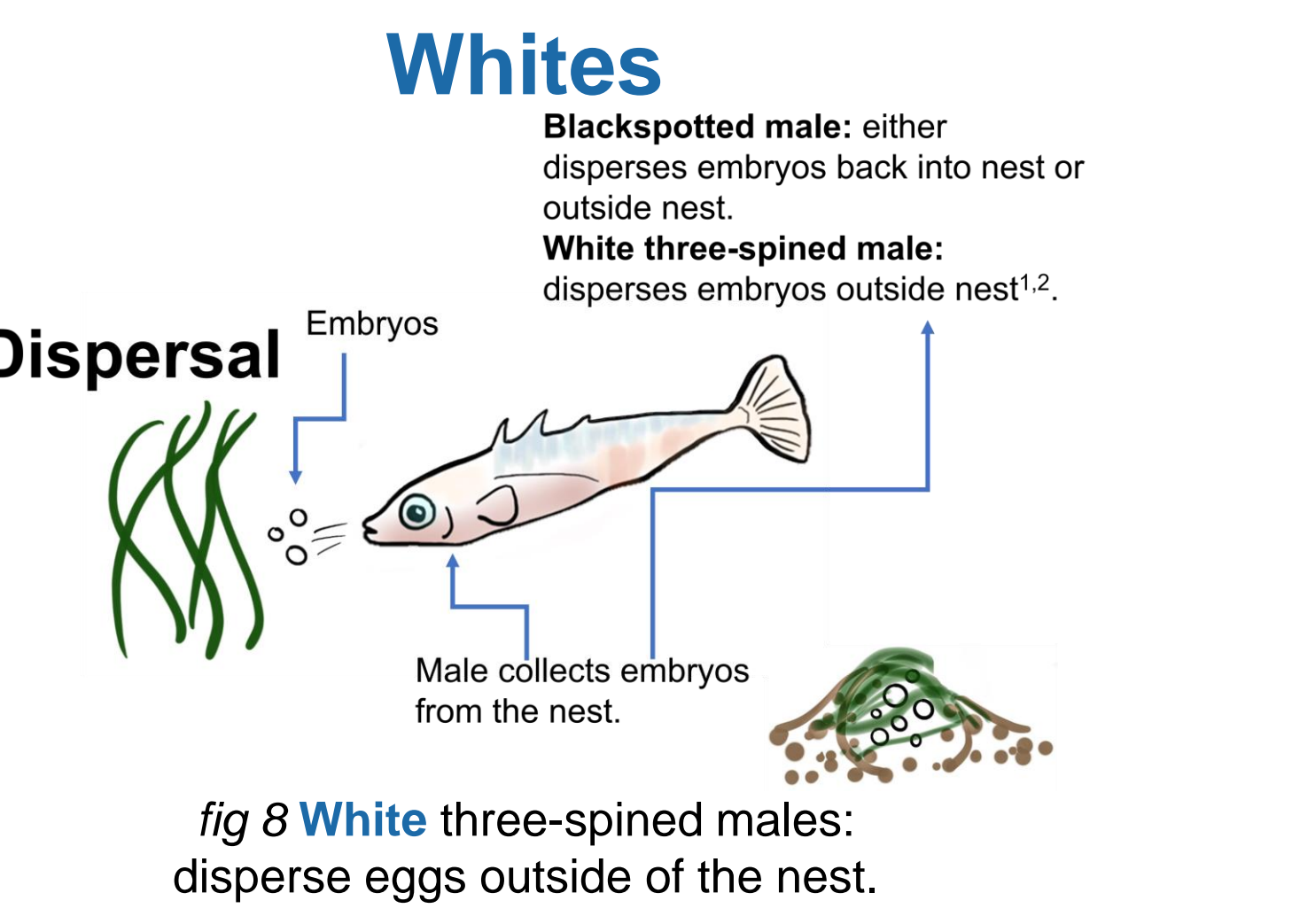
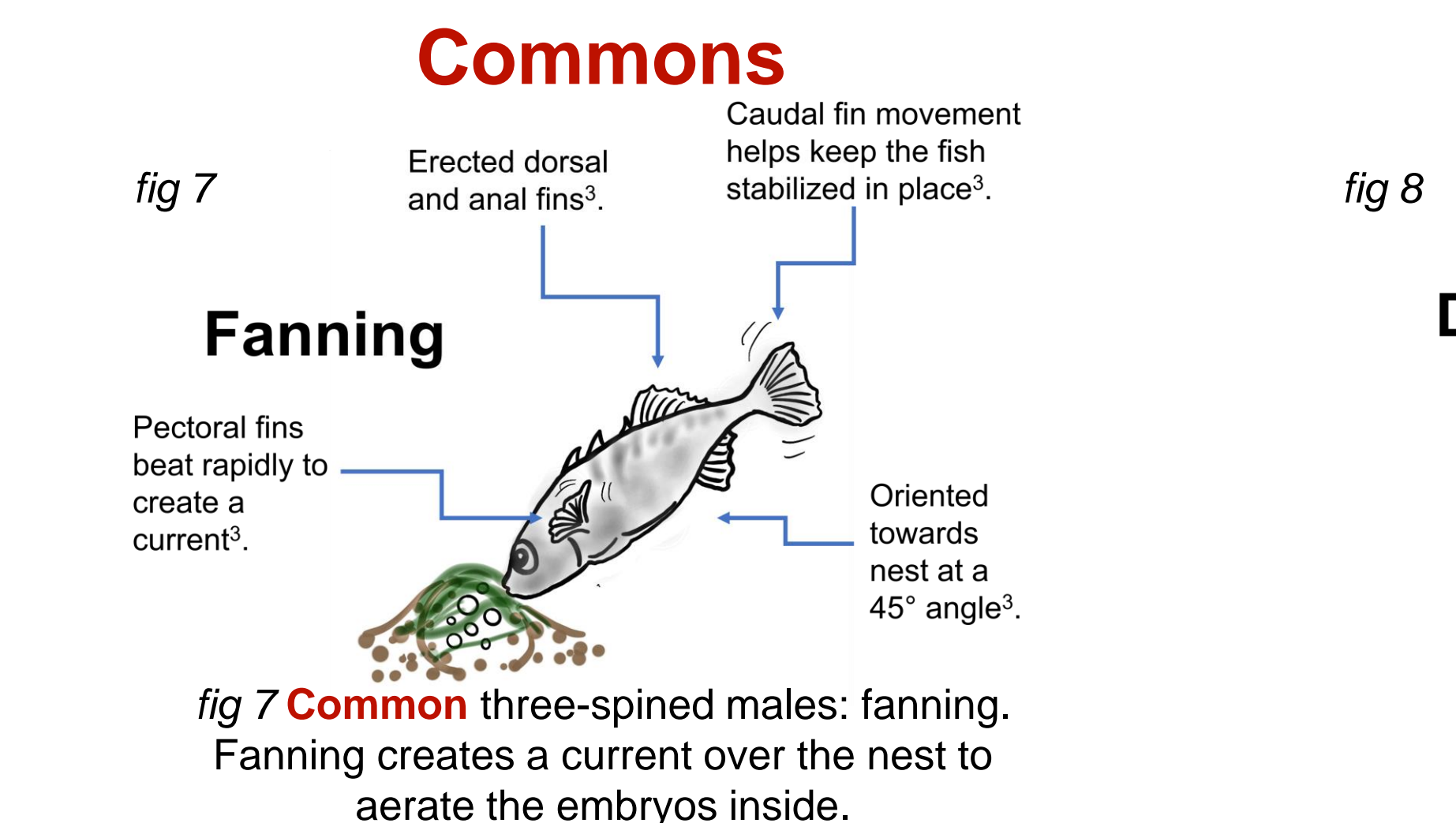
- Measured behaviors in individual ♂ blackspotted:
  - Dispersing, fanning, gluing, nesting, nest-quivering, poking, pulling, retrieving, & spitting
- 15 min trials (n = 4 ♂s); twice daily for ~8 days

Results of both assays were compared to existing data in the lab on white & common three-spined.

## BLACKSPOTTED COURTSHIP: Nest-Directed Similar, Female-Directed Novel



## BLACKSPOTTED PARENTING: White, Common, & Novel Components



## What We Learned & What's Next:

- "Vibrate Lead," a unique blackspotted behavior, is characterized by the male hovering near the nest and vibrating at a 45-degree angle.
- Male blackspotted disperse their eggs, warranting further inquiry comparing the blackspotted genome to that of the white and common three-spined ecotypes.
- Male blackspotted quivering is unique and may be used to break the clutch up for dispersal, necessitating further study of the female blackspotted's ovarian fluid, which keeps the eggs stuck together.
- This study underscores the benefits of studying natural variation to gain insights into how behaviors and their underlying genetic codes evolve.

## References:

- [1] Behrens, C.; Maciejewski, M.; Dalziel, A. C.; Weir, L. K.; Bell, A. M. *in review*
- [2] Blouw, D. M. 1996
- [3] McInerney, J. E. 1969

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