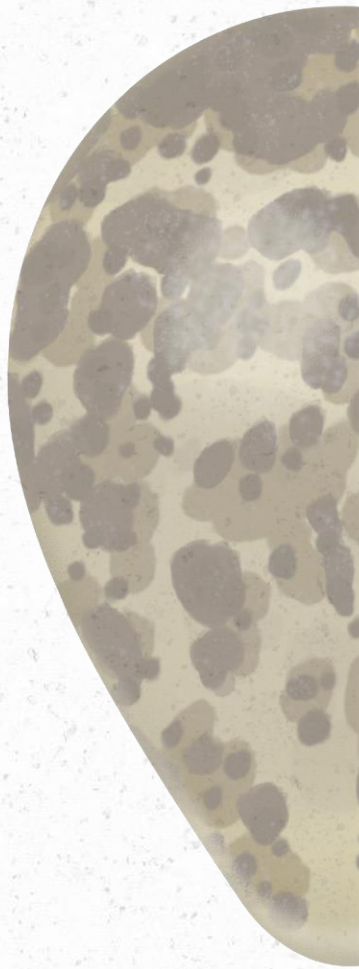
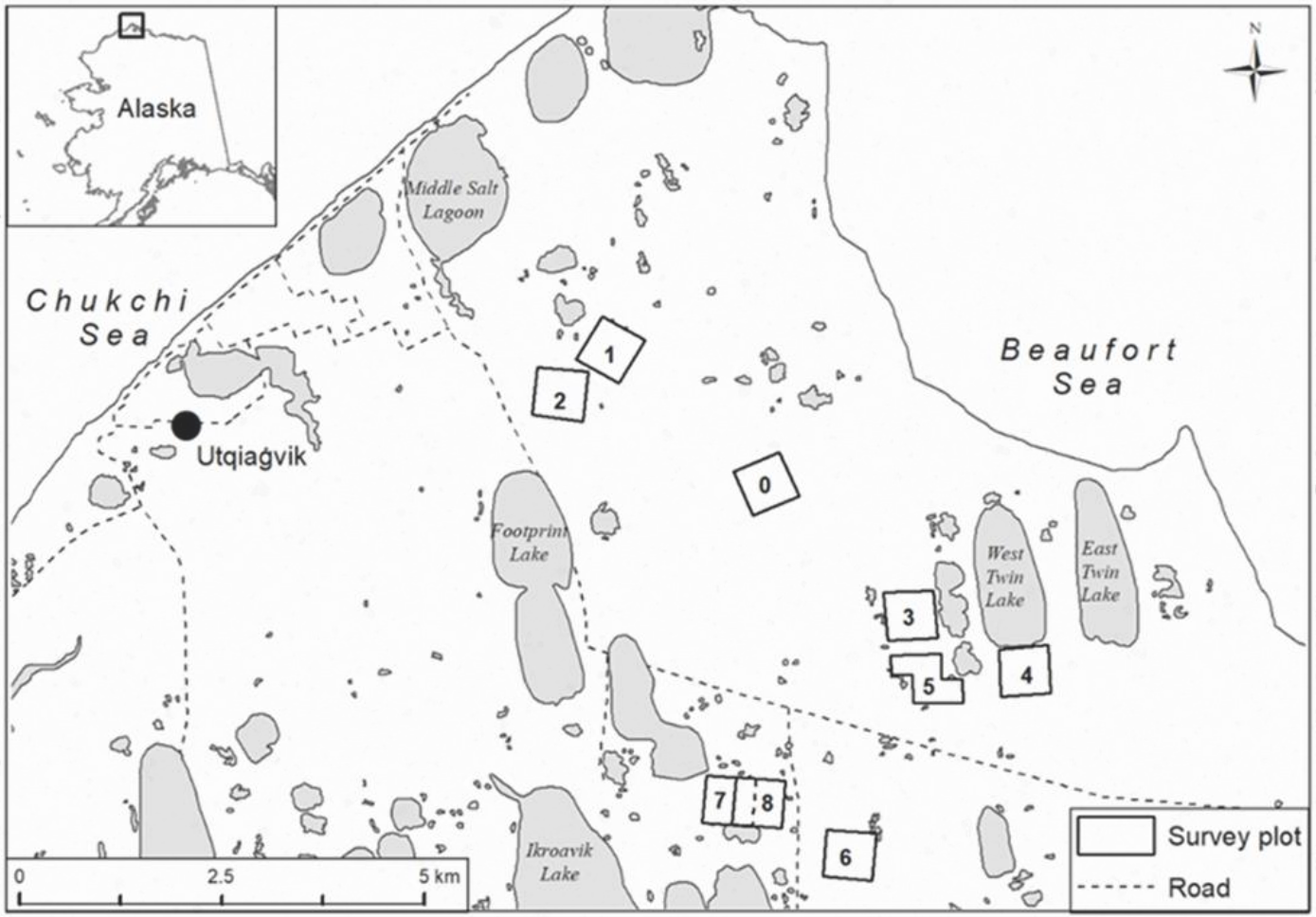
Evidence of egg size variation in Utqiaġvik shorebirds



Hunter E. Wells, Iowa State University
Richard L. Lanctot, U.S. Fish and Wildlife Service
Sarah T. Saalfeld, U.S. Fish and Wildlife Service
Stephen J. Dinsmore, Iowa State University

2025 ASG Meeting – Monday, February 23rd

Utqiaġvik, Alaska

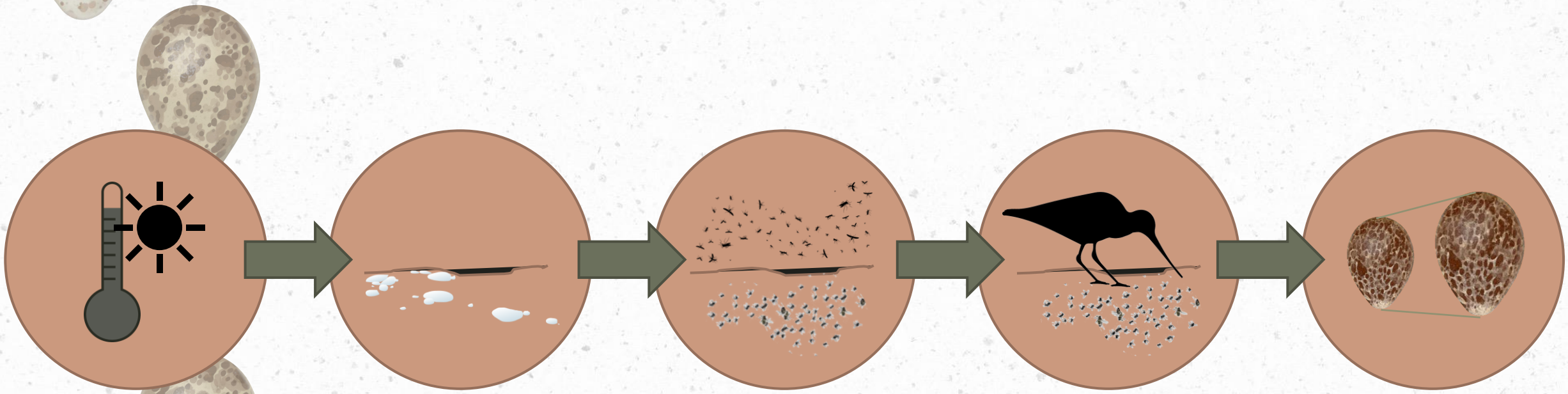


- 2003-2024
- 8 shorebird species
- Eggs found across the landscape

Research Questions

- Is egg size changing over time?
  - Average egg size variation over time and between years
- Does shorebird species affect egg size?
  - Prediction: Variation will be dependent on species
- What environmental variable best predicts egg size?
  - Underlying mechanism: An ecological cascade effect

Ecological Cascade Effect






Calidris melanotos


Calidris alpina





Phalaropus fulicarius

Pectoral Sandpiper

Larger egg size

Polygynous

Terrestrial wader

Southern South America

Dunlin

Medium egg size

Monogamous

Terrestrial wader

East Asia

Red Phalarope

Smallest egg size

Polyandrous

Aquatic/terrestrial wader

Central and South America




Calidris melanotos

Calidris alpina

Calidris pusilla



Phalaropus fulicarius

Pectoral San

Larger egg size

Polygynous

Terrestrial wad

Southern South

Semipalmated Sandpiper

Smaller egg size

Monogamous

Terrestrial wader

Northern South America

l Phalarope

egg size

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Nest Searching

- Nest searchers
- Rope drags
- Opportunistic

Egg Measurements

- Egg length and width
- Egg volume calculated, Governali et al. equation (2012)

Nest Initiation

- Nest found in laying
- Egg floatation
- All nests assigned at noon

“Foraging Window”

- Key egg formation period when females need nutrients
- 5 days prior to nest initiation – yolk formation
- Day of nest initiation and following days of laying – albumen and shell formation

Temperature

- Hourly temperature 2 m above ground (NOAA)
- Growing Degree Hours (GDH) of foraging window and Average GDH
- GDH – summed hourly temperatures above 0°C; < 0°C all zero

% Snow Cover

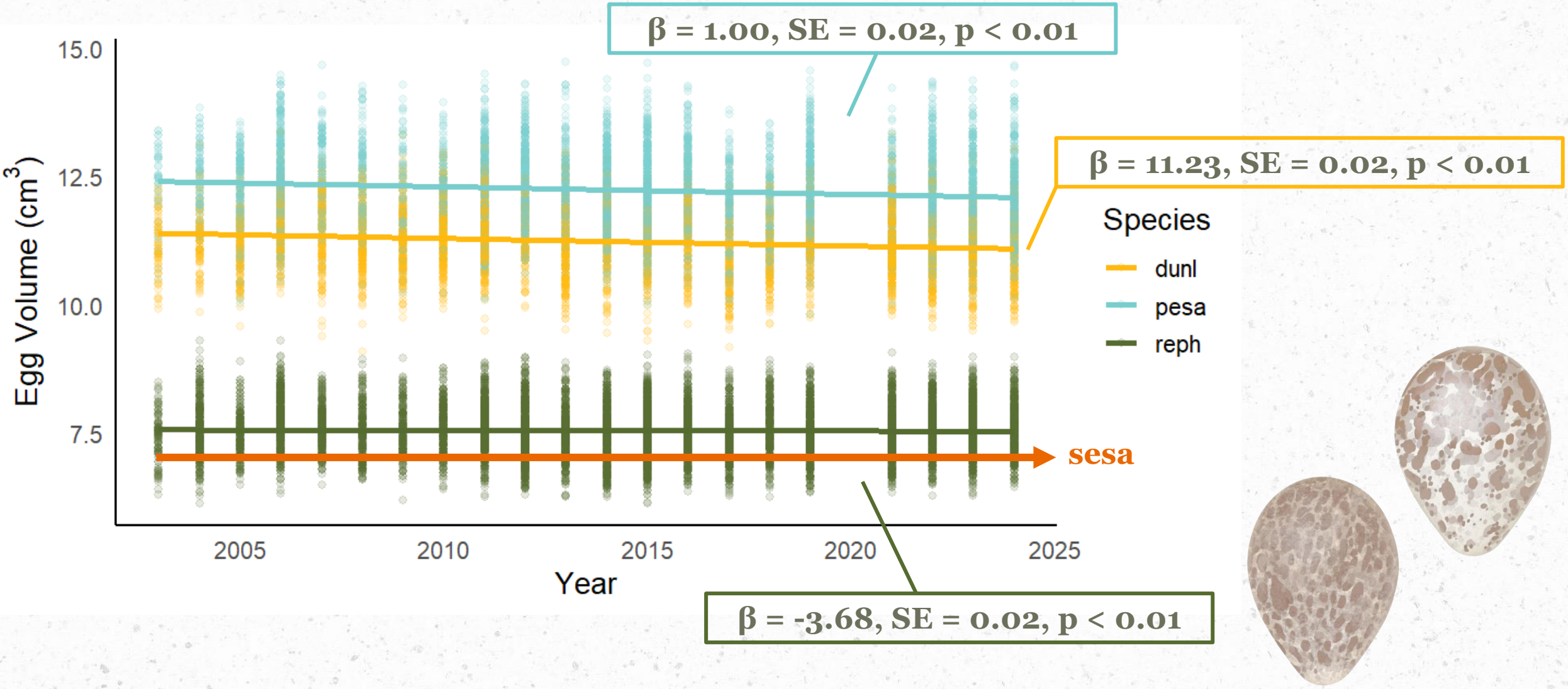
- Estimated % snow cover on plot, year
- Accumulated % snow cover at nest initiation, of foraging window, and average of foraging window
- Average plot and year data to get regressed predictions

Liner Mixed-Effect Modeling (LMM)

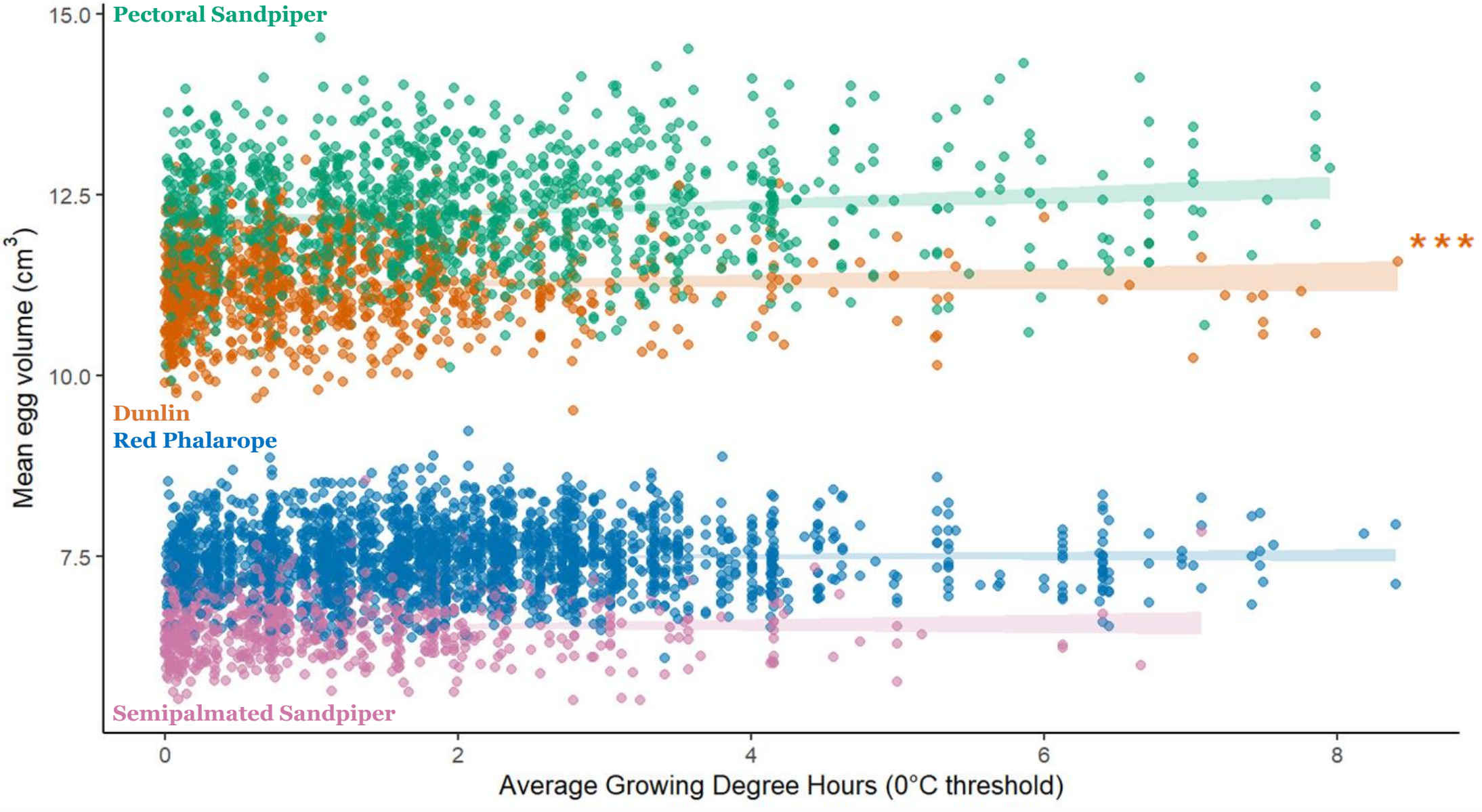
1. To compare competing hypotheses of individual environmental variables
2. To see which environmental variable best predicts egg size

- **Response variable:** Egg Volume
- **Random effects:** Nest ID, Year
- **Fixed effects:** Year, Species, GDH, % Snow Cover, Nest Initiation (Seasonality)
- **Effect sizes are scaled and standardized**

Shorebird species affect egg size



Egg size may have a modest relationship with growing degree hours



Next Steps

- Run LMM models for both between and within-year
- Look at additive and multiplicative models for confounding effects
- Assess chapter 2 – body size and morphological variation in adult shorebirds

Acknowledgments

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hwells@iastate.edu