



# 'Cause Mom Said So: Percent Methylation in Early and Late Summer *M. rotundata*



Ella Eleven<sup>1</sup>, Gwenth Sailer<sup>2</sup>, Joshua Rinehart<sup>2</sup>, Sheri Dorsam<sup>3</sup>, Julia Bowsher<sup>2</sup>

<sup>1</sup>Department of Biological Sciences, New Mexico Institute of Mining and Technology, Socorro, NM

<sup>2</sup>Department of Biological Sciences, North Dakota State University, Fargo, ND

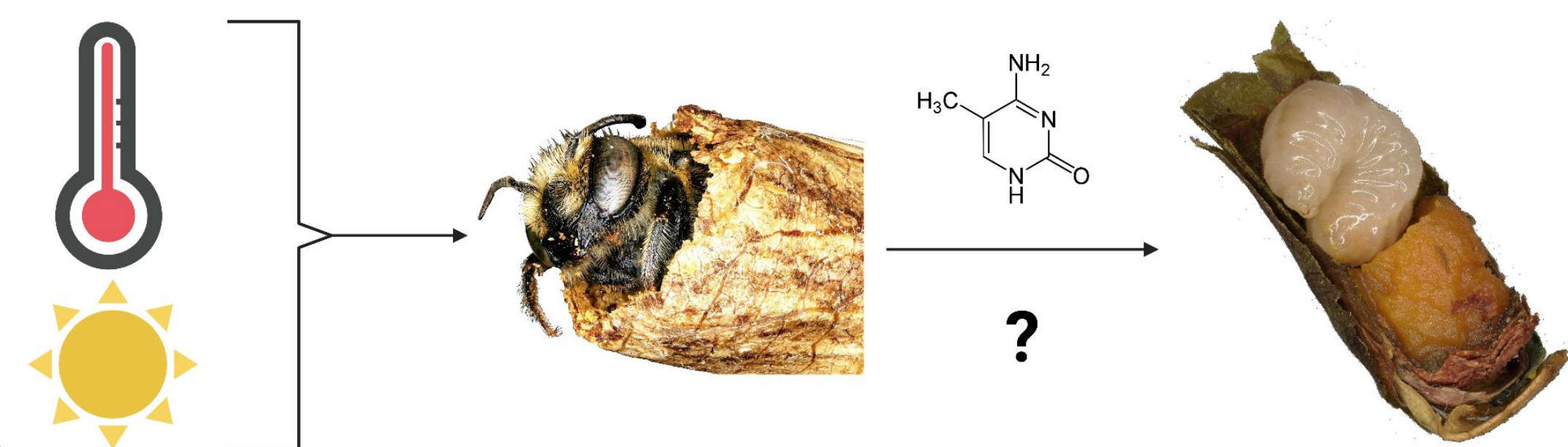
<sup>3</sup>USDA ARS, Edward T. Schafer Agricultural Research Center, Fargo, ND

## BACKGROUND

- Diapause is a period of extended developmental arrest and metabolic suppression that insects use to avoid harsh conditions.
- *Megachile rotundata*, or alfalfa leafcutting bees (ALCBs), are facultative diapausers, meaning some bees in a generation will emerge in the same summer in which they were laid.
- Temperature and photoperiod cues regulate the diapause decision.
- It is unknown how the mother bee evaluates these environmental cues and transmits this information to her eggs.

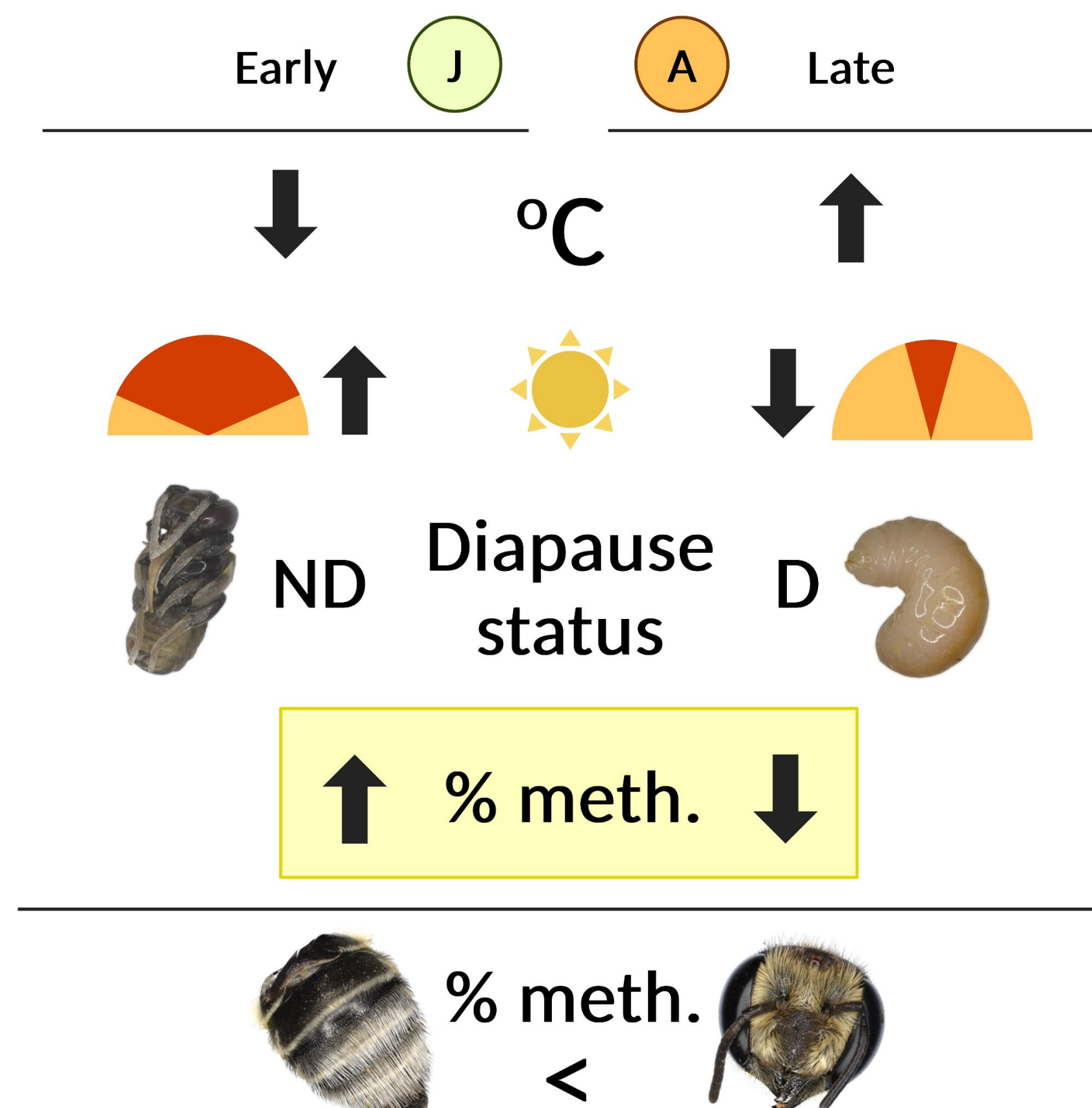
## HYPOTHESIS

DNA methylation may be a way for *M. rotundata* to influence the diapause status of their offspring.



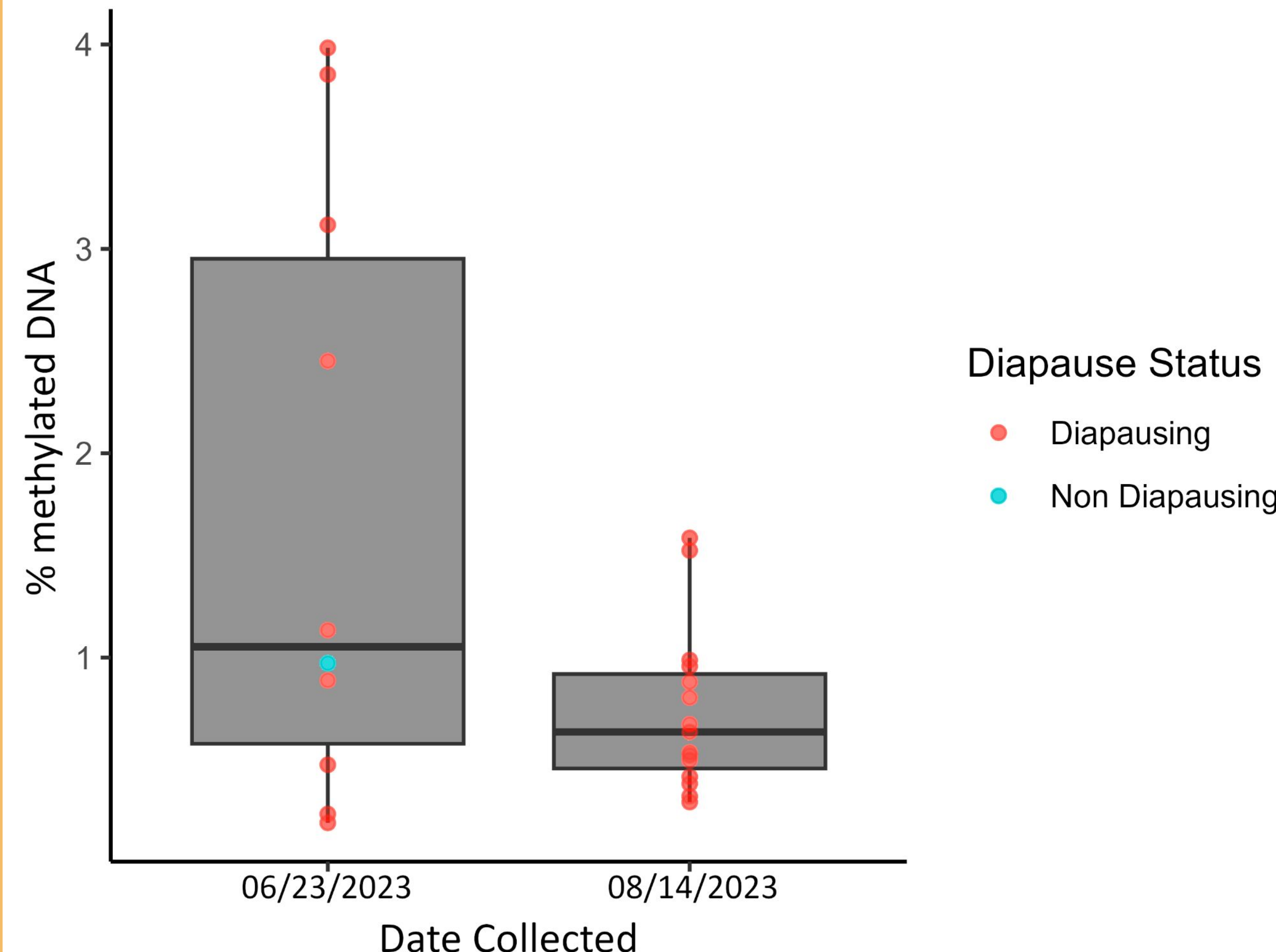
- Methylation is an epigenetic modification important for development and gene regulation.
- Methylation in insects is relatively understudied and generally rare in solitary Hymenoptera (<1% of the genome).
- If changing environmental conditions determine offspring diapause via methylation, it may be reflected in the seasonality of caught bees.

## PREDICTION

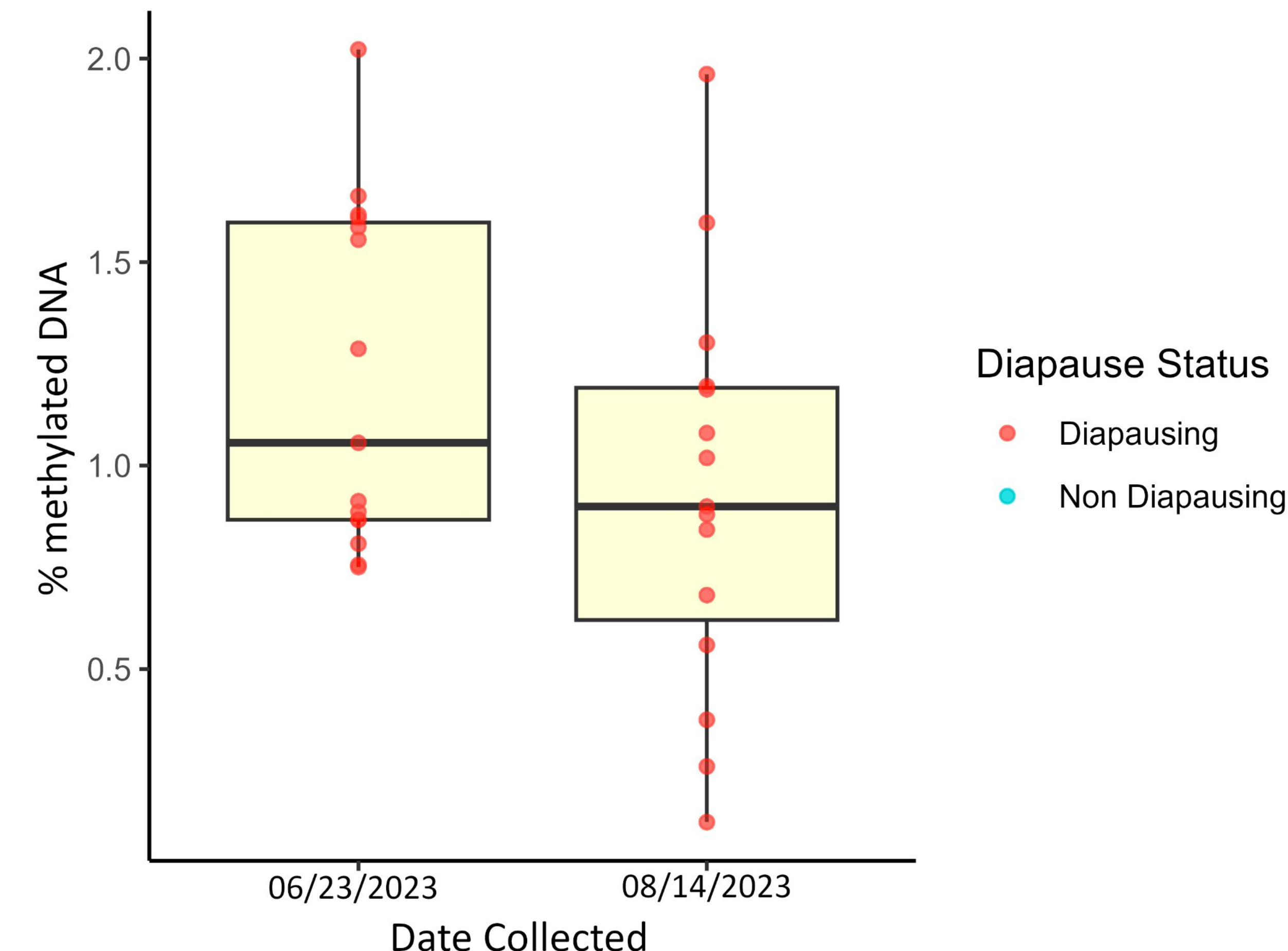


## RESULTS

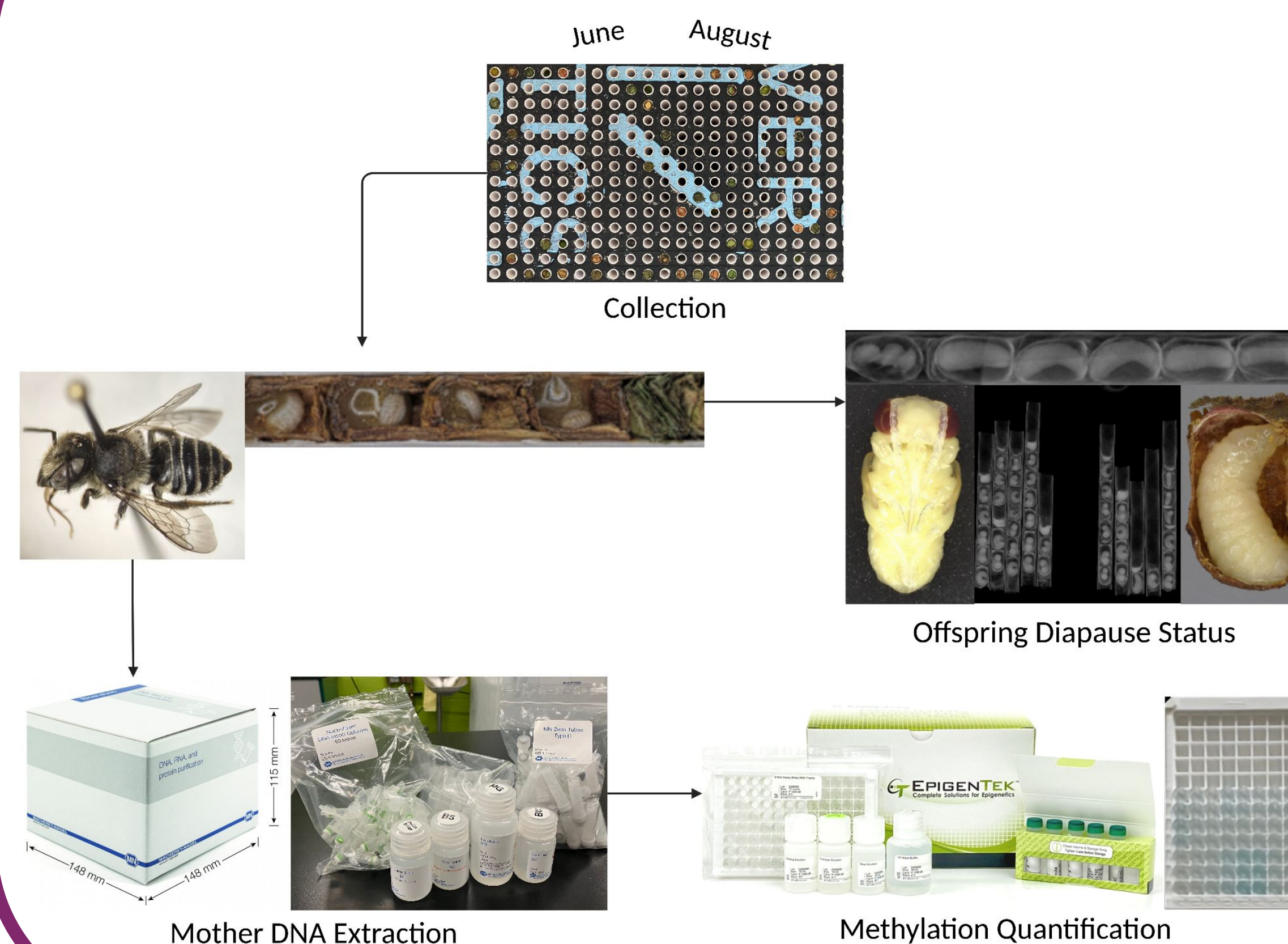
No Significant Difference in Head Methylated DNA



No Significant Difference in Abdomen Methylated DNA



## METHODS



## DISCUSSION

- No statistically significant differences between any group:
  - Early and late season bees ( $F=3.9928$ ,  $p=0.0506$ )
  - Diapausing and nondiapausing offspring ( $F=1.4333$ ,  $p=0.2364$ )
  - Abdomens and heads ( $F=0.0027$ ,  $p=0.9587$ )
- The average percent methylation for all was around 1%, consistent with results from previous methylation assays done on ALCBs.
- **This implies that percent methylation is not related to seasonality in ALCBs.**

## FUTURE WORK

- Increase sample size of nondiapausing offspring.
- Other assays to show methylation in individual genes as opposed to global methylation percentages.
- Other epigenetic modifications could be at play, leading to many possible avenues of research.
- **Better understanding of diapause cues will benefit farmers of ALCBs and other commercially important insects.**

## Contact Information

Ella Eleven - rottingpiethesquid@gmail.com

Gwenth Sailer - gwenth.sailer@ndus.edu

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## Citations

Bewick AJ., Evolution of DNA Methylation across Insects.  
Pegoraro M., DNA methylation changes induced by long and short photoperiods in *Nasonia*.  
Photos: Macherey-Nagel, EpigenTek, iNaturalist contributors, USDA APHIS, Josh Rinehart, and Ella Eleven  
Background, Methods, and Prediction images made in Biorender