# It's getting hot in here! Temperature dictating bean beatle emergence How will the temperature variability effect the emergence expectancy of the bean beetle

Callosobruchus maculatus? 

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## Introduction

Metabolism and temperature are closely linked, nearly all rates of biological activity increase exponentially with temperature. Brown et.al (2004) found that metabolic rates connect most ecological processes to temperature dependence (and body size) and follow predictable patterns.

The Bean Beatle (Callosobruchus maculatus) inhibits a short life cycle making them easy to manage and useful to investigate predictions of metabolic theories.

# Methods

- ✓ 5 different temperatures of 21 °C, 24.5 °C, 28 °C, 31.5 °C and 35 °C
- ✓ 3 replicates per temperature; a b and c
- ✓ 135 beans in each dish
- Each petri dish contains one female and one male Bean Beetle for fertilization and egg laying to occur
- ✓ 1st emergence onwards were counted and removed from petri dish
- ✓ Checked 5 days a week for 5 weeks











Figure 02: Overview of the metabolic rate models by Arryo et al. (red) and Gilloy et al. (blue), and comparing with the data samples

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### **Hypothesis**

The number of adults emerging successfully will be greater at higher temperatures since the metabolic rate will also rise.

Figure 01: Overview of the dataset by looking at the means from the replicates in each temperature, through time.

The Brown et al. equation predicts a linear relationship between temperature and mass concentrated development time, while the Arroyo et al. equation predicts a non-linear relationship. We found that the data fit the Arroyo equation best. The results show that the beetles have a temperature optimum at 28 degrees, as more beetles emerged at that temperature.



that the emergence rates followed the Arroyo et al. equation more closely than the Brown et al. equation, therefore the Arroyo equation is more suited to the metabolic theory.

**References:** Brown, J.H., Gillooly, J.F., Allen, A.P., Savage, V.M. and West, G.B., 2004. Toward a metabolic theory of ecology. Ecology, 85(7), pp.1771-1789.

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### Discussion

Our hypothesis; more beetles would emerge at higher temperatures, was partly correct. Our study shows

