Introduction – Polistes wasps
Polistes wasps (also known as ‘paper wasps’) often build their nest under the eaves of buildings. There are two species common in Ames, IA – *Polistes fuscatus* and *Polistes metricus* (Figure 1). In the process of monitoring wasp colony development for a larger study, we tracked the appearance and disappearance of wasp brood – eggs, larvae, and pupae – in these two species of paper wasps. Larval removal can be a sign of colony stress (e.g., parasites, nutrition; Kudo & Shirai 2012) and high rates of removal can interfere with researchers’ ability to conduct successful experiments.

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Figure 1. Polistes metricus

**Larval removal in paper wasps**

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We hypothesize: If larval removal is dependent on quality/quantity of food available, both species should be equally as likely to remove larvae. Alternatively, if larval removal is dependent on other factors (e.g., rates of parasitism), then species may vary in removal rates.

**Methods**

From June 4th – July 23rd 2012, 30 colonies of *P. metricus* (Figure 2) and 14 colonies of *P. fuscatus* were ‘mapped’ (Figure 3) every 3 days. All colonies were located at the Iowa 4-H Center in Madrid, IA. During a mapping event, the content of each nest cell (eggs, larval instar, or pupa) were recorded. Data from 10 nests of each species were analyzed. We averaged the number of 2nd-, 3rd instar and 4th- 5th instar larvae that were removed, and compared data across, species, date, and temperature.

Data are represented in Figure 4.

**Results**

Figure 6 shows a 3rd instar larva in a *P. metricus* nest. There was no evidence that *P. fuscatus* or *P. metricus* removed different numbers of 2nd-3rd instar larvae (ANOVA, p = 0.13), nor that there were different numbers of larvae removed each day (repeated measures ANOVA, p = 0.09), or that larval removal depended on temperature (ANOVA, p = 0.60).

**Figure 4. Missing instars 2-3**

![Image](image1.png)

Figure 7 shows 5th instar larvae in a *P. metricus* nest. One adult *P. metricus* was observed physically removing a 5th instar larva from the nest (Figure 8).

There was no evidence that *P. fuscatus* or *P. metricus* removed different numbers of 4th-5th instar larvae (ANOVA, p = 0.32). However, the number of 4th-5th instar larval removed did differ each day (repeated measures ANOVA, p = 0.04), although this difference was not due to temperature differences (ANOVA, p = 0.23). Data are represented in Figure 5.

**Figure 5. Missing instars 4-5**

![Image](image2.png)

**Conclusions**

1. No difference between species.
   - From our data, there was no difference in larval removal rates between *Polistes fuscatus* and *Polistes metricus*.

2. Larval removal varied by day.
   - Figure 5 shows that the number of 5th instar larvae removed was consistent between species, but differed by day. This supports our hypothesis: If larval removal is dependent on quality/quantity of food available, both species should be equally as likely to remove larvae each day.

3. Larval removal did not correlate with temperature.
   - Larval removal was not correlated with temperature (see Figs. 4 & 5), which suggests that other environmental factors (e.g., humidity, days since previous rainfall, resources available) may play a role.

4. Other factors that could affect larval removal.
   - We occasionally observed parasites in our nests (Figure 9). It is possible, that parasitism or disease may affected an adult’s decision to remove larvae, and that larval removal was not always due to adults cannibalizing them to compensate for missing resources. Future research may address the question: Does parasitism or disease affect larval removal rates, and does parasitism and/or disease rate vary by species?

5. Future directions.
   - An important next step will be to analyze the developmental rates of larvae in the two species to determine if there is a difference. If developmental rates, and other stressors vary by species, this information will be very valuable to researchers investigating paper wasps.

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**References**


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