Introdução - Polistes wasps

Polistes fuscatus and Polistes metricus were the two species of wasps studied in our research (Figures 1 & 2). When Polistes queen wasps drum their antennae on the nest, specific vibration frequencies have been shown to influence larval development (Suryanarayan et al. 2011). The scope of this project was to use data collected from piezoelectric devices (devices that measure vibration frequency) to understand how wasp behavior and environmental factors affect nest movement.

Polistes wasps build their nests outside, often under the eaves of buildings. As the season progresses, the wasps continue to build and increase the size of the nest. There are a variety of factors that might cause nests to move/vibrate.

We ask:
1. What proportion of vibrations are associated with wasp presence on the nest?
2. How does nest size affect number of vibration events recorded?

We Hypothesize:
1. If Polistes nests are constructed to maximize vibrational signaling, then vibration events triggered in the field should primarily be the result of active wasps on the nest.
2. If larvae in younger nests are more likely to receive drumming signals, then piezo devices hooked up to bigger, or older nests should record less vibration events.

Methods

From June 17 to July 20, 2013, two colonies of P. fuscatus and one colony of P. metricus were videotaped in the field. While videotaping, nest vibration frequencies were recorded by piezoelectric devices. Piezo devices recorded all vibrations occurring on the nest (Figure 3), and data were stored on a mini-SD card until they were transferred to a laptop, approximately once every 2-3 days. Data collected from the piezo device were synced with the time of video collection. All vibration events collected by the piezo device were categorized as events occurring while (1) a wasp was on the nest and inactive, (2) a wasp was on the nest and active, or (3) the wasp was off the nest.

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Results

There is little evidence to suggest that P. fuscatus differ from P. metricus in the number of events triggered per minute, whether they were recorded while the wasp was active or inactive (Figure 4). The foundress never left the nest during all three recordings, so no estimate of how vibrations occurred on the nest while she was absent could be made.

There was, however, evidence to suggest that nest size affected the frequency of vibration events. Larger nests had a greater number of events while the wasp was inactive on the nest (Figure 5). Nest size did not correlate with number of events triggered by an active wasp.

Figure 4: Data shows events per minute when wasps were active versus inactive or absent from nest. Sample sizes per nest varied: D4, n = 3; J10, n = 2; J35, n = 3.

Figure 5: Vibration events compared to nest size. (a) When the wasp was active, nest size did not correlate with the number vibration events that triggered the piezo. (b) When the wasp was inactive, vibration events were triggered more often on larger nests. (c) When events that occur whether the wasp is on or off the nests (1) are combined, vibration events were triggered more often on larger nests.

Conclusions

1. We reject our hypothesis that vibration events on the wasp nest triggered in the field are mostly the result of active wasps on the nest. More events were triggered while wasps were inactive on the nest. It is likely that wind accounts for many of the recorded vibration events when wasps were inactive.
2. We reject our second hypothesis as well. Bigger, older nests were associated with more events, not less. More research is needed to examine the positive correlation between increased events and larger nest sizes. Perhaps larger nests move more when disturbed by wind.
3. Future directions: With our data, we can begin to establish correlations between observed wasp behavior and piezoelectric data. Further, we can determine what the dominant (dark red) frequency of 5 Hz represents in vibration patterns like the one shown in Figure 6.

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References


Piezoelectric Data Use In Wasp Behavior Interpretation

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