A Survey of nidicolous arthropods found in abandoned vertebrate nests in Dominica, West Indies

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27 June 2016

Abstract

The purpose of this study was to understand the arthropod diversity found inside abandoned bird nests (a.k.a. "nidicolous" arthropods) on the Island of Dominica. Eight birds nests (all abandoned, one of which was presumably only abandoned recently) were collected for identification of arthropod taxonomic groups inhabiting them using a Berlese funnel. In total, 963 arthropods were collected from the 8 nests, including 831 insects (representing 12 orders), 9 non-mite arachnids, and 123 mite arachnids. The majority of the insects collected are characteristic of moist substrates and were categorized as *a posteriori* colonizers of nests subsequent to abandonment. *Dermanyssus, Thermobia,* and *Scytodidae* insect species were the only examples of ectoparasitic or nidicolous arthropods collected during this investigation.

Introduction

Many species of arthropods are obligate inhabitants within the nests of mammals and birds (Medical and Veterinary Entomology, 2009). Nidicolous arthropods may either feed directly from the body (e.g., blood or skin) or the waste products (e.g., feces and bedding) produced by the nesting vertebrate host. They may also feed on food scraps brought back to the nest by the host (G. Hamer, Pers. Comm.). Most of the time these arthropods are considered parasites. Examples of common nidicolous arthropods in the nests of animals include ticks, mites, fleas, lice, and kissing bugs. For example, Goodenough & Hart (2016) documented nine species of nidicolous ectoparasites inside the nests of the great tit (family Paridae), and Kovarik et al. (2008) documented a variety of beetles (including scarab, histerid, and rove beetles), cave

crickets, and anthomyiid flies inhabiting the burrows of pocket gophers. To date, no study has explored the diversity of nest-dwelling arthropods within nests of vertebrate hosts on the Caribbean island of Dominica.

With over 180 species of birds, and ~15 mammals (including introduced species), Dominica represents an excellent opportunity to investigate the interactions between vertebrates and their ectoparasitic arthropods commensals. Previous investigations of ectoparasites conducted by students on the Dominica study abroad course have focused largely on bats (e.g., Hunter et al., 2001). To date, there has been no survey of nidicolous arthropods inhabiting the nests of Dominican vertebrates. An attempt was made to expand our knowledge of vertebrate associated arthropods on Dominica by focusing on the nidiculous arthropods inhabiting the nests of birds and mammals.

Materials and Methods

Searches for nests were conducted around the Archbold Tropical Research and Education Center (ATREC), as well as during class excursions to other locations on Dominica. Once located, nests were checked to determine dweller activity (i.e., whether the nests were active or abandoned). Active nests were not collected. Nests determined to be abandoned were collected regardless of condition or age, placed into a plastic bag and transported back to the ATREC. Immediately upon return to ATREC, nests were placed into a Berlese funnel hung over a specimen container filled with soapy water and left for 3 days. After 3 days, the specimen container was removed from under the Berlese funnel and screened for arthropods. All specimens of arthropods collected were identified to the lowest possible taxon, recorded into an Excel spreadsheet and

categorized into general taxonomic groups. Recorded data were analyzed using Microsoft Excel©.

Results

Only the nests of birds were located during searches. A greater diversity of arthropods than expected was retrieved from the Berlese funnels. Based on the results of previous studies on ectoparasitic arthropods and prior knowledge, it is likely that only 9 out of 26 of the collected arthropod taxa would be in this habitat of abandoned nests. Figure 1 displays the collective taxa retrieved. 20% of collected specimens were accidentally collected, which is 192 specimens.

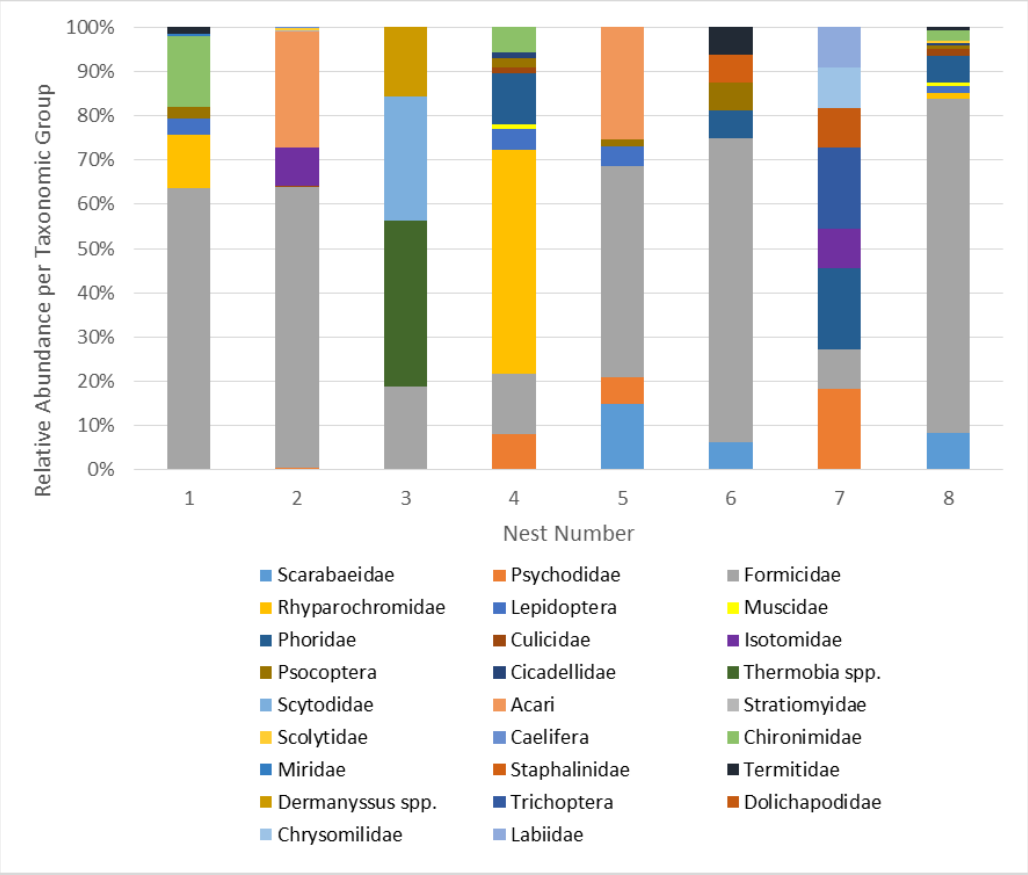

Fig. 1: Relative abundance of all nidicolous and accidental arthropod taxonomic groups found found in eight abandoned vertebrate nests.

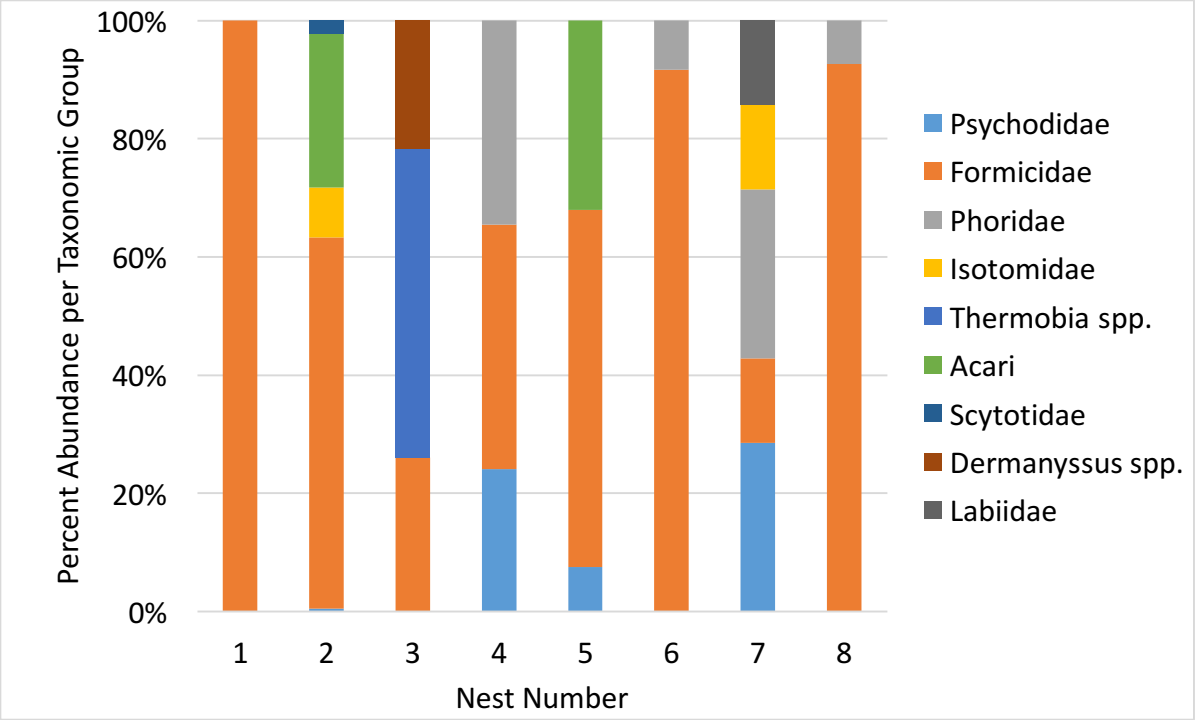

Fig. 2: Abundance of exclusively non-accidental arthropods found in eight abandoned vertebrate nests.

Discussion

The diversity of insects collected using the Berlese funnel is unlikely to reflect the natural diversity of arthropods inhabiting the nests of abandoned birds on Dominica, as is likely an artifact of contamination post collection. Specifically, a number of the insects collected in the container of the Berlese trap likely entered the Berlese chamber due to their attraction to the light source (phototaxis) rather than being present in the nest at the point of collection. For example, members of the family Scarabaeidae were collected from the Berlese trap but are unlikely to be found naturally in the abandoned nests of birds due to their size and habitat preferences. The problem of contamination could be easily solved in the future by sealing traps entirely and setting up the Berlese funnel in an enclosed room.

The abundance of arthropods predicted to be in this ecosystem from the collected specimens is uneven in distribution. It is possible that some of these groups (namely Family Formicidae, Phoridae, and order Acari) utilize these nests more than the other collected arthropods such as Labiidae and Psychodidae. The majority of specimens collected belong to the family Formicidae (ants). This makes sense given the circumstances. All of the collected nests were abandoned and showed no signs of bird activity. Given the amount of debris and plant matter contained within the nests of birds, this would be an ideal place for ant colonies to establish and forage for food. If these nests were inhabited by birds, the opposite would be likely to occur with their numbers reduced. Another common inhabitant of the nests collected during this study were flies of the family Phoridae. Phorid flies are natural predators of ants and the large number of ants collected in the sampled nests likely explains their presence in these nests.

All of nests sampled in this study were abandoned prior to collection. The majority of the nests were collected directly from the ground, were damp or in a state of degradation. It is not surprising that the arthropods collected from these nests are mostly those that enjoy damp leaf litter and debris ecosystems. By completing the experiment the way it was, specimens that were not expected to be in the nest were in variable numbers.

Using active vertebrate nests would change the findings entirely. This is supported somewhat by the arthropod diversity of nest three (figure 2). The arthropod fauna obtained from nest three comprises mostly of arthropods that would likely be found when a vertebrate is inhabiting the nest, and is completely different to that of the other nests. For example, *Thermobia spp.* (Firebrats) prefer an environment of high moisture and heat. An active birds nest would be ideal for them as they can get both from the birds body and fesces. This is likely because nest three was only recently abandoned by its prior occupants and the arthropods obtained had not yet

abandoned the nest. If the nest was left for some time, these arthropods would likely dissipate and the next set of arthropods displayed in the other nests would take their place.

Ultimately this study took an unexpected turn. Rather than collecting ectoparasitic arthropods or nidiculous arthropods inhabiting the nests of vertebrates I instead collected arthropods that prefer a leaf litter ecosystem. This includes arthropods displayed in figure 2 not in nest three. The expected specimens make sense as most parasitic arthropods do not continue to reside in a habitat if there are no hosts around. Further studies should be conducted on nests actively used by vertebrates rather than abandoned in order to more thoroughly sample the nidiculous arthropod fauna of Dominica

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Acknowledgements

I would like to thank Dr. Conway and Dr. Rangel-Posada for guiding me throughout this study as well as helping me with data arrangement, Adrian Fisher for helping set up my traps to collect specimen as well as identification help and guidance, my class mates for helping me find abandoned nests to study, and Dr. Hamer for his advising of this project and aid in the formation of the study. Additionally, I would like to thank Katrina Keith for reading an early draft of this project and providing helpful suggestions. Finally, I would like to thank Texas A&M University's Department of Entomology for supporting my travel and research in Dominica.

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