Trap-Nesting Bees and Wasps of Deep East Texas

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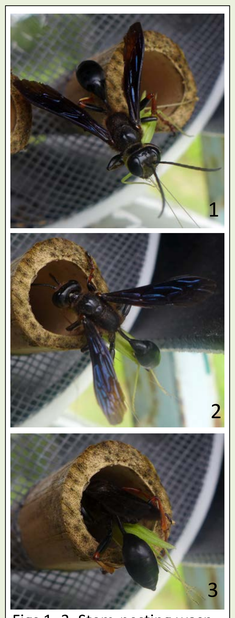
Introduction

Solitary, above-ground nesting bees and wasps comprise a distinct guild of pollinators and predators in most terrestrial habitats. These insects typically use cavities in woody vegetation. In these cavities they provision offspring, which are typically separated by partitions consisting of soil or plant materials (Fig. 7).

These insects can often be induced to nest in various materials. When these materials are placed in natural areas and later retrieved, they comprise a trap that can be used as a means to sample the trap-nesting insect fauna of a location. In the lab, trap-nests can be opened to gather data on developing offspring, which may be reared to adulthood under controlled conditions (Krombein, 1967). The vast majority of studies using trap-nesting techniques have relied on drilled wood blocks, paper tubes, or reed stems. Severed bamboo stems have less often been utilized by researchers.

Here, we provide preliminary data on the trap-nesting bees and wasps of Nacogdoches County, Texas and present a novel trap design for sampling cavity-nesting insects. This design utilizes bamboo stems and a housing constructed from PVC pipe, a PVC coupler, and window screen.



Figs 1–3. Stem-nesting wasp, *Isodontia auripes* & tree cricket prey, *Oecanthus* sp.

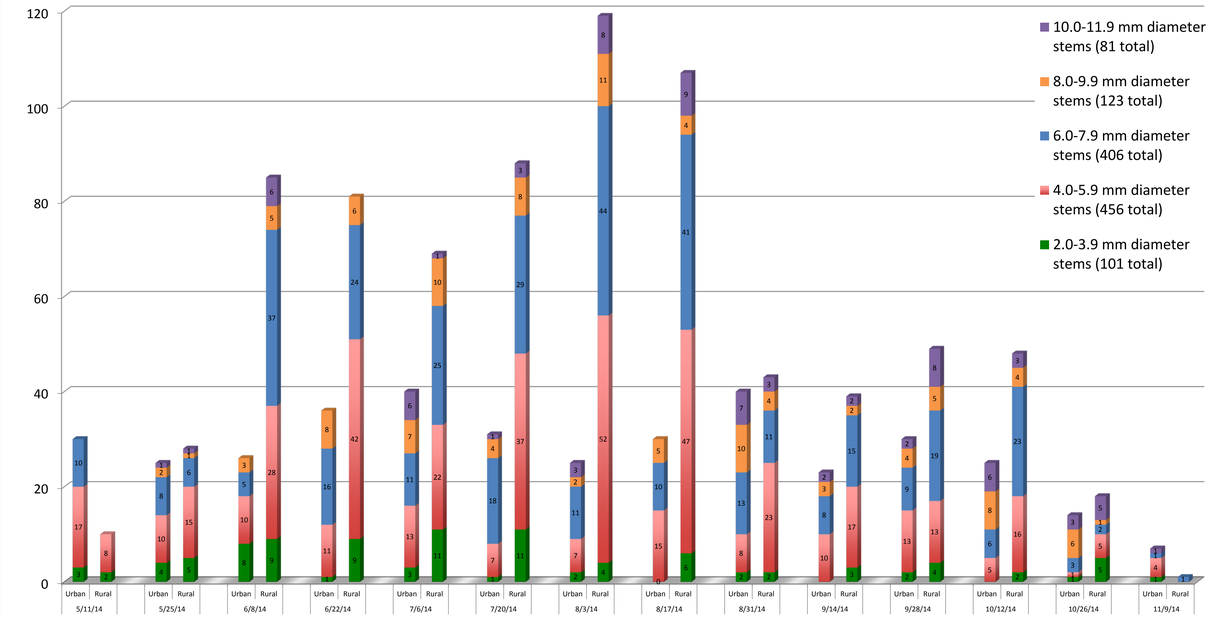


Fig. 8. Frequency distribution of trap-nests occupied by bees and wasps at urban sites (Nacogdoches, TX) and rural sites (USDA Plant Materials Center, Nacogdoches County, TX) from May–November, 2014.

Methods

Trap-nests comprised locally harvested and cut bamboo (*Arundinaria gigantea*) with cavities of 2–12 mm diameter and lengths of 10–20 cm. Stems were held in a housing (Fig. 6) that utilized two perforated panels of window screen. The screen panels were held taught between a 4” long section of 4” diameter PVC pipe and PVC pipe couplers. This design allowed for easy retrieval and replacing of the stems as well as for spacing between the stems, which was believed to reduce the spread of fungus and provide maximum ventilation. Moreover, other studies have shown that some stem-nesting insects prefer space between their nest and their neighbors’ nests (Sheffield *et al*., 2008). This housing was placed within a 12” long, green-painted PVC pipe to provide shelter from sun and rain (Fig. 5). A set of stems comprised six 2.0–3.9 mm stems, six 4.0–5.9 mm stems, six 6.0–7.9 mm stems, three 8.0–9.9 mm stems, and three 10.0–11.9 mm stems. Each set was spread across two separate housings, which were wired to metal T-posts about 1.5 meters above ground (Figs 4–5). Two sets of stems were attached to each post; posts were situated in groups of threes, with 30 meters between posts.

To test this new trap design, 18 sets of stems were placed at each of two sites in Nacogdoches County, Texas from late April until early November 2014. Site one comprised forested areas within the town of Nacogdoches along La Nana Creek (NAC). Site two comprised the USDA Plant Materials Center (PMC) located within the Stephen F. Austin State University Experimental Forest (Fig. 4).

Traps were checked for nesting activity twice monthly, active stems were removed, and replacement stems were added to the traps. Occupied stems were fitted with vials to trap emerging insects. Stems were stored in a shed at ambient conditions to ensure development at natural rates and were checked often for newly emerged adults. The latter are currently undergoing pinning, labeling, identification, and archival in the Dept. of Biology at Stephen F. Austin State University.

Figs 4–7. 4. USDA Plant Materials Center Nacogdoches, TX. 5. Trap-nest housing. with rain shield. 6. trap-nest housing 7. Opened stem showing pupae. and cell divisons.

Results and Discussion

Nesting activity. — During the course of this study, 1167 occupied stems were collected, which produced ca. 2200 individual insects representing 21 genera (Table 1).

Nesting activity was recorded from early May until early November 2014 (Fig. 8). Peak activity occurred in the urban sites on July 6 and August 31 and in the rural sites on August 3. Stems with 4.0–5.9 mm diameter openings were used most frequently (456), followed by 6.0–7.9 mm stems (406), 8.0–9.9 mm stems (123), 2.0–3.9 mm stems (101), and 10.0–11.9 mm stems (81).

During each collection event, typically < 10 stems were active per set. In most cases, unoccupied stems for each size class outnumbered occupied stems. Thus, stems of all size classes were consistently available to insects at each trap site over the course of the study (i.e., certain size classes were not excluded as possible nest sites due to previous insect activity).

Performance of trap-nests. — The housings developed to suspend the stems functioned well. They were inexpensive, durable, and reusable. They provided good shading, ventilation, and spacing of stems. They allowed the stems to be easily retrieved and replaced and were easily affixed to fence posts. Further, they apparently shielded the stems from attack by insect-eating birds.

The bamboo stems also functioned well in the field. They were utilized by bees and wasps at a substantial rate, easily carried in large numbers, easily split to observe nest occupants, durable, easily fitted with insect-emergence containers, and were not prone to harboring moisture. Disadvantages included the time required to harvest, cut, and sort stems to size classes, and the variations in shape of their inner cavities. In areas where readily available, such as the southeastern United States, bamboo offers an excellent trap-nesting material for use in surveys of bees, wasps and their parasites.

Family	Genus/species
Bombyliidae	*Anthrax* (nest parasite)
Bombyliidae	*Lepidophora* (nest parasite)
Chrysididae	*Chrysis* ? (nest parasite)
Crabronidae	*Trypoxylon* (2 spp.)
Ichneumonidae	*Messatoporus* (nest parasite)
Megachilidae	*Megachile* (3 spp.)
Megachilidae	Coelioxys
Megachilidae	*Osmia* (3 spp.)
Mutillidae	*Dasymutilla* ? (nest parasite)
Pompilidae	*Auplopus*
Rhipiphoridae	*Macrosiagon* (nest parasite)
Sarcophagidae	*Senotainia* (nest parasite)
Sphecidae	*Chalybion zimmermani*
Sphecidae	*Isodontia auripes*
Vespidae	*Ancistrocerus*
Vespidae	*Euodynerus* (3 spp.)
Vespidae	*Monobia quadridens*
Vespidae	*Pachodynerus erynnis*
Vespidae	*Parancistrocerus* (2 spp.)
Vespidae	*Stenodynerus*
Vespidae	*Symmorphus*

Table 1. Bees, wasps, and their nest parasites documented utilizing bamboo trap-nests in Nacogdoches County, TX.

Literature Cited

1. Krombein, K. V. 1967. Trap-nesting wasps and bees: life histories, nests, and associates. Smithsonian Press, Washington D.C.
2. Sheffield, C. S., P. G. Kevan, S. M. Westby, & R.F. Smith. 2008. Diversity of cavity-nesting bees (Hymenoptera: Apoidea) within apple orchards and wild habitats in the Annapolis Valley, Nova Scotia, Canada. Canadian Entomologist 140: 235–249.

Acknowledgements

We gratefully acknowledge the tireless efforts of Brian Humphreys, Lufkin, TX Eagle Scout, who contributed to the construction and monitoring of trap-nests used in this study.