OBSERVATIONS OF THE ORGAN PIPE MUD DAUBER WASP IN CAPTIVITY AND IN THE FIELD

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INSTRUCTOR: PAIGE CARITHERS
INTRODUCTION

There are four species of mud dauber wasps: *Trypoxylon politum*, *Trypoxylon clavatum*, *Sceliphron caementarium*, and *Chalybion californicum* (Lyon 2000). *Trypoxylon politum* constructs long, tubular nests of mud, and is common throughout the eastern United States (McIlven 2001). The following information is based upon observations by Shafer (1949), Cross et. al (1975), and Matthews (1997). This species is often seen at the edge of mud puddles collecting mud to construct their tubular nests. The female wasp collects this mud in her mandibles, which she mixes with her saliva and takes back to the chosen substrate on which her nest will be built. The organ pipe mud dauber wasp is solitary; each female constructs her own nest, unlike social wasps. After the female wasp selects a nest site and constructs her nest, she will then hunt and paralyze spiders to place in the nest as a food source for her offspring. Meanwhile, a male wasp may guard the nest while the female hunts. Once the cell is full of spiders, she then lays an egg, and seals the cell off with mud. After two to three days, the egg hatches and the larva feeds on captured spiders for approximately ten days. Then the larva spins a cocoon and overwinters as a prepupa. The following spring it will continue its development into an adult that will emerge by chewing its way to freedom through the nest wall.

Much is known about the habits of organ pipe mud daubers and their prey preference under natural conditions (Muma & Jeffers 1945, Shafer 1949, Cross et.al 1975, Brockman 1980, Matthews 1997); however, few studies have attempted to observe these animals and their prey and hunting tactics in captivity (e.g. Blackledge & Pickett 2000). The purpose of our study is to observe and compare substrate, prey, and mud preference of organ pipe mud dauber wasp (*Trypoxylon politum*) in captivity and in the field.

METHODS

This study was conducted during June and July of 2001 as part of the Upward Bound Math & Science Program at Western Carolina University, Cullowhee, NC. All field observations and collections were made in Jackson and Macon Counties, North Carolina. To construct our indoor enclosure, we chose a plastic storage container with the dimensions of 77.5cm X 47.5cm X 38.8cm. The enclosure was placed in a green house to simulate the same amount of light and temperature level as the outdoors. We used the following additional materials to construct a living environment for the wasps: gravel aquarium rocks, sand paper, mud samples, plywood boards, wire mesh screen,
copper wire, plastic dispensers (approx. 5.0cm in height), sponges, honey and water, and concrete and other adhesives. For our first substrate we used one plywood board (52.5cm X 30.0cm X 2.5cm) and cemented the gravel rocks in place. For our second substrate, we glued six sand paper strips onto one wall of the enclosure. On the third wall, we secured a plain plywood board (52.5cm 30.0cm X 0.3cm). Finally, we put the remaining gravel rocks on the bottom of the enclosure. We secured the enclosure by affixing a wire mesh screen over the opening with duct tape. We cut a circle out of the screen and sewed a sock on with copper wire, and then cut the other end off to create an entrance to allow access for placing specimens, changing nectar, placing mud, etc. In the field, we collected adult organ pipe mud dauber wasps and a variety of spiders to place in the enclosure for observations. Observations were made of any behaviors in captivity for three hours a day, from 9:30 - 10:30a.m., 12:30 - 1:30p.m., and 5:30 - 6:30p.m. Also, we observed nests in the field to record their substrate and prey preferences, and how many different sources of mud were typically used in nest construction. Different shades of mud of the nests suggest different sources of mud used in nest construction.

RESULTS AND DISCUSSION

Substrate
The choice of substrate by the female wasp is very important because it will serve as the fourth side of her nest, conserving materials and energy for the wasp (Matthews 1997). Although we observed no substrate preference in captivity, our field observations show that out of 175 nests 54.29 % were constructed on wood substrates, 22.29 % on rocky substrates, and 20.75 % on cement substrates (fig. 1). A total of 5 nests were constructed on other substrates, such as a light bulb, chain, and electrical wire and comprise the final 2.67% of observations. From these findings, wood seems to be the most preferred substrate. It seems that the wasps need a substrate that is accessible and that has a specific texture suited to holding the mud. Wood may provide a good texture to build nests upon because mud may not stick if a surface is too smooth. As seen in the results, there is a wide range in the diversity of substrates used by organ pipe mud dauber wasps. These wasps have been observed to use trap nests in the Okefenokee Swamp of Georgia (Barber & Matthews 1979). There were also personal observations of nests built on brick, and inside car motors (P. Carithers pers. comm.).
Mud

Once a substrate is chosen the female wasps begins nest construction. To construct her nest she must find a source of wet mud of the right consistency. She then collects a ball of mud in her mandibles, which is mixed with her saliva and applied to the substrate to form a tubular nest. This process can take from three hours, to 2 to 3 days to complete (Brockman 1980, Matthews 1997). Although no nests were constructed in captivity, observations of different sources of mud used in nest construction were recorded in the field. Figures 2, 3, and 4 show the percentages of nests from each site (Coweeta, Western Carolina University, East LaPorte) that we observed constructed from 1, 2, 3 or 4 different sources of mud. At the Western Carolina University and Coweeta sites, most nests were constructed with one source of mud, and only a few constructed with 2 or 3 sources of mud. At East LaPorte less than half of the nests were constructed with one source of mud, and a larger portion constructed with two or more sources of mud. This could possibly be because the availability and consistency of near-by mud sources varies at each site. At East LaPorte, they may be using more sources of mud because there are probably more types of mud available, closer to their nest sites. At Western Carolina University and Coweeta maybe only one or two sources of mud were available. Another possibility may be where one female abandons a nest, and another female takes over nest construction, using other mud sources (Brockmann 1980).

Prey

After the nest is constructed, the female hunts and paralyzes spiders, which she packs into the nest. These spiders are a food source for the developing wasp larvae. All the spiders collected come from field nests belong to the Arenidae (orb-weaving spiders) family. The spiders probably belong to two to three genera within this family (Ron Huff, pers. comm.). Muma & Jeffers (1945) have observed that *T. politum* are very limited in their food habits. Of 439 specimens, 64.4 percent belonged to the genus *Neoscoena*, and 23.6 percent were of the species *Eustala anastera*. The remainder of the specimens were from other genera. Other studies also have observed that *T. politum* is very selective in using only Arenidae spiders in other parts of its range (Cross et al. 1975, Barber & Matthews 1979, Brockmann 1980). Perhaps the use of these particular spiders has something to do with their abundance and availability. Another possibility is that this wasp specializes on these spiders and their behavior, thus becoming more efficient hunters. Blackledge and Pickett (2000) observed the hunting tactics of two other species of mud dauber wasps in captivity. One of the species used a tactic of plucking the web to lure the spider to the wasp, where
it is then stung and paralyzed by the predator wasp. Personal observation by Blackledge and Pickett (2000) also notes that this plucking predatory behavior is similar to other wasps in the genus *Trypoxylon*.

**Observations in captivity**

In captivity, a total of 13 wasps were observed over a ten-hour observation period, from July 10th - 19th. We observed that the wasps did not construct nests on any of the substrates provided. Some wasps may have not attempted to construct nests because of the limited space in the enclosure. This is suggested in one instance where one wasp died after being caught up in a spider web that was spun across the enclosure. Other reasons could include mud consistency. Although mud was watered daily, we could not decide the exact consistency that was necessary or preferred by the wasps. Other observations noted that some wasps became very territorial and seemed to fight off other wasps when they went near the nectar or mud that was provided. Some wasps may have killed others in the enclosure, as a number of wasps were found piled-up dead in one corner. Two wasps were observed mating in the enclosure. Most of the time, wasps were observed clinging to the top of the enclosure, flying around the mud or nectar, or occasionally feeding on the nectar. In some observations, the wasps were seen in the mud provided, possibly checking consistency.

In future observation studies, a larger enclosure would provide a more natural environment for monitoring wasps. Plenty of nectar dispensers should be available due to the territorial nature of these solitary wasps. Mud consistency should be monitored constantly, and a wide variety of mud types should be provided. Also, more time may be needed to acclimate the wasps to the artificial surroundings.
Figure 1 - Percentage of nests constructed on each substrate type.

Sources of Mud at Western Carolina University

Figure 2 - Percentage of nests constructed with 1, 2, 3 or 4 sources of mud at Western Carolina University.
Sources of Mud at East LaPorte

- 47% (47%)
- 44% (44%)
- 6% (6%)
- 3% (3%)

Figure 3 - Percentage of nests constructed with 1, 2, 3 or 4 sources of mud at East LaPorte.

Sources of Mud at Coweeta

- 73% (73%)
- 21% (21%)
- 6% (6%)
- 0% (0%)

Figure 4 - Percentage of nests constructed with 1, 2, 3 or 4 sources of mud at Coweeta.
LITERATURE CITED AND OTHER REFERENCES


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