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Observations on the Nesting Behavior of *Auplopus Caerulescens Subcorticalis* and Other Auplopodini (Hymenoptera: Pompilidae)

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OBSERVATIONS ON THE NESTING BEHAVIOR OF *AUPLOPUS CAERULESCENS SUBCORTICALIS* AND OTHER AUPLOPODINI (HYMENOPTERA: POMPILIDAE)

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ABSTRACT

Nest searching and mud and prey transport behavior in a small aggregation of *Auplopus caerulescens subcorticalis* nesting in a concrete cellar foundation in upstate New York are delineated. The contents of nine cells of this subspecies are identified, the mud cells and wasps' eggs are described and measured and the site of the egg attachment on the spider is defined. Selectivity in prey capture at the family level by certain females was indicated, with Thomisidae reported as a new prey family. The method of prey transport and a new prey family (Clubionidae) for *Auplopus mellipes variitarsatus* are given. Two prey records for *Ageniella fulgifrons* are included.

Knowledge of the nesting behavior and prey preference of Nearctic species in the spider wasp tribe Auplopodini is based mostly on isolated observations of individual females or their nests. Members of the tribe amputate several or all of the spider's legs to facilitate prey transport and feed on haemolymph exuding from the amputated leg bases (Evans and Yoshimoto 1962). Some species of *Ageniella* nest in the ground in pre-existing holes and place a paralyzed spider in a cell constructed near or at the end of the hole (Evans and Yoshimoto 1962, Wasbauer and Leech 1973, Evans 1974, Kurczewski and Kurczewski 1987). Species of *Phanagenia* and *Auplopus* build mud cells, sometimes in series, in sheltered situations and provision each cell with a paralyzed spider (Williams 1919, Kimsey 1980). Whereas species of *Phanagenia* and *Auplopus* are rather unselective of their family of prey (Krombein 1979), some species of *Ageniella* are family-specific in prey capture (Kurczewski and Kurczewski 1987). Because of the dearth of information on the nesting behavior of this tribe of pompilids, practically any observation made on this group of spider wasps adds new information and, hence, the following notes are recorded below. The wasps and prey spiders from this study have been given associated ethology note numbers and deposited in the insect museums of Cornell University and the State University of New York College of Environmental Science and Forestry, respectively.

Auplopus caerulescens subcorticalis (Walsh)

Individuals of this subspecies nested in pre-existing holes in the concrete cellar foundation of a house in Etna, Tompkins County, New York during 11 August–7 September 1987 (Ethological Note No. P-87-4-13). Three of the holes, 0.5–0.6 cm in diameter, were situated 43–45 cm above ground level, were 2.0–6.5 cm apart and were interconnected. Females were observed searching for nesting sites between 1155 and 1501

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h (EDT) on sunny or partly cloudy days. Such wasps made arcked flights, 15–30 cm-long, always facing the vertical foundation wall, landed frequently and entered holes and cracks in the concrete. Most females exited headfirst 1–8 min ($\bar{x} = 2.4$, $N = 17$) after entering, took flight and searched elsewhere in the foundation.

On 4 September at 1501 h a wasp began antennating a small cavity near the base of the wall, walked across an amaurobiid web without becoming entangled and entered the hole. She exited headfirst from this opening at 1525 h, made a 45 sec orientation flight that included turning many circles and flew away. The female returned in flight at 1531 h with a pellet of mud held beneath her head, presumably with the mandibles and bristles on the mentum (Evans and Yoshimoto 1962, Shimizu 1986), landed, ran across the amaurobiid web, entered and exited 1 min later. During this and subsequent entries by the wasp the amaurobiid ran to the opposite side of its web. At 1725 h the female entered with the 24th pellet of mud for her nest. At 1605 h of the next day this wasp was observed flying in with another pellet of mud, presumably for a second cell, as the interior of the cavity contained two adjacent cells when later exposed.

Several other females were seen during 11–30 August between 1130–1810 h, landing on the wall and holding mud pellets beneath their heads before flying into holes in the foundation. The mud pellets were about ⅓ the size of the wasp's head and had been gathered from the edge of a mud puddle 9 m away. One such wasp spent 1–10 min ($\bar{x} = 5.2$) between 10 entries, whereas another female brought in 30 mud pellets between 1625 and 1738 h. The latter wasp took 35–85 sec ($\bar{x} = 44$) to deposit a mud load inside.

Eight observations of wasps transporting paralyzed spiders into openings in the foundation were noted and, in all cases, the manner of prey transport was essentially the same. The legs of all spiders had been amputated at the coxal-trochanteral joints. Wasps straddled the spiders as they laid ventral side up and held the spider's spinnerets with the mandibles (see Evans 1953). They made either short flights or carried the spider forward on the ground. Some females climbed a tree nearby or other vegetation and then flew downward at an angle to assist in transport. Eventually, all of the wasps carried the prey up the concrete wall using the wings as an aid, or landed thereon and proceeded forward into one of the openings.

A total of nine cells was discovered in three shallow openings following removal of a small amount of concrete from the wall. Two, three and four cells were found roughly in series in areas separated by 6 and 9 cm, respectively. The outer surface of each cell was roughened and characterized by the texture of the individual mud pellets. The cell interior was smooth and appeared to be almost polished. The cells were roughly cylindrical in shape and were 0.6–0.8 cm long and 0.4–0.5 cm in diameter. The cell walls were about 0.1 cm thick. It is likely that the smaller cells would have given rise to male and the larger cells to female wasps.

Each cell contained a single paralyzed spider minus its legs in a head outward and ventral side up position. None of the spiders had recovered from the effects of the venom upon removal from the cells. The wasps' eggs, 0.15–0.17 × 0.04–0.06 cm in length and width, were sausage-shaped and attached obliquely near the basal portion on the underside of the spider's abdomen. Ten prey spiders, including one collected during prey transport, were identified as follows: CLUBIONIDAE: *Clubiona* sp., pen. ♀, pen. ♂; THOMISIDAE: *Xysticus* sp., pen. ♀; SALTICIDAE: *Eris militaris* (Hentz), ♀, *Phidippus audax* (Hentz), imm., *Phidippus* sp., imm. (2), *Platycryptus undatus* (De Geer), imm. (2), *Sitticus fasciger* (Simon), ♀. Certain females had provisioned only with clubionids and other wasps only with salticids and one thomisid. The spiders weighed (wet) 16–20 mg ($\bar{x} = 17.9$, $N = 10$) and the wasps, 14–16 mg ($\bar{x} = 15.2$, $N = 4$).

Auplopus mellipes variitarsatus (Dalla Torre)

Amber, Onondaga County, New York; 30 June 1987; 1410 h (EDT). A female was observed transporting a paralyzed spider forward on a wooden porch railing of a summer cottage. She held the prey venter up and grasped its spinnerets with the mandibles. After

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carrying the spider across the railing and up the side of the cottage, the wasp with the spider flew to the ground at which time the pair was collected. The spider was identified as a *Clubiona obesa* Hentz, ♀ (CLUBIONIDAE) (P-87-1), with all legs cut off at the coxal-trochanteral joints. It weighed (wet) 38 mg.

Ageniella fulgifrons (Cresson)

Erie, 2.4 km SE, Erie County, Pennsylvania; 28 July 1987; 1320 and 1440 h (E.D.T.). Two wasps were collected while transporting spiders on the ground. Prey: *Phidippus audax* (Hentz) (SALTICIDAE) (P-87-2,3), with all legs amputated at the coxal-trochanteral joints. Weights (wet): 55, 57 mg.

DISCUSSION

Auplopus a. architectus (Say), *A. nigrellus* (Banks) and *A. caerulescens subcorticalis* are three closely related, metallic blue-green, mud-daubing spider wasps of eastern North America (Townes 1957). *Auplopus a. architectus* is slightly larger than the two other species and inhabits fields and meadows (Townes 1957, Evans and Yoshimoto 1962). *A. nigrellus* and *A. caerulescens subcorticalis* are equivalent in size and difficult to separate morphologically in the female sex (Townes 1957). The former species is usually restricted to deciduous woodlands while *A. caerulescens subcorticalis* is found in pastures and at the edges of woodlands, often near water (Townes 1957, Medler 1964). The three species appear to be almost identical in nesting behavior and prey preference (Evans and Yoshimoto 1962, Krombein 1979).

Auplopus caerulescens subcorticalis constructs cylindrical mud cells under bark, inside other wasp nests and in a variety of other pre-existing cavities (Walsh and Riley 1869, Townes 1957, Medler 1964, Krombein 1967). Females of this subspecies and those of many other species of Auplopodini amputate the spider's legs at the junctures of the coxae and trochanters and this behavior apparently facilitates feeding on the spider's blood and aids in prey transport (Evans and Yoshimoto 1962). The paralyzed spider is carried either in flight or forward on the ground with the wings assisting in the forward thrust. The cells are often built in series, depending upon the confines of the pre-existing cavity (Medler 1964, Krombein 1967). A variety of small wandering spiders of the families Clubionidae, Anyphaenidae, Thomisidae and Salticidae are captured for use as prey.

Auplopus mellipes variitarsatus is another common, woodland, mud-daubing pompilid (Townes 1957, Evans and Yoshimoto 1962). Its nesting behavior and prey preferences are similar to those of other members in the genus (Evans and Yoshimoto 1962). The family Clubionidae, as reported in the present paper, represents a new prey family for this species of spider wasp.

The nesting behavior of *Ageniella fulgifrons* has been studied in some detail (Kurczewski and Kurczewski 1987). The additional prey records presented herein for this species substantiate its selective use of Salticidae.

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