

Probable marking behavior of *Cerceris clypeata* (Philanthinae, Crabronidae, Hymenoptera)

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Abstract

Males of *Cerceris clypeata* appear to mark grass stems and other plant parts with secretions from cephalic glands by placing the head and tip of the abdomen on the plant as they walk up the stem or around the leaf of the marked plant. Behavior of this sort has rarely been recorded for *Cerceris* but is common in the Philanthinae including some members of the Cercerini, which includes *Cerceris*. Males of *C. clypeata* very occasionally defended their small marking site against intruders but no nests or females were observed during the study. The abdomen dragging behavior of *C. clypeata* and another member of the genus suggest that marking behavior is ancestral for the subfamily.

Keywords

evolution of marking, male behavior, territoriality

Introduction

Marking behavior or abdomen dragging (we shall use the terms interchangeably), in which males walk up or down plant stems apparently depositing a sex-attractant pheromone from glands prominent only in the male (Weiss et al. 2017), is well known in *Philanthus* (Alcock 1975a, 1975b, McDaniel et al. 1987, Evans and O'Neill 1988, 1991, Gwynne 1980, O'Neill 1983). However, males belonging to the genus *Cerceris*, which is

also placed in the Philanthinae, have only been recorded abdomen dragging once in the literature, based on a brief observation involving a single individual of *C. nigrescens* (Evans and O'Neill 1985). Other species of *Cerceris* have been observed nonaggressively patrolling areas (particularly those with flowering plants or near nests with emerging females) in search of receptive females (Alcock and Gamboa 1974, Elliott 1984, Evans 2000). Two European species of *Cerceris* have very distinctive cephalic glands that differ from those exhibited by members of the genus *Philanthus* suggesting that male *Cerceris* do not generally engage in the marking behavior of other Philanthinae (Weiss et al. 2017). Here we report on observations of *C. clypeata* over a period of several days in which several males regularly appeared to mark grass stems in a hayfield in northern Virginia. Male behavior of this very small species of *Cerceris* has not been reported previously although female nesting behavior has been described by Matthews and Matthews (2005).

Materials and methods

When a single male of *C. clypeata* was seen apparently marking grass stems in a hayfield in the middle of the day on 16 July 2018, the site was inspected at midday on 21 following days. However, a male or males were only present for eight of these days (rainy or cloudy days were apparently unacceptable to the wasps although they were also absent on five sunny, warm days). The area in which males were found was located at the edge of a hayfield on the farm at 38°52'27.22"N, 77°54'17.12"W. The grasses there were introduced species, including Johnson grass (*Sorghum halepense*).

Five males were given distinctive color marks on the thorax with blue, white and pink Uniposca pencil-pens in order to attempt to follow known individuals at the marking sites.

Results

From one to three males occurred at the hayfield location during the 8 days when at least one male was present. During this time, a total of 5 sites were occupied at one time or another with the males flying out and returning to spots within a meter of their previous perches. Of the 5 painted males, one returned soon after application of the thoracic paint dot and for three consecutive days, one returned soon after being marked and for two consecutive days, one returned for a single day, and two did not return after being marked. The arrival of the first male at any site took place no earlier than 1111 E.D.T. and the duration of occupation of a site could last as long as slightly more than three hours, although some individuals were present for less than an hour.

When males first arrived, abdomen dragging behavior was frequent in which the male walked generally upward along a grass stem or leaf with the head and the tip of the abdomen touching the substrate (see Figure 1, Alcock 1975b). As time passed marking behavior became less frequent. Thus on 29 July when a male marked pink thorax on 27 July was watched from 1151 to 1406 E.D.T, the male flew out from its



Figure 1. A male of *C. clypeata* on his perch, a grass stem, at the site where he dragged his abdomen in the farm hayfield.

perch (Figure 1) and spent a few seconds flying through the site before returning to the perch or shifting to a new perch a few centimeters distant. The male did so without marking 16 times in the first half hour while apparently marking grass stems after its departure from its perch on 19 occasions; the same male left its perch without marking 42 times in the last half hour of observation and marked only 5 times. Likewise, on 6 August when a male with a blue thoracic dot (added on 5 August) was watched between 1111 and 1317 E.D.T. the wasp left its perch without marking 67 times in the first half hour while marking 34 times; the same male flew from its perch without abdomen dragging 43 times in the last half hour while marking only 10 times. Occasionally the male marked several different plant parts during one flight out from its perch.

Only three interactions between *C. clypeata* were seen during the study, two involving a resident male that pursued another individual presumed to be a conspecific male for a short distance and one that resulted in a brief grapple on the ground between the resident and the other wasp. No nests of the wasp were found near the marking sites and no copulations were observed.

Discussion

The behavior of the male *C. clypeata* was very similar to that of other philanthine wasps seen apparently marking plant stems and leaves at certain restricted locations that they

often defended from other males (Evans and O'Neill 1988, Kroiss et al. 2010). Males walked along stems in the middle of the day (as is true for many species of *Philanthus*, see Evans and O'Neill 1988) with their head and tip of abdomen lowered to touch the plant, presumably brushing the stem or leaf with a pheromone scent produced by cephalic glands to attract females (Evans and O'Neill 1991, Kroiss et al. 2010). Abdomen-dragging occurs more often early in the daily residence of a male rather than later in *P. basilaris* (O'Neill 1983) as in *C. clypeata*. Male tenure at marking sites is often short, lasting only a few days at most (Alcock 1975b, O'Neill 1983). Copulations are rarely, if ever, seen in any marking species (Alcock 1975b, O'Neill 1983, this study), even in those species that mark territories near nesting females (Gwynne 1980).

The occurrence of abdomen dragging by at least two species of *Cerceris* and several others in the Cercerini (especially *Eucerceris* spp.) (Alcock 1975a, Evans and O'Neill 1985) suggest that this behavior is widespread in the Philanthinae and perhaps is ancestral in this group. The fact that abdomen dragging is absent in many species of *Cerceris* is indicative of the loss of the application of a sex pheromone in some of the Cercerini, in addition to the modification of the application brushes found in many members of this group (Evans and O'Neill 1985) and changes in the cephalic glands that produce the sex attractant pheromone (Weiss et al. 2017).

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