

**Observations on the Biology of *Cerceris mimica* Cresson
(Hymenoptera: Sphecidae: Philanthinae)**

HOWARD E. EVANS

Department of Bioagricultural Sciences and Pest Management,
Colorado State University, Fort Collins, Colorado 80523-1177

ABSTRACT: Observations are presented on an aggregation of *Cerceris mimica* in the Pawnee National Grasslands, Colorado. Males patrolled flowers being visited by females, and females nested in the hard-packed soil of a dirt track. Nests lacked tumuli and were sometimes occupied by two females. Burrow was initially vertical, but deep in the soil descended at about a 30 degree angle to the horizontal and was considerably broadened. Prey consisted of weevils of the genus *Sphenophorus*.

Introduction

Cerceris mimica Cresson is one of the larger species of the genus and is a striking species, the females having a reddish head and the abdomen boldly patterned with yellow bands interrupted by reddish wedges. The species has a wide distribution, occurring throughout the Mexican central plateau and through southern United States as far north as Kansas (Scullen, 1965). In spite of this, there are no published reports on the biology of the species.

Study Area and Methods

I found *Cerceris mimica* to be abundant at one locality in Weld County, Colorado, during August of 3 years, 1998-2000. The location is along Wildhorse Creek where it intersects County Road 96, about 25 km east of Pierce, in the Pawnee National Grasslands. Here there is a dirt track that passes south from the county road and parallels Wildhorse Creek, which is dry most of the time except for occasional waterholes. The creek bed is filled in places with stands of tall smartweed, *Polygonum ramosissimum* Michaux. Along the track and sides of the creek gully are stands of Rocky Mountain bee plant, *Cleome serrulata* Pursh. I estimated the population of *Cerceris mimica* to exceed 100 during all three seasons in which observations were made. To my knowledge, this is the only locality in Colorado where this species has been found.

Searches along the dirt track and adjacent areas failed to reveal any holes surrounded by circular tumuli, characteristic of the nests of most species of *Cerceris*. There were, however, numerous vertical holes, 8-10 mm in diameter, scattered about in the bare soil of the track. Females were seen entering and leaving some of these, and when it became evident that some were, in fact, the entrances of nests, I made an excavation in August 2000. Unfortunately this was a very dry and hot summer, and the soil in the track was extremely dry and hard. By filling a burrow with dilute plaster of Paris and waiting for it to harden, I was able to follow one burrow to the bottom, but only after using water to soften the soil and using a hammer and chisel to get through the top 15 cm of soil and remove it in chunks. Below about 15 cm the dark clay-loam was still firm but could be removed with a trowel.

Results

Both males and females were abundant on flowers of *Polygonum* and *Cleome* in August of each year, but males were much less abundant after August 20. The flowers were clearly being used as sources of nectar, and males also sought females there.

Males patrolled within and above the plants in irregular patterns and often followed a few cm behind females. I observed several attempts to mount females, but no completed matings. I saw no evidence that males patrolled a restricted area or that plants were scent-marked, although such behavior is characteristic of some other Philanthinae (Alcock, 1975a; Evans and O'Neill, 1988).

During the morning hours, females were seen flying 5–20 cm above the soil of the dirt track, evidently attracted to holes and to dark objects on the ground. Some were even seen to stop briefly at the entrance of a nest of harvester ants (*Pogonomyrmex*). Females were seen to remain in such holes a few seconds up to three minutes. None of the females was seen to interact with other females during these circuitous flights.

The burrow that was eventually chosen to excavate was identified as an active nest because there were a desiccated, dismembered female *Cerceris* and 6 apparently dead weevils lying outside the entrance. A female was seen to enter the open burrow and a second female a few minutes later; one of them emerged shortly. An initial attempt to dig out this nest failed because of the extreme hardness of the soil. On the following day I returned more fully equipped. A female entered the nest at 0815, carrying prey in her mandibles, possibly also supported by her front legs. She plunged directly into the open hole, which as usual had no surrounding tumulus. A second female entered the nest at 0905, without prey; one of the females emerged a few minutes later.

The nest proved of unusual structure (Fig. 1). The entrance was 9 mm in diameter, but it soon narrowed to 7 mm. The initial burrow was nearly vertical, but at a depth of 25 cm it began to descend at about a 30 degree angle with the horizontal. Here the burrow widened to 10–14 mm and remained at this diameter to a terminus at 45 cm, 30 cm in vertical depth. A female and her weevil prey were located near the end of the burrow. Three cells were found beyond the end of the burrow, separated from the burrow and from one another by 8–14 cm. Vertical depth of the cells was 35 to 38 cm. Cells measured about 15 by 22 mm. Two contained fresh cocoons and one a large larva with weevil fragments. Undoubtedly there were further cells deeper in the soil. The weevils taken at the entrance and in the burrow belonged to two species of *Sphenophorus*, *cicatristriatus* (Fahraeus) and *compressirostris* (Say).

There may well have been other cells deeper in the soil. However, I was unable to expand the excavation, since the track was being used periodically by vehicles. For the same reason, I was unable to excavate further nests. No nests or open burrows were found away from the hard-packed soil of the track.

Discussion

Although male *Cerceris* have clypeal hair brushes not unlike those in most other Philanthinae, there is limited evidence that they employ these brushes in territorial scent-marking as do some other members of the subfamily. Alcock (1975a) reported that males of *C. simplex* Smith (= *intricata graphica* Smith) and *C. frontata* Say "cruise about a home range in search of mates," behavior very similar to that of *C. mimica*. Only *C. nigrescens* Smith has been reported to exhibit territorial scent-marking, and then only once (Evans and O'Neill, 1986). These authors suggest that territorial scent-marking may be a "relatively ancient character" within the Philanthinae and may have been lost in some taxa. Although males of *C. mimica* have an abundance of hair on the abdominal venter, it is not brush-like as in many species

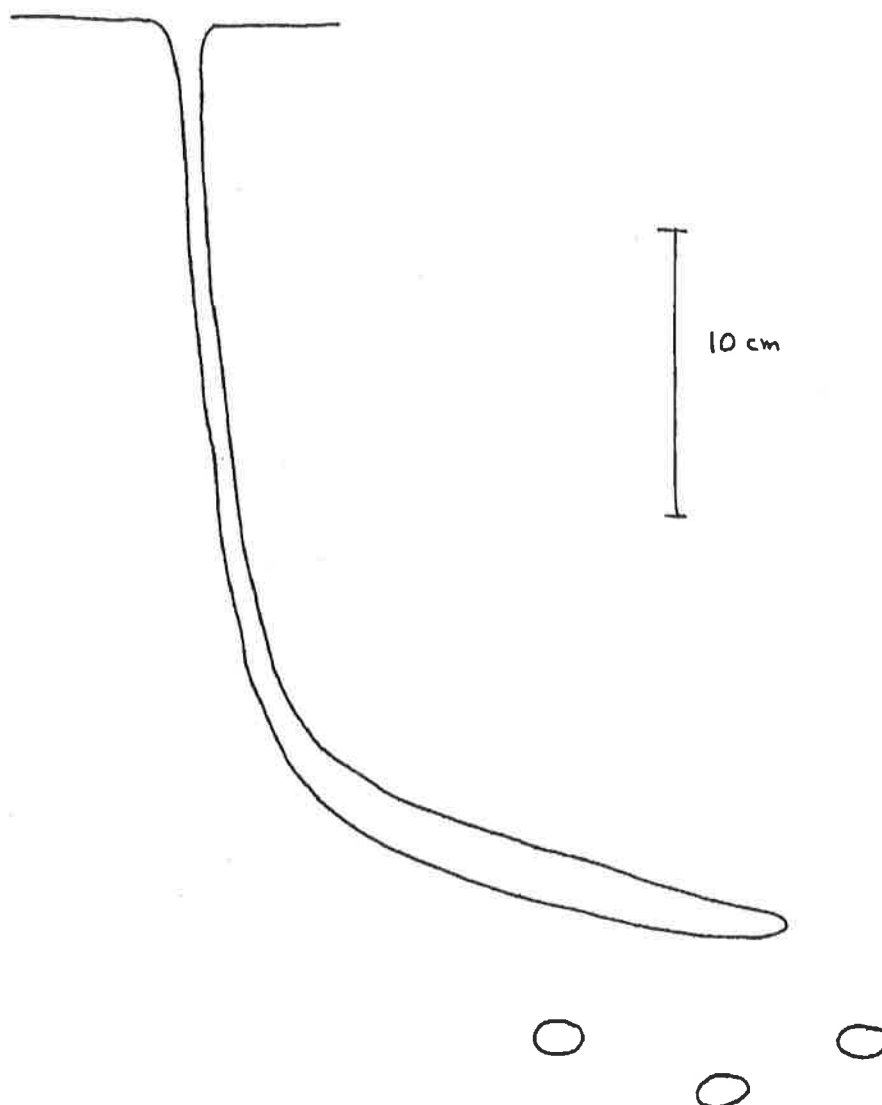


Fig. 1. Nest profile of *Cerceris mimica*, based on a plaster cast. Locations of three cells are shown below.

of *Eucerceris* and *Philanthus*. Probably in other Philanthinae clypeal hair brushes serve to apply pheromone from head glands, while abdominal brushes spread it on plants (Evans and O'Neill, 1988). Evidently such behavior does not occur in *C. mimica*.

The fact that females were frequently seen flying a few cm above the dirt track, examining and sometimes entering open holes, suggests that nest usurpation may occur in this species as it does in other species of the genus (Alcock, 1975b; Field, 1994); the presence of a dead female and prey at one entrance reinforces this belief.

Occupation of a nest by more than one female is common in the genus; such behavior does evidently occur in *C. mimica*, but I was unable to determine the status or behavior of nest-sharing females. Some of the females that examined holes may have been attempting to join rather than usurp a nest, or perhaps were attempting to reutilize an abandoned burrow. In *C. antipodes* Smith, nest initiation is impeded and nest sharing favored by extremely dry conditions resulting in strongly compacted soil (McCorquodale, 1989).

It is probable that the same burrow is used by successive generations of females, as in some other species (Evans and Hook, 1986; Hook, 1987). Two facts support this belief: tumuli do not occur at nest entrances, and mandibular wear in late-season females is by no means what one would expect if a female had to dig through the extremely hard surface soil. If this nest was, in fact, being reused, I would have expected further, older cells deep in the soil. As explained above, I was unable to explore more deeply in the soil. The reuse of burrows is also no doubt highly adaptive in species nesting in very hard soil.

I am not aware that other species of *Cerceris* are known to have an expansion of the lower part of the burrow similar to that of *C. mimica*. I believe this expansion serves as a receptacle for soil when a burrow to a new cell is dug. The soil may then be used to close off the cell burrow. However, it is possible that the expansion of the burrow is simply the result of long use. The lack of tumuli at any nest entrance suggests that soil is not removed to the entrance as the nest is expanded. Lack of tumuli may also be adaptive, as these may serve as landmarks for parasites such as Mutillidae.

The use of weevils of one genus comes as no surprise, as most *Cerceris* are highly selective predators. The species apparently most closely related to *C. mimica*, *C. bicornuta* Guérin, has been found to restrict itself to weevils of the genus *Sphenophorus* in a wide variety of localities (Scullen and Wold, 1968; Evans and Rubink, 1978). One species of weevil taken by *C. mimica* has been recorded as prey of *C. bicornuta* at two localities (*S. cicatristriatus*).

Acknowledgments

I thank Charles O'Brien for identifying the weevils and Allan Hook for his comments on an earlier draft of this paper.

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