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Courtship Behavior in *Habronattus Captiosus* (Araneae: Salticidae)

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COURTSHIP BEHAVIOR IN *HABRONATTUS CAPTIOSUS* (ARANEAE: SALTICIDAE)

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ABSTRACT

Courtship display of *Habronattus captiosus* involves several behavioral elements common to other members of the *Habronattus coecatus* species group. The one unique element is vibration of the patellae when raised over the opisthosoma. Male—male interactions included an agonistic display and grappling. Fourteen male—female interactions were observed, which exhibited various combinations of display elements. There was one successful mating and one case of cannibalism by a male.

Habronattus captiosus (Gertsch) is a common species of the genus in the northern midwest and plains regions of North America. It belongs to the largest species group of *Habronattus,* the *coecatus* group, with 23 species (Griswold 1987). Typical habitat includes open areas with sandy or gravelly soil and an abundance of fallen tree leaves. Little used roads, roadsides, and disturbed spots in urban areas bordered by trees such as *Populus* and *Quercus* species are the most productive collecting places in east-central Minnesota. Males and females can be seen hopping on dry leaves on warm sunny days during May. As the season progresses, males die and the females become less active, tending egg sacs hidden in and under debris at the soil surface. In September the penultimate and antepenultimate instars may be found active on the litter surface. The earlier instars are probably also active after emergence from the egg sac, but are overlooked because of their small size. The species is almost never taken while sweeping vegetation.

Mature males and females are strongly dimorphic. In both the body is about 6 mm long, but the male has longer legs. Griswold (1987) presented a detailed description of the male structure and coloration, although the latter was not fully accurate due to bleaching of preserved specimens. In living males, scales which are referred to by Griswold as being pale or white, are pale tan to a rich yellow. The clypeus is brown, and the gray-white scales covering the clypeus are opalescent, with a blue-pink iridescence. Females are clothed uniformly with tan scales, except for a heavy band of white clypeal scales.

The opportunity to describe courtship in *H. captiosus,* also provides the opportunity to corroborate Griswold's (1987) placement of the species in the *H. coecatus* group by using ethological rather than morphological characters.

METHODS

Two males and 2 females were taken hopping among dry cottonwood (*Populus deltoides*) leaves along a sandy truck trail in southern Minneapolis, Hennepin County, Minnesota on 11 May 1987. They were brought to the laboratory and maintained

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individually in 100 × 15 mm plastic petri dishes with a piece of damp sponge. All were fed midges (Chironomidae), until the first day of testing, 17 May. Tests were conducted over the next 5 days. Spiders were presented to other spiders, and the interactions observed. These trials were initially observed in a 3 gallon plastic aquarium covered with plastic wrap, illuminated by both natural light and a high intensity lamp. Later trials were observed in petri dishes. Trials were conducted by introducing an individual at the opposite side of the arena from the individual already occupying the arena. The first specimen occupying the arena was left undisturbed for 10–20 min prior to introducing the second individual. Males were not introduced to females in nests.

OBSERVATIONS

Female—female interactions: Females noticed each other as indicated by brief tracking movements of the prosoma, but took no further action. They never approached each other or made displays at a distance.

Male—male interactions: Males actively tracked each other, and on approaching, grappled with each other, which broke off after 15–30 sec. In the four observed interactions the smaller male decamped. The second of these grappling bouts was preceded by an agonistic display; the first legs were widely spread and parallel to the widely spread legs of the other male, and the chelicerae were engaged. The males pushed each other for about two minutes. After the fourth grappling incident the smaller male avoided all contact with the larger male, even though the larger male continued to approach the smaller male upon noticing it.

Male—female interactions: Males were aggressive in tracking females and courting them. In four out of 14 interactions observed, the males jumped on top of the females with almost no courtship activity, but the females dislodged the males after a short (1–3 sec) engagement. The following are the principal components of male display in *H. captiosus*. Within five cm of the females, males approach with wide, side-to-side zig-zags 50% of the time. Within two cm males approach with the wide zig-zags 70% of the time, the front legs are elevated alternately with low amplitude waving, and the palpi are extended forward and upward, and constantly waved in unison. Within one cm the front legs from the patellae distally are snapped up vertical and parallel to each other, with the ventral surfaces facing anteriorly. The third legs are bent upwards so that the patellae are brought together above the opisthosoma and rapidly vibrated alternately, the distal portions of the third legs (from the tibia on) being braced against the femora, and the tarsal tips firmly braced against the substrate. The palpi stop waving in unison at this point, but about 50% of the time vibrate alternately in concert with the third leg patellae.

A complete display would consist of in order: Approach with zig-zags, alternate front leg elevation with low amplitude waving, palpal extension and waving, front legs snapped vertically, third leg patellae over opisthosoma and vibrated, with concurrent vibration of palpi. A complete display by a male would last 1–2 min, and was only observed three times. In all other cases one or more display elements were missing.

The only successful mating followed a short (10 sec) display involving a zig-zag approach and front leg snap up by the smaller male to the larger female. The female crouched with the body lowered to the substrate, and the legs pulled in toward the body. The male approached the female and tapped her prosoma for about one sec. The male then tilted the female's opisthosoma with his right first and second legs so that the ventral side of the female's opisthosoma faced to her left. The right male palpus was applied to the female's epigynum, and the palpal bulb contracted at irregular intervals. During these contractions the leg spines of the third legs became erect. The fourth tarsus of the male vibrated briefly at about 30 sec intervals. The female opisthosoma twitched every 1–5 sec. At times the female moved about, hopping while the male was still attached and even landing upside down on top of the attached male. Mating lasted 140 min, and the male stayed on top of the female an additional 10 min before being dislodged or decamping, it was not clear which. Only the right palpus was used for insemination. Subsequently, this

female made an egg sac with 16 viable eggs 13 days after mating, a second sac with 7 inviable eggs was made 40 days after mating, and a third sac with 5 viable eggs was made 75 days after mating.

After a similar display with the same elements, the larger male pounced on, killed, and ate the smaller female.

DISCUSSION

Richman (1982) described courtship in several species of *Habronattus* [as *Pellenes*] including 3 species of the *H. coecatus* group, *H. brunneus* (Peckham and Peckham), *H. coecatus* (Hentz) and *H. pyrrithrix* (Chamberlin) [as *P.* cf. *coecatus*].

The courtship of *H. captiosus* has elements in common with other *Habronattus*, and are particularly similar to those of the *H. coecatus* group that have been observed. These elements include the zig-zag approach to the female, the early palpal motion and front leg elevation, the raising of the third leg patellae over the opisthosoma, the upward snap of the first legs later in the display, and the later forward carriage of the palpi (Richman 1982). These similarities in display elements confirm Griswold's (1987) classification of *H. captiosus* in the *H. coecatus* group. The one unique male—female display element for *H. captiosus* is the alternate vibration of the third leg patellae; other species group members just elevate and lower the third leg segments without a vibration component.

Male agonistic display is unusual in *Habronattus*. The only reported example was found by Richman (1982) in *H. carolinensis* (Peckham and Peckham). In this species leg carriage during male—male displays are similar to leg carriage in male—female displays, except that the males pushed each other (Richman 1982). In *H. captiosus* the male—male agonistic display was completely different from any male—female element. It consisted of the males spreading their front legs and pushing each other, with cheliceral engagement as well. This type of male—male agonistic display is seen in other salticid spiders, eg. *Corythalia, Hentzia, Menemerus* (Richman 1982), and *Simaetha* (Jackson 1985).

The crouching posture of the female *H. captiosus* probably indicates receptivity to copulation, since the only successful mating followed a female's assumption of a crouch. Since males avidly pursued females without this position, and even leapt onto females that did not assume the crouch, it is unclear what the signalling value of this position is. Perhaps under natural conditions where females could actively escape from males, the crouch enables males to more easily contact a receptive female.

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