SCIENTIFIC NOTE

PRE-COPULATORY BEHAVIOR OF THE WHEEL BUG *ARILUS GALLUS* (HEMIPTERA: REDUVIIDAE)[1]

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We describe the pre-copulatory behavior of a pair of *Arilus gallus* Stål (Heteroptera: Reduviidae) observed in a tropical dry forest in Sector Santa Rosa of Area de Conservación Guanacaste, northwestern Costa Rica (10º40'N, 85º 30'W). To our knowledge this is the first description of mating behavior in the genus *Arilus* other than several notes on the time of year *A. cristatus* (Linné) mates in the USA (Barber, 1920; Moul, 1945; Hagerty and McPherson, 2000).

Species in the genus *Arilus* Hahn (subfamily Harpactorinae) are commonly known as "wheel bugs" due to their characteristic semicircular crest on the pronotum. *Arilus* species inhabit the Americas and are generalist predators of insects (Readio, 1927; Hagerty and McPherson, 2000). We concluded that the wheel bugs we observed were *A. gallus* based on the following criteria in Champion's key (1897-1901): 1) the 'wheel' crest of the pronotum was elevated, unlike *A. depressicollis* (Stål); 2) the sides of the pronotum were distinctly dilated behind the postero-lateral angles and had only short spines at the base, unlike *A. cristatus*; 3) the abdomen margins (connexivae) were not very sinuate, unlike *A. cristatus*; and 4) parts of the legs, antennae, and head were rust-colored, unlike *A. cristatus*. Pictures of the *A. gallus* holotype held at the Swedish Museum of Natural History are available online for comparison (www2.nrm.se/en/het_nrm/g/arilus_gallus.html). In Champion's species description (1897-1901) *A. gallus* pronotal crests have 9-11 tubercles, whereas the insects we observed had 8 tubercles. We are confident our identification is accurate despite the tubercle number discrepancy based on the aforementioned criteria and species range match: *Arilus gallus* inhabits the Pacific slope of southern Central America and parts of northern South America (Champion, 1897-1901; Maldonado Capriles, 1990). Although *A. gallus* specimens collected from the Pacific slope of Costa Rica are held in the Instituto Nacional de Biodiversidad of Costa Rica (accessed through GBIF Data Portal, www.gbif.net, 2009-06-08), ours appears to be the first published record of this species in Costa Rica.

We observed the pair of *A. gallus* on February 19, 2008, in the middle of the six month dry season that is characterized in this region by desiccation stress and low abundance of insect prey (Janzen, 1987). We saw the male at 11:30 h on a

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tree of 13 cm diameter at breast height, slowly approaching a tree hole 125 cm above ground. The male slowly entered the hole with his antennae extended forward (Fig. 1A). He spent two minutes in the hole before emerging riding on the dorsal surface of a female. She had been hidden in the hole facing outwards and emerged head-first, the male riding backwards with his head at her abdomen (Fig. 1B). He turned 180° atop the female within one minute of the pair emerging from the hole to face the same direction as her, and he stayed in this dorsal pre-copulatory riding position with his legs gripping the margins of her abdomen for the remainder of our observation time (approximately five hours). The male was 2.6 cm and the female 2.9 cm long. From the time the pair began to emerge from the tree hole until the male had turned around (approximately one minute), the female and perhaps also the male seemed to raise its pronotum away from its abdomen for reasons unknown. As the female was lowering her pronotum the male extended his proboscis to contact several spots on her pronotum for two minutes (Fig. 1C, D). During this time both male and female moved antennae toward each other but did not otherwise move body position. From this point onward, each individual tucked its proboscis under its body. The remainder of the behavior we observed was characterized by extended periods of stillness lasting up to an hour, punctuated by periods of slow movement by the female, straddling the tree hole, rotating her body position clockwise or counter-clockwise while the male rode almost motionless on top of her (Fig. 1E). At one point she briefly entered the tree hole, and the male had to adjust his body position slightly because of the small size of the hole (Fig. 1F). Occasionally one insect would slowly extend its antennae toward those of its mate and briefly touch antennae. At no point did we hear rostral stridulation (Manrique and Lazzari, 1994) or see head nodding characteristic of such stridulation. In contrast to pre-copulatory behavior typical of harpactorines (Ambrose, 1999), the female neither persistently raised and lowered her antennae nor did she vibrate her hind legs. After three hours of observation we left for one hour (14:35-15:45 h), and returned to find the pair in the same position as when we left. After another hour of observation in which they were completely still we left for two hours (16:45-18:35 h), and the pair was gone when we returned after sunset. Females of *A. cristatus* have been observed consuming their mates after copulation, although these observations seem to have been restricted to insects in the laboratory (Barber, 1920). Because we only observed pre-copulatory behavior we cannot comment on post-copulatory cannibalism in *A. gallus*.

Given the diversity and abundance of assassin bugs (family Reduviidae), surprisingly little is known about the diversity of their mating behavior (Ambrose, 1999). The subfamily Triatominae is the subject of some laboratory-based mating research due to the importance of its species as vectors of the flagellate *Trypanosoma cruzi* Chagas which causes Chagas Disease (Pires et al., 2004 and references therein). Despite the distant relatedness between Triatominae and Harpactorinae (Weirauch, 2008), studies of harpactorine species' mating behav-

ior (Edwards, 1966; Parker, 1969; Ambrose and Livingstone, 1984) suggest theirs is generally similar to that of triatomine species, and also similar to the behavior we observed.

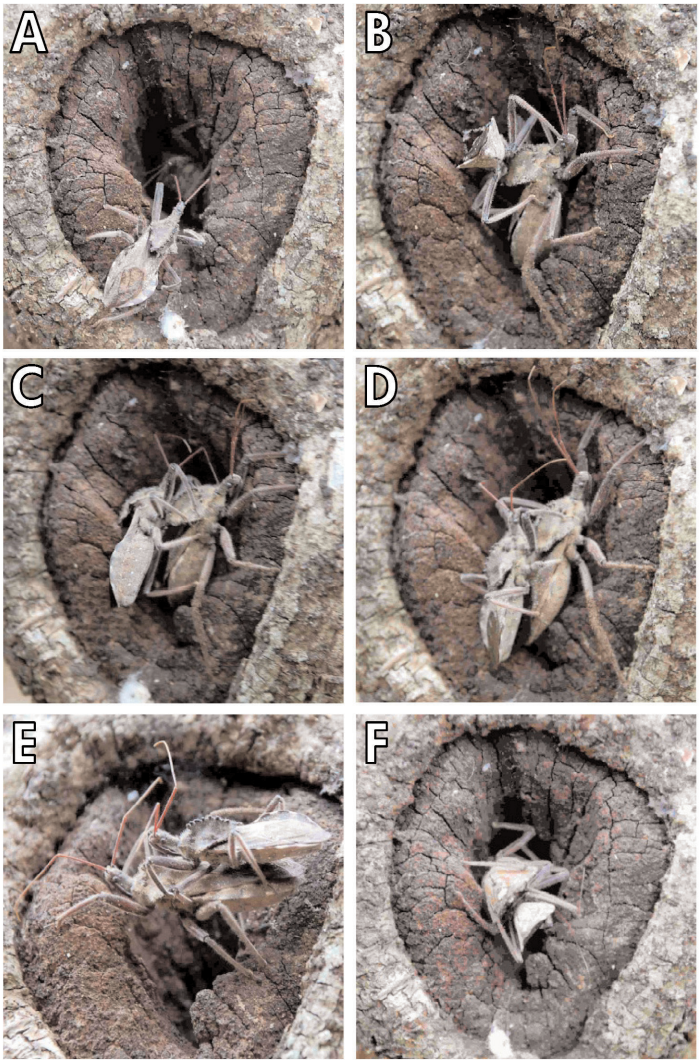

Figure 1. Pre-copulatory behavior of *A. gallus*. (A) 11:31 h male entering tree hole containing outward-facing female; (B) 11:34 h pair emerging from hole with male riding backwards on female, and female's pronotum is raised; (C) 11:35 h male has turned around atop female and his proboscis is contacting female's pronotum; (D) 11:36 h male's proboscis contacting another spot on female's pronotum, and insects' pronota are no longer raised; (E) 12:04 h typical stationary riding position for mating pair; (F) 12:12 h pair re-enters hole only to emerge again within five minutes.

Our observations are for only one pair, and further observations are required for generalizations. Given that ours is the first documentation of pre-copulatory behavior in the entire genus, we hope that our observations stimulate further investigations into this charismatic bug.

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