

Short communication

Aggregation and adult transportation in disturbed colonies of *Wasmannia auropunctata* Roger (Hymenoptera, Formicidae)

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Abstract. Disturbance of *W. auropunctata* colonies first produced, as expected, significant dispersal of workers and queens, but this was soon followed by a radiate aggregation of workers, heads to center, in groups of 5–8 individuals, all with mandibles widely open. Queens did not aggregate, but instead searched for the grouped workers, antennating the gaster of a selected individual; after this, workers began to slowly board onto the queen's body. This behavior was repeated with other groups, until the queen could not bear any more workers. This behavior is registered for the first time for adult ants, and is interpreted as a unique strategy to reorganize the nest or to establish a new colony. The open mandibles may indicate the release of alkylpyrazine, a known aggregation pheromone.

Keywords: Ants, *Wasmannia auropunctata*, colony disturbance, reorganization, alkylpyrazine.

The little fire ant, *Wasmannia auropunctata* (Roger) is an important invasive species known for its negative ecological impact on native arthropod species (Passera, 1994; Williams, 1994; Brandão and Silva, 2006). This species is native in the Neotropics, but has been introduced by human activity in other tropical and subtropical regions of the world (Wetterer and Porter, 2003).

In spite of the ample literature related to this species, some aspects of its behavioural biology remain virtually unknown. In this work I describe some patterns of aggregation and adult transportation possibly mediated by chemical substances in *W. auropunctata* disturbed colonies from the leaf litter.

The observations were made during collecting trips into forest fragments in Central Brazil (Tocantins and Goiás states) in 2005 (late June/early July). Leaf litter

samples of approximately 1 m² were submitted to Winkler extractors (Fisher, 1999) for 24 hours. About 10 fragments of *W. auropunctata* colonies were collected and separately observed in white trays for 20 minutes.

Once laid on the tray, the individuals were motionless, but after a few seconds workers started to organize themselves, through extremely slow movements, in groups of 5 to 6 individuals, assuming a radiate position, with heads toward the center of the formation (Fig. 1A). After about 5 minutes from the beginning of the observations, most workers had already adopted the radiate formation, except for some of them (approximately 10%) which remained motionless, or moved erratically. After some time, the queens which until then also remained motionless, started moving slowly toward the groups of workers. Also slowly, the queen antennated the gaster of one worker (Fig. 1B), which responded immediately by leaving the formation and slowly boarding onto the queen's back (Fig. 1C). The first worker was then followed by the others from the same formation, until all of them moved to the queen's back (Fig. 1D). After a few minutes, the queens continued to move toward the groups of workers recruiting and placing more individuals on their back. When meeting workers which were not in a radiate formation, queens simply ignored them. When the queens reached a limit of workers transported on their back (about 6 individuals), they moved to the extremities of the tray, ignoring other groups of workers, which remained in the formation for several minutes. During the entire observation period, workers remained with the mandibles open until boarding a queen's back. Eggs or immature individuals were not found in the colony fragments collected. About 10 minutes after the queens dispersal, transporting workers, no more trials of aggregation and transport behavior were observed, and the observation was terminated.

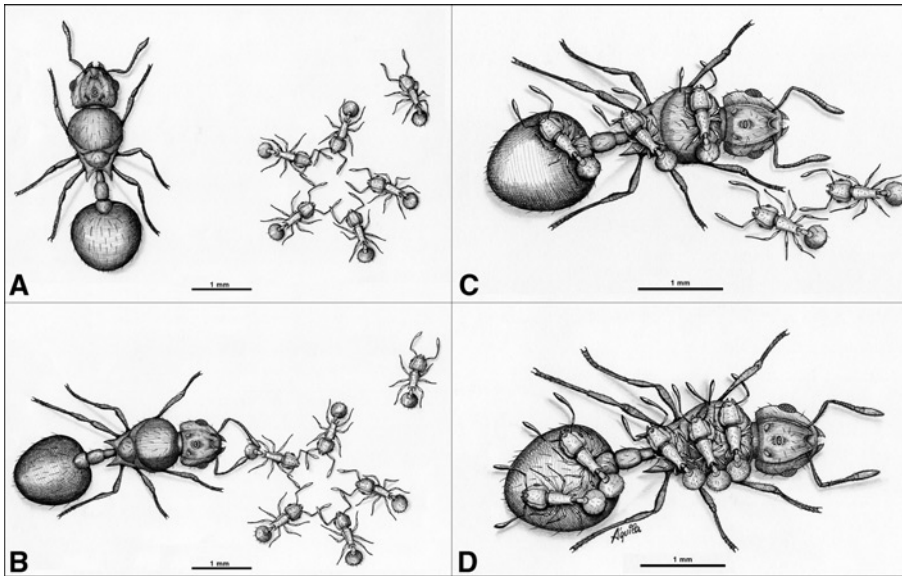


Figure 1. Aggregation and adult transportation in *Wasmannia auropunctata*. (A) Workers assume a radiate position while the queen remains motionless; (B) The queen moves slowly toward the groups of workers and start to antennate the gaster of one individual; (C-D) The selected worker responds immediately by leaving the formation and slowly boarding onto the queen's back followed by the individuals of the same group.

The observed behavior is apparently unique among ant species. It might represent an organization strategy to minimize loss of individuals to predation or disorientation. The study of Howard et al. (1982) detected the presence of alkylpyrazine (2,5-dimethyl-3-isopentylpyrazyna) from the mandibular glands of *W. auropunctata*, a compound which attracts nestmates to distressed workers. It seems reasonable to assume that the groups of workers have the function of attracting dispersed members while increasing the alkylpyrazine attractive power. This is further corroborated by the observation that workers kept their mandibles open during the entire aggregation process.

The above described aggregative and social transport behavior of *W. auropunctata* can play an important role in its ecological success. While the workers of most ant species can carry only one nestmate at a time (Möglich and Hölldobler, 1974), queens of *W. auropunctata* can transport up to 6 individuals. This behavior also allows the dispersed queens to return to the nest bringing a great number of workers or, in the case of more intense disturbances, allowing the individuals placed in colony fragments carried to long distances, to reorganize and find favourable sites for the establishment of new nests, with a significant number of workers to lead the initial tasks of the colony foundation.

The sampling method employed in this study (Winkler extractor) can be considered one of the stronger disturbances for which a leaf litter ant colony could be submitted, because of its mechanical intensity and long period of individual isolation. In this way, it remains to be demonstrated how the workers and queens react immediately following nest disturbance and what kind of behavior could be expected in the presence of eggs and brood.

This study was conducted in forests of Central Brazil, where *W. auropunctata* is believed to be native. There-

fore, it is likely that the observed behaviors are entirely natural and represent the normal pattern for this species. Further studies would be useful to investigate the occurrence of this behavior in exotic populations of *W. auropunctata*.

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References

- Brandão C.R.F. and Silva R.R. 2006. Synecology of *Wasmannia auropunctata*, an invasive ant species (Hymenoptera: Formicidae), in continuous and fragmented areas in the Brazilian Atlantic Forest. In: *Invasive Forest Insects, Introduced Forest Trees, and Altered Ecosystems: Ecological Pest Management in Global Forest of a Changing World* (Payne T., Ed), Springer, Dordrecht, Netherlands. pp 141 – 151
- Fisher B.L. 1999. Improving inventory efficiency: a case study of leaf-litter ant diversity in Madagascar. *Ecol. Appl.* **9**: 714 – 731
- Howard D.F., Blum M.S., Jones T.H. and Tomalski M.D. 1982. Behavioral responses to an alkylpyrazine from the mandibular gland of the ant *Wasmannia auropunctata*. *Insect. Soc.* **29**: 369 – 374
- Möglich M. and Hölldobler B. 1974. Social carrying behavior and division of labor during nest moving ants. *Psyche* **81**: 219 – 236
- Passera L. 1994. Characteristics of tramp species. In: *Exotic Ants: Biology, Impact, and Control of Introduced Species* (Williams D.F., Ed), Westview Press, Boulder, Colorado. pp 23 – 43
- Wetterer J.K. and Porter S.D. 2003. The little fire ant, *Wasmannia auropunctata*: distribution, impact, and control. *Sociobiology* **42**: 1 – 41
- Williams D.F. 1994. *Exotic Ants: Biology, Impact, and Control of Introduced Species*. Westview Press, Boulder, Colorado. 332 pp