Sociobiology 63(1): 724-727 (March, 2016) DOI: 10.13102/sociobiology.v63i1.904

Sociobiology
An international journal on social insects

SHORT NOTE

# Opportunistic predation of a colony of *Polybia platycephala* (Richards) (Hymenoptera: Vespidae) by *Labidus praedator* (Smith) (Hymenoptera: Formicidae)

TT Maciel, BC Barbosa, F Prezoto

Universidade Federal de Juiz de Fora, Minas Gerais, Brazil

**Article History**

**Edited by**
Gilberto M. M. Santos, UEFS, Brazil
Received 28 August 2015
Initial acceptance 01 March 2016
Final acceptance 08 March 2016
Publication date 29 April 2016

**Keywords**
Army ants, Ecitoninae, foraging, social wasp.

**Corresponding author**
Tatiane Tagliatti Maciel
Universidade Federal de Juiz de Fora
Laboratório de Ecologia Comportamental e Bioacústica - LABEC, Campus Universitário
Bairro Martelos, CEP: 36036-900
Juiz de Fora, Minas Gerais, Brazil
E-Mail: tatitagliatti@hotmail.com

**Abstract**
Social wasps have developed several defense mechanisms, especially against ants. Predator attacks are the main threat to their nests. The strategy adopted by the wasps, when attacked by ants, is to abandon the nest, thus preserving the adult population for future nesting. The present study reports in detail the predation of a colony of *Polybia platycephala* by *Labidus praedator*.

The main function of social wasp nests is to provide a microenvironment conducive to the development of offspring (Starr, 1991), providing protection from vertebrate and invertebrate predators (O'Donnell & Jeanne, 2002). Swarming wasps have the habit of building an envelope to cover the combs, thus limit the entrance to the nest to one or a few holes. Exceptions are the genera *Apoica* (Lepeletier, 1836) and *Agelaia* (Lepeletier, 1836) that do not present this habit (Wenzel & Carpenter, 1994). Nests of *Polybia platycephala* (Richards, 1978) are fixed directly to the substrate without the presence of apetiole and are made up of several overlapping combs covered by an envelope over the single access hole into the colony (Richards, 1978; Rocha, 2011). *P. platycephala* is a social wasp that begins its nests by swarming. It is distributed in Suriname, Peru, south and north of Brazil, with endemism in the southeast of the latter country (Hermes & Kohler, 2006; Richards, 1978).

Army ants are one of the main insect predators (Monteiro et al., 2008; Powell & Baker, 2008). The species *Labidus praedator* (Smith, 1858), popularly known as the army ant, is a generalist predator, that lives in colonies consisting of millions of individuals and plays an import ant role instructuring invertebrate communities, covering large areas due to its nomadic habit. Although Rettenmeyer (1963) states that *L. praedator* shows strong preference for plant matter, these ants are usually observed carrying a mixture of ants and other arthropods, including spiders, scorpions, cockroaches and isopods, demonstrating diet plasticity (Monteiro et al., 2008; Powell & Baker, 2008).

Although basic aspects of nomadic behavior and group predation of army ants are well known, few studies have been carried out about their specific foraging behavior and the impact of their attacks. The objective of this study was to report in detail the predation of *L. praedator* on a colony of *P. Platycephala* and to describe the behaviors presented by both species.

The observations were made in December 2012, the rainy season being a favorable period for the occurrence of a large number ofspecies of insects, especially termite swarms, in the Botanical Gardens of the Federal University of Juiz


ISSN: 0361-6525

de Fora (21°43'28"S - 43°16'47"W - 800m asl). The site is located in a fragment of seasonal semideciduous montane forest (IBGE,2012), located in the urban area of Juiz de Fora, which features warm subtropical climate with a dry winter and rainy summer (Cwa), according to the classification of Köppen (Sá-Júnior et al., 2012). The area, which covers 84 acres in length was classified by Santiago et al. (2014) as a complex of expressive richness, diversity and floristic heterogeneity of woody vegetation with endangered species and a predominance of pioneer plants, in addition to the considerable presence of exotic species, Maciel & Barbosa (2015) suggest this area as novel ecosystem.

The post-emergent colony (Jeanne, 1972) of *P. platycephala* was conical in shape, with approximate dimensions of 15cm x 9cm, and was located on the a baxial part of a leaf of *Monstera deliciosa* Liebm. (Araceae) at about 130cm above the ground (Fig 1A). When they detected the presence of the ants, adult wasps that were inside the nest assumed a defensive posture characterized by semi-open wing sand contraction of the abdomen. As the number of ants increased, wasps left the nest and remained flying nearby, unable to defend themselves. It was observed that adult wasps were only attacked when returning from foraging and, as a typical behavior of foragers, entered the colony directly without displaying any defensive behavior, being immediately attacked by the ants present in the nest.

Ants exhibit two behaviors: (I) defensive posture of the soldiers, which remained standing with their jaws open and pointing upwards and (II) foraging and transport by workers of eggs, larvae, pupae and stored resources, such as termite wings, described by Prezoto et al. (2005) as a food source, regularly stored in *P. platycephala* colonies. There was no division of foraging items and these were transported whole (Figs 1B and C). The action of the ants lasted about17min and during the attack, wasps gathered on other leaves (Fig 1D), with no re-occupation of the nest. The wasps then aggregated to form a new colony.

The foraging time shown by the ants corroborates the results of Rettenmeyer (1963), which affirm that *L. praedator* attacks usually last between a few minutes to about an hour, before the ants gather underground, sometimes re-emerging from the soil shortly after, in a nearby area.

It is important to note that prey of *Labidus* are mostly species that occur in the soil, with some individuals being able to forage at a height ofup to 130cm (Monteiro et al., 2008). For this reason, the reports about army ant attacks on social wasps are opportunistic and occasional, as in the work of Monteiro et al. (2008) who, in addition to foraging time, also recorded a social wasp trying to seize a caterpillar that was being transported by ants and ended up being preyed upon by them. O'Donnell and Jeanne (1990), in Costa Rica, reported an attack on a colony of *Agelaia yepocapa* (Richards, 1978) located in the hollow of a tree trunk, facilitating the chance meeting by the ants. In this study, the *P. platycephala* nest was in a slope and the ants came from a higher level, thus facilitating the nest meeting and the opportunistic attack (Fig 1 A).

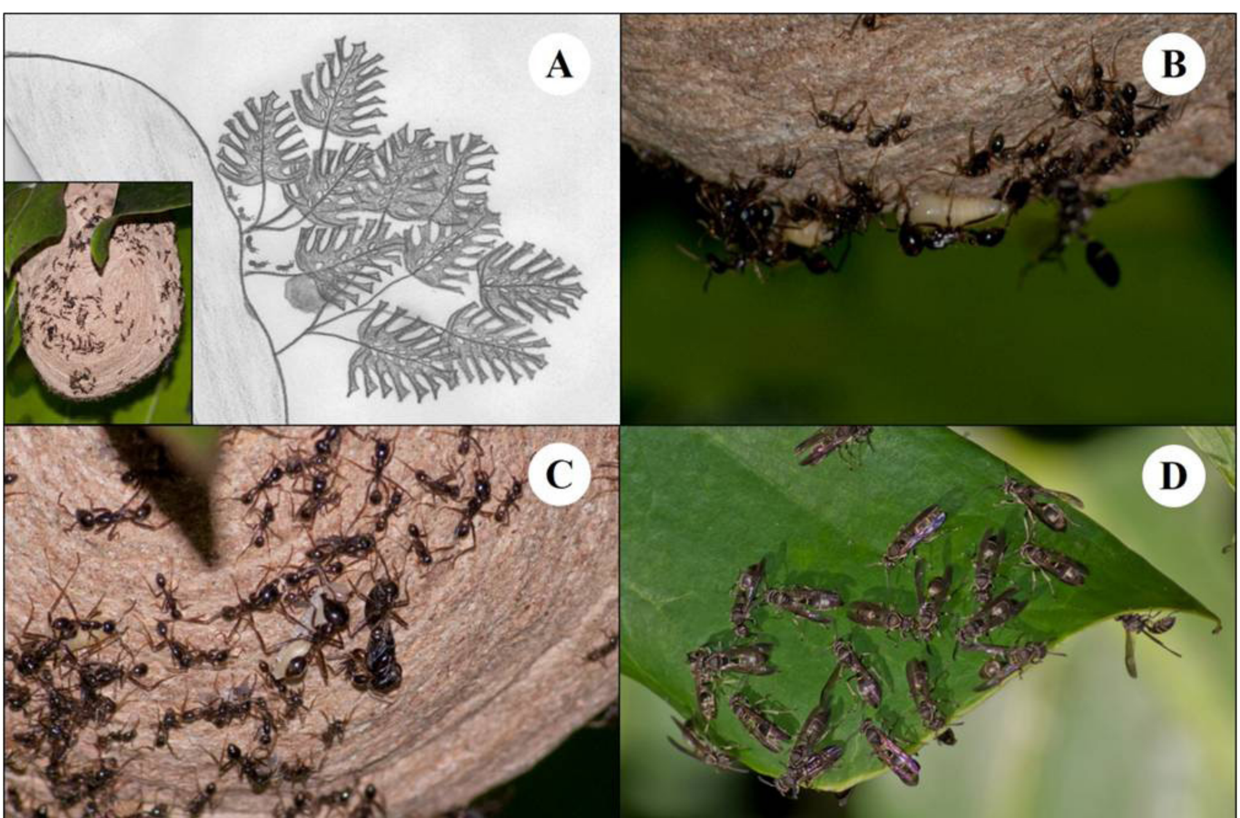


**Fig 1.** A - Nesting place of *Polybia platycephala* in the abaxial part of a *Monstera deliciosa* leaf in a gully. B and C - *Labidus praedator* transporting eggs, larvae and pupae. D - Aggregation of wasps during the attack of the colony by the ants.

Attacks by predators are a major threat to the integrity of social wasp nests (Jeanne,1975; Judd, 1998). Those wasps have developed various defense mechanisms, especially against ants, such as the construction of a protective envelope that surrounds the entire surface of the nest, reducing access to the interior to a single hole, as in the case of *P. platycephala* (Jeanne, 1975; Wenzel& Carpenter, 1994). Other adaptations include the fixing of the substrate to the nest by a single petiole, hindering the entry of non-flying insects; secretion of an ant repellent by the gland in the fifth gastral sternite by species of independent foundation; vibrating wings, pumping abdomen, opening and closing of the jaw, and stinging (Jeanne, 1995; Togni,2008).

The capability of wasps to detect army ants by sight and smell, as suggested by Chadab (1979) as a result of co-evolution, is quite advantageous because, when the ants find a colony of wasps, they are unable to defend the attack, besides which, the speed of escape is crucial since the ants attack suddenly and in large numbers (Chadab & Rettenmeyer, 1975).

Thus, a strategy adopted by wasps of the tribe Epiponini, when attacked by army ants, is the immediate abandonment of the nest by the adult population (Naumann, 1975; Jeanne, 1979), confirmed by observations in this study. The success of this strategy is due to the fact that the queens of Epiponini are quite numerous and poorly differentiated, allowing them to easily fly away and thus making possible the re-establishment of the colony in a new location (Mateus, 2005). However, experiments conducted by Mateus (2005) showed that there is a high energy expenditure during an abandonment which involves the search for a new nest site and chemical marking of the route. Yet it should be noted that due to difference in size and slender body shape, the wasps are unable to sting ants, especially smaller ones like *L. praedator*. Thus, the present report contributes to the understanding of the defense strategies presented by social wasps against ants, as well as opportunistic predatory behavior of the army ant.

**Acknowledgements**

The authors thank Michelle Tagliatti Maciel the contribution made by the making of the illustration of the location of *Polybia platycephala* colony.

**References**

Chadab, R. (1979). Early warning cues for social wasps attacked by army ants. Psyche: A Journal of Entomology, 86(2-3): 115-123. doi: 10.1155/1979/38164

Chadab, R & Rettenmeyer, C.W. (1975). Mass recruitment by army ants. Science, 155: 1124-1125

IBGE - Instituto Brasileiro de Geografia e Estatística. (2012). Manual técnico da vegetação brasileira. IBGE, Rio de Janeiro

Jeanne, R.L. (1975). The adaptiveness of social wasp nest architecture. The Quarterly Review of Biology, 50: 67-287

Jeanne, R.L.& Keeping, M.G. (1995). Venom Spraying in *Parachartergus colobopterus* – a Novel Defensive Behavior in a Social Wasp (Hymenoptera, Vespidae). Journal of Insect Behavior, 8: 433-42. doi: 10.1007/BF01995317

Jeanne, R.L. (1979). A latitudinal gradient in rates of ant predation. Ecology, 60: 1211-1224. doi: 10.2307/1936968

Judd, T.M. (1998). Defensive Behavior of Colonies of the Paper Wasp, *Polistesfuscatus*, against Vertebrate Predators over the Colony Cycle. Insectes Sociaux, 45: 197-208. doi: 10.1007/s000400050080

Maciel, T.T. & Barbosa, B.C. (2015). Áreas Verdes Urbanas: História, Conceitos e Importância Ecológica. CES Revista, 29: 30-42.

Martin, S.J. (1992). Colony Defense against Ants in Vespa. Insectes Sociaux, 39: 99-112. doi: 10.1007/BF01240534

Mateus, S. (2005). Análise dos comportamentos envolvidos na organização social e no processo de enxameio de *Parachartergus fraternus* (Hymenoptera, Polistinae, Epiponini). Thesis, Universidade de São Paulo.

Monteiro, A.F.; Sujii, E.R. & Morais, H.C. (2008). Chemically based interactions and nutritional ecology of *Labidus praedator* (Formicidae: Ecitoninae) in an agroecosystem adjacent to a gallery forest. Revista Brasileira de Zoologia, 25: 674-681. doi: 10.1590/S0101-81752008000400012

Naumann, M. (1975). Swarming behavior: Evidence for communication in social wasps. Science, 189: 642-644

O'Donnell, S. & Jeanne, R.L. (1990). Notes on an army ant (*Eciton burchelli*) raid on a social wasp colony (*Agelaia yepocapa*) in Costa Rica. Journal of Tropical Ecology, 6: 507-509. doi: 10.1017/S0266467400004958

O'Donnell, S. & Jeanne, R.L. (2002). The nest of fortress: defensive behavior of *Polybia emaciata*, a mud-nesting eusocial wasp. Journal of Insect Science, 2(3):1-5. doi: 10.1673/031.002.0301

Powell, S. & Baker, B. (2008). Os grandes predadores dos neotrópicos: Comportamento, dieta e impacto das formigas de correição (ecitoninae). In: E.Ferreira Vilela; IASantos;JE Serrão; JH Schoereder; J Lino-Neto & LAO Campos (eds). Insetos sociais da biologia à aplicação, Universidade Federal de Viçosa, Viçosa, Minas Gerais, pp 18-37

Prezoto, F., Lima, M.A. & Machado, V.L. (2005) Survey of preys captured and used by *Polybia platycephala* (Richards) (Hymenoptera: Vespidae, Epiponini). Neotropical Entomology, 34: 849-851. doi: 10.1590/S1519-566X2005000500019

Rettenmeyer, C.W. (1963). Behavioral studies of army ants. The University of Kansas Science Bulletin, 44: 281-465.

Richards, O.W. (1978).The social wasps of the Americas excluding the Vespinae. London, British Museum (Natural History)

Sá Júnior, A.; Carvalho, L.G.; Silva, F. F. & Carvalho Alves, M. (2012). Application of the Köppen classification for climatic zoning in the state of Minas Gerais, Brazil. Theoretical and Applied Climatology, 108: 1-7. doi: 10.1007/s00704-011-0507-8

Santiago, D.S.; Fonseca, C.R. & Carvalho, F.A. (2014). Fitossociologia da regeneração natural de um fragmento urbano de Floresta Estacional Semidecidual (Juiz de Fora, MG). Revista Brasileira de Ciências Agrárias, 9: 117-123. doi: 10.5039/agraria.v9i1a3538

Starr, C.K. (1991). The nest as the locus of social life In: Ross, K.G. & Matthews, R.C. (eds) The Social Biology of Wasps, Cornell University Press, pp 520-539

Togni, O.C. & Giannotti, E. (2008). Nest Defense Behavior against Ant Attacks in Post Emergent Colonies of Wasp *Mischocyttarus cerberus* (Hymenoptera, Vespidae). Acta Ethologica, 11(2):43-54. doi: 10.1007/s10211-008-0040-7

Wenzel, J.W. & Carpenter, J.M. (1994). Comparing methods: Adaptive traits and tests of adaptation In: P. Eggleton & R.I. Vane-Wright (eds). Phylogenetics and ecology, London: Academic Press, pp 79- 101