Sociobiology
An international journal on social insects

SHORT NOTE

Natural Parasitism in *Acromyrmex landolti* Forel (Hymenoptera: Formicidae) in Pastures of Bahia, Brazil

MS Rodrigues[1], MA Castellani[1], AA Moreira[1], MS D'Esquivel[2], EB Ribeiro[1], LC Forti[3], S Lacau[2]

1 - Universidade Estadual do Sudoeste da Bahia, Vitória da Conquista-BA, Brazil
2 - Universidade Estadual do Sudoeste da Bahia, Itapetinga-BA, Brazil
3 - Universidade Estadual Paulista, Botucatu-SP, Brazil

Article History

Edited by
Evandro Nascimento Silva, UEFS, Brazil
Received 24 march 2015
Initial acceptance 04 June 2015
Final acceptance 07 August 2015

Keywords
Attini, Biological Control, Diapriidae, *Mimopria*.

Corresponding author
Maria Aparecida Castellani
Department of Plant and Animal Science
State University of Southwest Bahia
C.P. 95, CEP: 45.083-900
Vitória da Conquista, Bahia, Brazil
E-Mail: castellani@uesb.edu.br

Abstract

This study aimed to evaluate the occurrence of natural parasitism in *Acromyrmex landolti* Forel, to identify parasitoids associated to the species and to estimate parasitism rates. The experiment was conducted from January to May 2012 in Itapetinga, BA. A sample comprised of 20 nests was studied. Nests were excavated, eggs, larvae, pupae and adults were removed for counting and parasitism evaluation, isolating adult parasitoids and parasitized ant larvae. Parasitism by *Mimopria* sp. (Hymenoptera: Diapriidae: Diapriini) occurred in nine nests, with an average rate of 12% of parasitized larvae. It is the first record of parasitism of *Mimopria* Holmgren in an Attini species.

Leaf-cutting ants from the *Atta* and *Acromyrmex* genera (Myrmicinae: Attini) are general pests in agricultural crops, forestry and pastures. The *Acromyrmex* genus is endemic in the Americas and its distribution occurs from California (USA) to Patagonia (Argentina), being present in Mexico, Central America, as well as Cuba and the Lesser Antilles (Trinidad, Tobago, Corriacou, Curaçao and Guadeloupe) and in all countries of South America, except Chile (Gonçalves, 1961; Weber, 1972; Delabie et al., 2011). Some *Acromyrmex* species, like *A. balzani* (E.) and *A. landolti* (F.), have specialized in cutting monocots, occurring in high densities of nests and causing severe damage to pastures due to the fact that they cut the grass very close to the ground (Mariconi et al., 1963; Amante, 1967a, b). In pastures in the municipality of Itapetinga, State of Bahia, in Brazil, the occurrence of *A. landolti* is common, reaching average density of 260 nests ha^{-1} (Silva Júnior et al., 2013).

The control of leaf-cutting ants can be accomplished by mechanical, cultural, biological and chemical methods, and chemical control is the only one used on a large scale. The natural biological control by predators, parasitoids and pathogens is an important factor in regulating the populations of these insects. However, there are knowledge gaps for the species of leaf-cutting ants specialized in cutting grasses. Among the parasitoids of leaf-cutting ants, a small group of Hymenoptera species is known, especially from the Diapriidae family. This family has 121 species in 34 genera, which were collected in association with ants, and 26 species in seven genera were recorded with parasitoid behavior (Lachaud & Pérez-Lachaud, 2012). The species *Doliopria myrmecobia* (K.), *Szelenyiopria pampeana* (L.) and *Trichopria formicans* (L.), belonging to Diapriini tribe, were recorded in Argentina in association with *Acromyrmex lundii* (G.M.) and *A. lobicornis* (E.) (Loiácono et al., 2013).

The present study was conducted to evaluate the occurrence of parasitism in colonies of *A. landolti*, identify the species of parasitoids associated and estimate parasitism rates. The experiment was conducted between January and May 2012, in the Lagoa Alagoinhas Farm (15°21'S/40°17'W), Municipality of Itapetinga, Southwest Region of the State of

Bahia, Brazil. The property comprises the countryside dominated by extensive cattle raising, within an area of pasture (*Brachiaria* sp., Poaceae) with 2.7 ha and sub-humid to dry climate, with average annual rainfall and temperature of 800 mm and 25.4°C. *A. landolti* nests were located, marked with stakes and georeferenced with a GPS (Global Position System), four groups consisting of five nests each were established, named as nuclei, totaling twenty plots, selected at random. Nests were excavated by following the procedures described by Moreira et al. (2003, 2004a, b), with adaptations. As the nest was dug, the eggs, larvae, pupae, workers and queen were collected with the aid of suction devices (oral suction device) and spoons. The material collected was immersed in ethanol hydrated to 70% in properly identified plastic containers, sent to the Laboratory of Animal Biosystematics - LBSA/UESB, for screening and identifying of parasitoids as to their genus according to Naumann (1982). After identification, individuals were counted and isolated, considering the nest of origin for subsequent calculation of mean and standard deviation and estimate of parasitism rates.

All specimen of wasps found in association with the leaf-cutting ants *A. landolti* belong to the *Mimopria* genus (Hymenoptera: Diapriidae). In the excavated nests, adults of the *Mirmopria* sp. were found and parasitized larvae of *A. landolti*. *Mimopria* (H.), according to Masner and Garcia (2002), has its distribution in several countries in South America, in tropical lowland areas, from Argentina to southern Venezuela. In the few studies of parasitism in leaf-cutting ants, no references were found to describe the action of parasitoid species of the *Mimopria* genus. Lachaud and Pérez-Lachaud (2012), reviewing the diversity of species and behavior of parasitoids (Hymenoptera) of ants, do not include in their records the existence of parasitism by *Mimopria*.

Nine in 20 nests excavated in this work (45 %) presented *A. landolti* larvae parasitized by *Mimopria* sp. (Table 1). Considering the total population of larvae of the 20 nests in relation to the total parasitized larvae of *A. landolti* collected, a parasitism rate of 12% was obtained, with a mean of 16.1 ± 26.9 parasitized larvae per nest (Table 1). However, evaluating only the nine parasitized nests, there was a 20.1% rate of parasitism, averaging 35.7 ± 30.4 parasitized larvae per nest (Table 1). Seven winged adult parasitoids were found and a total of 321 parasitized larvae, the rate of parasitism per nest ranging from zero to 51.6 % (Fig 1).

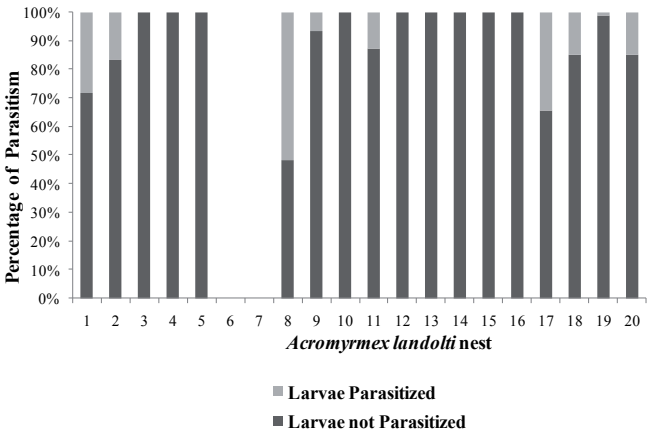

Fig 1. Parasitism rate of *Mimopria* sp. in relation to larvae per nest of *Acromyrmex landolti*. Itapetinga, BA, 2012.

The works published on the *Mimopria* genus do not present data regarding parasitism rates in relation to the ants studied. However, Fernández-Marín et al. (2006) showed parasitism rates by *Acanthopria* spp. of 16.6 ± 2.4% and 34.3 ± 3.3 % for the total number of *Cyphomyrmex minutus* (M.) and *Cyphomyrmex rimosus* (E.) larvae, respectively, when observing the infestation of four morphospecies of *Acanthopria* and one of *Mimopriella*. Comparing the data presented, it appears that, for the total number of larvae in parasitized nests, there was a higher incidence of parasitism in *C. rimosus*, than that occurred for *Mimopria* sp. in *A. landolti,* however, in *C. minutus*, smaller quantities of larvae egg-layed by *Acanthopria* sp. were found.

Thus, the discovery of the unprecedented parasitism of *Mimopria* sp. in *A. landolti* paves the way for new studies needed to understand the factors related to this association and to the development of management techniques of leaf-cutting ants, considering the possibility of being potential biological control agents of some species of the Attini Tribe.

For the first time, the occurrence of natural parasitism in larvae of *A. landolti* is recorded, with parasitoids of the *Mimopria* genus.

Table 1. Parasitism rate, average and standard deviation of *Mimopria* sp. in larvae and nests of *Acromyrmex landolti*. Itapetinga, BA, 2012.

Nests	Larvae not parasitized (Nº)	Parasitized larvae (Nº)	Total larvae (Nº)	Average parasitized larvae per nest (Nº)	Standard deviation	Parasitism nests (%)	Parasitism larvae (%)
Escavated n=20	2347	321	2668	16.1	26.9	45	12.0
Parasitized n=09	1273	321	1594	35.7	30.4	100	20.1

References

Amante, E. (1967a). Saúva tira boi da pastagem. Coopercotia, 23: 38-40.

Amante, E. (1967b). A saúva *Atta capiguara*, praga das pastagens. Instruções Práticas DPA 41, 12p.

Delabie, J.H.C., Alves, H.S.R., Reuss-Strenzel, G.M., Carmo, A.F.R. & Nascimento, I.C. (2011). Distribuição das Formigas-Cortadeiras *Acromyrmex* e *Atta* no Novo Mundo. In T.M.C. Della Lucia (ed), Formigas-Cortadeiras da Bioecologia ao Manejo (pp.80-101). Viçosa: Editora UFV.

Fernández-Marín, H., Zimmerman, J.K. & Wcislo, W.T. (2006). *Acanthopria* and *Mimopriella* parasitoid wasps. (Diapriidae) attack *Cyphomyrmex* fungus-growing ants (Formicidae, Attini). Naturwissenschaften. 93: 17-21. doi: 10.1007/s00114-005-0048-z.

Gonçalves, C.R. (1961). O gênero *Acromyrmex* no Brasil (Hymenoptera, Formicidae). Studia Entomologica. 4: 113-180.

Lachaud, J.P. & Pérez-Lachaud, G. (2012). Diversity of Species and Behavior of Hymenopteran Parasitoids of Ants: A Review. Psyche. 24p. doi: 10.1155/2012/134746.

Loiácono,M.S., Margaría, C.B.& Aquino, D.A. (2013). Diapriinae Wasps (Hymenoptera: Diaprioidea: Diapriidae) Associated with Ants (Hymenoptera: Formicidae) in Argentina. Psyche. 11p. doi: 10.1155/2013/320590.

Mariconi, F.A.M., Zamith, A.P.L., Castro, U.P. & Joly, S. (1963). Nova contribuição para o conhecimento das saúvas de Piracicaba (*Atta* spp.) (Hymenoptera: Formicidae). Revista Agrícola. 38: 86-93.

Masner, L. & García, R.J.L. (2002). The genera of Diapriinae (Hymenoptera: Diapriidae) in the New World. Bulletin of the American Museum of Natural History. 268:1-138. doi: 10.1046/j.1439-0418.2003.00719.x.

Moreira, A.A., Forti, L.C., Boaretto, M.A.C., Andrade, A.P.P. & Rossi, M.N. (2003). Substrate distribution in fungus chambers in nests of *Atta bisphaerica* Forel, 1908 (Hymenoptera: Formicidae). Journal of Applied Entomology. 127: 96-98. doi: 10.1046/j.1439-0418.2003.00719.x.

Moreira, A.A., Forti, L.C., Andrade, A.P.P., Boaretto, M.A.C. & Lopes, J.F.S. (2004a). Nest Architecture of *Atta laevigata* (F. Smith, 1858) (Hymenoptera: Formicidae). Studies on Neotropical Fauna and Environment. 39: 109-116. doi: 10.1080/01650520412331333756.

Moreira, A.A., Forti, L.C., Boaretto, M.A.C., Andrade, A.P.P., Lopes, J.F.S. & Ramos, V.M. (2004b). External and internal structure of *Atta bisphaerica* Forel (Hymenoptera: Formicidae) nests. Journal of Applied Entomology. 128: 204-211. doi: 10.1111/j.1439-0418.2004.00839.x.

Naumann, I.D. (1982). Systematics of the Australian Ambositrinae (Hymenoptera: Diapriidae), with a synopsis of the non-Australian genera of the subfamily. Australian Journal of Zoology. 85: 1-239. doi: 10.1071/AJZS085.

Silva Júnior, M.R., Castellani, M.A., Moreira, A.A., D'esquivel, M., Forti, L.C. & Lacau, S. (2013). Spatial Distribution and Architecture of *Acromyrmex landolti* Forel (Hymenoptera: Formicidae) Nests in Pastures of Southwestern Bahia, Brazil. Sociobiology. 60: 20-29. doi: 10.13102/sociobiology.v60i2.162-168.

Weber, N.A. (1972). Gardening ants: The Attines. Philadelphia: American Philosophical Society. xvii+146pp.