

Hormigas como plagas potenciales en tres criaderos de mariposas del sur occidente de Colombia

Ants as potential pests in three butterfly farms in the south west of Colombia

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RESUMEN

La fauna de hormigas asociada con la zoocría de mariposas en los departamentos de Valle del Cauca y Quindío (Colombia), se colectó por captura manual en tres ambientes (mariposario, vivero y laboratorio). De 125 muestras se extrajeron 779 hormigas, pertenecientes a cinco subfamilias, 18 géneros y 24 especies. El mayor número de especies se registró en el área de laboratorio (17), seguido por vivero (16) y mariposario (13). No se encontraron diferencias significativas ($\text{Chi}^2 = 6.019$, g.l.= 10, $P > 0.75$), al evaluar la preferencia de las hormigas por un ambiente, sin embargo se observaron tendencias de esta manera: *Wasmannia auropunctata* (50%), *Linepithema* sp. (47%), *Monomorium floricola* (40%) fueron las más importantes en el laboratorio, mientras que en el mariposario fueron *Linepithema humile* (42%), *Camponotus novogranadensis* (39%) y *Paratrechina longicornis* (37.5%) y en el vivero *W. auropunctata* (37.5%) y *P. longicornis* (37.5%). Algunas de estas hormigas son reconocidas como vagabundas y plagas urbanas, lo que podría considerarse como un riesgo potencial para las actividades de zoocría de mariposas. En el presente estudio se propuso conocer las especies de hormigas que se asocian con tres criaderos de mariposas localizados en el sur occidente colombiano.

Palabras claves: Hormigas vagabundas; *Camponotus novogranadensis*; *Linepithema* spp; *Monomorium floricola*; *Paratrechina longicornis*; *Wasmannia auropunctata*.

ABSTRACT

We studied the ant fauna associated with butterfly farms in the departments of Valle del Cauca and Quindio (Colombia). The ants were collected using manual capture methods in three different environments (butterfly garden, nursery and laboratory). From 125 samples, 779 ants were extracted, which belonged to five sub-families, 18 genera and 24 species. The greatest number of species was found in the laboratory (17), followed by nursery (16) and butterfly garden (13). No significant differences were seen between the environment preferences of ants ($\text{Chi}^2 = 6.019$, d.f.= 10, $P > 0.75$). However trends were observed: the most common species: in the lab were *Wasmannia auropunctata* (50%), *Linepithema* sp. (47%), *Monomorium floricola* (40%); in the butterfly garden were *Linepithema humile* (42%), *Camponotus novogranadensis* (39%) and *Paratrechina longicornis* (37.5%); and *W. auropunctata* (37.5%) and *P. longicornis* (37.5%) in the nursery. Some of these ants have been recognized as tramp ants and urban pests, and thus could be considered as a potential risk for butterfly rearing activities. In this research, we aimed to recognize the ant species associated in three butterfly farms located in South West Colombia.

Key words: Tramp ants; *Camponotus novogranadensis*; *Linepithema* spp; *Monomorium floricola*; *Paratrechina longicornis*; *Wasmannia auropunctata*.

INTRODUCTION

Colombia has the richest butterfly fauna in the World, with 3500 species (Becerra y Ramos, 2002). Given the diverse, colorful, attractive, exotic shapes and sizes, there is a substantial international market for butterflies for exhibition in vivariums, gardens and zoos (Constantino, 2006). Another important market is for dried, preserved butterflies, as material for handicrafts and ornaments, and for museums and collections where larvae, chrysalises and adults are used (Constantino, 2006; Restrepo and Wilches, 2008). This commercial activity has been implemented through the establishment of animal breeding farms as a productive option supporting butterfly conservation (Biocaf, 2007). Over the past six years, Colombia has been promoting butterfly commerce (Biocomercio, 2003), as well as their conservation, and public education and exhibitions (Corredor and Mercuri, 2006).

In the field of butterfly breeding, it is important to ensure strict sanitary control, in order to avoid loss of biological material and agrochemical applications. Amongst the problems that affect butterfly breeding, predation by mammals, birds, spiders, wasps, and principally ants is prominent (Wildlife Management Center “Awacachi”, 2006, Gómez, 2006). Ants may act directly, feeding on the immature states, or indirectly, associating with sucking insects, or defoliating nutritional plants (Sanabria-Blandón and Chacón de Ulloa, 2008).

The present study aims to recognize the ant species associated with three butterfly farms located in south west Colombia, and to estimate the frequency of occurrence in the different stages of butterfly breeding. This information will form the basis for appropriate management of the problem.

MATERIALS AND METHODS

The study was carried out on three rearing facilities (Table 1). Butterfly breeding is carried out under controlled conditions (Claro and Perdomo, 2005) in three environments 1. Butterfly garden: An area of public exhibition formed by a screened house; the adults feed on nectarous plants, honey, pollen and fruits; copulation and oviposition occurs on host plants in individual pots (plant traps). 2. Laboratory: an area where the eggs, once collected, complete the

incubation and larval periods, and form the pupae. 3. Nursery: the area where the nutrition plants for the larvae are cultivated.

Table 1. Geographic location, environmental characteristics, and production in butterfly rearing farms in the area of study.

Characteristics of the Butterfly Farms	Alas de Colombia mariposas nativas Ltda.	Cali Zoo Foundation	Botanical Garden Quindío
Municipality/ Department	Palmira -Valle	Cali -Valle	Calarcá - Quindío
Latitude north	3°30	3°24	4°31
Longitude west	76°12	76°3	75°38
Altitude m.a.s.l.	1600	970	1490
Average Temperature	20°C	24°C	19°C
Precipitation (mm)	1600	1000	2000
Life Zone (<i>sensu</i> Holdridge)	Premontane humid forest	Tropical dry forest	Premontane super- humid forest
Start Year	2001	2003	2000
Butterfly Species	30	18 a 27	36
Production (butterflies/month)	4000	1200 - 1500	1200

Sampling was carried out during the rainy season in the two butterfly farms of the Valle del Cauca, in April and September 2007, and in the butterfly farm of Quindío in January 2008. The three aforementioned areas were inspected during daylight hours, searching for ants associated with nutritional plants, and the different developmental stages of the butterflies. Work benches, soil and walls were also examined. Ants were captured manually, and the samples preserved in 70% alcohol. Ants were identified to genus using the Key of Fernández and Palacio (2003), and 67% were identified to species with the guide of electronic keys (Longino, 2003), or after comparison to the reference collection of the Entomological Museum of the University 'del Valle', Cali.

For data analysis, collection of worker ants was considered as a sample. To calculate the capture frequency, the presence of the species in samples from each farm, and the respective environments was taken into consideration.

To test the hypothesis of preference for one of the environments in the farm, a Chi-square test was carried out using a contingency table (Zar, 1996).

RESULTS

General composition of myrmecofauna

779 ants were counted from 125 samples. 24 species were identified belonging to 18 genera from five subfamilies (Table 2). Eleven species appeared only in one or two samples, with a low capture frequency ($\leq 1.6\%$); seven species showed frequencies between 2.4 and 4.8%; and only six species showed frequencies between 6.4 and 14.4%.

The butterfly farm “Alas de Colombia” contributed 59.2% of the samples, with 15 species of ant, followed by Cali Zoo with 30.4% of the samples and 17 species, and finally, the Botanical Garden of Quindío, with 10.4% of the samples and nine species.

Table 2. Ants associated with three butterfly farms. L: Laboratory, G: Butterfly Garden, N: Nursery. Values correspond to the number of samples in which each species was observed.

Ant Species	Alas de Colombia			Cali Zoo Foundation			Botanical Garden, Quindío			Total	Capture Frequency (%)
	L	G	N	L	G	N	L	G	N		
Dolichoderinae											
<i>Linepithema</i> sp. 1	8	5	3		1					17	13.6
<i>Linepithema humile</i>	3	4	3		1	1				12	9.6
<i>Tapinoma melanocephalum</i>	3									3	2.4
Ectatomminae											
<i>Ectatomma ruidum</i>					2			1		3	2.4
Formicinae											
<i>Camponotus indianus</i>						1	1			2	1.6
<i>C. novogranadensis</i>	4	5	2	2	2	2			1	18	14.4
<i>Camponotus</i> sp. 1									1	1	0.8
<i>Camponotus</i> sp. 2		1								1	0.8
<i>Myrmelachista</i> sp 1	5									5	4.0
<i>Paratrechina longicornis</i>		2	1	2		1		1	1	8	6.4
Myrmicinae											

<i>Atta cephalotes</i>	1	4			1				6	4.8	
<i>Cephalotes</i> sp. 1				1					1	0.8	
<i>Crematogaster carinata</i>				1					1	0.8	
<i>Crematogaster nigropilosa</i>	1		1				1	1	4	3.2	
<i>Cyphomyrmex rimosus</i>	1				1				2	1.6	
<i>Monomorium floricola</i>	3			2	2	1	1	1	10	8	
<i>Mycocepurus smithi</i>	1								1	0.8	
<i>Pheidole mendicula</i>				1	1	1	1		4	3.2	
<i>Solenopsis geminata</i>				1	2	1			4	3.2	
<i>Tetramorium bicarinatum</i>						1			1	0.8	
<i>Trachymyrmex</i> sp. 1	1								1	0.8	
<i>Wasmannia auropunctata</i>	7		4	1	1	2		1	16	12.8	
Pseudomyrmecinae											
<i>Pseudomyrmex</i> sp.1				1		1			2	1.6	
<i>Pseudomyrmex</i> sp.2					1	1			2	1.6	
Total Samples	37	18	19	9	13	16	3	5	5	125	100

Ants in the three areas of the farm

The majority of the samples were obtained in the laboratory (39%), where 17 species were counted, in second place was the nursery (32% of the samples and 16 species), and in third place the garden (29% of the samples and 13 species). However, the incidence of the species depended on the locality (Figure 1). In “Alas de Colombia”, the majority of the species (80%) were found in the laboratory; while in Cali Zoo the highest frequency was found in the nursery (70.6%); In the Botanical Garden of Quindío, the garden and the nursery were areas equally rich in ants (55.5%).

Common species

Six species of ant were considered common (64.8% of the samples), being found in two or three localities and associating with all three environments (Figure 2). Although no significant differences were found on evaluating preference ($\chi^2 = 6.019$, g.l.= 10, $P > 0.75$), some tendencies to colonize one or another environment were seen. In the laboratory three species were seen, the small fire ant, *Wasmannia auropunctata* (50%), the Dolichoderinae *Linepithema* sp. (47%) and the Myrmicine *Monomorium floricola* (40%). In the butterfly garden, the three most common species were the Argentine ant *Linepithema humile* (42%), the Formicine *Camponotus novogranadensis* (39%) and the crazy ant *Paratrechina*

longicornis (37.5%). In the nursery, *P. longicornis* and *W. auropunctata* were the most frequent species, presenting the same capture percentage (37.5%).

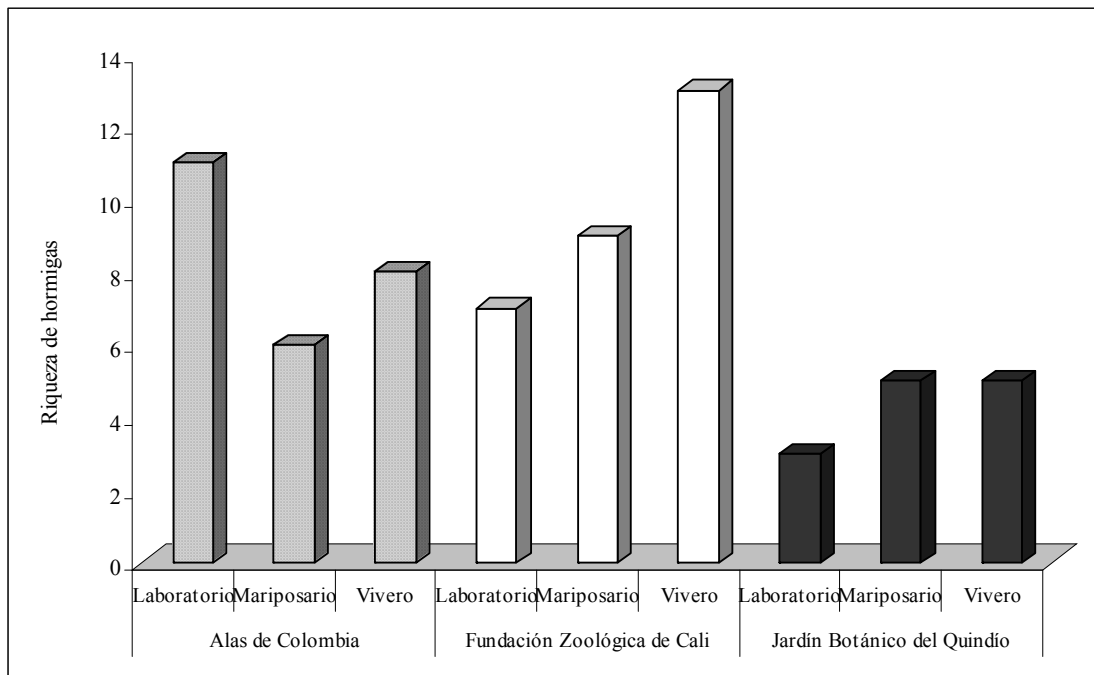


Figure 1. Ant richness associated with three sampled areas of the butterfly farms.

Secondary species

Seven ant species were observed in one or two farms, and showed frequencies no more than 4.8%. Four of these were associated primarily with one of the environments, as was the case for the leaf-cutter ant *Atta cephalotes* in the nursery; *Myrmelachista* sp. in the laboratory; the hunting ant *Ectatomma ruidum* in the garden; and the ghost ant *Tapinoma melanocephalum* in the laboratory of “Alas de Colombia”. The other three species were the Myrmicines *Crematogaster nigropilosa*, *Pheidole mendicula* and *Solenopsis geminata*, which were found in the three environments.

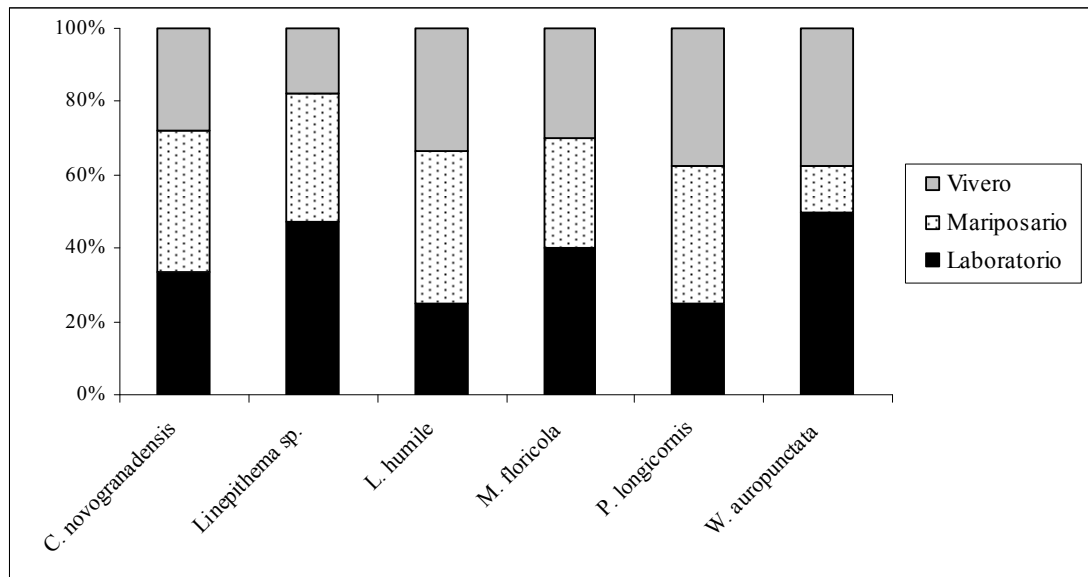


Figure 2. Most common ant species, and frequency of occurrence in the three environments of the large scale rearing of butterflies.

In the two butterfly farms of the department of the Valle del Cauca almost 50% of the ant species found were recognized as domestic species. In the city of Cali, 17 species of urban ants are known (Chacón de Ulloa *et al.*, 2006), nine (52.3%) of which were collected in the Zoo; and of the 13 species known for the municipality of Palmira (Chacón de Ulloa *et al.*, 2006), six (46%) were also found in the butterfly farm “Alas de Colombia”.

Six of the 24 species registered (50%) (*L. humile*, *M. floricola*, *P. longicornis*, *T. melanocephalum*, *T. bicarinatum* y *W. auropunctata*) are so-called “tramp ants”, for their habit of colonizing systems associated with man (Passera, 1994). For this reason, they are of great interest in the large-scale rearing of butterflies, where they can encounter a variety of food resources from sugary substances, fruits, eggs, larvae, pupae and even butterfly cadavers and other insects associated with the areas of the nursery and garden.

The high capture of ants in the region of El Arenillo, Palmira-Valle, could be due to the fact that “Alas de Colombia” has involved 12 families (Restrepo and Wilches, 2008) that produce butterflies in close proximity to their houses, increasing the probability of infestation by tramp ants. This was seen principally in the ghost ant *T. melanocephalum*, a species widely known

as a pest in kitchens, bathrooms and bedrooms (Chacón de Ulloa *et al.*, 2006), and whose presence was notable in the laboratories of “Alas de Colombia” (64 individuals in three samples). The ghost ant has caused problems in insect houses, consuming the eggs of the mosquito *Aedes aegypti* in Cuba (Pérez *et al.*, 2004), and also predating lizard eggs in Zurich Zoo (Bustos and Cherix, 1998), and cayman eggs in rearing facilities in the department of Magdalena in the Atlantic region of Colombia (De la Ossa, 2001). This is concordant with the concern that this and other ant species could be predating immature stages of the butterflies.

The species *C. novogranadensis* appeared in seven of the nine environments (absent only from the laboratory and the butterfly garden of the Botanical Garden of Quindío), and had the greatest appearance (14.4%) in samples (Figure 2). This species is very common in environments with human intervention (Encyclopedia of Life, 2008), and can be considered a generalist, exploiting sweet substances such as fruit (eg. mango, orange), and secretions of sucking insects.

The small fire ant *W. auropunctata* showed a high frequency of appearance (12.8%), and benefits from the association with the sucking hemipteran pests the plants in nurseries (Delabie and Fernández, 2003; Lach, 2003), and / or exploits the foods offered to adult butterflies. In the laboratory they can become a grave problem predating on immature stages and interfering with the rearing work, as their bite is painful (Wetterer and Potter, 2003). One solution to this problem is to examine the plants that are transported to the laboratory from the garden or the nursery.

The Dolichoderines, *Linepithema* sp. 1 and *L. humile* had a high incidence in the farm “Alas de Colombia” (Table 2). The Argentine ant is a generalist, with aggressive behavior towards other ant species (Holway, 1998) and other invertebrates (Anónimo, 2002). In the butterfly farms studied, they were observed feeding from sugary substances and fruits, and if this species is not controlled it could invade this environment.

The leaf-cutter ant found in the nursery is polyphagic and prefers young plants (Hart and Ratnieks, 2000). In this environment regenerating plants are found, the majority of which have tender leaves offering an excellent resource for this species.

The presence of the crazy ant *P. longicornis*, is notable, as it is recognized as the second most important urban species in the Cauca Valley (Chacón de Ulloa *et al.*, 2006). This species is an

opportunistic, with populous colonies, and the workers can move long distances. They feed on live insects as well as cadavers, and fruit, sweet substances etc. (Passera, 1994), and can behave like the other crazy ant (*P. fulva*) whose presence coincided with a notable reduction in lepidopteran larvae in Cundinamarca (Zenner-Polanía, 1990). In this study, the crazy ant was not collected in the laboratory of “Alas de Colombia”, where the ghost ant had a notable presence, an observation which agrees with those of Chacón de Ulloa *et al.* (2006) in the sense that these two species have a negative association, that is to say, they are exclusive.

CONCLUSIONS

The study provided a contribution to the knowledge of the ant fauna associated with three environments in the large scale rearing of butterflies, and allowed the recognition of potentially dangerous species, which due to flow between environments are moving towards forming nests and increasing populations. The laboratory was the environment with the greatest incidence of ants, and the presence of tramp ants stood out. These can cause economic losses on using the immature butterfly stages as a food source.

In order to undertake targeted control it is important to know the species that may be harmful, or may become pests in the rearing facilities.

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