

**Mating Flight Seasonality in the Genus *Labidus*
(Hymenoptera: Formicidae)
at Minas Gerais, in the Brazilian Atlantic Forest Biome, and
Labidus nero, Junior Synonym of *Labidus mars***

by

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ABSTRACT

This study examines a series of records made on mating flight activity of species of the *Labidus* genus in a forest reserve at Viçosa, Minas Gerais State, Brazil, in the dominium of the Atlantic Forest. Due to an exhaustive sampling effort over 18 years, the males of three species of *Labidus* were collected at light traps: *Labidus coecus*, *Labidus nero* and *Labidus praedator*, showing that they are the only three species of *Labidus* existent in the locality. The occurrence of the males of *L. nero*, as well as two records of *L. mars* workers were recently made in the same place, let us conclude that *Labidus nero* (Santschi 1930) is in fact a junior synonym of *Labidus mars* (Forel 1912).

INTRODUCTION

As other army ants, the species of the Ecitoninae subfamily are different from most other ant groups by having unique characteristic behaviors such as nomadism and organized mass foraging (raids) (Gotwald 1995). The Ecitoninae males are winged (to the contrary of the reproductive females, even when virgin), more or less regularly produced by the colonies during the year, and are very different morphologically from the females. Between the five genera of the subfamily, all of the New World, a couple of species of *Labidus* are among the most commonly observed in Ecitoninae, since they frequently forage in open habitat (Fowler 1979).

Due to the cryptic behavior of many species, a range of Ecitoninae have been described only from winged males, because they are easily caught with light traps when they take flight for mating (Borgmeier 1955; Watkins 1976). For this reason, almost half the known species

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of Ecitoninae have been initially described exclusively from males, which is a very uncommon situation in the Formicidae (Watkins 1976). When compared with workers, rather similar from one species to another, the males have a conspicuous gaster, mandibles and genitalia well developed and differentiated, markedly different between species, while showing few intraspecific variation, making them a very reliable material for taxonomic purposes.

Available data on the periodicity of male mating flight between the Ecitoninae are almost exclusive to the Nearctic Region (Baldrige 1972, Baldrige *et al.* 1980), the only exception for Neotropics being the paper of Kanno (1969), made from observations conducted at Barro Colorado Island, Panama. Nevertheless, due to the short period of observations, no definitive conclusion was reported on seasonality and periodicity of Ecitoninae male flights.

This study examines a series of records made on mating flight activity of species of the *Labidus* genus for the first time in South America: in a forest reserve at Viçosa, Minas Gerais State, Brazil, in the dominium of the Atlantic Forest. Coincidentally, recently available observations about the ant fauna of the same locality have been crossed with those of *Labidus*, leading us to conclude that two taxa of the genus are in fact synonyms.

MATERIALS AND METHODS

The study was carried out in the reserve Mata Corrego do Paraíso (20°45'S 45°52'W), belonging to the Federal University of Viçosa (UFV), with 194 hectares at an altitude of 650m, and is located at Viçosa, Minas Gerais State, Brazil. The predominant vegetation type is a secondary forest of the Brazilian Atlantic rain forest, sub-type Sub-Deciduous Tropical Forest (Alonso 1977). As the reserve is being naturally progressively rehabilitated, different succession stages can be observed: managed and abandoned pasture, bush land and dense secondary forest.

According to the Köppen system, the climate is rainy, subtropical and mesothermic (Cwb) and the precipitation is about 1,315 mm per year (Antunes 1979, 1986). The average temperature is between 18°C and 19°C per year (15°C - 22°C, respectively during colder and warmer months) with two well-defined seasons: a dry season from June to August, while it rains the rest of the year (Nimer 1977).

Ecitoninae male collections have been made at irregular intervals between 1981 and 1998. Light traps model "Luiz de Queiroz" (Silveira Neto & Silveira 1969), adapted according Ferreira & Martins (1982) at the height of 1.50m, were used at night, from 6:00 p.m. to 6:00 a.m.

During the 98 months of collecting, 277 samples were taken at a minimum interval of one week between successive trappings.

The specimens were kept in entomological blankets at the Regional Entomological Museum of the UFV, until their study. The identification was made at specific level, following the Borgmeier's (1955) and Watkins' (1976) keys and characters. Vouchers are deposited in UFV Regional Entomological Museum, Viçosa, Minas Gerais State, Brazil, and in the Myrmecology Laboratory collection, Cocoa Research Center, Ilheus, Bahia State, Brazil.

RESULTS AND DISCUSSION

Mating Flight Activity in *Labidus* spp.

A total of 368 males of three species of *Labidus* were collected during this study. They belong to the following species: *Labidus coecus* (Latreille 1802) [106 individuals], *Labidus nero* (Santschi 1930) [69 individuals] and *Labidus praedator* (Fr. Smith 1858) [193 individuals]. Simultaneously, males of other 12 species of Ecitoninae and belonging to the genera *Eciton*, *Neivamyrmex* and *Nomamyrmex*, have been trapped too. They will be object of a further detailed study.

L. coecus males are making their mating flights during the colder periods with low precipitation from July to September (Fig. 1). This case is unique in the whole Ecitoninae subfamily. Similar observations on the same taxon have been made in Barro Colorado Island (Kanno 1969) and Texas (Baldrige 1972; Baldrige *et al.* 1980) where *L. coecus* males were flying in the colder times ($\leq 20^{\circ}\text{C}$ in Texas) too. The production of larvae of sexuals of *L. coecus* begins before the dry period and is accomplished only during the colder months of the year (Baldrige 1972). This is exactly the opposite situation of most of other Ecitoninae species, where the higher peak of immature production occurs at the end of the dry season (Schneirla 1971). *L. praedator* males are flying for mating from October to May, with a peak during the summer. It is also the species that have the longest period of mating flight activity (Fig. 1). *L. nero* males are flying only during the spring months (Fig. 1) and co-occurs with *L. praedator* in only 1.8% (n=5) of samples. Even during the days where different species of the same genus fly for mating, there still exists the possibility that flight occurs at different times in the day. Segregation of the mating flight in short periods of time (around 12 hours) has already been reported for congeneric species of army-ants in the Dorylinae genus *Dorylus* (Haddow *et al.* 1966), and in the Ecitoninae *Neivamyrmex* and *Labidus* (Kanno 1969).

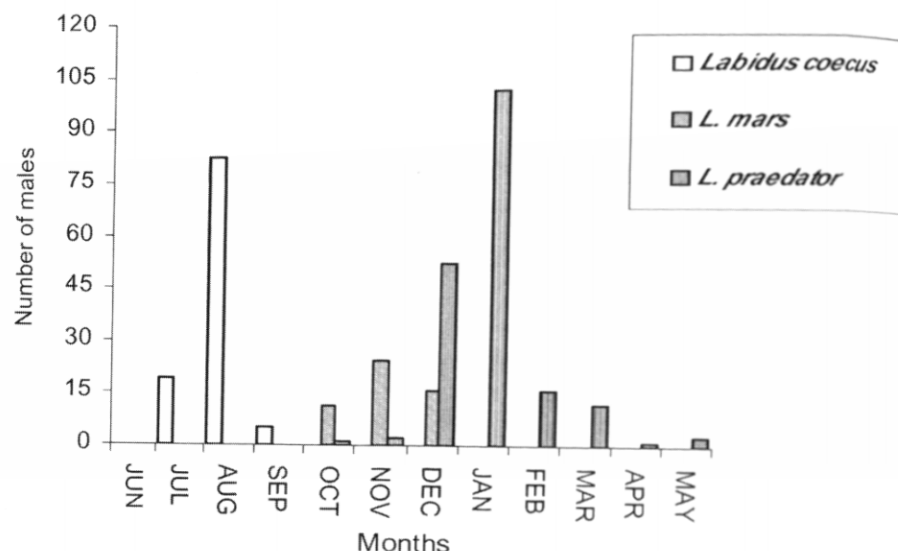


Fig. 1. Male mating flight activity of *Labidus coecus*, *L. mars* (= *L. nero*) and *L. praedator* in the Reserve Mata Corrego do Paraíso, Viçosa, Minas Gerais, Brazil, 1981-1998.

The marked seasonality presented by the three species of *Labidus* flying for mate at Viçosa and the weak overlap between the flight activity periods of the taxa suggest that this seasonality is acting as a mechanism of reproductive isolation. Similar phenomena seem to be happening with few North-American Ecitoninae (Baldrige *et al.* 1980, Hölldobler & Wilson 1990). The hybridization prevention is sometimes seen as the main reason that different species, phylogenetically close, are mating in different periods of the year (Snow 1974), although available information about reproductive phenology in ant communities in tropical habitats strongly show generic affinities (Kaspari *et al.* 2001).

***Labidus nero* (Santschi 1930), Junior Synonym of *Labidus mars* (Forel 1912).**

At the end of the flight activity period records on ant communities at different places of the same locality were intensively taken, and specimens were deposited as vouchers in the UFV Entomological Museum and Myrmecology Laboratory collections. Several species of Ecitoninae were trapped using different methods, mainly, Winkler sacks, pit-fall, and hand general collection (for a general revision of the methods and efficiency of ant collecting, see Bestelmeyer *et al.* 2000). Three species of *Labidus* were taken: *L. praedator*, *L. coecus* and *Labidus mars*.

This last species has been encountered twice at Viçosa (MG, Brazil): a) one worker, pit-fall trap, forest reserve, 28.XII.1994, S.M. Soares and C.G. Marinho col., CPDC #4952B; b) 40 workers, hand collection, UFV fields, 14.X.1999, C.S.F. Mariano col., CPDC #5268. Vouchers of this series have been further deposited in UFV Entomology Museum, AMNH, IHVL, LACM, MNHN, MZSP (acronyms following Brandão 2000). According to the collector, at around 10:00 a.m., several hundreds of workers were observed getting out of a hole in the ground near a building of the university, crossing a cemented area very quickly, before going back underground on the opposite side (C.S.F. Mariano, personal communication). As mentioned by Zara *et al.* (2003), records of *L. mars* are very unusual and this is the second raid recorded for that species, even though few detailed observations were made. No larva was observed being carried by the workers, indicating that the trail was certainly a hunting raid. The cryptic behavior of this species, marching and foraging hidden and underground, only in galleries naturally opened by a range of fossorial organisms, is common in many Ecitoninae, such as in *Neivamyrmex* spp. and also in *Labidus coecus*. Nevertheless, this last species is commonly seen in many parts of the Neotropics, certainly because its behavior is not so cryptic as *L. mars*, while this one is always reported as rare. On the other hand, *L. praedator* makes its raids almost always without remittance (Fowler 1979).

According to Borgmeier (1955), Kempf (1972), Watkins (1976) and Zara *et al.* (2003), *L. mars*, described only from workers, occurs in the Brazilian states of São Paulo, Pernambuco, Ceará and Goiás, and is present in Peru too (Watkins 1976). Here, we report a new locality for the occurrence of *L. mars* in São Paulo State: two workers, Campinas (SP, Brazil), XI.1998, A. Gasparetto col., CPDC. On the other hand, *L. nero*, described only from males, occurs in the Brazilian states of Minas Gerais, Rio de Janeiro and São Paulo (Borgmeier 1955, Kempf 1972, Watkins 1976). Interestingly, the occurrence of *L. nero* has been reported from Viçosa since 1931, according Borgmeier (1955). The subspecies *Labidus nero denticulatus* Borgmeier, 1955, is reported from the Brazilian State of Para (Borgmeier 1955, Watkins 1976).

Even not perfectly sympatric, the distributions of both *L. nero* and *L. mars* are largely overlapping. In addition to the information given by Borgmeier (1955) for Viçosa, we found many males of *L. nero* (69, in a range of independent light trap samples) and two new records of *L. mars* workers, together with many additional data on *L. coecus* and *L. praedator*, the only two other species of *Labidus* occurring in the same locality and resulting of an exhaustive sampling effort for 18 years. We have then no doubt in concluding that *L. nero* and *L. mars* belong to the

same taxon, even though no series with male and worker together have ever been found due to the ant rareness. We conclude that *Labidus nero* (Santschi 1930) is in fact a junior synonym of *Labidus mars* (Forel 1912). Our information does not yet allow us to statute on the case of *L. nero denticulatus*.

Labidus mars (Forel)

Eciton mars Forel 1912: 44. Worker, Soldier. Original Description; *Labidus mars* (Forel), Borgmeier 1953: 8, first combination in *Labidus*; *Labidus mars* (Forel), Borgmeier, 1955: 121-123, confirmed combination in *Labidus*; *Labidus mars* (Forel), Watkins 1976: 8, confirmed combination in *Labidus*; *Labidus mars* (Forel), Bolton, 1995: 220, confirmed combination in *Labidus*.

Eciton (Labidus) coecum nero Santschi, 1930: 82. Male. Original Description; *Labidus nero* (Santschi), Borgmeier 1953: 14, first combination in *Labidus*; *Labidus nero* (Santschi), Borgmeier, 1955: 127-129, confirmed combination in *Labidus*; *Labidus nero* (Santschi), Watkins 1976: 8, confirmed combination in *Labidus*; *Labidus nero* (Santschi), Bolton 1995: 220, confirmed combination in *Labidus*. **New Synonymy.**

According to the available collection data, the irregular distribution of *L. mars* certainly results in its rareness combined to its cryptic behavior. This rareness is here confirmed by the relatively discrete occurrence of its males (until here, under the junior synonym name *L. nero*) at Viçosa although a strong sampling effort, if compared with the records of the two other species of the genus. It is reasonably possible in fact that this taxon offers a continuous distribution between the southeastern, central-western and northeastern regions of Brazil, since there exists sporadic records for these areas.

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