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RESEARCH ARTICLE

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DINOPONERA LUCIDA EMERY 1901 (HYMENOPTERA, FORMICIDAE, PONERINAE) RECORD IN SANDBANK FOREST IN SOUTHERN ESPÍRITO SANTO, BRAZIL

Aline Macarini Vaz¹, Juliana Babisk Braga¹, Eduarda Aparecida James Paulo¹, Gilson Silva-Filho², Helimar Rabello³ and Cintia Cristina Lima Teixeira³

¹Biologist University Center São Camilo, Cachoeiro de Itapemirim, Espírito Santo, Brazil

²Postgraduate Program in Engineering and Sustainable Development, UFES, Vitória, Espírito Santo, Brazil / University Center São Camilo, Cachoeiro de Itapemirim, ES, Brazil.

³University Center São Camilo, Cachoeiro de Itapemirim, Espírito Santo, Brazil

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*Corresponding author:

Gilson Silva-Filho,

ABSTRACT

This work aims to evaluate and record the occurrence of *D. lucida* in a sandbank environment in the Atlantic Forest in the south of the State of Espírito Santo and to assist in the geographic update of the species occurrence. 40 pitfall traps without baits were used, consisting of plastic pots 15 cm high by 10 cm in diameter, buried in the soil so that they were with the edge at ground level, inside the pots 250 were added ml of 2% formalin solution for the conservation of captured individuals. A total of 286 individuals of *Dinoponera lucida* were collected in the environmental protection area (APA) Guanandy sandbank fragment. This record helps in the knowledge of the geographical limits of occurrence of the species. It should also be taken to account the incentive to scientific research for the best biological knowledge of this species, as well as the monitoring and location of the nests.

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INTRODUCTION

The ants of the genus *Dinoponera* Roger 1861, (Formicidae: Ponerinae), known as the largest ants in the world are strictly South American. The eight described species of the genus (*D. australis*, *D. gigantea*, *D. grandis*, *D. longipes*, *D. mutica*, *D. quadriceps*, *D. hispida* and *D. lucida*) are distributed from the Andean rainforests in Peru, Colombia, Ecuador, to the savannas and rainforests of Brazil (Lenhart et al., 2013). *Dinoponera lucida* Emery, 1901, is an endemic species of the Atlantic Forest, and has been reported to occur only from the south of the state of Bahia to the north of the state of Espírito Santo and in some locations on the eastern margin of Minas Gerais (Capiolo & Delabie 2007). According to Baccaro et al. (2015) This species supposedly occurs throughout the Atlantic Forest and is associated with the different forest formations of the state of Espírito Santo.

One of the main risk factors for *D. lucida* is the fragmentation of its habitat (Capiolo & Delabie 2008), the consequent isolation of colonies and endemism of the species has led it to be included in the vulnerable category in the endangered species list. Brazil (Machado et al., 2005). One of the most affected ecosystems is the sandbank, which constantly loses part of its domain (Thomazi et al., 2013), mainly due to the removal of vegetation due to real estate constructions (Pimentel e Silva 2011), since the state of Espírito Santo is one of eight Brazilian states with the largest representation in forest remnants (Câmara & Galindo-Leal, 2009), ranks fifth in the list of states that most deforest the Atlantic Forest (Inpe, 2011). Thus, assessing the occurrence of *D. lucida* in san in southern Espírito Santo State makes it possible to draw up management plans in these areas and protection of the endangered species through the justified promotion of greater surveillance, since the only work developed in the States are concentrated in the northern region of Espírito Santo

and Bahia (Resende, 2008; Mariano *et al.* 2008; Simon, 2013) however, no registration of the species had been performed in the southern region of Espírito Santo. Thus, this work aims to evaluate and record the occurrence of *D. lucida* in an environment of sandbank forest in the Atlantic Forest in the south of the state of Espírito Santo and assist in the geographic update of the occurrence of the species.

Study Area Characterization: The study was conducted from December 2013 to November 2014 on a fragment of Arboreal restinga or Sandbank in the Guanandy Environmental Protection Area (APA) with 154 hectares. It is located between the municipalities of Itapemirim, Marataizes and Piúma in the southern state of Espírito Santo, Brazil (Figure 1, A, B), located at 24 311386.89m E 7680190.082m N UTM. The climate of the region is tropical (Aw) with dry winter seasons, according to the Köppen classification, and annual average temperature of 21 to 23 °C and annual average precipitation between 1000 to 1500 mm (MAGALHÃES, 2013). One of the main problems in the area are those caused by anthropogenic actions such as deforestation and fragment isolation, as well as the use of this area for training of navy soldiers.



Figure 1. Location of research area and installation of pitfall traps at Restinga APA Guanandy. 1 - Limits (in green) of APA Guanandy; 2 - Limits (in yellow) of the area of the surveyed sandbank. In red, representation of the transects of installation of the traps. SOURCE: Google Earth with adaptations

Ants Collection: This research had as its initial objective the collection and identification of the APA Guanandy Coleoptera community, thus the ants captured and identified a secondary fauna of the collections in the research area, commonly these organisms are discarded in works where the specific objective is limited to only a kind of insect. Forty bait pitfall fall traps were used, consisting of plastic pots 15 cm high by 10 cm in diameter, buried in the ground so that they were bordered at ground level, inside the pots were added 250 ml of 2% formalin solution for the conservation of captured individuals. The traps were distributed every 20 meters in two transects 400 meters apart. The traps remained in the area for three consecutive days each month. The insects collected were properly stored in plastic pots, labeled and transported to the Ecology and Entomology Laboratory of the Department of Biological Sciences of the São Camilo University Center, Espírito Santo, where sorting, counting, labeling and identification were performed at the species level. the classification proposed by Lenhart *et al.* (2013) describing the main identification characteristics for *D. lucida* (Process similar to a tooth in the antero-inferior corner of the pronotum, long and flagellar hair with white glow, smooth and shiny integument with bluish glow, length of scape greater than width head, petiole inclined obliquely on the dorsal border and total body length between 2.7 cm to 3.0 cm). The ants were deposited in the collection of the Ecology and Entomology Laboratory of the Department of Biological Sciences of the São Camilo University Center, Espírito Santo, Brazil.

A total of 286 *Dinoponera lucida* individuals were collected from the APA Guanandy forest fragment (Fig. 2), Simon (2013) recorded a total of 129 individuals studying the effects of forest fragmentation on *D. lucida* population density in eleven units. of *D. lucida* as the other *Dinoponera* ants do not have morphologically distinct breeding caste, the species has only one female worker fertilized (monogenic behavior), but the other females are fertile (Peixoto *et al.*, 2008). The number of workers in the colonies can range from 27 to 189 individuals and this variation may be influenced by environmental conditions (Peixoto *et al.*, 2010). The male is the only winged individual in the colony, therefore the only one capable of gene exchange between populations of different fragments, however they have limited flight capacities and are rarely found in open areas (Mariano *et al.*, 2008). The foraging activity is daytime and without recruitment, reaching an average radius of up to 26 meters away from the nest and the formation of new nests occurs by fission of larger colonies (Peixoto *et al.*, 2010). *D. lucida* populations are found in the region where today it is known as the Central Atlantic Forest Corridor (comprising the entire state of Espírito Santo and southern Bahia), and are mainly recorded in semideciduous forest fragments and coastal trays (Mariano *et al.*, 2008), but these Atlantic Forest fragments are currently reduced and isolated, and this loss of forest area is the main cause of the species extinction risk (Packer and Quen, 2001; Mariano *et al.*, 2008).



Figure 2. *Dinoponera lucida* collected from a sandbank fragment at Apa Guanandy, ES

Due to the fragmented state of their habitat, *D. lucida* colonies are small, isolated and distant from each other. This causes the isolation of populations of the species, inducing high rates of inbreeding and genetic erosion, which may occur locally (Campiolo & Delabie 2007; Mariano *et al.*, 2008). These ants are considered opportunistic predators (Peixoto *et al.*, 2010), and just as most poneromorphs are dependent on the soil, mainly the litter substrate, where most of their prey predominate (Delabie *et al.* 2007). Any change in the forest substratum contributes to the lower availability of resources to the local colonies, which consequently causes a decrease in the number of individuals within each nest, increasing the population isolation possibilities. It is observed that the forest fragment of this study presents all the risks exposed to *D. lucida*, as it is an isolated area that has been losing its vegetation cover due to the advancement of pasture and recurrent burns, besides the use of this area for the training of the forest navy. Resende *et al.* (2010) suggests that *D. lucida* may have adapted to small areas of forest remnants, as it evolved under fragmentation pressure and limitation of areas of its habitat. Cruz *et al.* (2011), evaluating the density of *D. lucida* nests in the northern region of Espírito Santo, found that apparently the density of this species is stronger in small fragments. However, Simom *et al.* (2014) did not record the occurrence of the species in small fragments, suggesting that their extinction occurred in these fragments. Despite intense fragmentation of the Atlantic Forest in Espírito Santo, forest remnants are less isolated when compared to Bahia and Minas Gerais, suggesting that the species' extinction risks in the state are less acute, as *D. lucida* populations can still maintain certain level of gene flow among populations of different fragments (Franklin *et al.*, 2002), but it is still very important to invest in management and conservation of forest remnants where the occurrence of the species is already known as well as encourage the development and expansion of studies and surveys both in the northern region and especially in the southern region of the state of Espírito Santo covering the largest number of areas of possible occurrence of the species. It was recorded the occurrence of *D. lucida* in the Sandbank fragment of the Guanandy Environmental Protection Area (APA), in the south of Espírito Santo State. Consideration should also be given to encouraging scientific research for better biological knowledge of this species, as well as monitoring and locating nests.

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