



## RESEARCH ARTICLE - ANTS

## The Capixaba ant species inventory is far from complete: A local scale assessment of the ants (Formicidae) reveals the importance of diversity studies and entomological collections

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### Abstract

The Atlantic Forest is the third largest biome in Brazil, the most sampled, and has the second highest diversity of ant species described. However, these data are spatially very heterogeneous, with the central region of the Atlantic Forest being better sampled. There is a visible gap from the south of Bahia to the north of Rio de Janeiro, comprising the entire state of Espírito Santo. Knowing this biodiversity gap, in this work, we list the ant fauna (Hymenoptera, Formicidae) deposited in the Coleção Entomológica of the Reserva Natural Vale (CERNV), located in the municipality of Linhares, Espírito Santo. The CERNV has 143 ants collected from August 1984, belonging to 63 species, 29 genera, and eight subfamilies. Of the 143 records, 94 are ant workers (66%), 27 queens (19%), and 22 males (15%). Seventy three percent of the ant workers are identified, 52% of queens and 36% of males. The species with the most individuals deposited are *Camponotus* sp. (15 records), *Eciton burchellii* (8), *Atta sexdens* (7), *Neoponera villosa* (7), and *Solenopsis* sp. (6). Among the identified ants, 12 species were recorded for the first time in the state of Espírito Santo, Brazil. The collection still holds workers (and probably unidentified males) of a species considered endangered, *Dinoponera lucida*. We can observe the importance of biological collections for the knowledge of biodiversity, local and regional since species are recorded for the first time in a state whose biome is widely studied, helping to fill in Linnean and Wallacean shortfalls.

### Introduction

Ants are considered ecosystem engineers for their essential environmental services provided (Del Toro et al., 2012). They occupy different habitat strata of urban ecosystems, from urban parks to buildings, or natural ecosystems from the canopy to the soil (Dáttilo et al., 2012; Santos-Silva et al., 2016; Vicente et al., 2016), interacting with several organisms such as animals, fungi, microbes, and plants, shaping the biodiversity (Sanders et al., 2014; Vicente et al., 2014; Pereira et al., 2015; Puker et al., 2015; Candiani & Bonaldo, 2017; Anjo-Pereira et al., 2021; Alencar et al., 2022; Santos et al., 2022). For these reasons, they react to environmental changes, therefore being excellent bioindicator

organisms. Their use as bioindicator organisms in various types of study is facilitated by sampling methodology and consolidated taxonomy (Casagrande et al., 2017; Ribas et al., 2021; Souza & Fernandes, 2021; Arruda et al., 2022; Przybyszewski et al., 2022).

Currently, Formicidae has about 16,000 valid described species and subspecies (Bolton, 2023). Like other biological groups, its highest diversity is found in tropical regions, i.e., where new discoveries are likely to be under threat of disproportionate deforestation (Guénard et al., 2012). A significant portion of South America is in a tropical region, with Brazil being the country with the largest territorial extension within this territory, being responsible for the greatest diversity of ants in the Americas and one of the largest in the world (Baccaro et al., 2015).

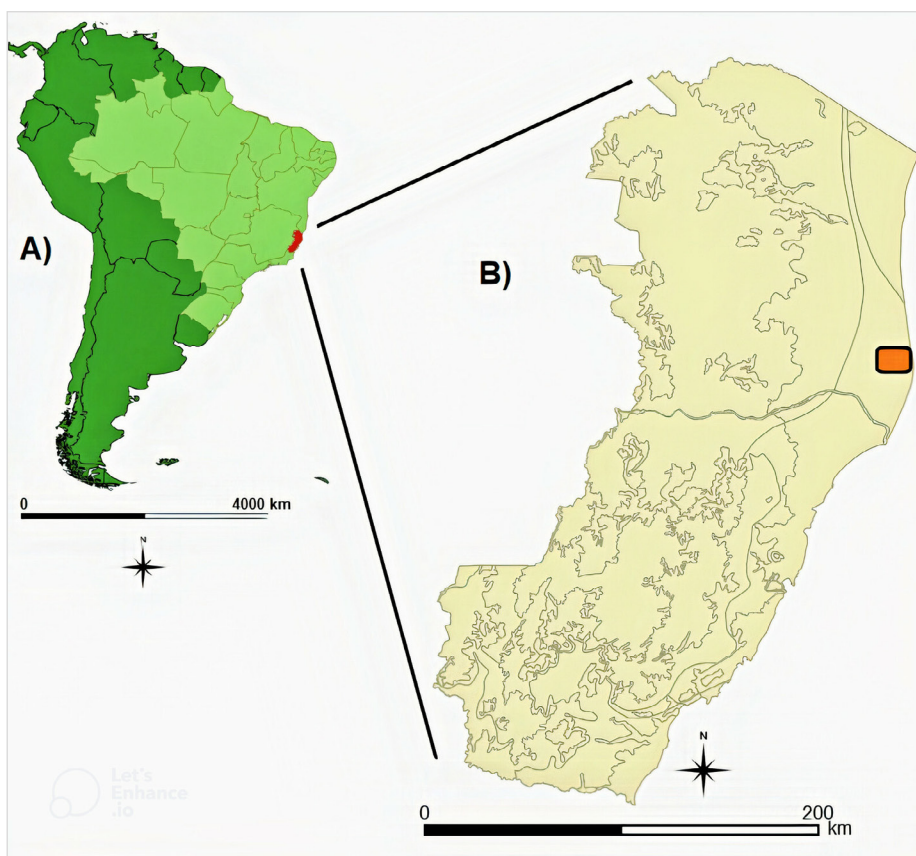


The Atlantic Forest is the third largest biome in Brazil, the most sampled, and which has the second highest diversity of ant species described (Feitosa et al., 2022; Schmidt et al., 2022; Silva et al., 2022; Queiroz et al., 2023). The great and invaluable effort employed by researchers to create a dataset on Atlantic Forest ants generated a database with 53,818 ant records from 7,636 study locations (Silva et al., 2022). However, these data are spatially very heterogeneous, with the central region of the Atlantic Forest being better sampled (Schmidt et al., 2022). There is a visible gap from the south of Bahia to the north of Rio de Janeiro, comprising the entire state of Espírito Santo (Schmidt et al., 2022). This gap comprising the state of Espírito Santo is even more visible when we realize that it has 215 recorded species, and the neighboring state, Rio de Janeiro, with a similar size, has records of 485 species. Another neighboring state, Bahia, has more native species (603), reaching three times more registered species (645) in Minas Gerais (Janicki et al., 2016).

Knowing this biodiversity gap, in this work, we list the ant fauna (Hymenoptera, Formicidae) deposited in the Coleção Entomológica of the Reserva Natural Vale (CERNV), located in the municipality of Linhares, Espírito Santo. In addition, we highlight new records by state and discuss the importance of biological collections and increasing knowledge about the state's ant fauna.

## Material and Methods

This study was conducted at the CERNV, located 30 km North of the Rio Doce. The collection receives specimens sampled at the Reserva Natural da Vale (RNV) by researchers who visit the reserve. The RNV covers part of the municipalities of Linhares and Jaguaré (19°06' - 19°18'S and 39°45' - 40°19'W – Figure 1), located in the North of the state of Espírito Santo, Brazil (Lima et al., 2022). The RNV encompasses approximately 23,000 hectares and is situated in one of the most important areas for the conservation of the biodiversity of the Atlantic Forest, being part of the Central Corridor of the Atlantic Forest and possessing one of the last great remnants of the Tabuleiro Forest, one of the most threatened formations of the Atlantic Forest biome (Reserva Natural Vale – Vale 2023). Since the mining company Vale began the process of acquiring the properties that gave rise to the RNV in the 1950s, researchers cataloged approximately 2,500 plant species, over 1,500 insect species or morphospecies, and 103 mammal species, in addition to 59 amphibians, 66 reptiles and 402 birds (Reserva Natural Vale – Vale 2023). The RNV has four distinct formations: the high forest, the Mussununga forest, the formations of floodable areas (herbaceous and forest), and the native fields (Vicens et al., 2004). The heterogeneity of the vegetation allows the formation of several ecosystems



**Fig 1.** Location of the South America (A) expanding to the Espírito Santo state (B) and highlighting for the Reserva Natural Vale locality (orange rectangle).

conducive to developing a great wealth of insect species and their preservation (Martins et al., 2014; Lima et al., 2022). Furthermore, RNV is surrounded by other conservation areas such as Reserva Biológica de Sooretama, RPPN Recanto das Antas, and RPPN Mutum Preto, which jointly reduce the effects of landscape modification in the region and have synergistic buffer effects (Martins-dos-Santos, 2023).

The ants were identified by four specialists, as listed in Table 1. We provide all the information on the label and the code associated with each specimen (Table 1). All specimens remain deposited in the CERNV.

## Results

In the CERNV, 143 ant specimens have been deposited, collected between August 1984 and December 2013. The oldest samples date from August 8, 1984, and comprise 21 ants of different genera, sampled by Casimiro AB (Antonio B. Casimiro), Santos JS (José Simplicio dos Santos), and Lacau S (Sébastien Lacau - Table 1). While the most recent record was collected on December 3rd, 2013.

The 143 ants sampled belong to 63 species, 29 genera, and eight subfamilies. The species with the most individuals deposited are *Camponotus* sp. (15 records), *Eciton burchellii* (8), *Atta sexdens* (7), *Neoponera villosa* (7), and *Solenopsis* sp. (6).

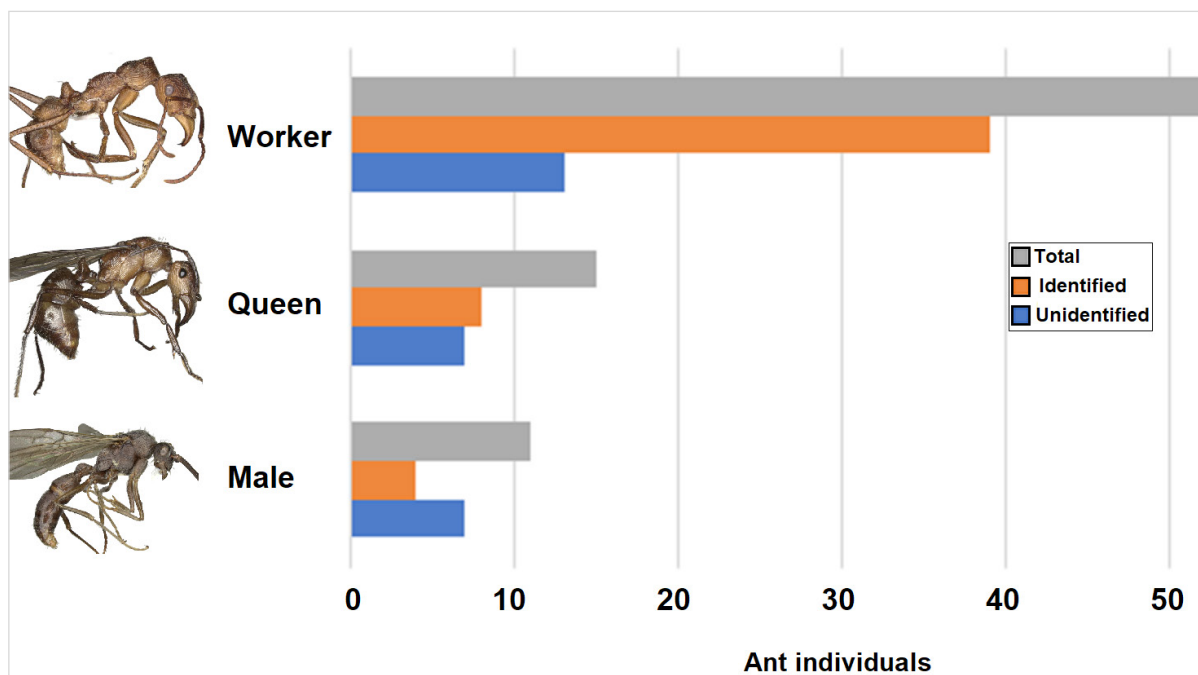
Among the identified ants, 12 species were recorded for the first time in the state of Espírito Santo. Of the 143 records, 94 are from ant workers (66% – Figure 2), 27 from queens (19%), and 22 from males (15%). Of the 94 ant workers, 69 are identified (73%), 14 of the 27 queens are identified (52%), and eight of the 22 males are identified (36%).

## Discussion

Considering the results of this study, we can observe the importance of biological collections for the knowledge of biodiversity, locally and regionally, since species are recorded for the first time in a state in which the Atlantic Forest biome is widely studied. Therefore, identifying the ants deposited in the Coleção Entomológica of the Reserva Natural da Vale helps fill in Linnean shortfalls by knowing the local fauna and Wallacean shortfalls by expanding the distribution of several species. The collection still holds workers (and probably unidentified males) of a species considered endangered, *Dinoponera lucida* (Fraga et al., 2019; Simon et al., 2020).

One exemplar of the ant *D. lucida* was sampled on December 10, 1986 (second oldest collection) by the retired professor at the Universidade Federal de Viçosa, Dr. Paulo Sergio Fiuza Ferreira. This Brazilian researcher has contributed strongly to the Coleção Entomológica of the RNV and to Brazilian entomology, mainly in the field of insect taxonomy with emphasis on Miridae (Hemiptera, Heteroptera. e.g., Carvalho & Ferreira, 1995; Ferreira et al., 2005; Ferreira & Henry, 2011). *Dinoponera lucida* is an endangered ant species endemic to the Atlantic Forest (Peixoto et al., 2010; Fraga et al., 2019; Silva et al., 2022). Recently, researchers studied the natural history the *D. lucida* in the RNV, observing its diurnal foraging that is relative to the litter leaf temperature, as well as its efficient care and maintenance of the nests, in addition to agonistic interactions representing the nest defense (Curbani et al., 2021; Zocca et al., 2021).

Other species that we highlight are the 12 species that are recorded for the first time in the state of Espírito Santo.



**Fig 2.** The ant's abundance by castes and the identification status of the specimens deposited in the Coleção Entomológica of the Reserva Natural Vale. Images from [www.antweb.org](http://www.antweb.org): *Ectatomma tuberculatum* (worker, Z. Lieberman CASENT0281510; queen, Estella Ortega, JTLC000014186; male, Ryan Perry, CASENT0249601).

Four species are from the genus *Camponotus*, which is one of the most diverse ant genera and has a challenging taxonomy (Baccaro et al., 2015). The *Camponotus* species that are new records, *C. blandus*, *C. cingulatus*, *C. fastigatus*, and *C. melanoticus*, are species with wide distribution in the Neotropical region, including neighboring states, such as the other new records belonging to other genera (Janicki, 2016), showing that the gap is due to the lack of studies in the state. Many of these species are from the oldest collections made by Antônio Batista Casimiro, Sébastien Lacau, and José Simplicio dos Santos who was the curator at the time. Antônio Batista Casimiro, Sébastien Lacau, and other researchers from the municipality of Ilhéus, Bahia state, visited the RNV twice. The researchers used pitfall traps, random searches for ant nests, and nocturnal collections where they knocked plant branches into plastic bags.

The ants with the most records largely belong to genera with abundant colonies and large, easily collected species, such as *Camponotus*, *Eciton*, *Atta*, and *Solenopsis* (Baccaro et al., 2015). Except for *Neoponera*, which is a genus whose species have small colonies, including the sampled species *N. villosa*. Despite having colonies with less than 200 workers, *N. villosa* has been extensively studied and become a model system for studies of social behavior and foraging (Schmidt & Shattuck, 2014).

The proportion of castes in the collection reflects natural patterns, where reproductive forms are less abundant and seasonal. However, it is worth noting that we collected an undescribed queen of *Pheidole fimbriata*, highlighting the potential for new discoveries in the RNV. Since workers are the most abundant and frequent forms, the identification keys are based on workers and are not recommended for identifying queens and males (Feitosa et al., 2012; Baccaro et al., 2015; Oliveira et al., 2021). This explains the pattern observed in the identification of ants found in the collection; after all, 73% of the workers were identified, in contrast to 52% of the queens and 36% of the males. Queens are generally more robust forms of workers, whereas males are quite different (Baccaro et al., 2015). Therefore, if the keys are about workers, association with workers sometimes can identify some queens, but never the males, which reinforces the fact that myrmecologists should invest in the manual collection of ants to access nests and associate castes (Delabie et al., 2015).

Although the material deposited in the CERNV comes from sporadic, aleatory collections carried out by employees, and visitors at the RNV, without a systematized inventory using specific methodologies for the group, 19% of the sampled species are new records for the state of Espírito Santo. Therefore, carrying out a systematized inventory of the RNV, with methodologies that cover different microhabitats with the widest spatial coverage, would collaborate with the

biodiversity of ants in the Espírito Santo state. Beyond that, it is crucial to know the history and heritage of the collections because, in addition to essential materials for the knowledge of biodiversity, they also carry a lot of local history, researchers, and Brazilian science (Ferreira et al., 2016; Andrade & Feitosa, 2020; Delabie et al., 2020; Fernandes & Oliveira, 2020; Oliveira et al., 2020; Prado et al., 2020; Souza-Campana et al., 2020; Ulysséa & Brandão, 2020).

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### Authors' Contribution

REV: conceptualization, methodology, investigation, writing & review.

JLPS: writing & review.

LPP: conceptualization, methodology, investigation, writing & review.

### Conflicts of Interest

The authors declare that they have no conflict of interest related to the publication of this manuscript.

### Ethics

The authors confirm that the manuscript has been submitted only to this journal and confirm that all the research meets the ethical guidelines, including adherence to the legal requirements of the study country.

### Data availability

The data is not yet available on digital platforms; however, all the data are reported in the manuscript, and the first author is available for any questions, or even the entomological collection where ants are deposited can be consulted.

**Table 1.** Data on ant species deposited in the Coleção Entomológica of Reserva Natural da Vale, Espírito Santo, Brazil. \*First record from Espírito Santo state.

Subfamily/genera/species	Collection code	Caste/sex	Collection date	Collector	Determination year	Number of individuals
<b>AMBLYOPONINAE</b>						
<i>Prionopelta</i>						
<i>Prionopelta amabilis</i> Borgmeier, 1949*	2646	worker	08.viii.1984	S Lacau	LP Prado det., 2022	1
<b>DOLICHODERINAE</b>						
<i>Azteca</i>						
<i>Azteca</i> sp.	2648	worker	08.viii.1994	S Lacau	JHC Delabie det., 1995	3
<i>Azteca</i> sp.	2716	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	6
<i>Azteca</i> sp.	2774	worker	05.iv.1995	JS Santos	JHC Delabie det., 1995	5
<i>Azteca</i> sp.	2774	worker	05.iv.1995	JS Santos	JHC Delabie det., 1995	1
<i>Dolichoderus</i>						
<i>Dolichoderus attelaboides</i> (Fabricius, 1775)	4583	worker	11.iv.2006	JS Santos	RE Vicente det., 2022	5
<i>Dolichoderus attelaboides</i> (Fabricius, 1775)	5169	queen	17.v.2011	JS Santos	RE Vicente det., 2022	1
<i>Dorymyrmex</i>						
<i>Dorymyrmex</i> sp.	2714	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	5
<b>DORYLINAE</b>						
<i>Eciton</i>						
<i>Eciton burchellii</i> (Westwood, 1842)	610	male	13.iii.1987	JS Santos	JHC Delabie det., 1994	1
<i>Eciton burchellii</i> (Westwood, 1842)	610	male	24.iii.1987	JS Santos	JHC Delabie det., 1994	2
<i>Eciton burchellii</i> (Westwood, 1842)	610	male	17.v.1991	JS Santos	JHC Delabie det., 1994	1
<i>Eciton burchellii</i> (Westwood, 1842)	2522	worker	08.ii.1992	JS Santos	JHC Delabie det., 1994	4
<i>Eciton burchellii</i> (Westwood, 1842)	2717	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	5
<i>Eciton burchellii</i> (Westwood, 1842)	2622	worker	17.viii.2004	JS Santos	JHC Delabie det., 1994	1
<i>Eciton burchellii</i> (Westwood, 1842)	2469	male	18.ix.2007	JS Santos	JHC Delabie det., 1994	1
<i>Eciton burchellii</i> (Westwood, 1842)	2022	worker	20.vi.2012	JS Santos	JHC Delabie det., 1994	6
<i>Labidus</i>						
<i>Labidus coecus</i> (Latreille, 1802)	2656	worker	08.viii.1994	S Lacau	JHC Delabie det.	2
<i>Labidus praedator</i> (Smith, 1858)	609	male	13.iii.1987	JS Santos	JHC Delabie det., 1994	4
<i>Labidus praedator</i> (Smith, 1858)	2775	worker	05.iv.1995	JS Santos	JHC Delabie det.	6
<i>Labidus praedator</i> (Smith, 1858)	609	male	16.ix.2003	JS Santos	JHC Delabie det., 1994	1
<i>Labidus</i> sp.	2469	male	12.xi.1991	JS Santos	JHC Delabie det., 1994	3
<i>Labidus</i> sp.	2469	male	22.xi.1991	JS Santos	JHC Delabie det., 1994	1
<i>Labidus</i> sp.	2469	male	09.ix.2008	JS Santos	JHC Delabie det., 1994	1
<i>Neivamyrmex</i>						
<i>Neivamyrmex pilosus</i> (Smith, 1858)	2743	worker	08.iii.1995	JS Santos	JHC Delabie det.	6
<b>ECTATOMMINAE</b>						
<i>Ectatomma</i>						
<i>Ectatomma brunneum</i> Smith, 1858	1914	worker	08.viii.1984	JS Santos	JHC Delabie det., 1994	5
<i>Ectatomma brunneum</i> Smith, 1858	2358	queen	30.vii.1991	JS Santos	LP Prado det., 2022	1
<i>Ectatomma brunneum</i> Smith, 1858	3207	queen	15.iii.1994	JS Santos	LP Prado det., 2022	1
<i>Ectatomma tuberculatum</i> (Olivier, 1792)	2655	worker	08.viii.1984	S Lacau	JHC Delabie det., 1994	3
<i>Ectatomma tuberculatum</i> (Olivier, 1792)	2347	queen	24.vii.1991	JS Santos	LP Prado det., 2022	1
<i>Ectatomma tuberculatum</i> (Olivier, 1792)	3733	male	27.iii.1997	JS Santos	LP Prado det., 2022	2
<i>Ectatomma tuberculatum</i> (Olivier, 1792)	3914	queen	01.vi.2001	JS Santos	LP Prado det., 2022	1
<i>Ectatomma tuberculatum</i> (Olivier, 1792)	2347	queen	13.ix.2005	JS Santos	LP Prado det., 2022	1
<i>Ectatomma</i> sp.	3733	male	14.xii.2010	JS Santos	LP Prado det., 2022	1

**Table 1.** Data on ant species deposited in the Coleção Entomológica de Reserva Natural da Vale, Espírito Santo, Brazil. \*First record from Espírito Santo state. (Continuation)

Subfamily/genera/species	Collection code	Caste/sex	Collection date	Collector	Determination year	Number of individuals
<b>Gnamptogenys</b>						
<i>Gnamptogenys annulata</i> (Mayr, 1887)*	2634	worker	08.viii.1984	AB Casimiro	JHC Delabie det., 1994	1
<i>Gnamptogenys horni</i> (Santschi, 1929)	2633	queen	08.viii.1984	AB Casimiro	RE Vicente det., 2022	1
<i>Gnamptogenys horni</i> (Santschi, 1929)	2632	worker	08.viii.1984	AB Casimiro	RE Vicente det., 2022	5
<b>Typhlomyrmex</b>						
<i>Typhlomyrmex major</i> Santschi, 1923*	2647	worker	08.viii.1984	S Lacau	JHC Delabie det., 1994	1
<b>FORMICINAE</b>						
<b>Brachymyrmex</b>						
<i>Brachymyrmex fiebrigi</i> Forel, 1908*	2629	worker	08.viii.1994	AB Casimiro	LP Prado det., 2022	3
<i>Brachymyrmex</i> sp.	2628	queen	08.viii.1994	AB Casimiro	JHC Delabie det.	2
<b>Camponotus</b>						
<i>Camponotus atriceps</i> (Smith, 1858)	4582	worker	11.iv.2006	JS Santos	RE Vicente det., 2022	5
<i>Camponotus atriceps</i> (Smith, 1858)	4584	worker	11.iv.2006	JS Santos	RE Vicente det., 2022	5
<i>Camponotus blandus</i> (Smith, 1858)*	2738	worker	01.iii.1995	JS Santos	JHC Delabie det.	5
<i>Camponotus blandus</i> (Smith, 1858)*	2740	worker	08.iii.1995	JS Santos	JHC Delabie det.	5
<i>Camponotus cingulatus</i> Mayr, 1862*	4581	worker	11.iv.2006	JS Santos	LP Prado det., 2022	7
<i>Camponotus crassus</i> Mayr, 1862	2710	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	6
<i>Camponotus crassus</i> Mayr, 1862	2773	worker	05.iv.1995	JS Santos	JHC Delabie det.	5
<i>Camponotus crassus</i> Mayr, 1862	2773	worker	05.iv.1995	JS Santos	JHC Delabie det.	1
<i>Camponotus fastigatus</i> Roger, 1863*	2653	worker	08.viii.1994	S Lacau	JHC Delabie det.	3
<i>Camponotus melanoticus</i> Emery, 1894*	4150	worker	15.vii.2003	JS Santos	RE Vicente det., 2022	3
<i>Camponotus melanoticus</i> Emery, 1894*	4531	worker	17.i.2006	JS Santos	RE Vicente det., 2022	9
<i>Camponotus rufipes</i> (Fabricius, 1775)	2357	worker	30.vii.1991	JS Santos	JHC Delabie det., 1994	2
<i>Camponotus rufipes</i> (Fabricius, 1775)	2357	worker	14.iii.2006	JS Santos	JHC Delabie det., 1994	2
<i>Camponotus rufipes</i> (Fabricius, 1775)	2357	worker	16.v.2006	JS Santos	JHC Delabie det., 1994	2
<i>Camponotus sericeiventris</i> (Guérin-Méneville, 1838)	2109	worker	08.viii.1984	AB Casimiro	RE Vicente det., 2022	5
<i>Camponotus</i> aff. <i>blandus</i>	2740	worker	08.iii.1995	JS Santos	JHC Delabie det.	1
<i>Camponotus</i> sp.	2738	worker	01.iii.1995	JS Santos	JHC Delabie det.	1
<i>Camponotus</i> sp.	1392	queen	08.viii.1984	AB Casimiro	JHC Delabie det., 1994	5
<i>Camponotus</i> sp.	611	queen	08.viii.1984	JS Santos	JHC Delabie det., 1994	1
<i>Camponotus</i> sp.	1243	queen	21.xi.1988	JS Santos	JHC Delabie det., 1994	5
<i>Camponotus</i> sp.	1391	queen	07.iii.1989	JS Santos	JHC Delabie det., 1994	5
<i>Camponotus</i> sp.	1764	male	30.i.1990	JS Santos	LP Prado det., 2022	1
<i>Camponotus</i> sp.	1952	worker	19.vii.1990	JS Santos	JHC Delabie det., 1994	1
<i>Camponotus</i> sp.	2005	queen	28.viii.1990	JS Santos	JHC Delabie det., 1994	1
<i>Camponotus</i> sp.	2707	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	5
<i>Camponotus</i> sp.	2772	worker	05.iv.1995	JS Santos	JHC Delabie det.	2
<i>Camponotus</i> sp.	3649	male	28.i.1997	JS Santos	LP Prado det., 2022	1
<i>Camponotus</i> sp.	1764	male	01.iv.2003	JS Santos	LP Prado det., 2022	1
<i>Camponotus</i> sp.	1952	worker	18.xi.2003	JS Santos	JHC Delabie det., 1994	3
<i>Camponotus</i> sp.	1952	worker	13.xii.2005	JS Santos	JHC Delabie det., 1994	1
<i>Camponotus</i> sp.	1391	queen	24.iv.2007	JS Santos	JHC Delabie det., 1994	2
<b>Nylanderia</b>						
<i>Nylanderia</i> sp.	2637	worker	08.viii.1994	AB Casimiro	LP Prado det., 2022	4
<i>Nylanderia</i> sp.	2638	worker	08.viii.1994	AB Casimiro	LP Prado det., 2022	3

**Table 1.** Data on ant species deposited in the Coleção Entomológica of Reserva Natural da Vale, Espírito Santo, Brazil. \*First record from Espírito Santo state. (Continuation)

Subfamily/genera/species	Collection code	Caste/sex	Collection date	Collector	Determination year	Number of individuals
<b>MYRMICINAE</b>						
<b><i>Acromyrmex</i></b>						
<i>Acromyrmex balzani</i> (Emery, 1890)*	2711	worker	02.xii.1995	JS Santos	JHC Delabie det., 1995	5
<i>Acromyrmex brunneus</i> (Forel, 1912)	1274	queen	02.xii.1988	JS Santos	JHC Delabie det., 1994	5
<i>Acromyrmex coronatus</i> (Fabricius, 1804)	2708	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	5
<b><i>Atta</i></b>						
<i>Atta sexdens</i> (Linnaeus, 1758)	1210	queen	21.x.1988	JS Santos	JHC Delabie det., 1994	1
<i>Atta sexdens</i> (Linnaeus, 1758)	1210	queen	10.xi.1992	JS Santos	JHC Delabie det., 1994	1
<i>Atta sexdens</i> (Linnaeus, 1758)	3102	worker	10.vi.1993	JS Santos	JHC Delabie det., 1994	1
<i>Atta sexdens</i> (Linnaeus, 1758)	1210	queen	04.xi.1995	JS Santos	JHC Delabie det., 1994	1
<i>Atta sexdens</i> (Linnaeus, 1758)	3373	male	22.xii.1995	JS Santos	JHC Delabie det., 1994	5
<i>Atta sexdens</i> (Linnaeus, 1758)	3102	worker	17.v.2005	JS Santos	JHC Delabie det., 1994	3
<i>Atta sexdens</i> (Linnaeus, 1758)	3102	worker	18.vii.2012	JS Santos	JHC Delabie det., 1994	1
<i>Atta</i> sp.	2720	worker	06.v.1995	JS Santos	JHC Delabie det., 1995	5
<b><i>Cephalotes</i></b>						
<i>Cephalotes atratus</i> (Linnaeus, 1758)	1892	worker	12.vi.1990	JS Santos	JHC Delabie det., 1994	3
<i>Cephalotes atratus</i> (Linnaeus, 1758)	5191	worker	30.viii.2011	JS Santos	JHC Delabie det., 1994	1
<i>Cephalotes pusillus</i> (Klug, 1824)	3921	worker	07.vi.2001	JS Santos	LP Prado det., 2022	6
<i>Cephalotes</i> sp.	3375	queen	22.xii.1995	JS Santos	LP Prado det., 2022	1
<i>Cephalotes</i> sp.	4391	queen	17.ix.2004	JS Santos	RE Vicente det., 2022	1
<b><i>Crematogaster</i></b>						
<i>Crematogaster acuta</i> (Fabricius, 1804)	2741	worker	08.iii.1995	JS Santos	RE Vicente det., 2022	5
<i>Crematogaster acuta</i> (Fabricius, 1804)	2741	worker	08.iii.1995	JS Santos	RE Vicente det., 2022	1
<i>Crematogaster</i> aff. <i>evallans</i>	2715	worker	02.ii.1995	JS Santos	RE Vicente det., 2022	6
<i>Crematogaster</i> aff. <i>minutissima</i>	2650	worker	08.viii.1994	S Lacau	RE Vicente det., 2022	5
<i>Crematogaster</i> sp.	5287	queen	17.iv.2012	JS Santos	RE Vicente det., 2022	1
<b><i>Pheidole</i></b>						
<i>Pheidole fallax</i> Mayr, 1870*	2713	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	5
<i>Pheidole fimbriata</i> Roger, 1863*	3582	queen	08.viii.1984	JS Santos	JHC Delabie det., 1994	5
<i>Pheidole fimbriata</i> Roger, 1863*	4007	queen	13.xi.2001	JS Santos	JHC Delabie det., 1994	1
<i>Pheidole</i> aff. <i>flavens</i>	2630	worker	08.viii.1994	AB Casimiro	RE Vicente det., 2022	5
<i>Pheidole</i> aff. <i>flavens</i>	2640	worker	08.viii.1994	AB Casimiro	RE Vicente det., 2022	1
<i>Pheidole</i> aff. <i>flavens</i>	2641	worker	08.viii.1994	AB Casimiro	RE Vicente det., 2022	4
<b><i>Solenopsis</i></b>						
<i>Solenopsis geminata</i> (Fabricius, 1804)	2709	worker	02.ii.1995	JS Santos	JHC Delabie det., 1995	12
<i>Solenopsis virulens</i> (Smith, 1858)	2644	worker	08.viii.1994	S Lacau	JHC Delabie det., 1994	5
<i>Solenopsis virulens</i> (Smith, 1858)	2742	worker	08.iii.1995	JS Santos	V Nagatani, 2022	1
<i>Solenopsis virulens</i> (Smith, 1858)	2742	worker	08.iii.1995	JS Santos	JHC Delabie det.	5
<i>Solenopsis</i> sp.	2626	worker	08.viii.1994	AB Casimiro	JHC Delabie det., 1994	5
<i>Solenopsis</i> sp.	2657	worker	08.viii.1994	S Lacau	JHC Delabie det., 1994	4
<i>Solenopsis</i> sp.	2625	worker	08.viii.1994	AB Casimiro	JHC Delabie det., 1994	1
<i>Solenopsis</i> sp.	2642	worker	08.viii.1994	S Lacau	JHC Delabie det., 1994	4
<i>Solenopsis</i> sp.	2643	worker	08.viii.1994	S Lacau	JHC Delabie det., 1994	1
<i>Solenopsis</i> sp.	4335	male	16.iii.2004	JS Santos	LP Prado det., 2022	6
<b><i>Wasmannia</i></b>						
<i>Wasmannia auropunctata</i> (Roger, 1863)	2627	worker	08.viii.1994	AB Casimiro	JHC Delabie det.	5

**Table 1.** Data on ant species deposited in the Coleção Entomológica of Reserva Natural da Vale, Espírito Santo, Brazil. \*First record from Espírito Santo state. (Continuation)

Subfamily/genera/species	Collection code	Caste/sex	Collection date	Collector	Determination year	Number of individuals
<b>PONERINAE</b>						
<b><i>Dinoponera</i></b>						
<i>Dinoponera lucida</i> Emery, 1901	168	worker	10.xii.1986	PS Fiuza	JHC Delabie det., 1994	1
<i>Dinoponera lucida</i> Emery, 1901	168	worker	13.ix.2005	JS Santos	JHC Delabie det., 1994	1
<i>Dinoponera lucida</i> Emery, 1901	168	worker	13.x.2009	JS Santos	JHC Delabie det., 1994	2
<i>Dinoponera</i> sp.	2528	male	22.ix.1992	JS Santos	LP Prado det., 2022	1
<i>Dinoponera</i> sp.	2928	male	01.xii.2013	JS Santos	LP Prado det., 2022	2
<b><i>Hypoponera</i></b>						
<i>Hypoponera</i> sp.1	2631	worker	08.viii.1984	AB Casimiro	RE Vicente det., 2022	5
<i>Hypoponera</i> sp.2	2654	worker	08.viii.1984	S Lacau	RE Vicente det., 2022	2
<i>Hypoponera</i> sp.2	2649	worker	08.viii.1984	S Lacau	RE Vicente det., 2022	4
<i>Hypoponera</i> sp.2	2645	worker	08.viii.1984	S Lacau	RE Vicente det., 2022	1
<i>Hypoponera</i> sp.2	2652	worker	08.viii.1994	S Lacau	RE Vicente det., 2022	2
<b><i>Leptogenys</i></b>						
<i>Leptogenys</i> sp.	3713	male	19.iii.1997	JS Santos	LP Prado det., 2022	1
<i>Leptogenys</i> sp.	3713	male	15.iii.2003	JS Santos	LP Prado det., 2022	1
<i>Leptogenys</i> sp.	3713	male	03.xii.2013	JS Santos	LP Prado det., 2022	1
<b><i>Mayaponera</i></b>						
<i>Mayaponera constricta</i> (Mayr, 1884)	2639	worker	08.viii.1984	S Lacau	JHC Delabie det., 1994	5
<b><i>Neoponera</i></b>						
<i>Neoponera villosa</i> (Fabricius, 1804)	1858	worker	10.v.1990	JS Santos	JHC Delabie det., 1994	1
<i>Neoponera villosa</i> (Fabricius, 1804)	3027	worker	10.vi.1993	JS Santos	JHC Delabie det., 1995	3
<i>Neoponera villosa</i> (Fabricius, 1804)	1858	worker	12.xii.1993	JS Santos	JHC Delabie det., 1994	4
<i>Neoponera villosa</i> (Fabricius, 1804)	1858	worker	03.i.1995	JS Santos	JHC Delabie det., 1994	1
<i>Neoponera villosa</i> (Fabricius, 1804)	1858	worker	16.i.1995	JS Santos	JHC Delabie det., 1994	1
<i>Neoponera villosa</i> (Fabricius, 1804)	3874	worker	20.iii.2001	JS Santos	RE Vicente det., 2022	1
<i>Neoponera villosa</i> (Fabricius, 1804)	3874	worker	17.vii.2006	JS Santos	RE Vicente det., 2022	5
<i>Neoponera</i> sp.	611	queen	08.viii.1984	JS Santos	JHC Delabie det., 1994	1
<i>Neoponera</i> sp.	2174	male	11.xii.1990	JS Santos	LP Prado det., 2022	1
<b><i>Odontomachus</i></b>						
<i>Odontomachus biumbonatus</i> Brown, 1976	2635	worker	08.viii.1984	AB Casimiro	JHC Delabie det., 1994	1
<i>Odontomachus haematodus</i> (Linnaeus, 1758)	2636	worker	08.viii.1984	AB Casimiro	JHC Delabie det., 1994	1
<i>Odontomachus haematodus</i> (Linnaeus, 1758)	2739	worker	08.iii.1995	JS Santos	JHC Delabie det.	5
<i>Odontomachus hastatus</i> (Fabricius, 1804)*	3460	worker	12.viii.1996	JS Santos	JHC Delabie det., 1994	6
<i>Odontomachus</i> sp.	611	queen	08.viii.1984	JS Santos	JHC Delabie det., 1994	3
<b><i>Pachycondyla</i></b>						
<i>Pachycondyla harpax</i> (Fabricius, 1804)	2024	queen	18.ix.1990	JS Santos	RE Vicente det., 2022	1
<i>Pachycondyla harpax</i> (Fabricius, 1804)	3016	queen	08.i.1993	JS Santos	RE Vicente det., 2022	1
<i>Pachycondyla harpax</i> (Fabricius, 1804)	3550	worker	24.x.1996	JS Santos	RE Vicente det., 2022	1
<b><i>Pseudoponera</i></b>						
<i>Pseudoponera stigma</i> (Fabricius, 1804)	2651	worker	08.viii.1984	S Lacau	JHC Delabie det., 1994	4
<b>PSEUDOMYRMICINAE</b>						
<b><i>Pseudomyrmex</i></b>						
<i>Pseudomyrmex gracilis</i> (Fabricius, 1804)	2721	worker	06.ii.1995	JS Santos	LP Prado det., 2022	1



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