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Social wasps of Unilavras/Boqueirão Biological Reserve, Ingaí, state of Minas Gerais, Brazil

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Abstract: Social wasps (Hymenoptera, Vespidae, Polistinae) usually build nests using vegetable materials mixed with water and salivary secretion, resulting in a product similar to paper. Between April 2009 and March 2010 an inventory of these wasps was made at Unilavras/Boqueirão Biological Reserve, located in the municipality of Ingaí-MG. Thirty four species of social wasps belonging to ten genera were recorded, *Polybia fastidiosuscula* Saussure (1854) was the most common.

Introduction

Social wasps belong to the order Hymenoptera, presenting about 115,000 known species (Sharkey 2007). Vespidae is a family included in the order Hymenoptera and divided into six subfamilies: Eumeninae, Masarinae and Euparagiinae comprise solitary individuals, Stenogastrinae is pre-social, and Vespinae and Polistinae include all the species with eusocial behavior (Carpenter 1981). All social wasps from Brazil belong to the subfamily Polistinae, with 319 species registered for the country, and about 970 species for the rest of the world. This makes Brazil the most diverse country in social wasps in the world, reaching almost 33% of the total (Prezoto *et al.* 2007). The vespids can be found from the Amazonian forest to the Pantanal and Atlantic forest (Carpenter and Marques 2001). The full extent of social wasp distribution in Brazilian ecosystems is still unknown due to insufficient research in other environments such as savanna and southern Brazilian fields.

Twenty five genera are known for the subfamily Polistinae, 21 of them are Neotropical (Carpenter 2004). They are distributed across three tribes: Polistini (genus *Polistes*), Mischocyttarini (genus *Mischocyttarus*) and Epiponini (the other genera) (Carpenter and Marques 2001).

Social wasps build nests that shelter immature stages and adults. The materials primarily used for nests building are vegetable fibers mixed with water and salivary secretion from the mandibular glands, resulting in a product similar to paper (Gallo *et al.* 1988). The nests are built in variable forms and sizes, ranging from large and complex to small and simple structures. Frequently, nest characteristics can determine the species that built the structure (Richards and Richards 1951). The most accepted classification for social wasp nests is that proposed by Richards and Richards (1951).

Phragmocyttarous nest: the initial comb is fixed on substratum and covered by an envelope. A second comb is built by adding new cells at the bottom of the first envelope, and also is covered by an envelope. New combs are built through identical processes. Each envelope has an entrance to the respective combs. Examples: *Polybia, Brachygastra* and *Protonectarina* (Figure 1A).

Astelocyttarous nest: a single comb is built directly on substratum and covered by an envelope with one entrance. Example: *Synoeca* (Figure 1B).

Stelocyttarous nest: comb or combs are suspended by stalks. There are two Stellocyttarous nest types: Gymnodomous, in which the combs are not covered by envelopes (Examples: *Apoica, Polistes* and *Mischocyttarus* (Figure 1C) and Calyptodomous, in which the combs has an envelope (Examples: *Pseudopolybia* and *Parachartergus* (Figure 1D).

According to Richards and Richards (1951) and Jeanne (1980), social wasps can be divided into two categories based on the founding of the colony. Founding by swarming (Figure 2A) is characterized by defined social organization, with queens responsible only for oviposition, and the workers build the nest. This founding type is practiced by species of Epiponini. The second group represents independent founding (Figure 2B), where there is a hard conflict for dominance because there is no hierarchy initially established, resulting in a decrease in the number of colonies (Tannure and Nascimento 1999. It is practiced by species of Polistini and Mischocyttarini.

Materials and Methods

The study was conducted at Unilavras/Boqueirão Biological Reserve, (21°20'47" S and 44°59'27" W), which possesses an area of 160 ha and 1,100 m high (Pereira and Volpato 2005). It is a property of Centro Universitário de Lavras (Unilavras) located on the municipality of Ingaí, southest Minas Gerais.

The methods used for collections were active search, traps baited with passion fruit juice and sardine broth (Souza and Prezoto 2006; Prezoto and Clemente 2010)

beside Malaise interception traps. From April 2009 to March 2010 surveys were conducted monthly in Cerrado (*senso latu*) and riparian vegetation in the study area. The collected specimens were taken to the Zoology laboratory of Centro Universitário de Lavras (Unilavras) for identification and assembly of a control collection. Species identification was carried out using an identification key (Carpenter and Marques 2001) and with the aid of the researchers Dr. Marcos Magalhães de Souza and Orlando Tobias Silveira.

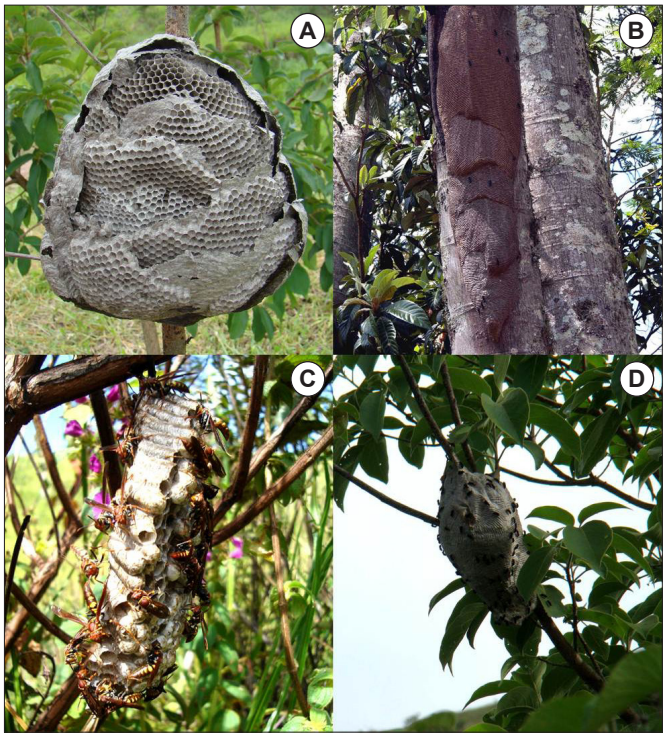

Figure 1. Nest types. A) Phragmocyttarous nest (*Protonectarina sylveirae*); B) Astelocyttarous nest (*Synoeca* sp.); C) Stelocyttarous Gymnodomous nest (*Mischocyttarus confusus*); D) Stelocyttarous Calyptodomous nest Calyptódomo (*Parachartergus fraternus*).

Results and Discussion

Thirty four species of social wasps were recorded, belonging to ten genera with *Polybia fastidiosuscula* Saussure (1854) being the most common (Table 1). The present study is the first in the south of Minas Gerais and the great diversity of social wasps of the region is revealed in comparison with studies conducted in other areas of the state.

Elpino-Campos *et. al.* (2007) registered 29 species in 10 genera in Cerrado areas in Uberlândia. The work was conducted in the Ecological Reserve of the Clube de Caça e Pesca Itororó of Uberlândia (CCPIU) (640 ha.), in the Ecological Station of Panga (EEP) (400 ha.), on the Experimental Farm of Gloria, at the UFU (0,1 ha) and in a fragment of Cerrado within the urban perimeter (0,1 ha). Besides the smaller number of species this study was conducted in an area about seven times larger than that of the Reserva Biológica Unilavras/Boqueirão.

Prezoto and Clemente (2010) sampled 23 species distributed in 10 genera in the Parque Estadual do Ibitipoca (PEIB). PEIB possesses an area about ten times that of the present study. PEIB includes a fragment of Atlantic forest, a biome where one would expect to find a high diversity of organisms.

The largest number of species sampled in a single area occurred in the municipal district of Barroso, located in the south central part of the state, conducted in the Mata do Baú, within a 400 ha area (Souza and Prezoto 2006). Thirty eight species belonging to ten genera were recorded. Adding the species registered for the area of Barroso, the number of species reaches 42 distributed in 12 genera. Only studies in the Amazonian region have recorded higher species diversity than the Barroso survey, confirming its importance as an area of high diversity of social wasps in Brazil (Souza *et al.* 2008). The area studied in Barroso was twice as large as the area of the present study, confirming the great diversity of social wasps found in the Unilavras/Boqueirão Biological Reserve.

Table 1. Species of social wasps sampled in Unilavras/Boqueirão Biological Reserve.

SPECIES	ABUNDANCE (%)
Apoica (*Apoica*) *gelida* Van der Vecth, 1972	0.33
Brachygastra lecheguana (Latreille, 1824)	0.15
Mischocyttarus (*Haplometrobius*) *confusus* Zikan, 1935	0.09
Mischocyttarus (*Haplometrobius*) *tricolor* Richards, 1945	0.01
Mischocyttarus socialis (de Saussure, 1854)	0.01
Mischocyttarus (*Kappa*) *latior* (Fox, 1898)	0.24
Mischocyttarus (*Mischocyttarus*) *drewseni* de Saussure, 1954	0.42
Mischocyttarus (*Mischocyttarus*) *rotundicollis* (Cameron, 1912)	0.01
Mischocyttarus (*Monocyttarus*) *marginatus* (Fox, 1898)	0.06
Mischocyttarus (*Monocyttarus*) *cassununga* R. von Ihering, 1903	0.01
Parachartergus fraternus (Gribodo, 1892)	0.09
Polistes actaeon Haliday, 1836	0.03
Polistes billardieri Fabricius, 1804	0.15
Polistes cinerascens de Saussure, 1854	0.07
Polistes ferreri de Saussure, 1853	0.86
Polistes geminatus (Fox, 1898)	0.01
Polistes goeldii Ducke, 1904	0.01
Polistes lanio (Fabricius, 1775)	0.03
Polistes subsericeus de Saussure, 1854	0.11
Polistes versicolor (Olivier, 1791)	0.06
Polistes sp.	0.03
Polybia (*Apopolybia*) *jurinei* de Saussure, 1854	0.01
Polybia (*Hypopolybia*) *bifasciata* de Saussure, 1854	0.11
Polybia (*Myrapetra*) *fastidiosuscula* de Saussure, 1854	93.4
Polybia (*Myrapetra*) *occidentalis* (Olivier, 1791)	0.22
Polybia (*Myrapetra*) *paulista* H. von Ihering, 1896	0.03
Polybia (*Trichotorax*) *chrysothorax* (Lichtenstein, 1796)	0.21
Polybia (*Trichotorax*) *ignobilis* (Haliday, 1836)	0.61
Polybia (*Trichotorax*) *minarun* Ducke, 1906	0.01
Polybia (*Trichotorax*) *sericea* (Olivier, 1791)	2.2
Protonectarina sylveirae (de Saussure, 1854)	0.11
Protopolybia sedula (de Saussure, 1854)	0.15
Pseudopolybia vespiceps (de Saussure, 1864)	0.09
Synoeca cyanea (Fabricius, 1775)	0.07

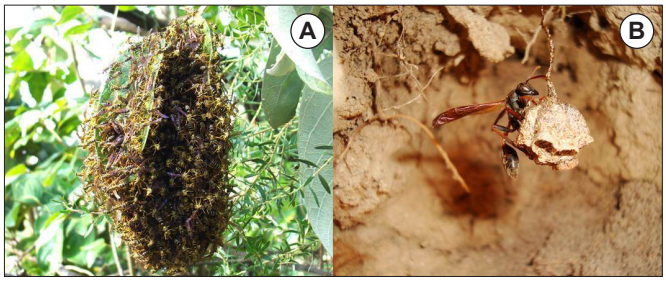

Figure 2. Types of the founding of colonies. A) Swarming wasp *Polybia fastidiosuscula;* B) independent founding wasp *Mischocyttarus drewseni*.

Description of species

***Apoica (Apoica) gelida* Van der Vecht, 1972** (Figure 3).
Common name: Marimbondo-branco, Marimbondo-queijo.
Distribution in Brazil: AM, GO, MG and MT.
Description: It has nocturnal habits, individuals are commonly found on balconies of residences, attracted by the light. Species are relatively large (around 2.5 cm) and very aggressive. The abdomen has pale yellow coloration and the thorax is brown with patches of the same color as the abdomen (Figures 3C and 3D). The nest has a shower-head form and there is no protecting envelope (Figure 3B). The individuals of the colony stay grouped which gives the colony a half-moon shape (Figure 3A). The common names are due to the coloration of the organisms and the form in which the individuals are organized in the nest.

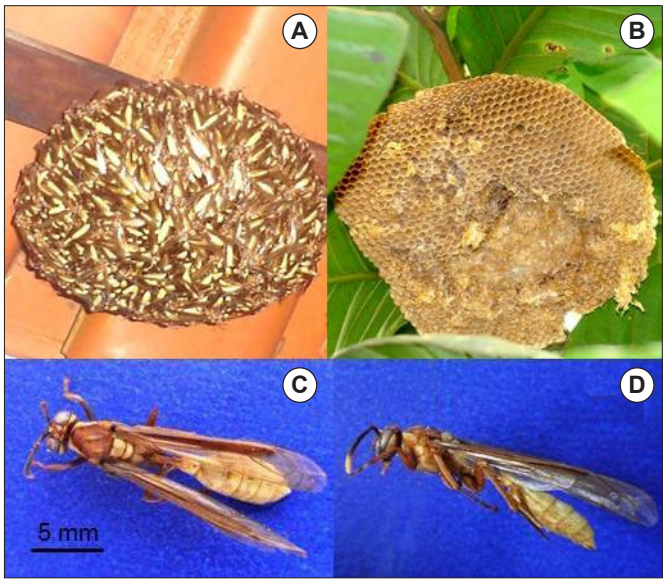

Figure 3. Nests (A and B) and specimen (B and C) of *Apoica* (*Apoica*) *gelida* Van der Vecth, 1972.

***Brachygastra lecheguana* (Latreille, 1824)** (Figure 4).
Common name: Marimbondo-do-campo, Marimbondo-do-pasto.
Distribution in Brazil: AM, BA, CE, ES, GO, MA, MG, MT, PA, PE, PR, RJ, RN, RR, RS, SC and SP.
Description: Black coloration, yellow striped abdomen, presenting yellow patches in the thorax and head (Figures 4B and 4C). The nest possesses a globular form and is built among the undergrowth, thus its common name (Figure 4A). Very aggressive species, and therefore care should be taken when walking or working in pastures.

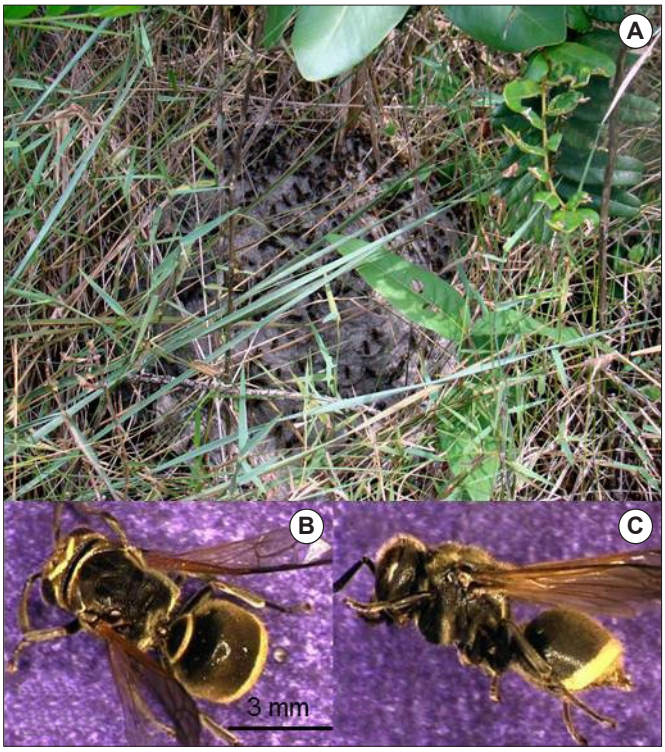

Figure 4. Nest (A) and specimen (B and C) of *Brachygastra lecheguana* (Latreille, 1824).

***Mischocyttarus (Haplometrobius) confusus* Zikan, 1935** (Figure 5).
Common name: Marimbondo-amarelo.
Distribution in Brazil: RJ and MG.
Description: It is the third record of this species for Minas Gerais, being the first in the area of Barroso and the second in the Parque Estadual do Ibitipoca. The nest does not possess a protecting envelope, like all the other species of the genus (Figure 5A). It presents many yellow patches on the body, thus its common name (Figures 5B and 5C). Although they do not use the stinger as a defense weapon, like the other species of the genus, when the individuals in the colony are threatened they exhibit the behavior of supporting and lifting the body on the third pair of legs (Souza *et al.* 2008).

***Mischocyttarus (Haplometrobius) tricolor* Richards, 1945** (Figure 6).
Common name: Marimbondo.
Distribution in Brazil: MT and MG.
Description: Very similar to the ***Mischocyttarus confusus***, having yellow as the predominant color, however it differs by the presence of orange patches, mainly on the abdomen (Figures 6A and 6B). Only one individual was collected during foraging activity and it was not possible to find the colony, indicating that it is rare in the study area.

***Mischocyttarus (Kappa) socialis* (de Saussure, 1854)** (Figure 7).
Common name: Marimbondo.
Distribution in Brazil: MG, MT, RJ, SC and SP.
Description: Black colored species with white-tipped forewings (Figures 7B and 7C) being very similar to the *Parachartergus fraternus*. Several nests of that species were found in a construction site near the collection sites

(Figure 7A) and none in the natural environment. This demonstrates that construction sites can be hospitable for the species, offering protection from predators and/or bad weather.

***Mischocyttarus (Kappa) latior* (Fox, 1898)** (Figure 8).
Common name: Marimbondo.
Distribution in Brazil: MG, MT and SP.
Description: Black colored species with white-tipped forewings similar to the *Polybia ignobilis* (Figures 8A and 8B). Only one individual was found foraging and it was not possible to find its colony, indicating a rare species in the study area.

***Mischocyttarus (Mischocyttarus) drewseni* de Saussure, 1954** (Figure 9).
Common name: Marimbondo-cintura-fina.
Distribution in Brazil: BA, ES, GO, MG, MT, PA, PR, RJ, RS, SC and SP.
Description: Its common name is due to the first abdominal segment being much longer than wide. They build their nests suspended by a stalk in rocky cavities and ravines (Figure 9A). It presents a rusty coloration over the whole body and it does not possess evident patches (Figures 9B and 9C). A colony was found when only the founder was present and was accompanied until it was abandoned. The number of individuals reached 13 and the colony stayed active for about five months.

Figure 5. Nest (A) and specimen (B and C) of *Mischocyttarus* (*Haplometrobius*) *confusus* Zikan, 1935.

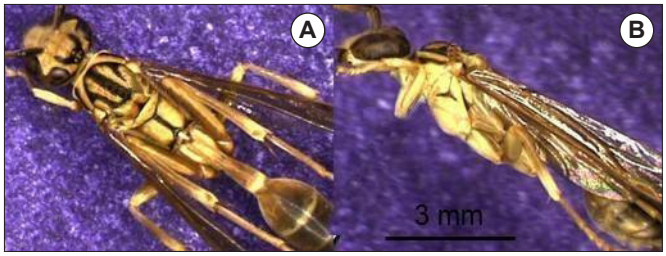

Figure 6. Specimen of *Mischocyttarus* (*Haplometrobius*) *tricolor* Richards, 1945.

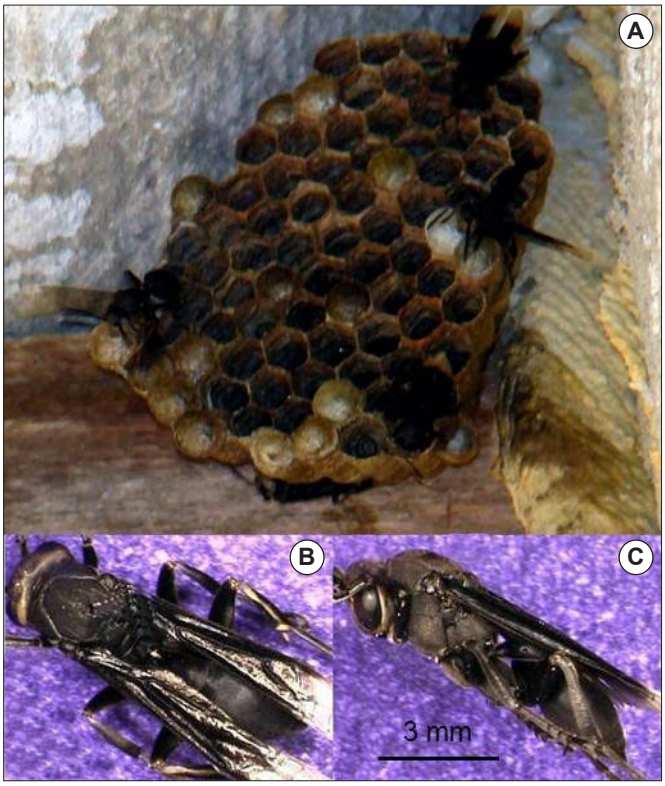

Figure 7. Nest (A) and specimen (B and C) of *Mischocyttarus* (*Kappa*) *socialis* (de Saussure, 1854).

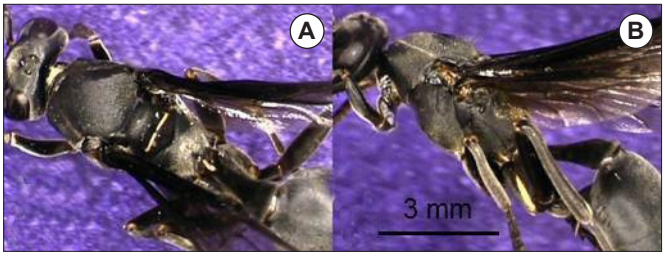

Figure 8. Specimen of *Mischocyttarus* (*Kappa*) *latior* (Fox, 1898).

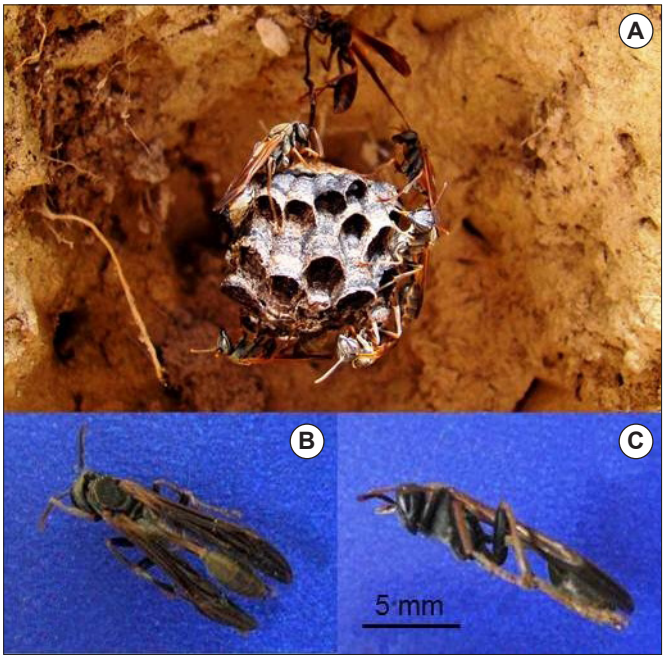

Figure 9. Nest (A) and specimen (B e C) of *Mischocyttarus* (*Mischocyttarus*) *drewseni* de Saussure, 1954.

***Mischocyttarus (Mischocyttarus) rotundicollis* (Cameron, 1912)** (Figure 10).
Common name: Marimbondo-cintura-fina.
Distribution in Brazil: AM, BA, ES, GO, MG, MT, PA, PR, RJ, RS, SC and SP.
Description: Very similar to the *Mischocyttarus drewseni* (Figures 10A and 10B) being distinguished by the presence of lateral bristles in the first abdominal segment of *M. rotundicollis* using a stereoscopic microscope (Souza *et al.* 2008). No colony of this species was found in the study area.

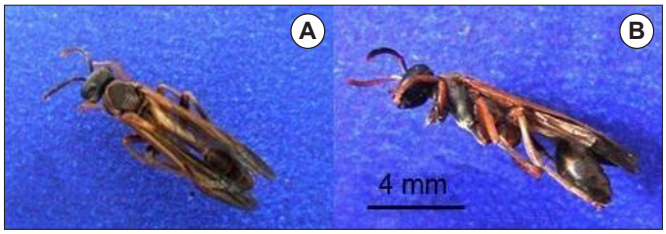

Figure 10. Nest (A) and specimen (B e C) of *Mischocyttarus* (*Mischocyttarus*) *rotundicollis* (Cameron, 1912).

***Mischocyttarus (Monocyttarus) marginatus* (Fox, 1898)** (Figure 11).
Common name: Marimbondo
Distribution in Brazil: GO, MG, MT, RJ, and SP.
Description: It has a golden coloration (Figures 11A and 11B) similar to *Polybia sericea* and *Polybia chrysothorax*, however it is possible to distinguish them by the first abdominal segment being longer than wide, asymmetric tarsi and two yellow strips on the back of the metathorax in *M. marginatus.* Only one individual was captured and it was not possible to find the colony, indicating we are dealing with a rare species in the study area.

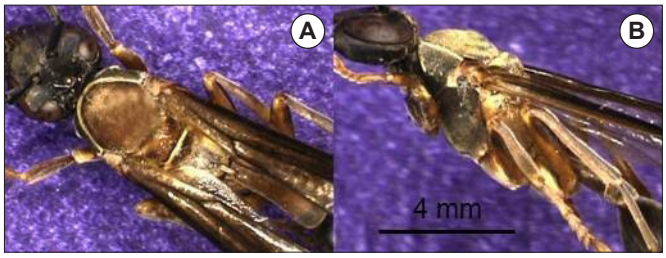

Figure 11. Nest (A) and specimen (B e C) of *Mischocyttarus* (*Mischocyttarus*) *marginatus* (Fox, 1898).

***Mischocyttarus (Monocyttarus) cassununga* (R. von Ihering, 1903)** (Figure 12).
Common name: Marimbondo-da-casa, Marimbondo-caseiro.
Distribution in Brazil: BA, ES, MG, RJ, RS, SC and SP.
Description: Very common in urban areas, they build their nests in construction sites. In the natural environment the nests of this species are common in branches of herbaceous plants (Figure 12A) and on the abaxial part of leaves (Figure 12B), and differences are apparent between nests established on the leaf and on the branch. When built on the abaxial part of the leaf, the nest is larger in diameter, while the nests constructed on the branch are longer. Nests built in cavities in ravines were also observed. The species possesses brown coloration with yellow stripes on the abdomen (Figures 12C and 12D).

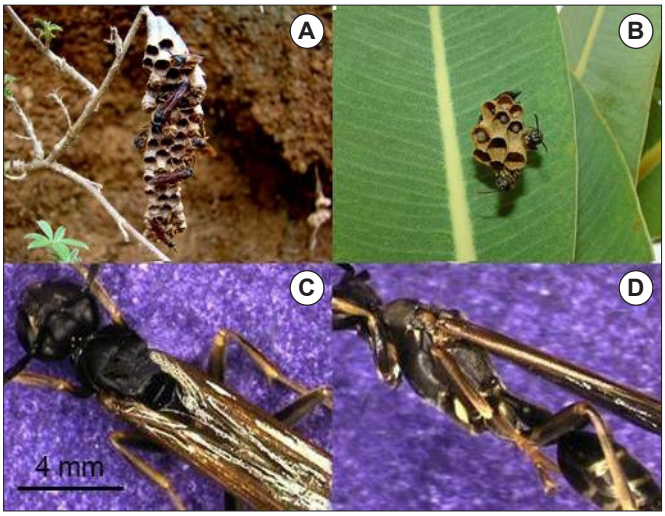

Figure 12. Nest (A) and specimen (B e C) of *Mischocyttarus* (*Mischocyttarus*) *cassununga* R. von Ihering, 1903.

***Parachartergus fraternus* (Gribodo, 1892)** (Figure 13).
Common name: Marimbondo-chiador, Marimbondo-cuspidor.
Distribution in Brazil: AM, GO, MA, MG, MT and PR.
Description: Their common names are due to the behavior of scraping the abdomen in the nest when they are threatened and they can throw their venom by the stinger (Souza *et al.* 2008). Its nest possesses a protecting envelope with the opening located in the lower part (Figure 13A). It has black coloration with white-tipped forewings (Figures 13B and 13C), similar to the *Mischocyttarus socialis*, however it is more aggressive.

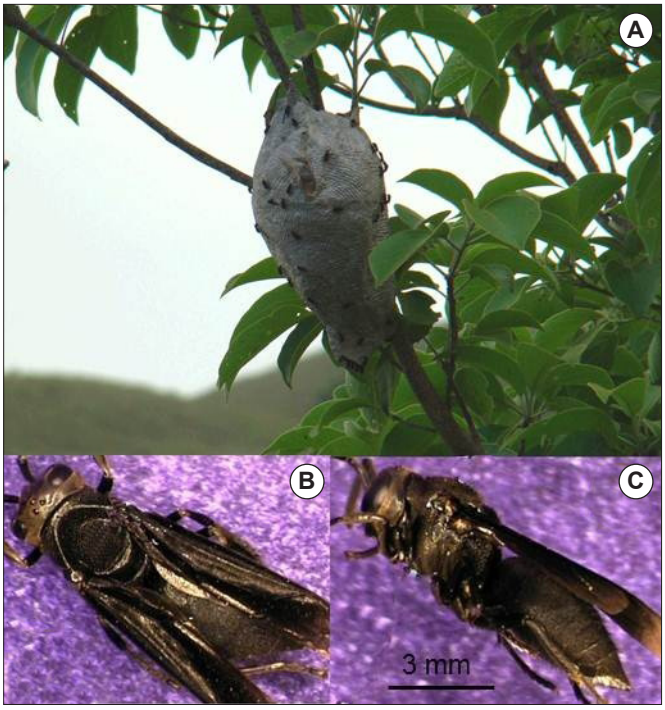

Figure 13. Nest (A) and specimen (B and C) of *Parachartergus fraternus* (Gribodo, 1892).

***Polistes actaeon* Haliday, 1836** (Figure 14).
Common name: Marimbondo
Distribution in Brazil: ES, MG, RJ, RS, SC and SP.
Description: This species, as all members of the genus, possess nests without a protective envelope and form

small colonies that rarely go beyond ten individuals (Figure 14A). It possesses black coloration with two yellow stripes on the thorax and they can present yellow patches on the clypeus (Figures 14B and 14C).

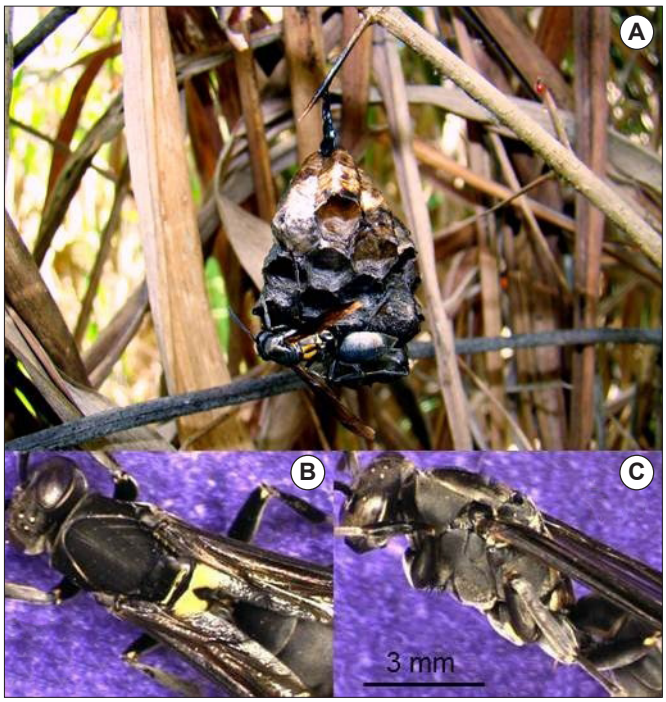

Figure 14. Nest (A) and specimen (B and C) of *Polistes actaeon* Haliday, 1836.

***Polistes billardieri* Fabricius, 1804** (Figure 15).
Common name: Marimbondo-arco-íris.
Distribution in Brazil: GO, MG, MT, PR, RS and SP.
Description: Its antenna is orange and the body possesses a wide color variation, thus its common name (Figures 15A and 15B). No colony of this species was found in the area, however several individuals were captured during the research, being captured only by active search and passion fruit juice trap, indicating higher use of carbohydrate based resources.

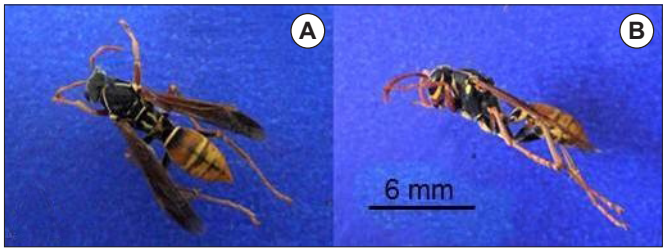

Figure 15. Nest (A) and specimen (B and C) of *Polistes billardieri* Fabricius, 1804.

***Polistes cinerascens* de Saussure, 1854** (Figure 16).
Common name: Marimbondo-cara-amarela.
Distribution in Brazil: AL, BA, ES, GO, MG, MT, PR, RJ, RS, SC and SP.
Description: It possesses dark coloration with stripes and yellow marks on the body (Figures 16C and 16D). Its clypeus is all yellow, thus the common name (Figure 16B). When threatened they exhibit the behavior of supporting themselves on the third pair of legs and lifting the body (Figure 16A). That behavior was already seen in other species and related by other authors (Souza *et al*. 2008).

Figure 16. Nest showing the behavior of supporting on the third pair of legs and raising the body (A) and specimen (B, C and D) of *Polistes cinerascens* de Saussure, 1854 showing the yellow clypeus (C).

***Polistes ferreri* de Saussure, 1853** (Figura 17).
Common name: Marimbondo-cavalo.
Distribution in Brazil: BA, DF, MG, MT, PR, RS and SP.
Description: It is among the largest Polistinae found (around 2.5 cm) and possesses a rusty coloration (Figures 17B and 17C). It is a very aggressive species. The nest does not possess a protecting envelope (Figure 17A). This species is quite common in the study area and a preference for carbohydrate diet is noticed, because more were found in the passion fruit juice bait traps. Andrade and Prezoto (2001) observed the preference of that species for nectar collection during foraging.

***Polistes geminatus* Fox, 1898** (Figure 18).
Common name: Marimbondo.
Distribution in Brazil: MG and MT.
Description: This wasp possesses brownish coloration with many stripes and yellow marks on the body, mainly on the back of the thorax (Figures 18A and 18B). A single specimen was found foraging in the study area and it was not possible to locate the colony, indicating it is a rare species in the study area.

***Polistes goeldii* Ducke, 1904** (Figure 19).
Common name: Marimbondo.
Distribution in Brazil: AM, MG and PA.
Description: This species possesses a black coloration very similar to the *Synoeca cyanea* (Figures), including the red clypeus (Figure 19A). The nest, as well as the other species de *Polistes*, does not possess a protecting envelope (Figure 19B and 19C). There was only record of this species in the Amazonian region, but was recorded by the researcher Marcos Magalhães de Souza for the region of Barroso, Minas Gerais (personal communication). This is the second record for the state.

***Polistes lanio* (Fabricius, 1775)** (Figure 20).
Common name: Marimbondo
Distribution in Brazil: AC, AM, AP, BA, ES, GO, MG, PA, PR, RJ, RO, RS, and SP.
Description: Species of rusty coloration similar to *Polistes*

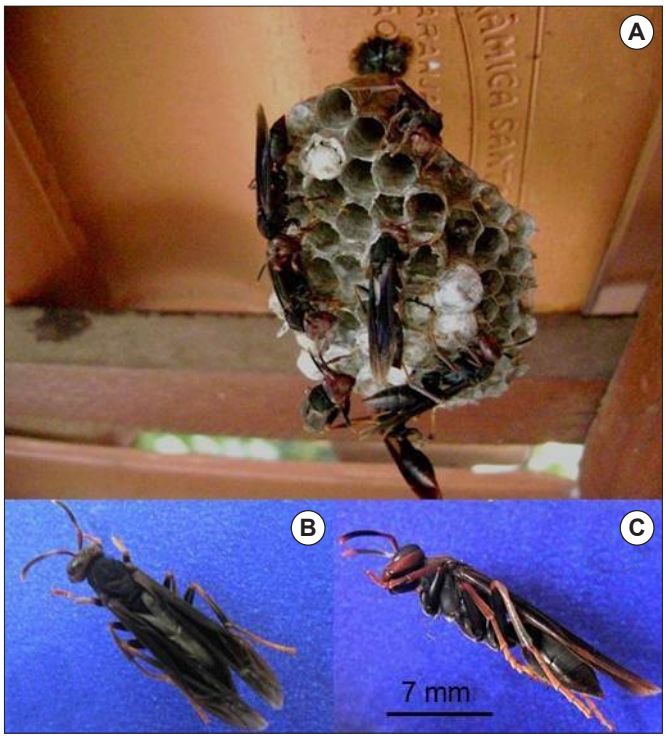

Figure 17. Nest (A) and specimen (B and C) of *Polistes ferreri* de Saussure, 1853.

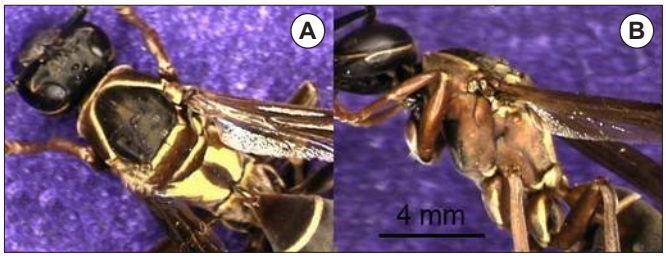

Figure 18. Specimen of *Polistes geminatus* (Fox, 1898).

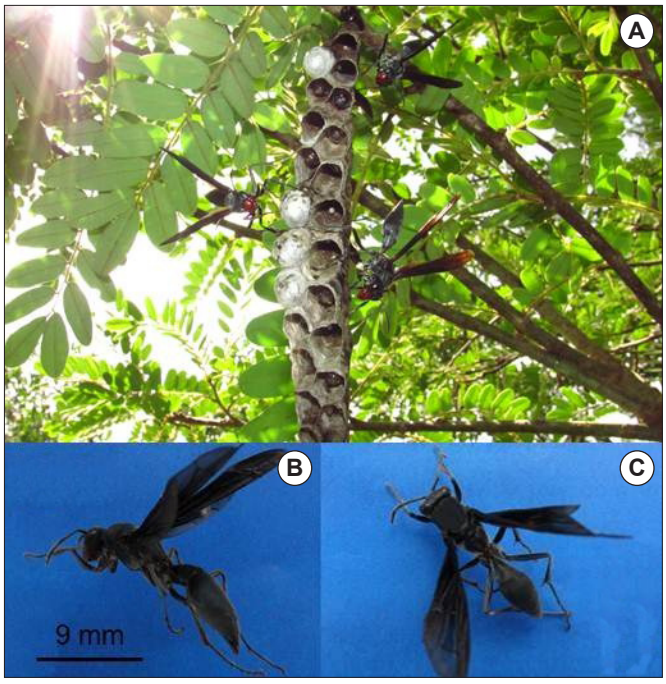

Figure 19. Nest (A) and specimen (B and C) of *Polistes goeldii* Ducke, 1904.

ferreri (Figures 20A and 20B). Only two specimens of this species were found during the research and it was not possible to locate the colony. In spite of most of the material collected by this wasp being made up of nectar, studies show that it can be a potential biological control agents for insects that cause economic damage to agriculture (Giannotti *et al.* 1995).

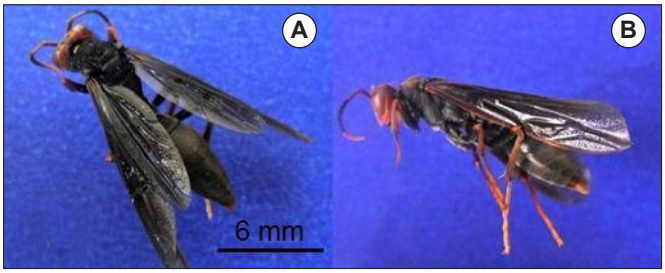

Figure 20. Specimen of *Polistes lanio* (Fabricius, 1775).

***Polistes subsericeus* de Saussure, 1854** (Figure 21).
Common name: Marimbondo.
Distribution in Brazil: AM, AP, BA, MG, MT, PA, RJ, and SP.
Description: This species has a slightly golden coloration (Figures 21A and 21B), being easily confused with *Polybia sericea* and *Polybia chrysothorax*. They can be distinguished by observing the first abdominal segment. It is conical in P. *subsericeus,* with a yellow stripe at the division with the second segment. In spite of it being common to find individuals of this species foraging in the underbrush, no colony was located in the open field.

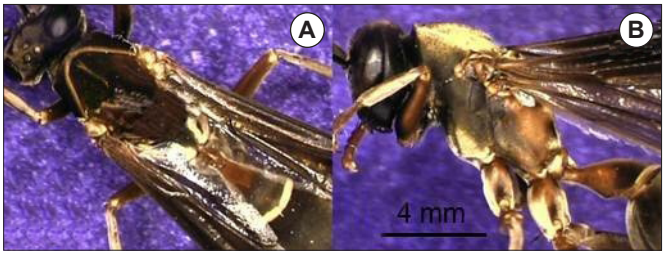

Figure 21. Specimen of *Polistes subsericeus* de Saussure, 1854

***Polistes versicolor* (Olivier, 1791)** (Figure 22).
Common name: Marimbondo-cavalo.
Distribution in Brazil: AC, AM, AP, DF, ES, GO, MA, MG, MT, PA, PR, RJ, RS, SC and SP.
Description: A very common species in urban areas and plantations as it is a predator of some caterpillar species considered agricultural pests. The nest does not possess a protecting envelope (Figure 22A). This wasp possesses rusty coloration with many yellow marks (Figures 22B and 22C), different from *Polistes ferreri* and *Polistes lanio*. It is very aggressive and when the individuals of the colony are threatened they lift the wings adopting an "alert position."

***Polistes* sp.** (Figure 23).
Description: It was not possible to identify this species. It possesses coloration very similar to the *Polistes cinerascens* species, the marimbondo-cara-amarela, however it does not possess the yellow clypeus (Figures 23A and 23B).

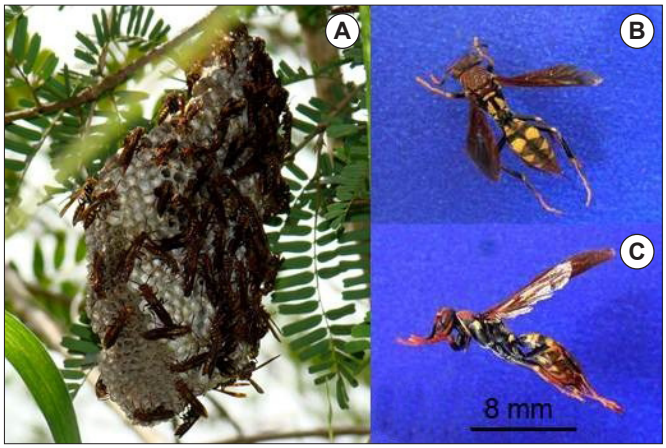

Figure 22. Nest (A) and specimen (B and C) of *Polistes versicolor* (Olivier, 1791).

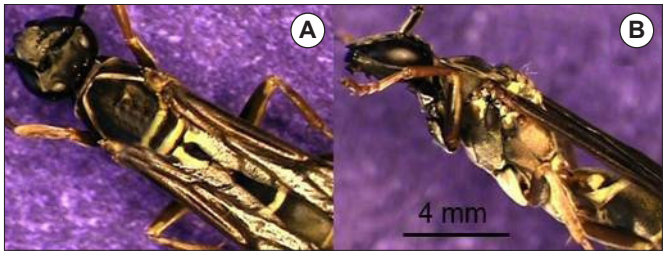

Figure 23. Specimen of *Polistes* sp.

***Polybia (Apopolybia) jurinei* de Saussure, 1854** (Figure 24).
Common name: Marimbondo.
Distribution in Brazil: AC, AM, AP, BA, CE, ES, GO, MG, MT, PA, RJ, RO and SP.
Description: Possesses black coloration with two transverse yellow stripes on the back of the thorax similar to the *Polybia paulista* (Figure 24). A single specimen was collected in the study area and it was not possible to locate the colony, indicating a rare species in the study region.

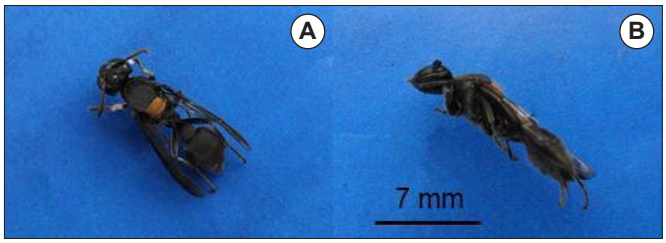

Figure 24. Specimen of *Polybia* (*Apopolybia*) *jurinei* de Saussure, 1854.

***Polybia (Hypopolybia) bifasciata* de Saussure, 1854** (Figure 25).
Common name: Marimbondo.
Distribution in Brazil: AC, AM, ES, GO, MG, MT, PA, PR, RJ, and SP.
Description: No colony of this species was located, however a swarm was found on a leaf, possibly in search of a place to nest (Figure 25A). It presents black coloration, having a thin yellow stripe on the back of the thorax (Figures 25B and 25C).

***Polybia (Myrapetra) fastidiosuscula* de Saussure, 1854** (Figure 26).
Common name: Marimbondo.
Distribution in Brazil: BA, DF, ES, GO, MG, MT, PR, RJ, RS, SC and SP.
Description: This species is polymorphic, presenting at least three variations. In the present work P1, P2 and P3 will be described. The variation P1 possesses brown coloration with yellow stripes on the ventral area of the abdomen (Figures 26B and 26C). P2 is similar to P1, however it presents two longitudinal yellow stripes on the back of the thorax (Figures 26A and 26F). P3 possesses many yellow patches and stripes on the body (Figures 26H and 26I). The P1 variation is very similar to the *Mischocyttarus cassununga* and P3 to *Mischocyttarus confusus*. The nests of P1 (Figure 26A), P2 (Figure 26D) and P3 (Figure 26G) are elaborated without any stalk and possess a protecting envelope.

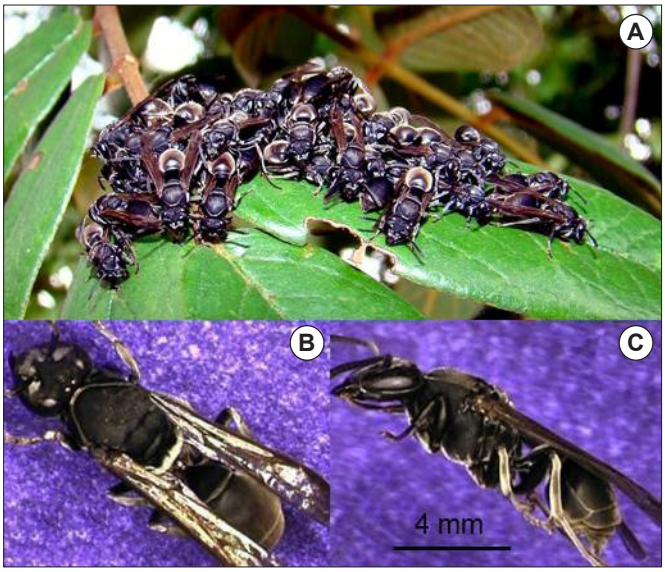

Figure 25. Swarm (A) and specimen (B and C) of *Polybia* (*Hypopolybia*) *bifasciata* de Saussure, 1854.

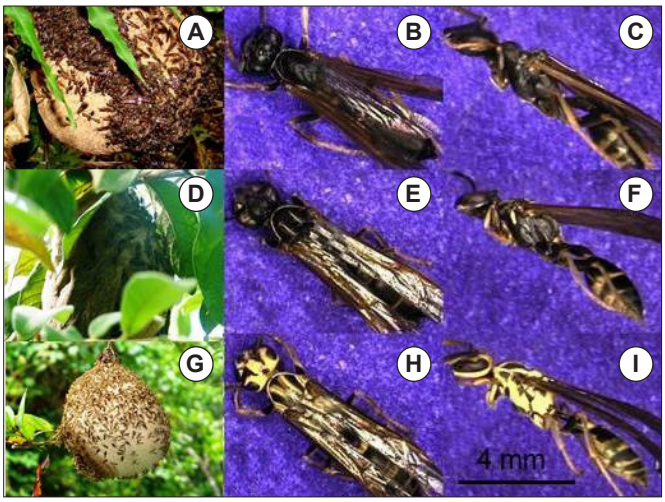

Figure 26. Nests (A, D and G) and specimen (B, C, E, F, H and I) of *Polybia* (*Myrapetra*) *fastidiosuscula* de Saussure, 1854.

***Polybia (Myrapetra) occidentalis* (Olivier, 1791)** (Figure 27).
Common name: Marimbondo-estrela.
Distribution in Brazil: AM, BA, CE, DF, ES, GO, MA, MG, MT, PA, PB, PE, PR, RJ, RN, RO, RR, RS and SP.
Description: A species of black coloration with several yellow marks and stripes on the body (Figures 27B and 27C). A single colony was found in the study area, located close to the soil, near the side of a highway, close to the

embankment (Figure 27A). The nest is hidden, being difficult to differentiate from the embankment. This suggests that this species uses mud in the construction of their nests.

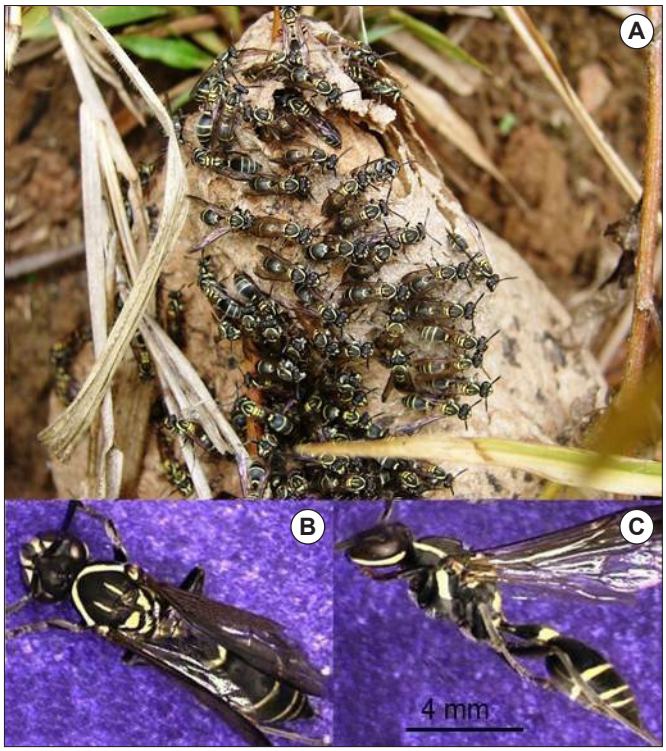

Figure 27. Nest (A) and specimen (B and C) of *Polybia* (*Myrapetra*) *occidentalis* (Olivier, 1791).

***Polybia (Myrapetra) paulista* H. von Ihering, 1896** (Figure 28).
Common name: Marimbondo-chumbinho.
Distribution in Brazil: GO, MG, MT, PR and SP.
Description: A relatively small species (usually smaller than 1.0cm), of black coloration, hence its common name. It possesses two transverse yellow stripes on the back of the thorax (Figures 28B and 28C). The nest is usually in a bell shape (Figure 28A). *Polybia paulista* is very aggressive and the sting is painful. It is possible to observe a fusion of the nests of this species (Prezoto and Santos-Prezoto 2005).

***Polybia (Trichotorax) chrysothorax* (Lichtenstein, 1796)** (Figure 29).
Common name: Marimbondo-dourado.
Distribution in Brazil: BA, CE, ES, GO, MA, MG, MT, PA, PR, RN and SP.
Description: This species does not use the stinger in the defense of its colonies. The specific epithet comes from the gold coloration of the thorax (Figures 29A and 29B). With the naked eye it is confused with *Polybia sericea*, having red first and second abdominal segments as a difference. Under a stereoscopic microscope they can be distinguished by the presence of bristles on the compound eyes of *P. sericea* and their absence on *P. chrysothorax.*

***Polybia (Trichotorax) ignobilis* (Haliday, 1836)** (Figure 30).
Common name: Marimbondo-do-chão.
Distribution in Brazil: AM, CE, DF, ES, GO, MA, MG, MT, PA, PB, PE, PR, RJ, RN, RO, RR, RS, SC and SP.
Description: The common name is derived from the fact that this species builds their nests on the soil. It possesses black coloration and white tipped hind wings (Figures 30A and 30B). It is common to find this species foraging near animal feces and carcasses under decomposition, because necrophagous flies are a part of their proteic diet. They are an aggressive species that hinders the approach to their colonies.

***Polybia (Trichotorax) minarun* Ducke, 1906** (Figure 31).
Common name: Marimbondo.
Distribution in Brazil: BA, MG, PR, RJ, RS, SC and SP.
Description: This species possesses brown coloration

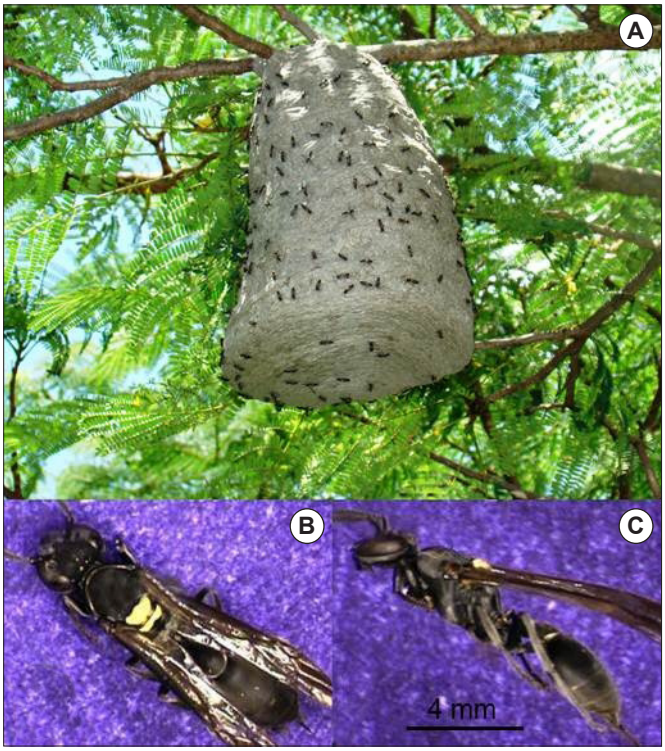

Figure 28. Nest (A) and specimen (B and C) of *Polybia* (*Myrapetra*) *paulista* H. von Ihering, 1896.

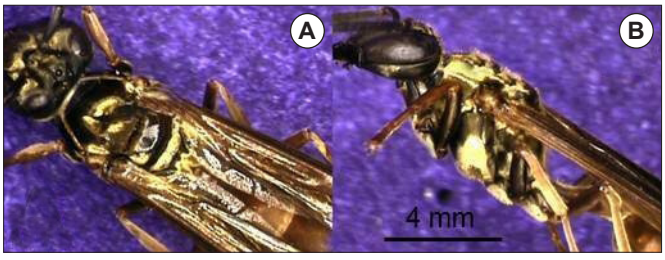

Figure 29. Specimen of *Polybia* (*Trichotorax*) *chrysothorax* (Lichtenstein, 1796).

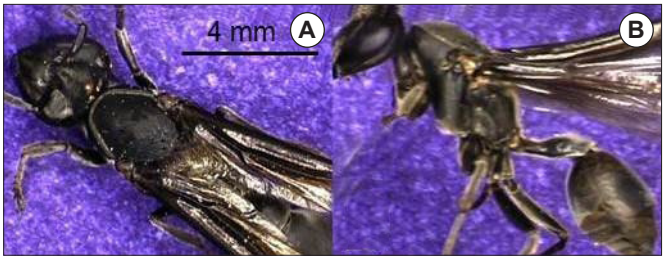

Figure 30. Specimen of *Polybia* (*Trichotorax*) *ignobilis* (Haliday, 1836).

with yellowish stripes on the abdomen (Figures 31A and 31B). According to Souza *et al.* (2008) they nest in banks near streams. The nest possesses coloration similar to the surroundings, hindering sightings. Only one specimen of this species was found in the Riparian Forest of the research area and the colony was not located, indicating it is a rare species in the area.

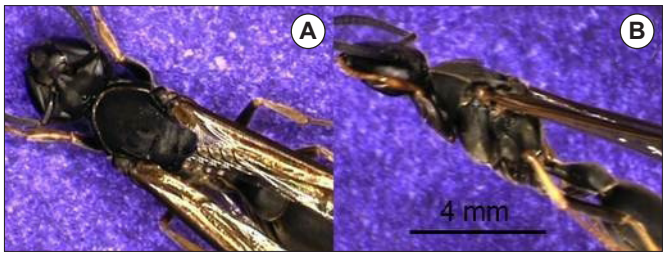

Figure 31. Specimen of *Polybia* (*Trichotorax*) *minarun* Ducke, 1906.

***Polybia (Trichotorax) sericea* (Olivier, 1791)** (Figure 32).
Common name: Marimbondo-zumbidor, Marimbondo-dourado.
Distribution in Brazil: AM, AL, BA, CE, DF, ES, GO, MA, MG, MT, PA, PB, PR, RJ, RN, RO, RR, RS, SC and SP.
Description: This wasp exhibits a gold coloration (Figures 32C and 32D), similar to the *Polybia chrysothorax*, however it is very aggressive. It builds nests in the undergrowth (Figure 32A) and in holes of abandoned termite mounds (Figure 32B). When threatened they vibrate their wings producing a buzzing that gives them one of their the common names. Abundant locally, it was possible to locate several colonies in the undergrowth and in abandoned termite mounds.

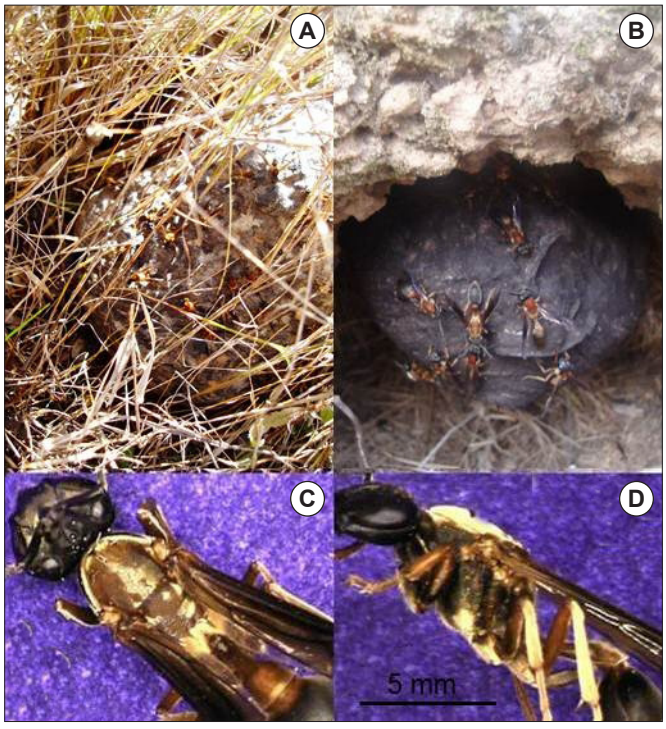

Figure 32. Nest (A and B) and specimen (C and D) of *Polybia* (*Trichotorax*) *sericea* (Olivier, 1791).

***Protonectarina sylveirae* (de Saussure, 1854)** (Figure 33).
Common name: Marimbondo-chumbinho.
Distribution in Brazil: BA, CE, ES, GO, MG, MT, PR, RJ, RS, SC and SP.
Description: The only species described for the genus, *Protonectarina sylveirae* possesses a small size (smaller than 1.0 cm), however very aggressive and the sting is painful. It has black coloration with many yellow marks and stripes on the body (Figures 33B and 33C). They build the nest in a globular manner, among tree branches (Figure 33A).

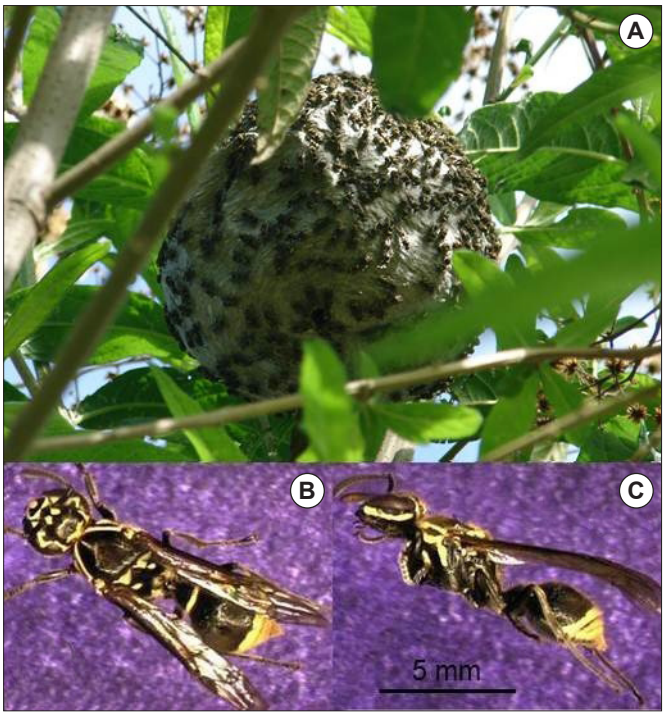

Figure 33. Nest (A) and specimen (B and C) of *Protonectarina sylveirae* (de Saussure, 1854).

***Protopolybia sedula* (de Saussure, 1854)** (Figure 34).
Common name: Marimbondo-chumbinho.
Distribution in Brazil: BA, ES, GO, MA, MG, MT, RJ, SC and SP.
Common name: This species has black coloration with several yellow marks and stripes on the body (Figures 34B and 34C), similar to the *Polybia occidentalis*, however of smaller size (around 0.5cm), being among the smallest Polistinae. It builds nests among the branches and leaves of trees and many times leaves are part of the construction (Figure 34A).

***Pseudopolybia vespiceps* (de Saussure, 1864)** (Figure 35).
Common name: Marimbondo.
Distribution in Brazil: BA, ES, GO, MG, RJ and SP.
Description: A species of brownish coloration with many yellow stripes and marks on the whole body (Figures 35B and 35C). It constructs nests among branches and leaves of trees. A characteristic observed in the nests of *P. vespiceps*

is that the protecting envelope is not flat and possesses structures similar to scales (Figure 35A). *P. vespiceps* deserve attention as it possibly returns to abandoned nests for collection of previously used construction material, and it may be an indicator of the lack of human disturbance (Souza *et al.* 2010b).

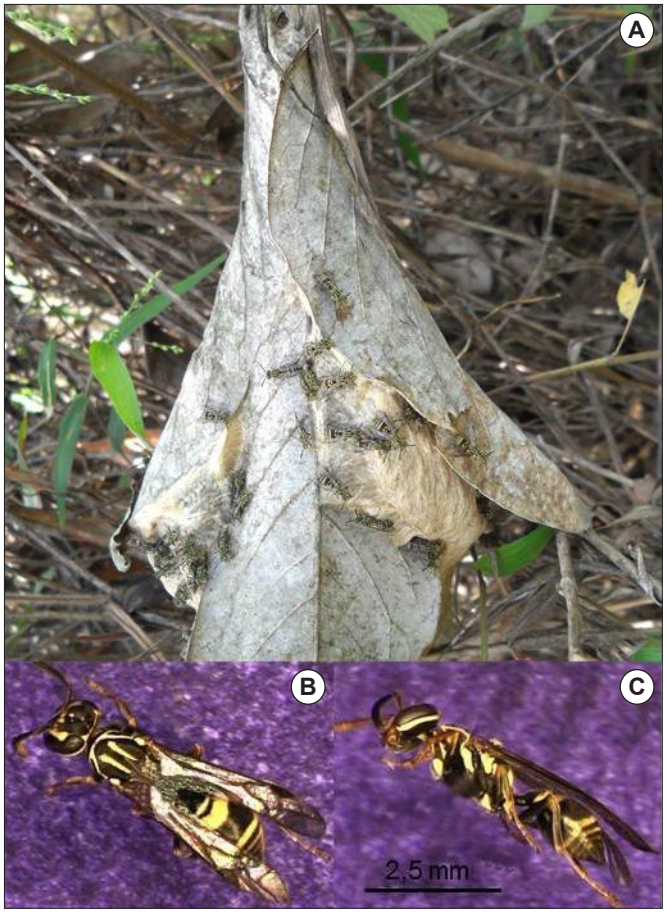

Figure 34. Nest (A) and specimen (B and C) of *Protopolybia sedula* (de Saussure, 1854).

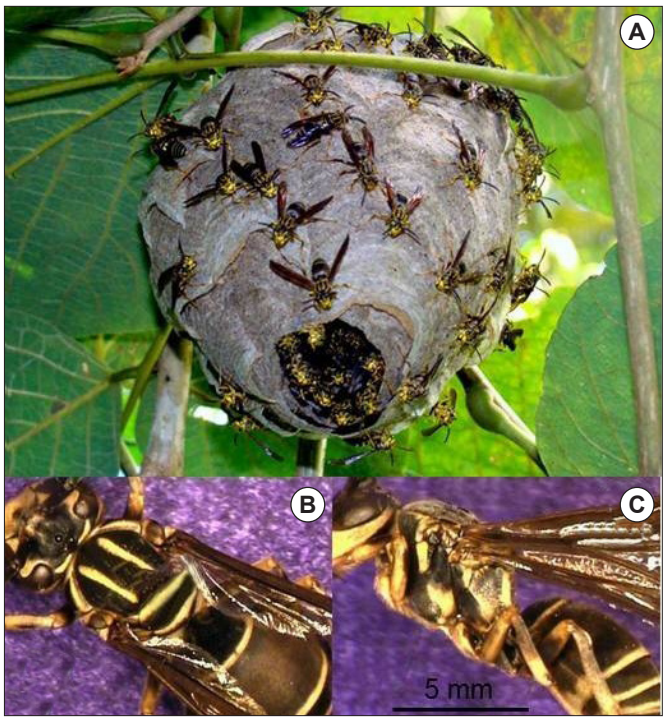

Figure 35. Nest (A) and specimen (B and C) of *Protopolybia vespiceps* (de Saussure, 1864).

***Synoeca cyanea* (Fabricius, 1775)** (Figure 36).
Common name: Marimbondo-tatu.
Distribution in Brazil: BA, ES, MG, MT, PE, RJ, RS, SC and SP.
Description: Black with metallic blue patches on the body (Figures 36C and 36D) and a red clypeus (Figure 36B). It is among the largest species of social wasps and is quite aggressive, being much feared in rural communities. The common name of this species is due to the format of its nest, built directly on the substrate. The protecting envelope presents an architecture and form similar to an armadillo shell (Figure 36A).
nests.

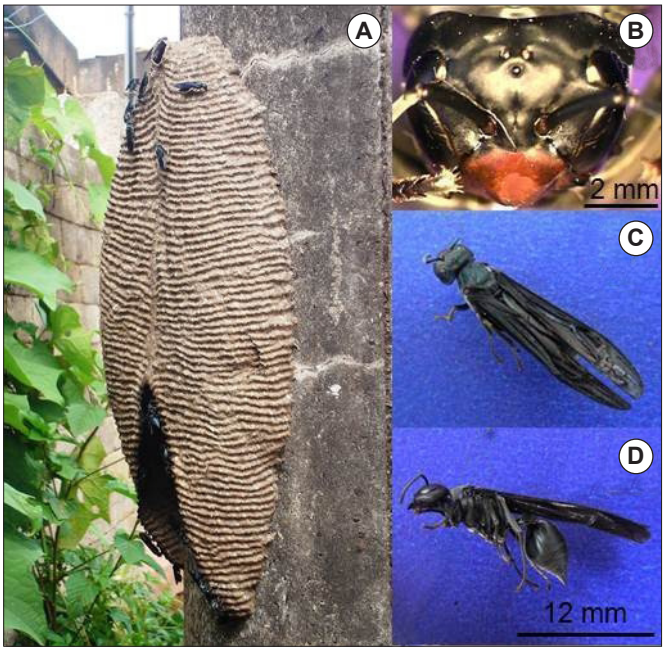

Figure 36. Nest (A) and specimen (B and C) of *Synoeca cyanea* (Fabricius, 1775).

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