

MARCO PAULO MACEDO GUIMARÃES

COMPENDIUM OF NEOTROPICAL TERMITE GENERA: MORPHOLOGY AND
ECOLOGY DATABASE, ONTOLOGY AND APPLICABILITY

Tese apresentada à Universidade Federal de Viçosa, como parte das exigências do Programa de Pós-Graduação em Entomologia, para obtenção do título de *Doctor Scientiae*.

Orientador: Og Francisco Fonseca de Souza

Coorientadora: Gladys Julieth Castiblanco Quiroga

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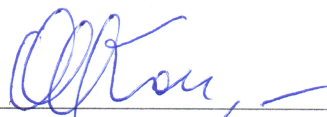
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Assentimento:



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Orientador

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Para Marcelo, Marilda, Nívia e Gael.

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Resumo

GUIMARÃES, Marco Paulo Macedo, D.Sc., Universidade Federal de Viçosa, agosto de 2022. **Compendium of Neotropical Termite Genera: morphology and ecology database, ontology and applicability**. Orientador: Og Francisco Fonseca de Souza. Coorientadora: Gladys Julieth Castiblanco Quiroga.

Os bancos de dados biológicos são ferramentas fundamentais para a pesquisa moderna, oferecendo uma ampla gama de dados relevantes. Nas últimas duas décadas, a explosão de dados interconectados estimulou o desenvolvimento e a adoção de tecnologias de banco de dados. Aqui propomos o primeiro modelo de banco de dados de morfologia e ecologia de cupins, acoplado a uma ontologia padrão, e aplicamos o banco de dados em um estudo específico. Com o banco de dados, foi possível extrair informações sobre a morfologia e ecologia interna e externa dos 108 gêneros que ocorrem na região Neotropical. Também criamos um modelo de ontologia baseado na morfologia interna e externa dos cupins para apoiar a integração entre bancos de dados. Além disso, mostramos que é possível aplicar o banco de dados para extrair informações que podem ser utilizadas em um estudo específico.

Palavras-chave: Isoptera. Catálogo. Grafo. Entomologia.

Abstract

GUIMARÃES, Marco Paulo Macedo, D.Sc., Universidade Federal de Viçosa, August, 2022. **Compendium of Neotropical Termite Genera: morphology and ecology database, ontology and applicability.** Advisor: Og Francisco Fonseca de Souza. Co-advisor: Gladys Julieth Castiblanco Quiroga.

Biological databases are fundamental tools for modern research, offering a wide range of relevant data. Over the past two decades, the explosion of interconnected data has spurred the development and adoption of database technologies. Here we propose the first termite morphology and ecology database model, coupled with a standard ontology, and apply the database in a specific study. With the database, it was possible to extract information about the internal and external morphology and ecology of the 108 genera that occur in the Neotropical region. We also created an ontology model based on the internal and external morphology of termites to support the integration between databases. Furthermore, we show that it is possible to apply the database to extract information that can be used in a specific study.

Keywords: Isoptera. Catalogue. Graph. Entomology.

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Chapter 1

Introdução geral

Nos últimos anos, houve uma explosão na quantidade de dados biológicos disponíveis. O grande volume de informações dispersas tornaram a produção de compilações cada vez mais difíceis de serem produzidas. Além disso, existe a necessidade crescente de conectar uma coleção de informação a outra. Os bancos de dados e ontologias são uma solução moderna para o armazenamento e conexão de grande volume de informações de um determinado tema. Em ciências naturais existem poucos modelos de bancos de dados e ontologias, principalmente aqueles que englobam biologia, ecologia e morfologia dos grupos de seres vivos. Neste trabalho propomos um banco de dados biológicos e uma ontologia sobre morfologia para os cupins neotropicais.

Os bancos de dados biológicos oferecem aos pesquisadores a oportunidade de acessar uma ampla variedade de dados cientificamente relevantes, incluindo sequências genômicas e interações entre indivíduos de uma variedade cada vez mais ampla de organismos (Baxevanis & Bateman, 2015). Mas até agora sua integração se mostrou problemática (Stein, 2003). A integração entre bancos de dados pode ser facilitada através de ontologias. A existência de uma ontologia compartilhada permite a integração entre dois bancos de dados com alguma garantia de que um termo usado em um banco de dados corresponda ao mesmo termo usado no outro (Stevens *et al.*, 2000).

Assim como em outros grupos de insetos (Stucky *et al.*, 2019; Sachs *et al.*, 2019),

os dados de história natural dos cupins encontram-se dispersos em diversas fontes. Atualmente, existem 2.977 espécies de cupins descritas no mundo, pertencentes a 303 gêneros e nove famílias. Na região neotropical, existem atualmente 615 espécies, que estão distribuídas em 108 gêneros e cinco famílias (Constantino, 2016). Além disso, este grupo apresenta uma diversidade de hábitos alimentares (Donovan *et al.*, 2001), de nidificação (Noirot, 1970) e de morfologia (Krishna *et al.*, 2013) e são fundamentais para a fertilidade do solo (Wood, 1978). No entanto, em alguns casos os cupins são considerados pragas (Krishna *et al.*, 2013). Isso faz com que os cupins sejam tratados como um importante grupo de insetos para testar hipóteses nos mais variados campos do conhecimento. Aqui apresentamos o primeiro banco de dados morfológicos e biológicos de cupins neotropicais.

O objetivo desta tese foi produzir um modelo de banco de dados de morfologia e ecologia de cupins, acoplado a uma ontologia padrão, e aplicar o banco de dados em um estudo específico. O assunto foi abordado em quatro capítulos:

- O primeiro capítulo é uma introdução geral.
- No segundo capítulo descrevemos como foi feito o modelo do banco de dados de morfologia e ecologia dos gêneros de cupins neotropicais.
- No terceiro capítulo propomos a ontologia da morfologia interna e externa dos gêneros de cupins neotropicais.
- No quarto capítulo verificamos os efeitos da construção de ninho no mecanismo defesa ao longo do tempo e adaptação da mandíbula para a construção de ninho em uma espécie de cupim. Neste capítulo extraímos do banco de dados as informações que permitiam analisar a probabilidade da adaptação da mandíbula dos operários para a construção de um tipo de ninho.

Também está disponível o anexo (capítulo 5) que contém o Catálogo dos Gêneros de Cupins Neotropicais e o modelo de termos e definições para ontologia morfológica de cupins.

Bibliography

- Baxevanis, Andreas D, & Bateman, Alex. 2015. The importance of biological databases in biological discovery. *Current protocols in bioinformatics*, **50**(1), 1–1.
- Constantino, Reginaldo. 2016. *Termite Database*. Available from: <<http://termitologia.net>>: Departamento de Zoologia, Universidade de Brasília. Updated in Sept 2020.
- Donovan, SE, Eggleton, P, & Bignell, DE. 2001. Gut content analysis and a new feeding group classification of termites. *Ecological Entomology*, **26**(4), 356–366.
- Krishna, Kumar, Grimaldi, David A, Krishna, Valerie, & Engel, Michael S. 2013. Treatise on the Isoptera of the world. (Bulletin of the American Museum of Natural History, no. 377).
- Noirot, Charles. 1970. The nests of termites. *Pages 73–125 of: Biology of termites*, vol. 1. Academic Press.
- Sachs, Joel, Page, Roderic, Baskauf, Steven J, Pender, Jocelyn, Lujan-Toro, Beatriz, Macklin, James, & Comspon, Zacchaeus. 2019. Training and hackathon on building biodiversity knowledge graphs. *Research Ideas and Outcomes*, **5**, e36152.
- Stein, Lincoln D. 2003. Integrating biological databases. *Nature Reviews Genetics*, **4**(5), 337–345.
- Stevens, Robert, Goble, Carole A, & Bechhofer, Sean. 2000. Ontology-based knowledge representation for bioinformatics. *Briefings in bioinformatics*, **1**(4), 398–414.
- Stucky, Brian J, Balhoff, James P, Barve, Narayani, Barve, Vijay, Brenskelle, Laura, Brush, Matthew H, Dahlem, Gregory A, Gilbert, James DJ, Kawahara, Akito Y, Keller, Oliver, *et al.* 2019. Developing a vocabulary and ontology for modeling insect natural history data: example data, use cases, and competency questions. *Biodiversity data journal*, **7**.

Wood, Tom G. 1978. Food and feeding habits of termites. *Pages 55–80 of: Production ecology of ants and termites.*

Chapter 2

Neotropical termite database

2.1 Introduction

Relational and non-relational databases are used to build organized collections of information (Date, 2004). Widely used in data management, the relational database consists of rows and columns forming a table (Codd, 1989). Rows and columns define a table (Rodriguez & Neubauer, 2012), limiting how data must be stored (Miller, 2013) and their ability to capture semantics (Hull & King, 1987). In addition, the rigidity of tables constantly leads to blank fields when data is missing. The problem with using tables is aggravated when different tables are used to relate a large amount of data (Segaran *et al.*, 2009). With a large volume of data, it becomes more complicated to establish the relationship schema between multiple tables. So, storing, retrieving and manipulating big data becomes hard when using traditional approaches such as tables (Berge, 2001). Contrary to tables, a graph is a non-relational database (Hecht & Jablonski, 2011) that is not based on rigid rows and columns but on a flexible system showing data and their relationship (Segaran *et al.*, 2009). It allows the inclusion of any type of data from different sources independent of the data type, and is possible to adapt to changes to new data, maintaining the original graph structure. Graphs are extremely useful in representing a wide diversity of data sets in fields such as science, government, and business (Robinson *et al.*, 2013). The graph-oriented databases are simple to create, as they do not need tables. Information can be included directly in the database as needed using construction specific computational language (Cypher).

Graph database models communicate meaning (semantics) (Timón-Reina *et al.*, 2021) using a system of “subject-verb-object” to connect data (Angles & Gutierrez, 2008). In a graph, the nodes (or vertices) are the visual representation and hold the subject or object, while the edges connects and carry the verb indicating the relationship between nodes (Bollobás & Bollobas, 1998). Blanks are impossible in a graph-oriented database because it doesn't have rigid fields, and a new node is created for new data (Segaran *et al.*, 2009). Given the advantages of non-relational databases, here we propose the construction of a graph database on the morphology and ecology of the Neotropical termite genera.

Termites, as well as other groups of insects, represent an unlimited opportunity to test distal and proximate hypotheses on a wide range of biological topics, including phylogenetics and large-scale ecological patterns (Resh & Cardé, 2009). Termite species have diversified life habits (Kistner, 1969) and morphologies classified by feeding groups (Donovan *et al.*, 2001) and with high biological effects on soil fertility (Wood, 1978) and economic impact as pests in some cases (Krishna *et al.*, 2013). The graph-oriented database present here is an effort to concentrate the data of Neotropical termite genera dispersed among a multitude of sources.

This article presents a model of a graph-oriented database of morphology and ecology of Neotropical termite genera. In this work, the database of morphological and ecological characters is presented for each termite caste.

2.2 Material and Methods

2.2.1 Graph

A graph is composed of an ordered pair of two separated sets: nodes (also referred to as vertices) and edges (relationships and verbs) (Bollobás & Bollobas, 1998). In a graph-oriented database, nodes are connected to each trough their relationships, as depicted in (fig. 2.1). Each node is composed of properties (properties keys) that are used refine the information therein displayed (fig. 2.1). Relationships may also

include properties.

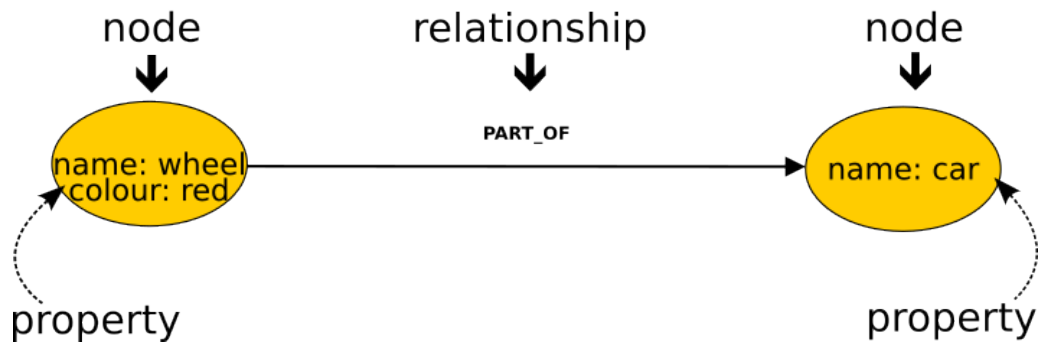


Figure 2.1: Diagram illustrating components of a graph-oriented database. Note the hierarchical relationship (“part_of”) between nodes. Node properties are indicated with arrows.

2.2.2 The database

We created the Neotropical Termite Genera Database collecting data on the morphology and ecology of termite genera occurring in the Neotropics. To confirm the occurrence in the Neotropics and the updated nomenclature of termite taxa we used the *Termite database* Constantino (2016).

Data on neotropical termites were collected from 59 updated taxonomic descriptions and reviews of the genera.

We divided the database into nine topics or “Labels” : Bibliography, Sample, Systematic, Etymology, Ecology, Geography, Semaphoront, Locator, Morphology (see tab. 2.1 for full definitions). Labels specify the “type” of information contained in that particular node. Label nodes were linked to the central node “sample” preserving the identification of specimens sampled (see fig. 2.2). We used the relationships (verbs) to hierarchically connect the nodes from the most specific information to the central node (sample) tracking their origins.

Table 2.1: Groups (labels) of knowledge areas present in the graph. Columns headings: Node Labels = the type of information contained in the particular node; Definition = the statement of the meaning of the labels; Node label connected (in fig. 2.2) = Indicative number of the nodes that are connected.

Node Labels	Definition	Node label connected (in fig. 2.2)
1 - Sample	Sample number and the set of individuals in the sample	1, 2, 3, 4, 5, 6
2 - Bibliography	Bibliographic sources used the revision	1
3 - Systematic	Taxonomic identification of termites sampled	1
4 - Etymology	The linguistic origin of the termite genera name	1
5 - Ecology	Life habits of termites	1
6 - Geography	Geographic distribution of neotropical termite genera	1
7 - Semaphoront	Stage of development of the individual contained in the sample	1
8 - Locator	Term that point to a specific structure or a location in the structure of termites.	7
9 - Morphology	Body parts of termites	8

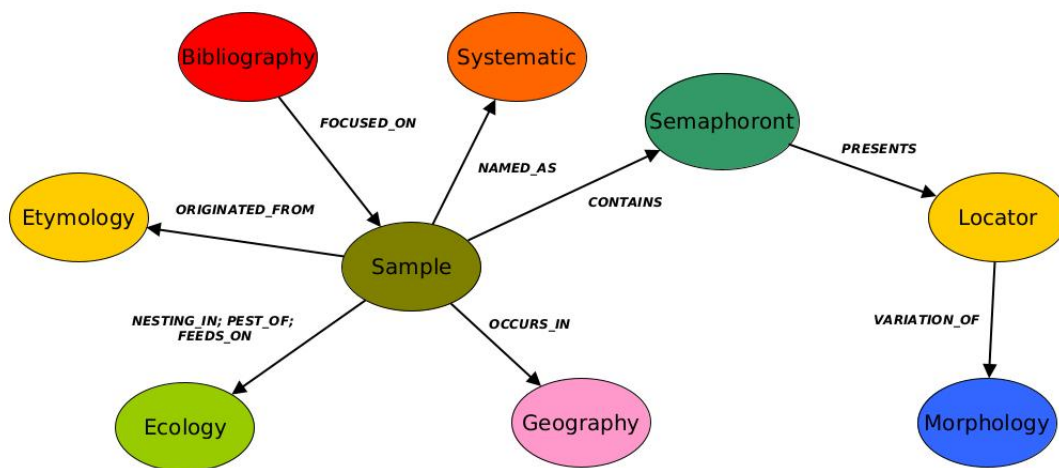


Figure 2.2: Diagram illustrating the template used for the graph-oriented database. Note that all label nodes are connected to the central node “Sample” using verbs as edges.

Two labels worked as archetypes (a reproducible model or pattern) in the graph: “systematic” and “morphology”. Systematic archetype refers to the taxonomic ranks composing the specimen identification (from order to genus) (fig. 2.3). On the other hand, the morphology archetype refers to the nodes that compose the generalized body plan of termites (fig. 2.4). Specific morphological variation nodes were linked to the nodes of the morphology archetype. To create a robust database integration, we constructed a standardized vocabulary of terms suitable for recording termite natural history data. From this vocabulary, the ontology was created to provide computable semantics for computers understand the relationship between terms (see chapter ontology).

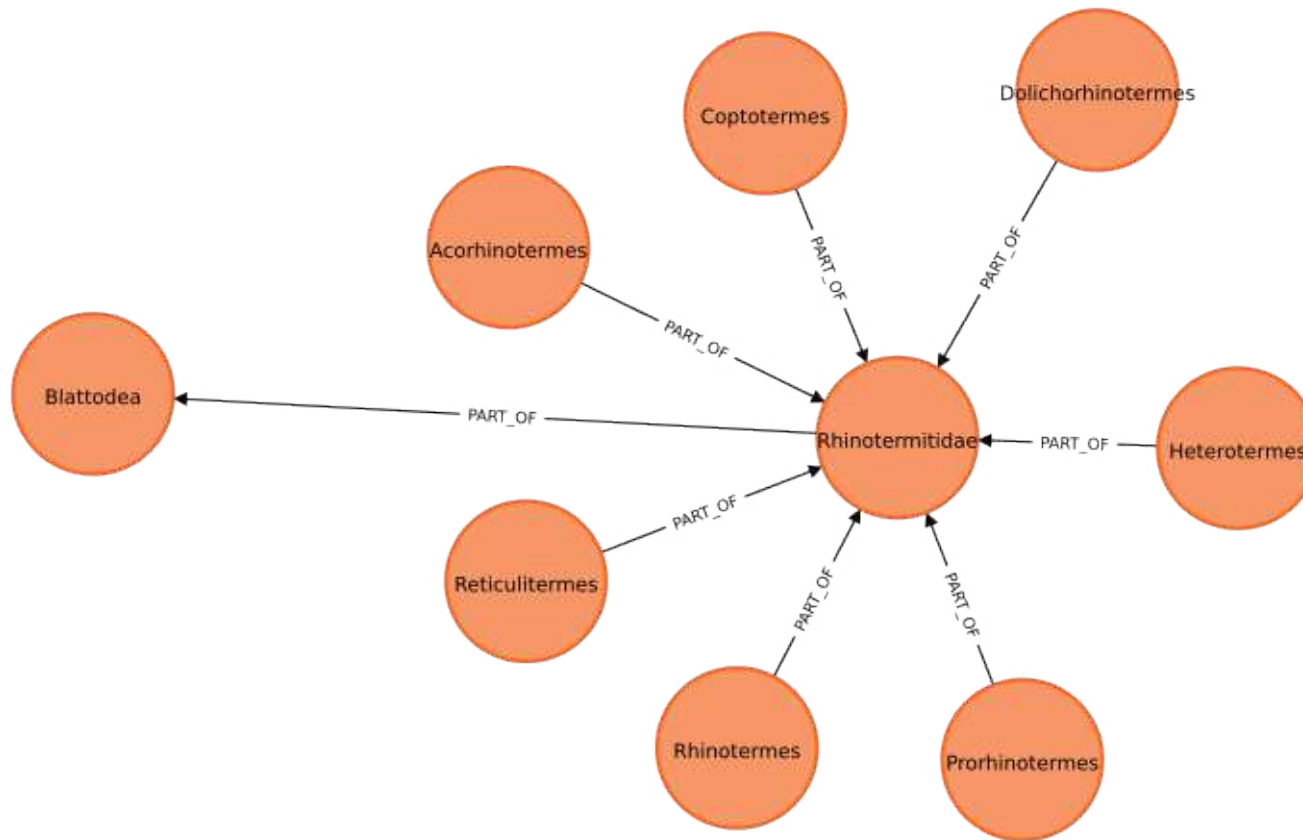


Figure 2.3: Systematic archetype graph depicting the taxonomic hierarchy for Neotropical termites from the Rhinotermitidae family, from Order to Genus. The identification of each sample is given by connecting it to the respective node. In doing so, a sample could be identified at any level: genus, family or order.

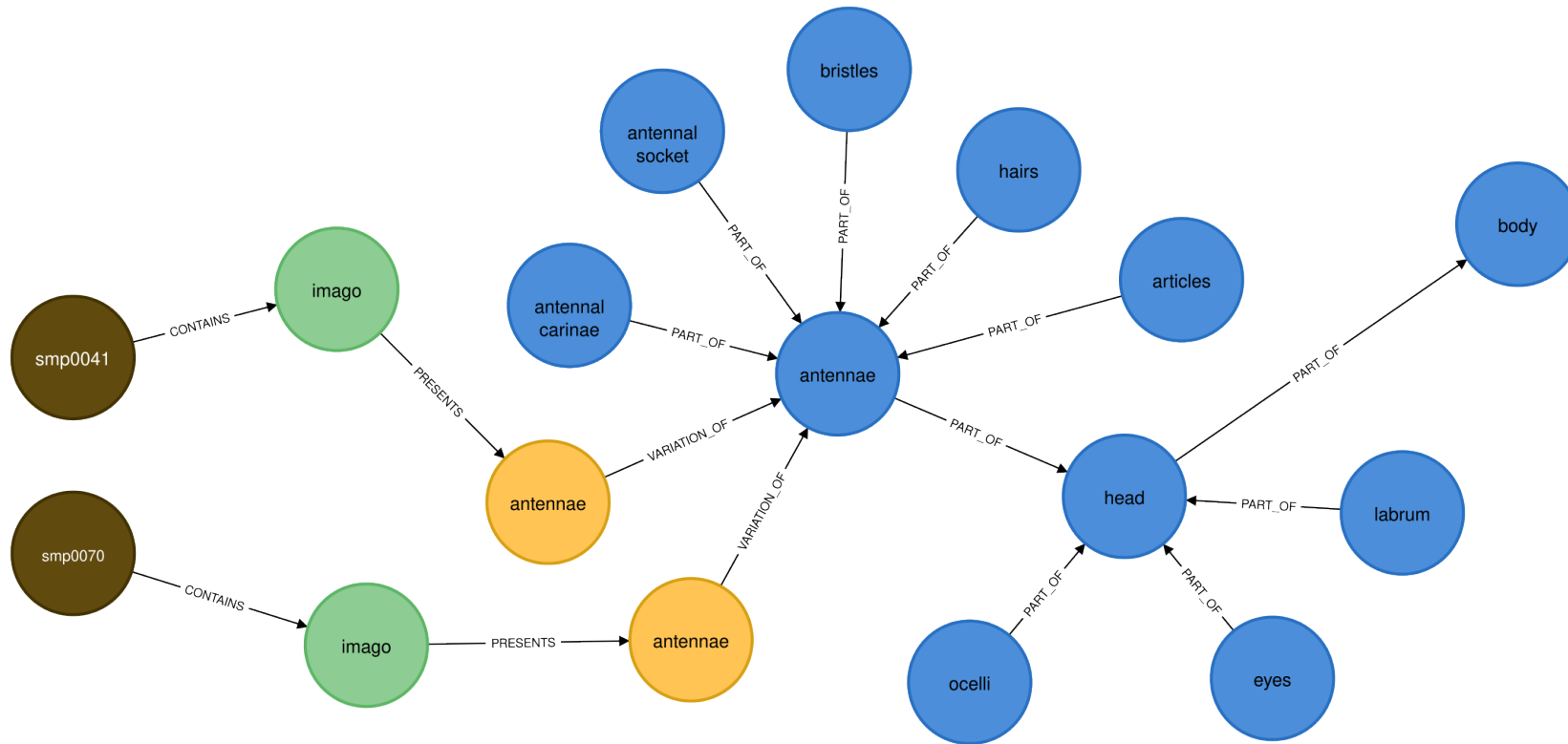


Figure 2.4: In blue: part of the morphologic archetype graph depicting the basic features of a termite body. Each particular morphological feature of a sample is connected to the respective basic feature in the archetype.

2.2.3 Database implementation

The neotropical termite genera database was built using Neo4j (Neo4j Desktop version 1.3.8) (Neo4j, 2020). Neo4j is an open-source, graph-oriented NoSQL ('Not Only Structured Query Language') database (Sasaki *et al.*, 2020). Written in Java, Neo4j is accessible by other softwares. In addition, it uses construction and query language called "Cypher", allowing highly complex database queries to be easily expressed (Neo4jTeam, 2020).

2.3 Results

From the compilation of the graph, we identified 6945 nodes and 13,480 relationships between them. The distribution of the number of the node labels is shown in table 2.2.

Table 2.2: Number of nodes present in the graph of the Neotropical Termites Database.

Node labels	Number of nodes
Systematic	118
Locator	5486
Sample	108
Morphology	687
Bibliography	59
Semaphoront	278
Geography	53
Ecology	119
Etymology	37
Total	6945

The systematic archetype was represented by 108 neotropical termite genera and their respective families and subfamilies (fig. 2.5, tab. 2.2).

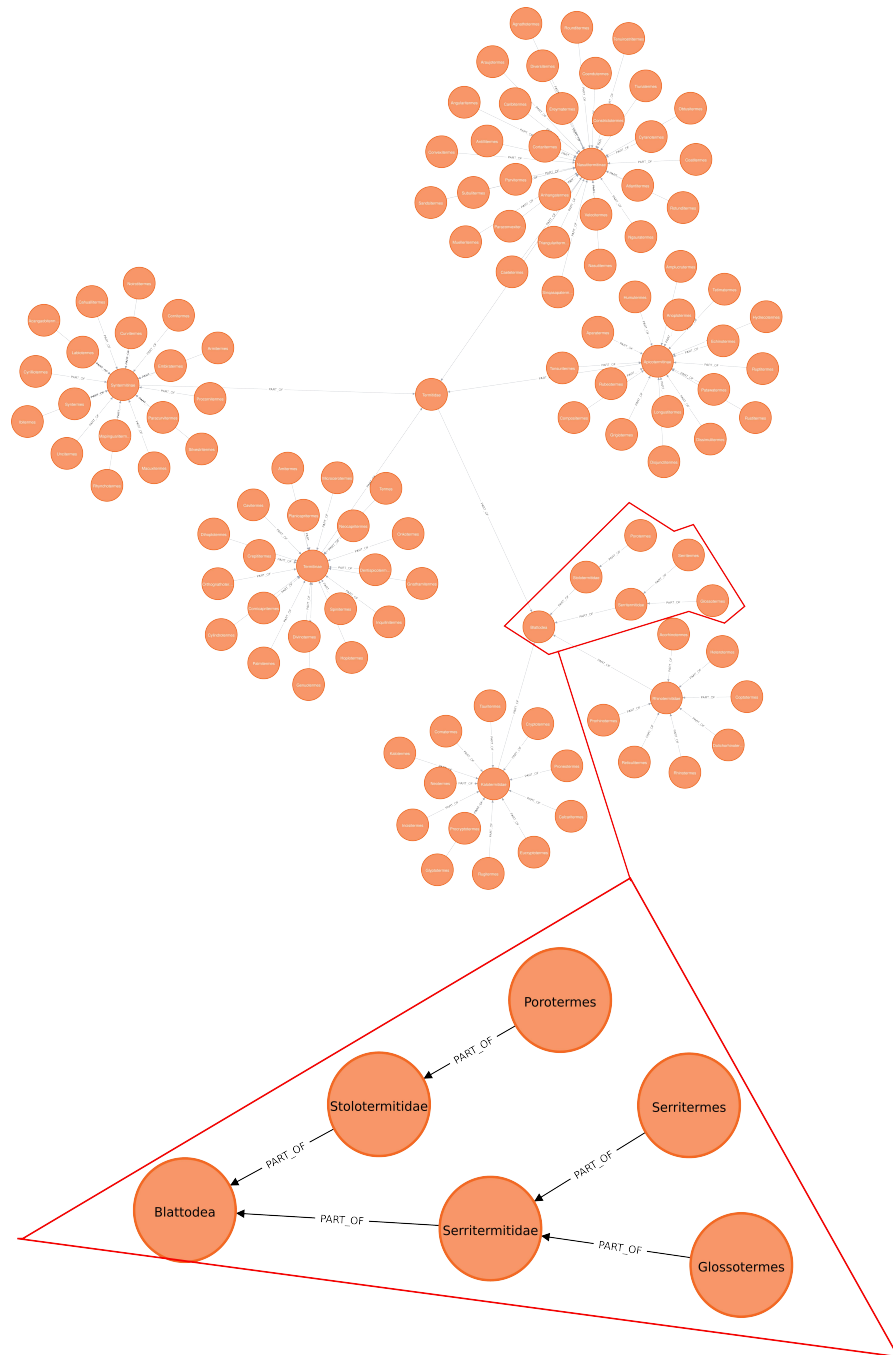


Figure 2.5: Systematic archetype graph depicting the taxonomic hierarchy for Neotropical termites, including relationships between Order, Families, and Genera. Inset: magnified graph area to show the relationships between Order, Families, and Genera.

The morphology archetype included a total of by 687 structures. In the archetype, the anatomical position of the structure, based on a specific structure position, was also indicated (e.g. *Pronotum lateral margins*) (fig. 2.6, tab. 2.2).

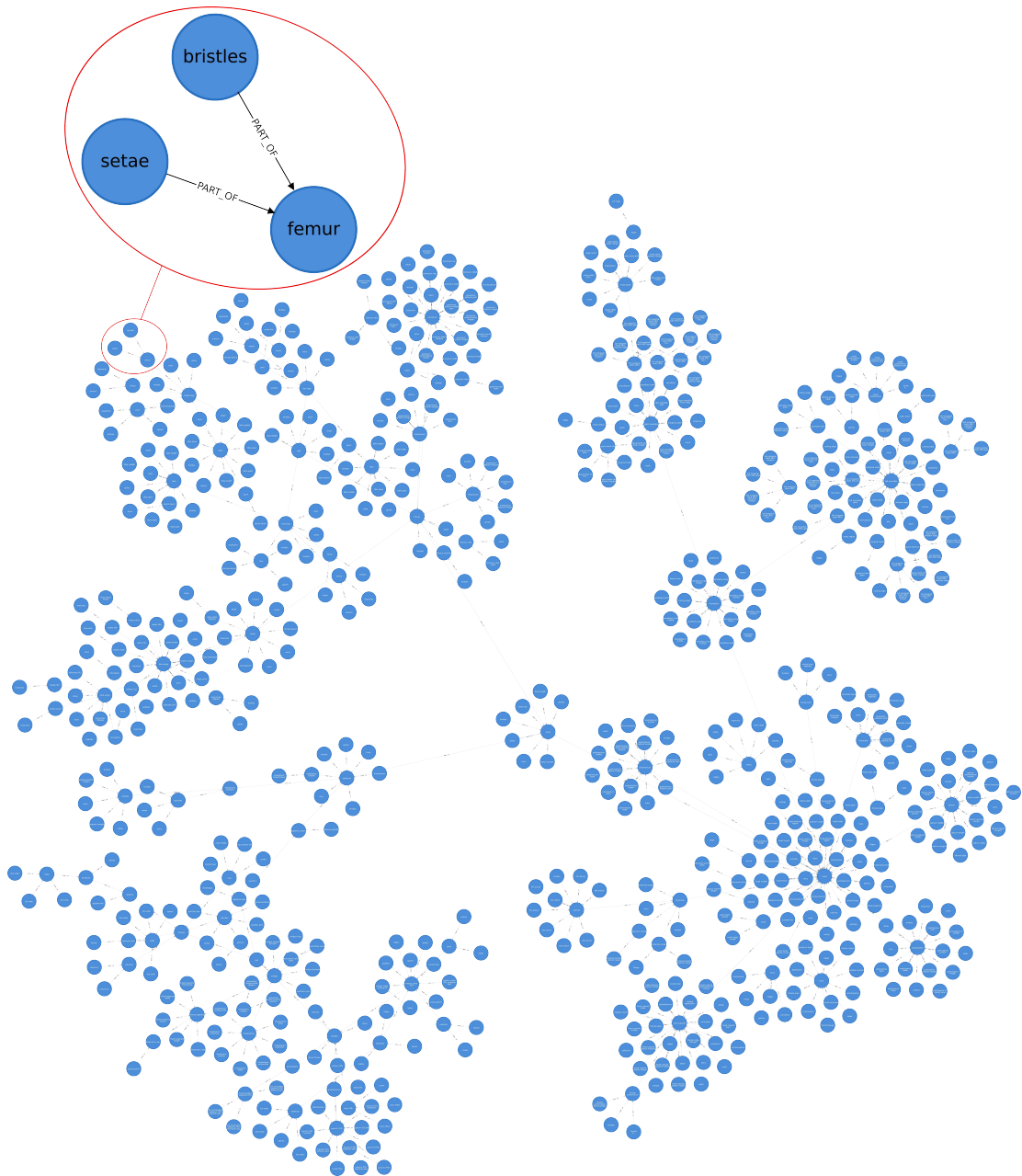


Figure 2.6: Graph of the Morphology of the Neotropical termite genera. Inset: magnified graph area to show the relationships between femur, setae and bristles.

The entire database resulting in a cloud of nodes connected by 13,480 relationships (fig. 2.7). The contents of the database can be accessed in the section 5.1.

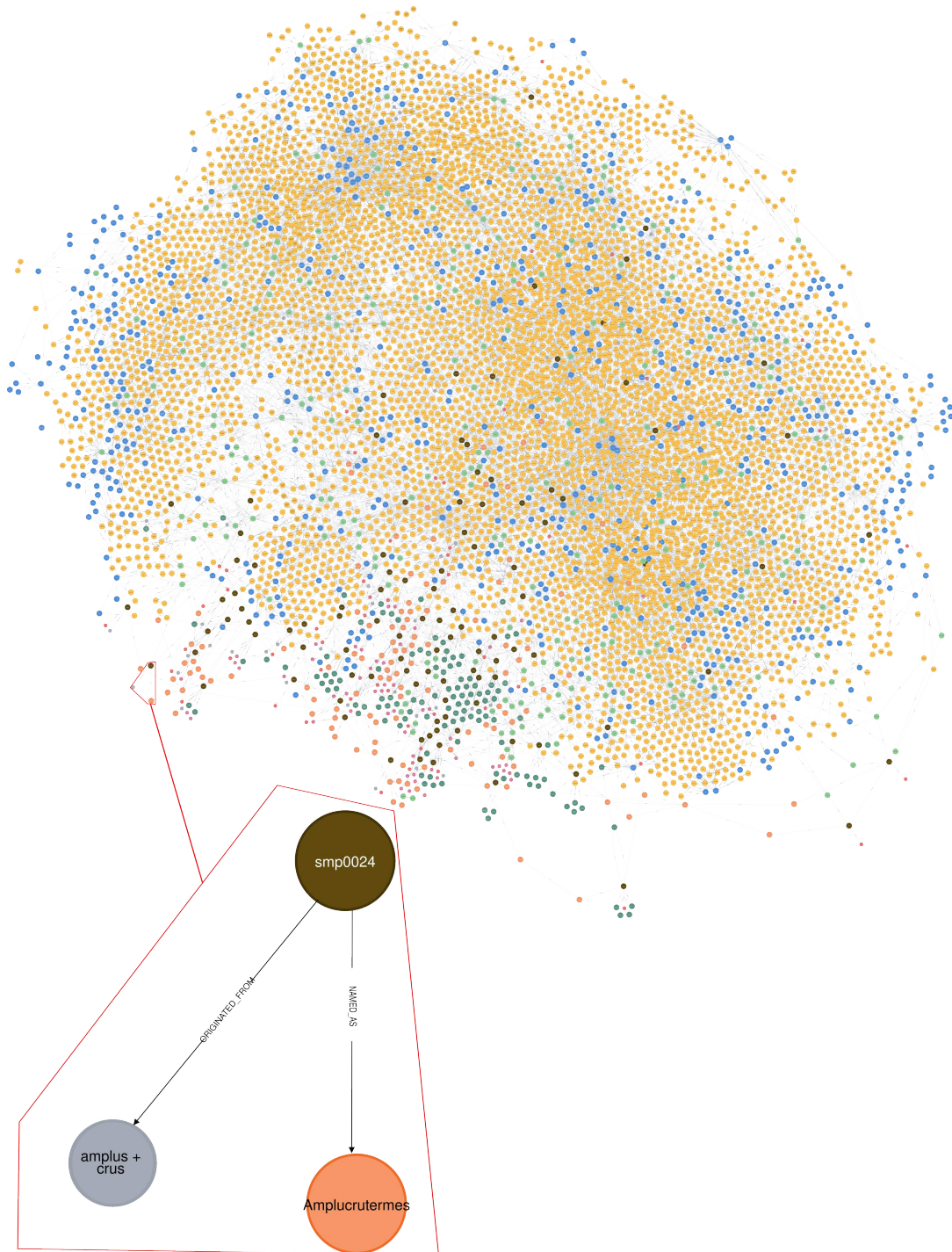


Figure 2.7: Graph representation on the Neotropical Termite Genera database. Inset: magnified graph area to show the relationships between Sample, Etymology and Genus.

2.4 Discussion

Databases are fundamental tools for organizing large volumes of data (Robinson *et al.*, 2013). Graph databases optimize the amount of data moving across a computer

network, being used by large companies and social networks. Due to the advantages of graph-oriented databases, here we developed by the first time a Neotropical termite graph database suitable to be adapted for other group insects.

To date, the most complete termite nomenclatural catalog is the the Termite Database created by (Constantino, 2016). It includes termite genera around the world, but does not present morphological data in a structured way. Being not built as a graph, the Termite Database can not be fed autonomously by users and is susceptible to blanks by missing data.

One of the most important morphological termite catalogues for the Neotropical region is the work carried out by Mathews in the Brazilian state of Mato Grosso (Mathews, 1977). This catalog, however, is focused on termites occurring in a given region of Brazil, including only 42 genera (out of the currently 108 present in the Neotropics). After 45 years since the publication of Mathews' catalog, many new genera have been described and this information is now dispersed on a variety of sources. A similar situation occurs with the important review work by Krishna which contains information on the morphology and ecology of 10 genera of Kalotermitidae (Krishna, 1961). Other more recent review studies such as (Bourguignon *et al.*, 2016) (6 genera of Apicotermitinae), (Rocha *et al.*, 2012) (4 genera of Syntermitinae); (Roisin *et al.*, 1996) (4 genera of Nasutitermitinae) present new diagnoses for previously described genera and also the description of new genera. The time has come to compile all this information in a single source, and that is what we propose here.

In older publications on termites, it is common to find the description of the external morphology only for reproductives (imagoes) and soldiers. Imagoes are the most anatomically generalized (Krishna *et al.*, 2013; Kistner, 1969). The most anatomically specialized caste is the soldier, which exhibits wider variation (than workers and imagoes) in conspicuous morphological features associated with the head capsule (Donovan *et al.*, 2000; Krishna *et al.*, 2013). As a result, a disproportionate amount of taxonomic work on termites has focused on the soldier caste.

Here we present the first and only attempt to compile a morpho-ecological graph

database of Neotropical termite genera. The template of the database allows for more information to be added without the need of modifying its underlying structure. In this way, the database is limited only to knowledge and not the amount of new information that can be added to the database.

Bibliography

- Angles, Renzo, & Gutierrez, Claudio. 2008. Survey of graph database models. *ACM Computing Surveys (CSUR)*, **40**(1), 1–39.
- Berge, Claude. 2001. *The theory of graphs*. Courier Corporation.
- Bollobás, Béla, & Bollobas, Bela. 1998. *Modern graph theory*. Vol. 184. Springer Science & Business Media.
- Bourguignon, Thomas, Scheffrahn, Rudolf H, Nagy, Zoltán Tamás, Sonet, Gontran, Host, Benoît, & Roisin, Yves. 2016. Towards a revision of the Neotropical soldierless termites (Isoptera: Termitidae): redescription of the genus *Grigiotermes* Mathews and description of five new genera. *Zoological Journal of the Linnean Society*, **176**(1), 15–35.
- Codd, Edgar F. 1989. Relational database: A practical foundation for productivity. *Pages 60–68 of: Readings in artificial Intelligence and Databases*. Elsevier.
- Constantino, Reginaldo. 2016. *Termite Database*. Available from: <<http://termitologia.net>>: Departamento de Zoologia, Universidade de Brasília. Updated in Sept 2020.
- Date, Christopher J. 2004. *Introdução a sistemas de bancos de dados*. Elsevier Brasil.
- Donovan, SE, Jones, DT, Sands, WA, & Eggleton, P. 2000. Morphological phylogenetics of termites (Isoptera). *Biological Journal of the Linnean Society*, **70**(3), 467–513.
- Donovan, SE, Eggleton, P, & Bignell, DE. 2001. Gut content analysis and a new feeding group classification of termites. *Ecological Entomology*, **26**(4), 356–366.
- Hecht, Robin, & Jablonski, Stefan. 2011. NoSQL evaluation: A use case oriented survey. *Pages 336–341 of: 2011 International Conference on Cloud and Service Computing*. IEEE.
- Hull, Richard, & King, Roger. 1987. Semantic database modeling: Survey, applications, and research issues. *ACM Computing Surveys (CSUR)*, **19**(3), 201–260.
- Kistner, David H. 1969. The biology of termitophiles. *Pages 525–557 of: Biology of termites*. Elsevier.
- Krishna, K. 1961. A generic revision and phylogeny study of the family Kalotermitidae (Isoptera). *Bulletin American Museum of Natural History*, **122**, 303–408.
- Krishna, Kumar, Grimaldi, David A, Krishna, Valerie, & Engel, Michael S. 2013. Treatise on the Isoptera of the world. (Bulletin of the American Museum of Natural History, no. 377).
- Mathews, AG Anthony. 1977. *Studies on termites from the Mato Grosso state, Brazil*. Academia Brasileira de Ciências Rio de Janeiro.
- Miller, Justin J. 2013. Graph database applications and concepts with Neo4j. *In: Proceedings of the southern association for information systems conference, Atlanta, GA, USA*, vol. 2324.

- Neo4j. 2020. *Neo4j Desktop version 1.3.8*.
- Neo4jTeam. 2020 (september). *The Neo4j Cypher Manual*. 4.1 edn. Neo4j, Inc.
- Resh, Vincent H, & Cardé, Ring T. 2009. *Encyclopedia of insects*. Academic press.
- Robinson, Ian, Webber, Jim, & Eifrem, Emil. 2013. *Graph databases*. " O'Reilly Media, Inc."
- Rocha, Mauricio Martins, Canello, Eliana Marques, & Carrijo, Tiago Fernandes. 2012. Neotropical termites: revision of *Armitermes* Wasmann (Isoptera, Termitidae, Syntermitinae) and phylogeny of the Syntermitinae. *Systematic Entomology*, **37**(4), 793–827.
- Rodriguez, Marko A, & Neubauer, Peter. 2012. The graph traversal pattern. *Pages 29–46 of: Graph data management: Techniques and applications*. IGI Global.
- Roisin, Y., Scheffrahn, R. H., & Krecek, J. 1996. Generic Revision of the Smaller Nasute Termites of The Greater Antilles (Isoptera: Termitidae: Nasutitermitinae). *Annals of Entomological Society of America*, **89**(6), 775–787.
- Sasaki, Bryce Merkl, Chao, Joy, & Howard, Rachel. 2020. *Graph Databases for Beginners*. neo4j.com.
- Segaran, Toby, Evans, Colin, & Taylor, Jamie. 2009. *Programming the semantic web: build flexible applications with graph data*. O'Reilly Media, Inc.
- Timón-Reina, Santiago, Rincón, Mariano, & Martínez-Tomás, Rafael. 2021. An overview of graph databases and their applications in the biomedical domain. *Database*, **2021**.
- Wood, Tom G. 1978. Food and feeding habits of termites. *Pages 55–80 of: Production ecology of ants and termites*.

Chapter 3

Morphological ontology for Neotropical Termites Genera

3.1 Introduction

Insects present a great richness of species covering every type of trophic strategy known in animals (Grimaldi *et al.*, 2005). This group of organisms represent an unlimited opportunity to test distal and proximate hypotheses on a wide range of biological topics, including phylogenetics and large-scale ecological patterns (Resh & Cardé, 2009). However, collecting data on several species could become a challenge considering data dispersion and non-standard definitions. Research on insect morphology has generated a variety of terms to name and compare their structures. This leads to a terminological diversity that lacks formalization, which makes comparisons made by computers using semantic web technologies difficult. Here we propose a standardizing model for describing termites anatomical structures which incorporates structural definitions and reproducible descriptions of insects morphology.

Currently, data on the natural history of insects remain widely dispersed among a multitude of sources, including specimens in biological collections, specialized publications and specific taxon databases (Stucky *et al.*, 2019). Usually such data sources are inaccessible or kept in restricted repositories (Sachs *et al.*, 2019). In addition, studies on insects, especially those on taxonomy differ in the observation details and terminology used by the authors, delaying attempts to unify data.

Data integration implies in a suitable robust information system for entering multiple data types (Walls *et al.*, 2014). However, data integration needs to be related to

well-defined terms for recording observations and data systematically inserted (Wu & Zhao, 2009). In addition, such data integration presumes computable semantics for computers to understand how terms relate to each other (Zhou *et al.*, 2006). Building an computational *ontology* provides this.

An computational ontology is an explicit definition of terms created from relationships between names and concepts (Gruber, 2009) which uses languages that allow abstraction for computational simplification (Borst & Borst, 1997) and for modeling interactions in big data (Deans *et al.*, 2012). In other words, ontologies correspond to a collection of terms and concepts that are assumed to exist in a topic and the relationships between them (Genesereth & Nilsson, 1987). In biology, ontologies can be used as controlled vocabularies for standardizing terminology and facilitating communication between scientists (Deans *et al.*, 2012) and have become a fundamental technology for semantic management and inference with biological knowledge (Dahdul *et al.*, 2014). Therefore, ontology is a suitable technology for addressing the problems of understanding and interpreting terminology in insect morphology. In this article, we propose the ontology for describing the morphology of the neotropical termite genera.

Termites are eussocial insects that live in colonies, which guarantees their survival and reproductive success (Inward *et al.*, 2007; Wilson, 1971). The colony is composed of morphologically distinct individuals who perform specific functions (Wilson, 1971). A group of individuals sharing the same morphology and function are named caste, being in termites: workers (i) who perform nest construction, foraging, feeding nestmates, parental care and sometimes defense; soldiers (ii) whose function is to defend nestmates against natural enemies; and alates (iii) whose purpose is to disperse and establish a new colony (Grassé, 1982).

Termites can establish their colonies within the wood, underground, on trees, or above the ground building a mound (Kistner, 1969; Noirot, 1970). Since termites frequently move particles of soil and their guts are rich in cellulolytic enzymes, they are considered vital for soil fertility in tropical regions (Wood, 1978). In addition,

termites are also indicators of environmental quality and in some cases they become pests (Krishna *et al.*, 2013). However, despite being a widely studied group, there is still a need to standardize knowledge about termite morphology. Such factors make termites a target of study.

3.2 Material and Methods

We construct the model to ontology of termite neotropical genera from a database implemented in Neo4j Software (Neo4j, 2020) in graph format. The graph represents the hierarchical relationships between the morphology of a termite individual and the general termite body plan. From this graph, the link between morphological structures and their concepts was constructed using a logical sequence of the structures that are part of the termite's body.

Each node in the graph represents a morphological character of the termite's body, and the edges show the type of link between them. Nodes are connected following a morphological sequence of the termite body plan: from the anterior to posterior regions. The relationship between the nodes is represented by the edge "*part_of*" to show a hierarchical structural dependence between the nodes.

The entire web of relationships in the graph displays a hierarchical order that connect the nodes to a single central node. This central node was named as '*body*' and refers to the termite body plan. This node denotes the top of the graph. Consider the following example, the anatomical part '*articles*' (node 4) is '*part_of*' (edge) '*antennae*' (node 3), which is '*part_of*' (edge) '*head*' (node 2), and which, in turn, is '*part_of*' (edge) body (node 1). Then, in this graph all nodes are directed to the '*body*' node through intermediary nodes forming a tree-shaped graph and a standardized schema of the termite body.

In the graph each node satisfy three properties: "name", "definition", and "type". "Name" property refers to the word attributed to a body structure; "definition" refers to the description of the body structure declared in the "name"; "type" property meaning the classification given for the structure which share similar characteristics

declared in the “name” of the node. This makes it possible to control vocabularies and standardize terminology. Such classification is based on the characteristics of the structure declared in the node (Figure: 3.1).

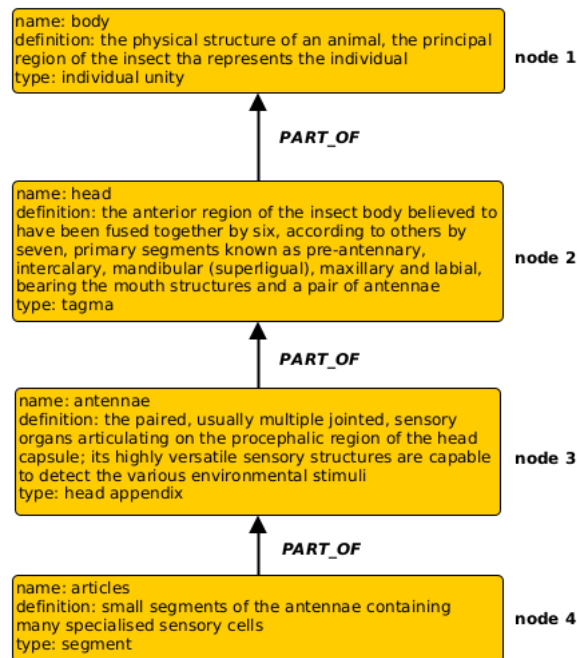


Figure 3.1: A representative graph model (nodes, properties and relationships) used to create the ontology of neotropical termite morphology.

We created a database using the descriptions and diagnosis of the Neotropical termite genera published on termite papers and books. For that, we used the terminology proposed by Snodgrass (2018); Zombori & Steinmann (1999); Grimaldi *et al.* (2005); Krishna *et al.* (2013); Donovan *et al.* (2000); Emerson (1965); Grassé (1949); Grassé (1982); Grassé (1986); Roonwal & Chhotani (1989); Weesner (1969); Roonwal *et al.* (1974); Noirot (1995, 2001); Constantino (2015) to describe both the general termite body plan and the specific anatomy for taxa.

For the construction of the ontology, we include only well-defined body structures. Structures poorly or vaguely defined were not mentioned.

3.3 Results

We included in the ontology a total of 257 morphological characters extracted from 74 articles on descriptions and diagnoses of Neotropical termite genera. From the compilation of the graph, we identified 256 relationships between the morphological characters (nodes) (Figure: 3.2). The formal definition of each character can be access in the section 5.2.

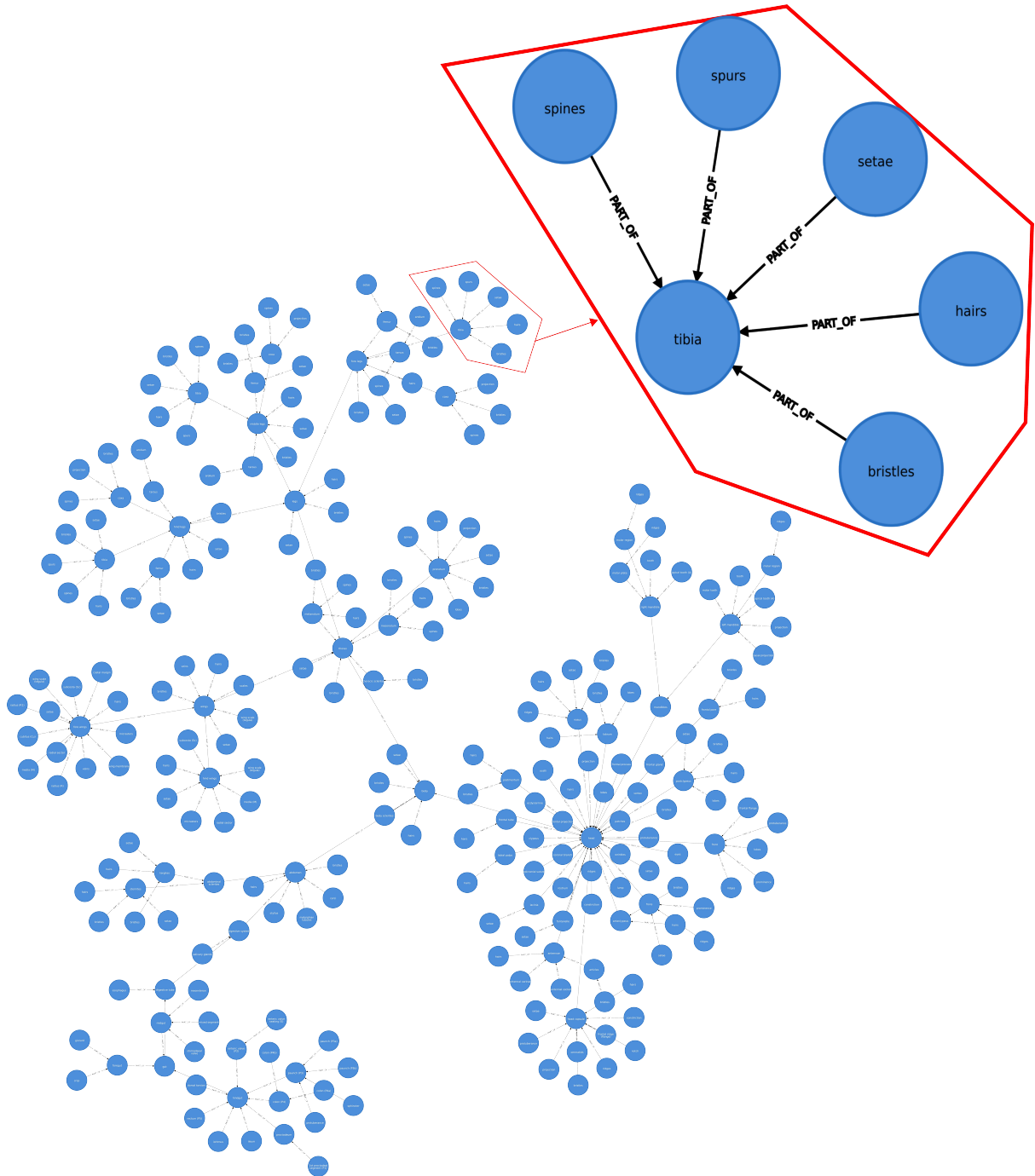


Figure 3.2: Graph on the relationships between the morphological characters of the Neotropical Termites Genera. Inset: magnified graph area to show nodes and edges details.

3.4 Discussion

Here we presented the first ontology of external and internal morphology for Neotropical termite genera. This ontology represents the first attempt to create a formal definition of termites' morphological structures based on major references on gen-

eral insect morphology (Snodgrass, 2018; Zombori & Steinmann, 1999; Grimaldi *et al.*, 2005) and specialized termite publications (Krishna *et al.*, 2013; Donovan *et al.*, 2000; Emerson, 1965; Grassé, 1949; Grassé, 1982; Grassé, 1986; Roonwal & Chhotani, 1989; Weesner, 1969; Roonwal *et al.*, 1974; Noirot, 1995, 2001; Constantino, 2015). The use of the same vocabulary for insect morphology in termites ontology will facilitate the integration of biological information despite taxa.

To date, there are only four published ontologies on insect anatomy; including a general ontology for Hymenoptera order (Yoder *et al.*, 2010), a *Drosophila* (Osumi-Sutherland *et al.*, 2013) and mosquito (Topalis *et al.*, 2008) ontologies in Diptera order, and a *Tribolium* (Dönitz *et al.*, 2013) ontology in Coleoptera order. On arthropods in addition to some insects, there is a morphological ontology on Collembola (González-Montaña, 2021) subclass. In both cases it has been successfully used in the production of morphological descriptions, demonstrating the potential for using anatomy ontologies in taxonomic research.

The construction of morphological ontologies is becoming essential quickly allowing the integration for large datasets (Topalis *et al.*, 2008). Beyond taxonomy, the primary use of ontologies is to represent data in a computer language, which is the base for integrating databases (Bard & Rhee, 2004), to label datasets (Bell *et al.*, 2009), and analyzing large-scale data (Gruber, 2009). The ontology proposed here was constructed following a hierarchical order with definitions of the morphological structures. Such hierarchical order associated to respective morphological structures definitions will facilitate linking and querying our ontology with other databases (Bard & Rhee, 2004; Dönitz *et al.*, 2013).

In the Open Biological and Biomedical Ontology (OBO) (Jackson *et al.*, 2021) and Ontobee (Xiang *et al.*, 2011) there are no specific ontology for termite morphology. Here we show the first morphological ontology for neotropical termite morphology, where each term is well defined by a standard language and logical sequence. Our termite morphological ontology model allows to associate different anatomical structures with their definitions and the positional relationships of them, irrespective of

developmental stage or caste.

Bibliography

- Bard, Jonathan, & Rhee, Seung. 2004. Ontologies in biology: Design, applications and future challenges. *Nature reviews. Genetics*, 5(04), 213–22.
- Bell, Gordon, Hey, Tony, & Szalay, Alex. 2009. Beyond the data deluge. *Science*, 323(5919), 1297–1298.
- Borst, Willem Nico, & Borst, W.N. 1997 (Sept.). *Construction of Engineering Ontologies for Knowledge Sharing and Reuse*. Ph.D. thesis, University of Twente, Netherlands.
- Constantino, R. 2015. *Cupins do Cerrado*. Technical Books.
- Dahdul, Wasila M, Cui, Hong, Mabee, Paula M, Mungall, Christopher J, Osumi-Sutherland, David, Walls, Ramona L, & Haendel, Melissa A. 2014. Nose to tail, roots to shoots: spatial descriptors for phenotypic diversity in the Biological Spatial Ontology. *Journal of biomedical semantics*, 5(1), 1–13.
- Deans, Andrew R, Mikó, István, Wipfler, Benjamin, & Friedrich, Frank. 2012. Evolutionary phenomics and the emerging enlightenment of arthropod systematics. *Invertebrate Systematics*, 26(3), 323–330.
- Dönitz, Jürgen, Grossmann, Daniela, Schild, Inga, Schmitt-Engel, Christian, Bradler, Sven, Prpic, Nikola-Michael, & Bucher, Gregor. 2013. TrOn: an anatomical ontology for the beetle *Tribolium castaneum*. *PloS one*, 8(7), e70695.
- Donovan, SE, Jones, DT, Sands, WA, & Eggleton, P. 2000. Morphological phylogenetics of termites (Isoptera). *Biological Journal of the Linnean Society*, 70(3), 467–513.
- Emerson, A. E. 1965. A Review of the Mastotermitidae (Isoptera), Including a New Fossil Genus from Brazil. *American Museum Novitates*, 2236, 1–46.

- Genesereth, Michael R, & Nilsson, Nils J. 1987. Logical foundations of. *Artificial Intelligence*.
- González-Montaña, A. 2021. Semantic-based methods for morphological descriptions: An applied example for Neotropical species of genus *Lepidocyrtus* Bourlet, 1839 (Collembola: Entomobryidae). *Biosystematics and Ecology*, **1**, e71620.
- Grassé, Pierre-Paul. 1986. *Termitologia. Anatomie, physiologie, biologie-systematique des termites. Tome III: Comportement, socialite, ecologie, evolution, systematique*.
- Grassé, PP. 1949. Ordre des Isoptères ou termites. *Traité de zoologie*, **9**, 408–544.
- Grassé, Pierre-Paul. 1982. *Termitologia. Anatomie, physiologie, biologie-systematique des termites. Tome III: Comportement, socialite, ecologie, evolution, systematique*.
- Grimaldi, David, Engel, Michael S, Engel, Michael S, & Engel, Michael S. 2005. *Evolution of the Insects*. Cambridge University Press.
- Gruber, Tom. 2009. *Ontology*. Boston, MA: Springer US. Pages 1963–1965.
- Inward, Daegan, Beccaloni, George, & Eggleton, Paul. 2007. Death of an order: a comprehensive molecular phylogenetic study confirms that termites are eusocial cockroaches. *Biology letters*, **3**(3), 331–335.
- Jackson, Rebecca, Matentzoglu, Nicolas, Overton, James A, Vita, Randi, Balhoff, James P, Buttigieg, Pier Luigi, Carbon, Seth, Courtot, Melanie, Diehl, Alexander D, Dooley, Damion M, Duncan, William D, Harris, Nomi L, Haendel, Melissa A, Lewis, Suzanna E, Natale, Darren A, Osumi-Sutherland, David, Ruttenberg, Alan, Schriml, Lynn M, Smith, Barry, Stoeckert Jr., Christian J, Vasilevsky, Nicole A, Walls, Ramona L, Zheng, Jie, Mungall, Christopher J, & Peters, Bjoern. 2021. OBO Foundry in 2021: operationalizing open data principles to evaluate ontologies. *Database*, **2021**(10). baab069.
- Kistner, David H. 1969. The biology of termitophiles. *Pages 525–557 of: Biology of termites*. Elsevier.

- Krishna, Kumar, Grimaldi, David A, Krishna, Valerie, & Engel, Michael S. 2013. Treatise on the Isoptera of the world.(Bulletin of the American Museum of Natural History, no. 377).
- Neo4j. 2020. *Neo4j Desktop version 1.3.8*.
- Noirot, Charles. 1970. The nests of termites. *Pages 73–125 of: Biology of termites*, vol. 1. Academic Press.
- Noirot, Charles. 1995. The gut of termites (isoptera): Comparative anatomy, systematics, phylogeny. I: Lower termites. *Pages 197–226 of: Annales de la Société entomologique de France*, vol. 31.
- Noirot, Charles. 2001. The gut of Termites (Isoptera) comparative anatomy, systematics, phylogeny. II. Higher Termites (Termitidae). *Pages 431–471 of: Annales de la Société entomologique de France*, vol. 37.
- Osumi-Sutherland, David, Marygold, Steven J, Millburn, Gillian H, McQuilton, Peter A, Ponting, Laura, Stefancsik, Raymund, Falls, Kathleen, Brown, Nicholas H, & Gkoutos, Georgios V. 2013. The Drosophila phenotype ontology. *Journal of biomedical semantics*, **4**(1), 1–10.
- Resh, Vincent H, & Cardé, Ring T. 2009. *Encyclopedia of insects*. Academic press.
- Roonwal, Mithan Lal, & Chhotani, Om Bahadur. 1989. *The Fauna of India and the Adjacent Countries: Isoptera (termites)..(Introduction and Families Termopsidae, Hodotermitidae, Kalotermitidae, Rhinotermitidae, Stylotermitidae and Indotermitidae)*. Zoological Survey of India.
- Roonwal, ML, Verma, SC, & Rathore, NS. 1974. On a new systematic character in termites, the micrasters. *Journal of Zoological Systematics and Evolutionary Research*, **12**(1), 55–76.
- Sachs, Joel, Page, Roderic, Baskauf, Steven J, Pender, Jocelyn, Lujan-Toro, Beatriz,

- Macklin, James, & Comspon, Zacchaeus. 2019. Training and hackathon on building biodiversity knowledge graphs. *Research Ideas and Outcomes*, **5**, e36152.
- Snodgrass, Robert E. 2018. *Principles of insect morphology*. Cornell University Press.
- Stucky, Brian J, Balhoff, James P, Barve, Narayani, Barve, Vijay, Brenskelle, Laura, Brush, Matthew H, Dahlem, Gregory A, Gilbert, James DJ, Kawahara, Akito Y, Keller, Oliver, *et al.* 2019. Developing a vocabulary and ontology for modeling insect natural history data: example data, use cases, and competency questions. *Biodiversity data journal*, **7**.
- Topalis, P., Tzavlaki, C., Vestaki, K., Dialynas, E., Sonenshine, D. E., Butler, R., Bruggner, R. V., Stinson, E. O., Collins, F. H., & Louis, C. 2008. Anatomical ontologies of mosquitoes and ticks, and their web browsers in VectorBase. *Insect Molecular Biology*, **17**(1), 87–89.
- Walls, Ramona L, Deck, John, Guralnick, Robert, Baskauf, Steve, Beaman, Reed, Blum, Stanley, Bowers, Shawn, Buttigieg, Pier Luigi, Davies, Neil, Endresen, Dag, *et al.* 2014. Semantics in support of biodiversity knowledge discovery: an introduction to the biological collections ontology and related ontologies. *PloS one*, **9**(3), e89606.
- Weesner, FRANCES M. 1969. External anatomy. *Biology of termites*, **1**, 19–47.
- Wilson, Edward O. 1971. The insect societies. *The insect societies*.
- Wood, Tom G. 1978. Food and feeding habits of termites. *Pages 55–80 of: Production ecology of ants and termites*.
- Wu, Maifang, & Zhao, Huiyan. 2009. Study on the ontology for entomology identification expert system. *Pages 2406–2409 of: 2009 First International Conference on Information Science and Engineering*. IEEE.
- Xiang, Zuoshuang, Mungall, Chris, Ruttenberg, Alan, & He, Yongqun. 2011. Ontobee: A linked data server and browser for ontology terms. *In: ICBO*.

- Yoder, Matthew J, Mikó, István, Seltmann, Katja C, Bertone, Matthew A, & Deans, Andrew R. 2010. A gross anatomy ontology for Hymenoptera. *PloS one*, 5(12), e15991.
- Zhou, Mingquan, Geng, Guohua, & Huang, Shiguo. 2006. Ontology development for insect morphology and taxonomy system. *Pages 324–330 of: 2006 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology Workshops*. IEEE.
- Zombori, Lajos, & Steinmann, Henrik. 1999. *Dictionary of insect morphology*. W. de Gruyter.

Chapter 4

Defensive effort in *Cornitermes cumulans* (Blattodea:Termitidae): the cumulative effect of nest maintenance and building over time

4.1 Introduction

Task allocation is a common problem for organisms at different scales, from cells in multicellular organisms to colonies of animals (Staps & Tarnita, 2022). Beyond task allocation, changes in metabolism as a consequence of size increments are also a common problem for multicellular organisms and animal societies. Often, these changes happen disproportionately concerning their size (allometric patterns). Although the mechanism underlying task allocation and allometric patterns have been studied, how social animals deal with task allocation through the metabolic changes of growth is an overlooked problem. Here we discuss the task allocation problem focusing on changes in the defensive effort and nest size increment of termite colonies.

In social insects, the age of individuals (Pequeno *et al.*, 2013), their morphology (Sarmiento, 2004), or both (Gordon, 1996) may mediate population dynamics in task allocation in the colony to supply feeding, parental care, defense and nest building. The proportion of individuals engaged in each task (e.g. feeding, defense and parental care) changes to respond to local conditions (e.g. temperature and humidity) (Gordon & Mehdiabadi, 1999; Pacala *et al.*, 1996). However, local conditions come from natural processes in the colony, such as the nest's growth during colony devel-

opment. In termites, the defensive effort (passive plus active defense) seems to change with the nest's size increments. The increase in nest volume triggers an exponential decrease (disproportional decrease and so, allometric) in the rate of patrolling done by soldiers (active defense) (DeSouza *et al.*, 2016) that is not due to the smaller presence of soldiers in large nests (Cunha *et al.*, 2003). Size increments correlating with the decrease in active defense suggest a change in task allocation in termite colonies during development. Indeed Rodrigues *et al.* (2021) showed that the size increments trigger termite colonies' sexual maturation, starting the defense-reproduction trade-off. Such changes in task allocation should occur because reproduction is a priority and energetically costly process and competes directly for available resources (De Jong & Van Noordwijk, 1992) demanding the energy previously allocated by individuals in other functions (Levins, 1968; Oster & Wilson, 1979; Stearns, 1992).

However, the theory predicts that in social insects, the level of defensive effort tends to increase with increasing colony size (Spradbery *et al.*, 1973). Since (i) there are more immature to defend in larger colonies than in smaller colonies or (ii) the population of defenders (mature) individuals grows with the colony (London & Jeanne, 2003). Then, the question is, how do termite colonies protect themselves during defense-reproduction trade-off? It is plausible that some sort of colony risk mitigation has been developed: as the colony grows, termites move from actively allocating individuals to defense to taking advantage of the energy investment made during the colony's development in nest building. Specifically, the colony could move to take advantage of the energy allocated in nest walls building.

In this work, we hypothesize that the defense of termite colonies switches from the active effort of patrollers to the passive protection of nest walls, as the colony grows. For that, we tested some predictions on investment in nest repair and nest wall thickness as a function of nest volume using as model *Cornitermes cumulans* termites (Blattodea: Termitidae: Syntermitinae).

4.2 Materials and methods

4.2.1 Rationale

To measure the investment of termites in passive defense through colonies' growth, we examined the nest structure and repair activity from nests of different volumes. Also, we measure the vitality of termite workers and the adaptation of their mandibles to construct epigeous nests as alternative explanations.

We tested the below predictions from our biological hypothesis: If the allocation of individuals for nest building is more intense at the early than the late development stage, (1) the rate of nest wall rebuilding should decrease with nest size increments. As a consequence, (2) big nests should grow less than small nests. However, merely by cumulative effect, (3) the thickness of the nest walls should increase with nest size increments. Additionally, if these differences in nest growth lead to differential task allocation between small and large nests, (4) the proportion of termite workers close to the nest walls should decrease with nest size increments. Such differences in nest growth could, however, result from alternative explanations: (5) larger nests, being generally older, would hold an older and less vigorous population of workers, triggering low rebuild and low growth in big nests. To test it, we regressed the vitality of termite workers against the size of their nest. Vitality was estimated as the meantime to death of these workers when subjected to starvation. Also, the bigger an epigeous nest, the farther its walls are from the ground. This should demand from termite builders some degree of specialization that is distinct from the demands imposed by, say, underground building. Thence, another alternative explanation for the differences in growth rate between smaller and bigger epigeous nests could be simply (6) a maladaptation of the workers' mandibles to epigeal (as opposed to underground) walls. To test it we inspected whether there would be a correlation between mandible traits and the propensity of a given genus to build epigeous nests. Propensity to build epigeous nests was measured as a binomial variable assuming value 0 when no epigeous nest has ever been recorded for that genus and 1 otherwise. The experimental setup and

data analysis are explained in detail in the following subsections.

We would present here a fluxogram with all these hypotheses, to help understanding by the reader (fig. 4.1):

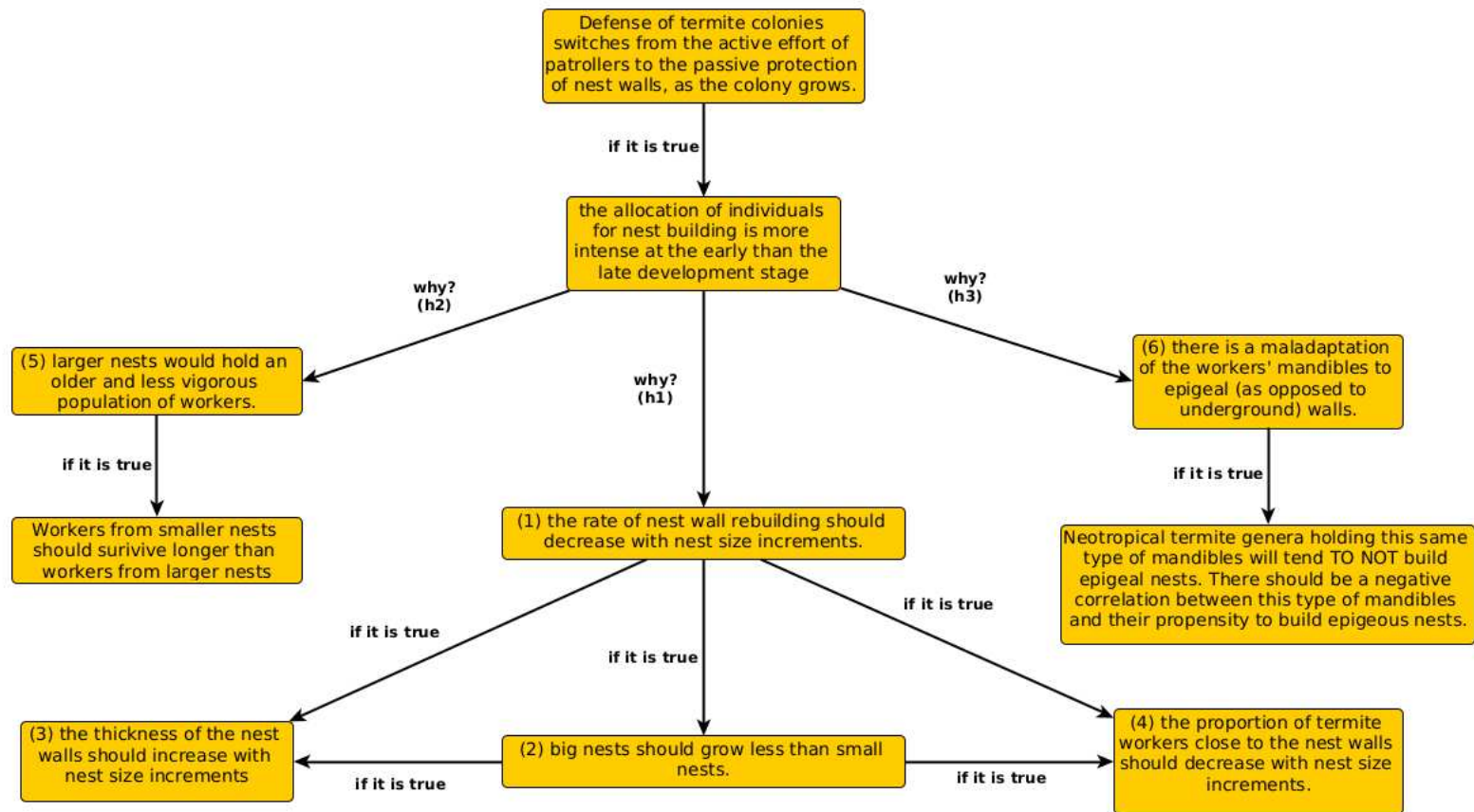


Figure 4.1: Fluxogram showing the sequence of all hypotheses tested.

4.2.2 Focal species

C. cumulans (Termitidae: Syntermitinae) is an abundant termite species that occurs in several kinds of open habitats, such as savannas, anthropized habitats, pastures, and urban gardens (Araujo, 1970; Mathews, 1977). *C. cumulans* termites feeds on living and dead grass and herbs on pastures or even gardens where it builds its termitarium on the ground. The termitarium serves as shelter for many other arthropod species of the Brazilian Cerrado ecosystem (Redford, 1984).

The nest of *C. cumulans* composed by a hard outer shell of soil, surrounding a fragile inner core (Coles & Redford, 1982). The external part of the nest is called the "wall" while the inner core is knowed as the "hive" (Redford, 1984). The young *C. cumulans* nest is essentially underground (hypogeal) and as the colony grows and the nest gets bigger, the nest rises above ground (epigeal) keeping a small part underground (Grassé, 1958).

4.2.3 Sampling

We sampled *C. cumulans* nests between June 2017 and January 2018, at the campus of the Federal University of Viçosa (20° 46'S, 042° 52' W, at 680 m of average altitude), at the municipality of Viçosa, Minas Gerais state, Brazil. The study area is in the Atlantic Rain Forest, the climate corresponds to "Cwa" (subtropical climate; dry winter, wet summer) in the Köppen system (Kottek *et al.*, 2006).

We collected thirty-four nests pieces of *C. cumulans* active nests without no sign of damage. The nest samples were labelled, placed in a plastic tray and taken to the laboratory.

Rain was not registered during the sampling period. Termite nests invaded by ants or destroyed along the experimental period were excluded from the analyses.

Nest volume

The volume of termite mounds was measured following the protocol proposed by [Cristaldo *et al.* \(2012\)](#), adding the volumes of cylindrical cross-sections visually decomposed in the epigeous portion and the volume of the hemispherical shell of the upper end of the termite mound (fig. 4.2).

Rebuilt rate

To measure the rebuild volume as a function of the termite nest volume, a damage on the nest wall was done using a metal cylinder (height = 40 cm, diameter = 12cm). The damage consisted of inserting this cylinder at the top of the nests sampled to make a hole of known dimensions. The depth of the hole was controlled through the height of the cylinder to guarantee a damage equivalent to 5% of the total volume of each mound. The hole was clean of all dirt and let to be rebuilt by termites. After 24h we collected and measured the volume that was rebuilt (fig. 4.2).

This volume was used as a proxy of the rebuilding investment of the colonies. To do so, the rebuilt material of each nest was oven dried for 48 hours at a temperature of 40°C. To obtain an accurate measurement of the sieved material volume we compressed the sample by placing in a graduated cylinder which was dropped 300 times at a height of 10 cm against a high-density foam board ([Cleassen, 1997](#)). The damage rebuild rate was calculated by dividing the volume of the rebuilt material by 5% of the volume of each termite mound.

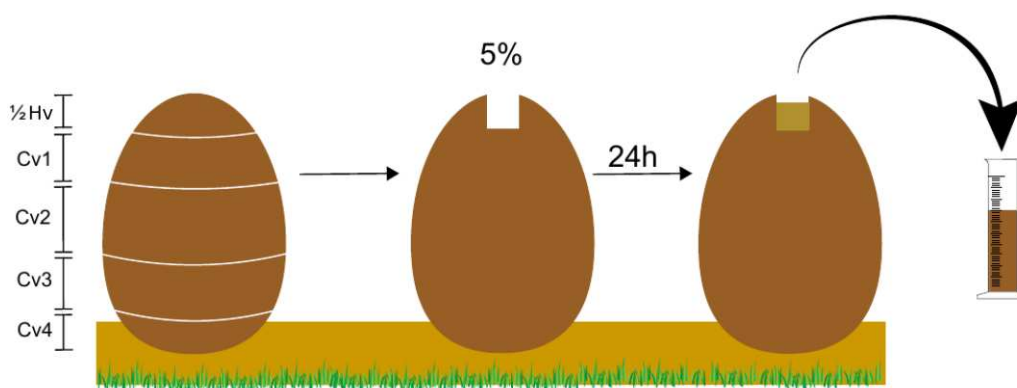


Figure 4.2: Diagram showing the sequence to measure the rebuilt rate of the nest made by *C. cumulans*. After 24 hours the rebuilt material volume was collected, processed and measured to use as a proxy the rebuilt investment of the colony. Symbols meaning: $1/2 Hv$ = volume of the hemispherical shell; $Cv1$ = volume of the first cylindrical cross-section; $Cv2$ = volume of the second cylindrical cross-section; $Cv3$ = volume of the third cylindrical cross-section; $Cv4$ = volume of the fourth cylindrical cross-section.

Nest growth

Six months after the first data collection, we measured by a second time the volume of the same nests previously sampled. We divided this second volume value by the volume value obtained in the first sampling to measure the growth rate of termite mounds.

Nest wall thickness

To measure the average nest wall thickness, we drilled three holes through the mound wall until reaching the hive. We drilled the nests at the top and at the base in order to cover the natural variations on the wall thickness of termite nests.

Proportion of termite workers at the nest wall

We registered the proportion of workers relative to the total of individuals at the wall to verify a likely correlation between this proportion and the the pattern found for the rebuilding rate. To do this, we counted the number of termite workers and soldiers extracted in the material removed to measure wall thickness (3 areas).

Mean survival time of termite workers

We measured the survival of termite workers of any given nest to test the alternative hypothesis that the rebuilt and grow rate of nests would be modulated by the vitality of its composing individuals. Survival was taken as a proxy of individual vitality assuming that vigorous individuals would survive longer. Twenty four termite workers individuals were extracted from the base of the nests sampled and placed in Petri dishes ($\varnothing = 50\text{mm}$) with the floor lined with filter paper. Because social interactions modulate the survival of termites (DeSouza *et al.*, 2001), we adjusted the number of individuals to reach an absolute density of 0.12, ensuring an optimal interactivity level (that is, the amount of space occupied divided by the amount of space available). Survival tests were performed in BOD with controlled temperature at 25°C in the dark. Readings of the number of individuals still alive were taken every 15 minutes during the first hour of the experiment. After the first hour, readings were taken every hour until all individuals were dead. This was done to record in the first hour of the experiment as many variations as possible in the time of death of the individuals.

Workers' mandibles adaptation for building epigeal nests

We verified whether selected morphological mandibular traits of termite workers would affect the propensity of that genus to build an epigeous nest. If a correlation would be found, we would have an alternative explanation for the slowing rates of nest growth.

To do so, we search for available information on the nest type built by termites (hypogeous, epigeal, arboreal and wood) and also on the mandibular morphology of workers contained in the Neotropical termites' genera database (Guimarães & DeSouza, 2022). For this, we extracted data from 71 termite genera contained in the database. The data used for the analysis was gathered from the original descriptions or reviews on the taxa. We consulted Constantino (2016) database to confirm the occurrence of each taxa in the neotropical region and the updated nomenclature.

4.2.4 Testing statistical hypothesis

Main hypothesis

To test if the investment in passive defense changes through the development stages of termite nests, we measured (y-var) four parameters: (i) the rebuilt rate, (ii) the wall thickness, (iii) the proportion of termite workers (relative to the total number of individuals) in the rebuilt area, and (iv) the growth rate.

All the response variables were tested as a function of the nest volume (x-var) using Generalized Linear Modelling (GLM). Analysis were performed in R ([R Core Team, 2021](#)).

For the continuous variables (i) rebuild and (iv) growth rate, we used a GLM under Gaussian error distribution. For the proportion data (iii) of workers, we performed a GLM under Binomial error distribution, while for (iv) nest rebuilt, we used Quasipoisson error distribution to correct for overdispersion.

We inspected if the parameters of the Metabolic Theory in Ecology (MTE) ([Sibly *et al.*, 2012](#)) would apply for nest rebuild in this system. This theory attempts to explain how the metabolic rate varies with body size (in this case, nest size). Using this parameters would help us to explain if the rebuild pattern would be within the pattern of energy consumption as a function of the size of the nest. For that, we adjusted a decay equation $y = ax^b$ with exponent $b = 0.25$ to the raw data. Then, we compared this fit with the power decay fit. To compare the power function fitted to the rebuilt rate against MTE decaying function for metabolic rates we used ANOVA.

Alternative hypothesis

To test if the meantime to death of termite workers (y-var) changes along with the development phases of the colony, we performed a censored survival analysis under Weibull distribution to estimate the average time of death of individuals using the nest volume as the independent variable (x-var). Survival analysis would help us to distinguish if the nest rebuilt pattern found would be more likely linked to a

differential vitality of termite workers than to a different investment in passive defense through time. This was done to check the effects of the variables on the meantime of death of workers. Analysis was performed using the Survival package (Therneau, 2022) in R software (R Core Team, 2021).

To test the the probability of termite workers to build epigeal nests (y-var) given their mandible morphology (x-var), we used a GLM under binomial error distribution. The complete model includes all workers mandibles characters from 71 genera of termites and the types of nests that they can be built (epigeal, hypogeal, arboreal and wood). This second alternative explanation would help us to distinguish if the nest rebuilt pattern found would be more likely linked to a maladaptation of the mandible for building epigeal nests than it was linked to a different investment in passive defense through time. The models were ranked with Akaike Information Criterion (AIC) to select the best model, using the package MuMIN (Barton, 2009) in R software (R Core Team, 2021).

4.3 Results

4.3.1 Rebuilt rate

Twenty four hours after artificial disturbance we detected reconstruction in 31 of 34 nest evaluated. The volume rebuilt by the workers 24h after the experimental disturbance ranged from 0 to 0.65 L ($\bar{x} = 0.17$ L).

The rebuilt rate of the nest wall decreased non-linearly with the increments in the nest volume (p-value = 0.00011; $F_{[1,29]} = 20.084$) (fig. 4.3, tab. 4.1). An allometric decline in the rate of rebuild of the nest wall was identified as the nest became larger. Our results showed that there was a higher investment in rebuilt the wall on smaller nests than in larger nests. This can be illustrated by the function:

$$y \sim 0.26 x^{-0.44} \quad (4.1)$$

The equation for the decay of the Metabolic Theory of Ecology (MTE), for these same data, is:

$$y \sim 0.14 x^{-0.25} \quad (4.2)$$

The power function adjusted to the rebuilt rate (Equation: 4.1) does not differ from the decay function of the MTE (Equation: 4.2) (p-value = 0.0569; $F_{[2,29]} = 3.9313$) (fig. 4.3, tab. 4.1).

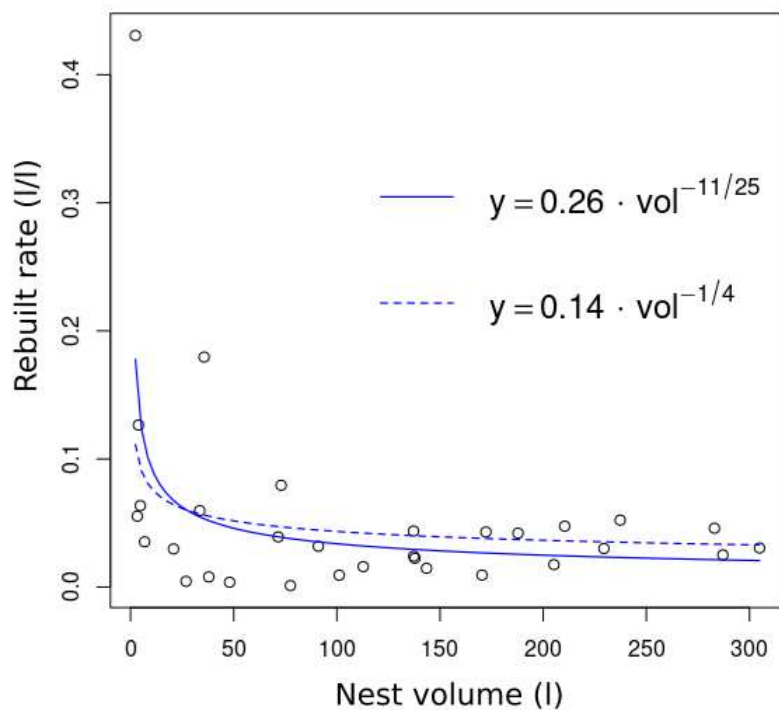


Figure 4.3: Correlation between nest volume and the rate of rebuilt. Each dot represents a single nest. The x axis represents the volume of nests in litres. The y axis represents the rebuilt rate after 24h of damage. Curves represent alternative adjustments: dotted line, refers to the allometric decay model, and the continuous line refers to the MTE model. Both curves differ significantly from the null hypothesis (p-value = 0.00011; $F_{[1,29]} = 20.084$) and do not differ from each other (p-value = 0.0569; $F_{[2,29]} = 3.9313$).

4.3.2 Nest wall thickness

The nest wall thickness was proportional to the volume of the nest. That is, there is a linear growth in the thickness of the wall with the increments in the nest volume (p-value = 0.0011; $F_{[1,20]} = 14.493$) (fig. 4.4, tab. 4.1). Therefore, the larger the nests,

the thicker the outer wall.

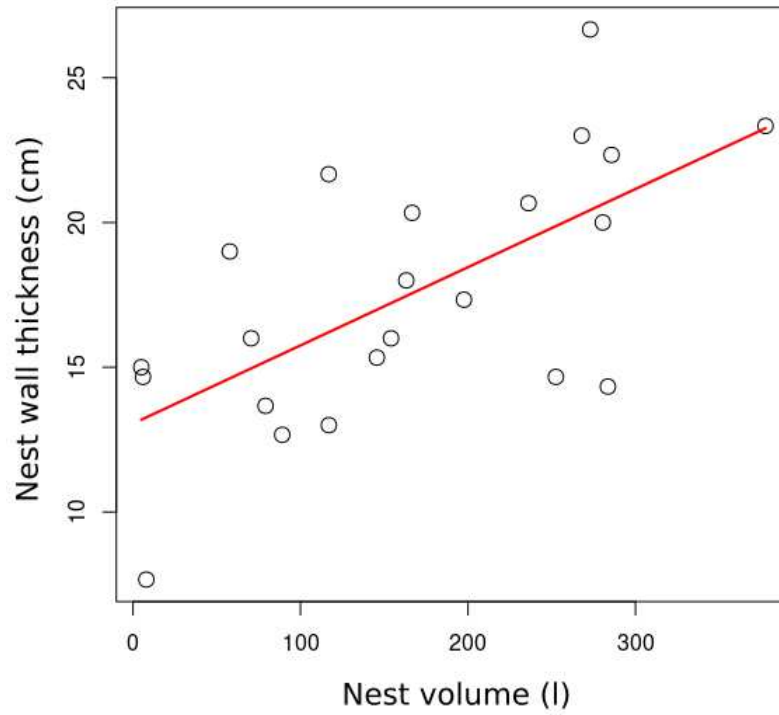


Figure 4.4: Correlation between nest volume and wall thickness. Each dot represents a single nest. The x axis represents the volume of the nests. The y axis represents the thickness of the nest wall in centimeters (cm). Nest wall thickness increase linearly with the increments in the nest volume (p -value = 0.0011; $F_{[1,20]} = 14.493$).

4.3.3 Proportion of workers at the nest wall

The proportion of workers at nest wall decreased non-linearly with the increments in the nest volume. In smaller nest there were more workers at the nest wall than in the larger nests. (p -value < 0.0001) (fig. 4.5, tab. 4.1).

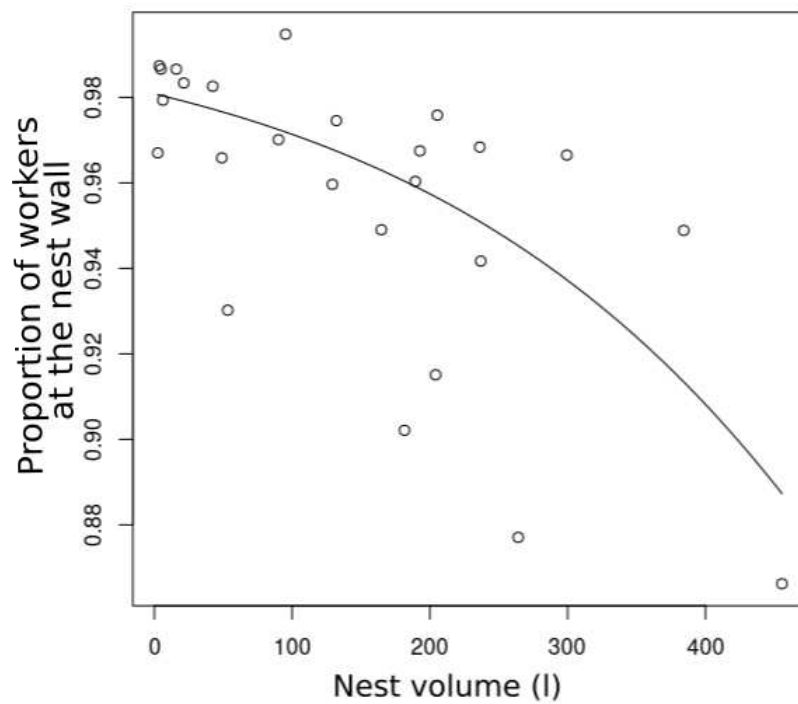


Figure 4.5: The presence of termite workers in nest wall as the colony grows. Each dot represents a single nest. The x axis represents the volume of the nests. The y axis represents the proportion of workers at the nest wall (p-value < 0.0001).

4.3.4 Nests growth

After six months, nests of smaller volume grew more than those with large volume (p-value = 0.01889; $F_{[1;20]} = 6.5264$) (fig. 4.6, tab. 4.1). Nests of up to 100 litres grew $\bar{x} = 2.02$ times after six months, while nests over 100 litres grew $\bar{x} = 1.41$ times after six months.

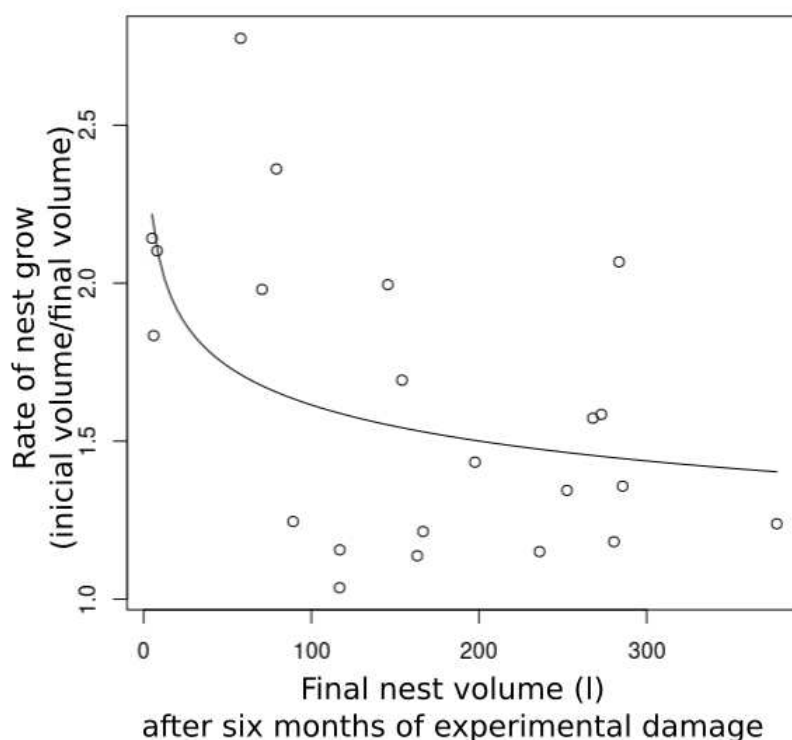


Figure 4.6: Nest growth rate after six months of the experimental damage. Each dot represents a single nest. The curve represents the nest growth rate. The growth rate of termite nests decreases with the increment in the volume (p-value = 0.01889; $F_{[1,20]} = 6.5264$).

4.3.5 Survival meantime of termite workers

The survival meantime of termite workers was not a function of the nest volume (p-value = 0.2731, $F_{[3,25]} = 1.37$) (tab. 4.1). With the increments in the nest volume, the mean survival time of *C. cumulans* remained constant.

4.3.6 Probability of *C. cumulans* termite workers of building epigeal nests

The best model selected for the epigeous nest based in genus *Cornitermes* workers' mandibles characters did not show substantial evidence predicting the pattern between the mandibles and nest building. Two characters, Left mandible apical tooth large and Right mandible Molar plate basal notch deep, were common to *Cornitermes* termite workers and other termite genera builders of epigeal nest (AIC = 68.23, $\Delta =$

0.00, weight = 0.14) (tab. 4.2).

4.4 Discussion

Our results indicate a negative correlation between nest size and nest damage rebuilding in termite colonies. The increase in the nest volume triggered an exponential decrease in the rate of nest rebuild (fig. 4.3, tab. 4.1). Actually, that exponential decrease followed an allometric pattern because the power function adjusted to the rebuilt rate did not differ from the decay function of the MTE (fig. 4.3, tab. 4.1). DeSouza *et al.* (2016) showed also that the number of patrolling *Constrictotermes cyphergaster* termite soldiers at the nest wall decayed allometrically with the increase in the nest volume. The allometric decaying of both nest rebuild and patrolling by soldiers with the increment in nest size may indicate that bigger termite colonies are less patrolled and less promptly maintained than smaller ones.

However, our data suggest that the investment made by colonies during the early development phase can balance these weaknesses by the progressive thickening of the nest walls (fig. 4.4, tab. 4.1). This might happen by virtue of by the accumulative effect of the constant deposition of building material on the nest walls (Cosarinsky, 2011).

The building and rebuilding activity is perhaps the most important component of colony defense (Noirot & Darlington, 2000). In smaller nest, as soon as damage is made to the nest, workers start to rebuild the wall or close the entrance of internal chambers and galleries to protect the colony (Noirot, 1970). So, it is important for the colony that workers work quickly and efficiently to move large amounts of substrate for nest building and rebuilding. Efficiency in the building task allows the decrease in time spent building and rebuilding the nest. This would result in directing workers to other tasks

The lower proportion of termite workers at the rebuilt wall in big nests (fig. 4.5, tab. 4.1) explains the tendency to decrease the rebuilt rate with the increment in nest size. In turn, the decreasing rebuilt rate of walls of large termite nests explains the

pattern of lowering the growth as the nest size increases (fig. 4.6, tab. 4.1). Then, the instantaneous rebuilt after the damage followed the same pattern that the long term building as an effect of the lower proportion of workers working on the nest wall.

Termite workers are responsible for the building and rebuild the nest walls (Eggleton, 2010). In addition to building, workers also execute other important functions such as foraging, feeding and cleaning nestmates (Oster & Wilson, 1979). Thus, termite colonies depend on the task allocation of workers to maintain themselves.

Such task allocation should become critical when colonies reach the size to begin reproduction due to the demand for food and care of the immatures (Rodrigues *et al.*, 2021). This change in the priority of tasks marks the beginning of the trade-off between growth and reproduction common to plants and other animals (Oster & Wilson, 1979; de Jong & van Noordwijk, 1992). In termites, this can be represented by the conflicting demand between the building/maintenance of the nest wall and reproduction. Reproduction is a process that demands the energy that was previously invested in other functions (Levins, 1968; Oster & Wilson, 1979). In ants, for example, when colonies reach the size for reproduction, workers become more active in discovering and defending food resources (Holway & Case, 2001; Palmer, 2004). Our results show that, in termites, tasks such as building and nest rebuilding decrease when *C. cumulans* colonies reach a size of over 100 liters (Rodrigues *et al.*, 2021).

In fact, some authors already have shown evidence of the reproduction-defense trade-off in termites colonies (Rodrigues *et al.*, 2021; Nutting, 1969). The defense of termite colonies is composed by the passive and active mechanism, the first refers to the action of soldiers and the second to the nest structure as a barrier for natural enemies (Noirot & Darlington, 2000; Noirot, 1970; Lepage & Darlington, 2000). Contrary to the negative correlation between nest size and the rate of patrolling soldiers found by DeSouza *et al.* (2016), the nest walls (passive defense) become thicker (fig. 4.4, fig. 4.1). These data suggest that, in bigger, presumably mature colonies, the nest structure could become primary in defense.

A physical mechanism can shed light on how termite workers would be allocated

to functions different from nest rebuilding in mature colonies. The accumulative effect of building material deposition thickens the nest walls, as a consequence a disturbance in the outer surface of the nest might not be strong enough to recruit workers to rebuild the damage. So, any damage to the nest wall can generate an alarm weakly noticeable by workers, thence not triggering massive recruitment to the damaged area. Thus, other workers, not realizing the problem, continue in other activities, such as parental care and foraging.

Low recruitment and low rebuilt rate were not explained by a decrease in the vitality of termite workers because we found that workers are equally healthy for different nest sizes (tab. 4.1). We also found larvae and alates in all nest sampled, indicating the good health of colonies during all stages of data collection.

Our data also failed to reveal any correlation between mandible traits and nest type (tab. 4.2). That would prevent any attempt to blame mandible maladaptation to the decreasing effort on rebuilding rate as the nest grows.

We found evidence to suggest that termites move from actively allocating individuals for defense purposes to taking advantage of the nest structure with the increment in nest size. We propose that the accumulative effort during colonies' development in nest building thickens the nest walls facilitating the alternation between defense mechanisms instead of leaving the colony unprotected during the reproductive phase.

4.5 Supporting information

4.5.1 Analyses results

Table 4.1: The effects of *C. cumulans* nest volume on (i) Rebuilt rate, (ii) Power decay, (iii) Nest wall thickness, (iv) Proportion of workers at the nest wall, (v) Nest grow rate, (vi) Survival meantime of workers.

	Df	Deviance	Resid. Df	Resid. Dev	Test	Pr(>F)	Pr(>Chi)
(i) Rebuilt rate							
Null model			30	1.9707			
Log (nest volume)	1	0.83601	29	1.1347	F=20.084	0.0001068	
(ii) Power decay							
Model 1: Rebuilt rate~log(nest volume)			29	1.1347			
Model 2: Rebuilt rate~offset(-0.25*log(nest volume))	-1	0.16364	30	1.2983	F=3.9313	0.05694	
(iii) Nest wall thickness							
Null model			21	412.38			
Nest volume	1	173.27	20	239.11	F=14.493	0.001104	
(iv) Proportion of workers at the nest wall							
Null model			24	924.77			
Nest volume	1	466.81	23	457.96			<2.2e-16
(v) Nest grow rate							
Null model			21	4.7439			
Nest volume	1	1.1672	20	3.5768	F=6.5264	0.01889	
(vi) Survival meantime of workers							
Model 1: average time ~1			28	2348127			
Model 2: average time~nest volume~nest wall thickness	3	332723	25	2015404	F=1.3757	0.2731	

AIC results - epigeous nests

Table 4.2: Results of the AIC (Akaike's information criterium) to model selection to the epigeous nest based in *C. cumulans* workers' mandibles characters. Models with substantial evidence ($\Delta \leq 2$) predicting the pattern between the mandibles and the nest building. Columns headings: id = model identification; INTCP = intercept; LAL = left Apical tooth large; LMlless1 = left mandible index less than 1; RAL = right Apical tooth large; Mpl1stRL = Molar plate 1st ridge large; RmplBND = Molar plate basal notch deep; MplB = Molar plate broad; MplC = Molar plate concave; MplD = Molar plate depressed; MplLM2pm = Molar plate longer than Second marginal tooth posterior margin; MplRL = Molar plate ridges large; MplRmore6 = Molar plate ridges more than 6; adjR² = Adjusted R-squared; df = degrees of freedom; logLik = log-likelihood; AIC = second order Akaike's Information Criterium; Δ = AICc difference between the model in concern and the best model; weight = Akaike weight.

id	INTCP	LAL	LMlless1	RAL	Mpl1stRL	RmplBND	MplB	MplC	MplD	MplLM2pm	MplRL	MplRmore6	adjR ²	df	logLik	AIC	delta	weight
18	-1.26	-17.1698	NA	NA	NA	36.0508	NA	NA	NA	NA	NA	NA	0.22	3	-31.11	68.23	0.00	0.14
21	-1.29	NA	NA	-17.1347	NA	36.0395	NA	NA	NA	NA	NA	NA	0.21	3	-31.36	68.72	0.49	0.11
530	-1.22	-17.1827	NA	NA	NA	52.4944	NA	NA	NA	NA	-16.6636	NA	0.24	4	-30.61	69.21	0.98	0.09
50	-1.32	-17.5033	NA	NA	NA	35.1583	1.3218	NA	NA	NA	NA	NA	0.24	4	-30.72	69.44	1.22	0.08
82	-1.45	-17.4588	NA	NA	NA	35.9676	NA	0.5715	NA	NA	NA	NA	0.24	4	-30.75	69.50	1.27	0.07
533	-1.24	NA	NA	-17.1438	NA	52.4624	NA	NA	NA	NA	-16.6438	NA	0.23	4	-30.86	69.72	1.50	0.07
53	-1.34	NA	NA	-17.5133	NA	35.1675	1.3437	NA	NA	NA	NA	NA	0.23	4	-30.96	69.91	1.69	0.06
85	-1.48	NA	NA	-17.4879	NA	35.9967	NA	0.6004	NA	NA	NA	NA	0.23	4	-30.96	69.91	1.69	0.06
26	-1.30	-17.1358	NA	NA	0.6061	35.4536	NA	NA	NA	NA	NA	NA	0.23	4	-31.01	70.01	1.79	0.06
20	-1.39	-17.0699	0.2076	NA	NA	35.8721	NA	NA	NA	NA	NA	NA	0.22	4	-31.06	70.12	1.89	0.05
274	-1.28	-17.1573	NA	NA	NA	35.8740	NA	NA	NA	0.1777	NA	NA	0.22	4	-31.10	70.20	1.98	0.05
1042	-1.26	-17.1739	NA	NA	NA	36.0648	NA	NA	NA	NA	NA	-0.0132	0.22	4	-31.11	70.22	2.00	0.05
146	-1.26	-17.3024	NA	NA	NA	19.8298	NA	NA	17.3024	NA	NA	NA	0.22	4	-31.11	70.23	2.00	0.05
22	-1.26	-17.3024	NA	0.1464	NA	36.0380	NA	NA	NA	NA	NA	NA	0.22	4	-31.11	70.23	2.00	0.05

Bibliography

- Araujo, Renato L. 1970. Termites of the Neotropical region. *Pages 527–576 of: Biology of termites*, vol. 2. Academic Press New York.
- Barton, Kamil. 2009. MuMIn: multi-model inference. <http://r-forge.r-project.org/projects/mumin/>.
- Cleassen, Marie EC. 1997. Manual de métodos de análise de solo. *Embrapa Solos-Documentos*.
- Coles, Helen R, & Redford, Kent H. 1982. The biology of nine termite species (Isoptera: Termitidae) from the Cerrado of Central Brazil. *Psyche*, **89**(1-2), 81–106.
- Constantino, Reginaldo. 2016. *Termite Database*. Available from: <<http://termitologia.net>>: Departamento de Zoologia, Universidade de Brasília. Updated in Sept 2020.
- Cosarinsky, Marcela I. 2011. The nest growth of the Neotropical mound-building termite, *Cornitermes cumulans*: A micromorphological analysis. *Journal of Insect Science*, **11**(1).
- Cristaldo, PF, Rosa, CS, Florencio, DF, Marins, A, & DeSouza, O. 2012. Termitarium volume as a determinant of invasion by obligatory termitophiles and inquilines in the nests of *Constrictotermes cyphergaster* (Termitidae, Nasutitermitinae). *Insectes Sociaux*, **59**(4), 541–548.
- Cunha, Helida, Costa, Diogo, Oliveira, Lucivânio, Brandão, Divino, & Filho, Kleber. 2003. Relationship between *Constrictotermes cyphergaster* and Inquiline Termites in the Cerrado (Isoptera: Termitidae). *Sociobiology*, **42**(01), 1–10.
- de Jong, G., & van Noordwijk, A. J. 1992. Acquisition and Allocation of Resources: Genetic (CO) Variances, Selection, and Life Histories. *American Naturalist*, **139**, 749–770.

- De Jong, G, & Van Noordwijk, AJ. 1992. Acquisition and allocation of resources: genetic (co) variances, selection, and life histories. *The American Naturalist*, **139**(4), 749–770.
- DeSouza, O, Miramontes, O, Santos, CA, & Bernardo, DL. 2001. Social facilitation affecting tolerance to poisoning in termites (Insecta, Isoptera). *Insectes Sociaux*, **48**(1), 21–24.
- DeSouza, Og, Araújo, Ana Paula Albano, Florencio, Daniela Faria, Rosa, Cassiano Sousa, Marins, Alessandra, Costa, Diogo Andrade, Rodrigues, Vinicius Barros, & Cristaldo, Paulo Fellipe. 2016. Allometric scaling of patrolling rate and nest volume in *Constrictotermes cyphergaster* termites: Hints on the settlement of inquilines. *Plos One*, **11**(1), e0147594.
- Eggleton, Paul. 2010. An introduction to termites: biology, taxonomy and functional morphology. Pages 1–26 of: *Biology of termites: a modern synthesis*. Springer, Dordrecht.
- Gordon, Deborah M. 1996. The organization of work in social insect colonies. *Nature*, **380**(6570), 121–124.
- Gordon, Deborah M, & Mehdiabadi, Natasha J. 1999. Encounter rate and task allocation in harvester ants. *Behavioral Ecology and Sociobiology*, **45**(5), 370–377.
- Grassé, Pierre-P. 1958. Sur le nid et la biologie de *Cornitermes cumulans* (Kollar), termites brésilién. *Insectes Sociaux*, **5**, 189–199.
- Guimarães, M.P., & DeSouza, O. 2022. *Neotropical Termites' Genera Database*.
- Holway, David A, & Case, Ted J. 2001. Effects of colony-level variation on competitive ability in the invasive Argentine ant. *Animal Behaviour*, **61**(6), 1181–1192.
- Kottek, Markus, Grieser, Jürgen, Beck, Christoph, Rudolf, Bruno, & Rubel, Franz. 2006. World map of the Köppen-Geiger climate classification updated. *Meteorologische Zeitschrift*, **15**(3), 259–263.

- Lepage, Michel, & Darlington, Johanna P. E. C. 2000. Population Dynamics of Termites. Pages 333–361 of: *Termites: evolution, sociality, symbioses, ecology*. Springer, Dordrecht.
- Levins, R. 1968. *Evolution in Changing Environments: Some Theoretical Explorations*. Vol. 2 of Monographs in population biology. Princeton University Press.
- London, Karen B, & Jeanne, Robert L. 2003. Effects of colony size and stage of development on defense response by the swarm-founding wasp *Polybia occidentalis*. *Behavioral Ecology and Sociobiology*, **54**(6), 539–546.
- Mathews, A. G. A. 1977. *Estudies on termites from the Mato Grosso State, Brazil*. Academia Brasileira de Ciências.
- Noirot, Charles. 1970. The nests of termites. *Biology of termites*, **1**, 73–125.
- Noirot, Charles, & Darlington, Johanna PEC. 2000. Termite nests: architecture, regulation and defence. Pages 121–139 of: *Termites: evolution, sociality, symbioses, ecology*. Springer.
- Nutting, W. L. 1969. Flight and colony foundation. Pages 233–282 of: *Biology of Termites*. Academic Press, New York Press, New York, 1st edition.
- Oster, George F, & Wilson, Edward O. 1979. *Caste and ecology in the social insects*. Princeton University Press.
- Pacala, Stephen W, Canham, Charles D, Saponara, John, Silander Jr, John A, Kobe, Richard K, & Ribbens, Eric. 1996. Forest models defined by field measurements: estimation, error analysis and dynamics. *Ecological monographs*, **66**(1), 1–43.
- Palmer, Todd M. 2004. Wars of attrition: colony size determines competitive outcomes in a guild of African acacia ants. *Animal Behaviour*, **68**(5), 993–1004.
- Pequeno, Pedro A C Lima, Franklin, Elizabeth, Venticinque, Eduardo M, & Serrao Acioli, Agno N. 2013. The scaling of colony size with nest volume in termites: a role in population dynamics? *Ecological entomology*, **38**(5), 515–521.

- R Core Team. 2021. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Redford, Kent H. 1984. The termitaria of *Cornitermes cumulans* (Isoptera, Termitidae) and their role in determining a potential keystone species. *Biotropica*, **16**(2), 112–119.
- Rodrigues, Vinícius Barros, Tuci, Elio, Holstein, Horst, Bowen, Miriam S., Costa, Diogo Andrade, Takahashi, Lucy T., Cristaldo, Paulo Felliipe, & DeSouza, Og. 2021. Macro-symbiosis triggered by a defence-reproduction tradeoff in a social insect. *Ecological Modelling*, **462**, 109780.
- Sarmiento, CE. 2004. A test of adaptive hypotheses: Mandibular traits, nest construction materials, and feeding habits in neotropical social wasps (Vespidae, Polistinae). *Insectes sociaux*, **51**(4), 387–391.
- Sibly, Richard M, Brown, James H, & Kodric-Brown, Astrid. 2012. *Metabolic ecology: a scaling approach*. John Wiley and Sons.
- Spradbery, J Philip, *et al.* 1973. *Wasps. An account of the biology and natural history of social and solitary wasps, with particular reference to those of the British Isles*.
- Staps, Merlijn, & Tarnita, Corina E. 2022. When being flexible matters: Ecological underpinnings for the evolution of collective flexibility and task allocation. *Proceedings of the National Academy of Sciences*, **119**(18), e2116066119.
- Stearns, Stephen C. 1992. *The evolution of life histories*. Oxford. Oxford University.
- Therneau, Terry M. 2022. *A Package for Survival Analysis in R*. R package version 3.3-1.

Chapter 5

Appendix

5.1 Catalogue of the Neotropical Termites Genera

5.1.1 Kalotermitidae

Genus *Calcaritermes* Snyder 1925

Nesting: wood (Krishna, 1962).

Feeding: wood (Krishna, 1962; Constantino, 2002).

Table 5.1: Morphological characters of the genus *Calcaritermes* extracted from the database according to Krishna (1962). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	spur	development: conspicuous; position: near apex of outer side	tibia (fore legs)
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	wings	as in <i>Glyptotermes</i>	thorax
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)
imago	1+2 marginal tooth (M1+2) posterior margin	merging with; equal to 3rd marginal tooth (M3) anterior margin	left mandible
imago	cutting edge	shape: concave	left mandible
imago	2nd marginal tooth (M2) posterior margin	slightly longer than molar plate anterior margin	left mandible

Genus *Comatermes* Krishna 1961

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Pest of: Tea and coffee (Constantino, 2002; Krishna *et al.*, 2013).

Distribution: South America (Krishna, 1961).

Table 5.2: Morphological characters of the genus *Comatermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	length: usually long; sometimes short; shape: dorso-ventrally flattened	body
soldier	frons	position: in front; shape: concave	head
soldier	prominence	number: 2; development: faint; position: anterodorsal part of frons	head
soldier	eyes	colour: unpigmented	head
soldier	articles	number: 13 to 14	antennae
soldier	3rd article	development: unmodified; equal to 2nd article	articles
soldier	mandibles	development: strong; shorter than head length	head
soldier	pronotum	as wide as head	thorax
soldier	pronotum anterior margin	shape: shallowly concave; shallowly concave	pronotum
soldier	femur	shape: swollen	hind legs
soldier	femur	shape: swollen	middle legs
soldier	femur	shape: swollen	fore legs
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	colour: dark brown	body
imago	hairs	length: remarkably long; width: thin; shape: somewhat wavy; texture: not stiff	pronotum
imago	hairs	length: remarkably long; shape: somewhat wavy; texture: not stiff	head
imago	eyes	diameter: 0.29 to 0.31 mm	head
imago	ocelli	in contact with eyes; in contact with eyes	head
imago	articles	number: 14	antennae
imago	mandibles	as in <i>Kalotermes</i>	head
imago	1+2 marginal tooth (M1+2) posterior margin	equal to 3rd marginal tooth (M3) anterior margin	left mandible
imago	pronotum	broader than head	thorax

Table 5.2: Morphological characters of the genus *Comatermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	wings	closely resembling <i>Paraneotermes</i>	thorax
imago	wings	closely resembling <i>Ceratotalotermes</i>	thorax
imago	major veins	arising independently at wing suture	fore wings
imago	branches	number: 9 to 10; running not so close to cubitus (Cu); running close to radial sector; weakly sclerotized than radial sector	fore wings
imago	branches	orientation: cross; position: between media and radial sector	fore wings
imago	cubitus (Cu)	development: weak	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)

Genus *Cryptotermes* Banks 1906

Nesting: wood (Scheffrahn & Krecek, 1999).

Feeding: wood (Scheffrahn & Krecek, 1999; Constantino, 2002).

Pest of: Forest trees, cocoa, fruit trees, tea, coffee, buildings and chambers (Constantino, 2002; Krishna *et al.*, 2013).

Table 5.3: Morphological characters of the genus *Cryptotermes* extracted from the database according to Scheffrahn & Krecek (1999). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head capsule anterior margin	colour: almost black, grading posteriorly to chest nut brown, orange brown, or orange yellow	head capsule
soldier	head capsule posterior margin	colour: orange-yellow	head capsule
soldier	head capsule	width: thick; length: short; function: phragmotic; colour: generally dark brown	head
soldier	head capsule sides	texture: sometimes rugose	head capsule
soldier	constriction	development: weak position: laterally near eyes; occurrence: sometimes absent	head capsule
soldier	head capsule	angle: 30 to 90 degrees; orientation: sloping; position: frontal plane from plane of vertex	head
soldier	frontal peels	Angle: more than 90 degrees; orientation: overhanging to slope; position: frontal plane from plane of vertex; occurrence: sometimes present	head capsule
soldier	frontal ridge (flange)	orientation: sloping; width: narrow; angle: more than 90 degrees; position: between frons and vertex; occurrence: usually present	head capsule
soldier	median notch	position: between frons and vertex; occurrence: absent	head capsule
soldier	projection	number: two pairs; development: sometimes weak; position: one in the lateral margin of the postclypeus in front of antennal fossae (frontal horns), the other formed by an anterior prolongation of the ventral genae, in front of and below the antennal fossae (genal horns); shape: horn-like	head capsule
soldier	frons	shape: generally concave or flat	head
soldier	ridges	occurrence: sometimes present	frons

Table 5.3: Morphological characters of the genus *Cryptotermes* extracted from the database according to Scheffrahn & Krecek (1999). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	convexity	sometimes present	frons
soldier	vertex	position: medially, behind frontal flange; shape: usually depressed	head
soldier	eyes	colour: unpigmented; development: usually distinct	head
soldier	articles	number: 10 to 16	antennae
soldier	3rd article	length: not especially long	articles
soldier	clypeus	shape: subtrapezoidal	head
soldier	labrum	shape: tongue-shaped or subtriangular	head
soldier	mandibles	length: extremely short to long; shape: weakly to strongly toothed	head
soldier	mandibles in the middle	position: externally in the middle; shape: weakly to strongly shouldered	mandibles
soldier	mandibles apex	position: from middle to tip of point; shape: curved inwards	mandibles
soldier	postmentum	width: broad; position: posteriorly	head
soldier	pronotum	as wide as head; wider than head; slightly narrower than head	thorax
soldier	pronotum anterior margin	shape: serrated; strongly concave	pronotum
soldier	pronotum posterior margin	shape: rounded	pronotum
soldier	pronotum sides	shape: rounded	pronotum
soldier	hind legs	shape: not inflated; length: short	thorax
soldier	middle legs	shape: not inflated; length: short	thorax
soldier	fore legs	shape: not inflated; length: short	thorax
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
soldier	segments	number: four-jointed	tarsus (hind legs)
soldier	segments	number: four-jointed	tarsus (middle legs)
soldier	segments	number: four-jointed	tarsus (fore legs)
soldier	cerci	number: four-jointed	abdomen
imago	body	colour: brown to dark brown	body
imago	hairs	density: sparsely to moderately hairy	head capsule

Table 5.3: Morphological characters of the genus *Cryptotermes* extracted from the database according to Scheffrahn & Krecek (1999). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
imago	head capsule	colour: pale yellow to dark yellowish brown; reddish brown to dark brown	head
imago	head capsule posterior margin	position: from behind or a point away from the eyes; shape: evenly rounded	head capsule
imago	scales	development: sometimes very distinct; occurrence: sometimes absent; shape: chevron pattern	fore wings
imago	epicranial suture	development: often vestigial; occurrence: generally present	head
imago	ocelli	shape: round; touching eyes; close to eyes; near to eyes	head
imago	eyes	size: small; shape: round, nearly round, or oval	head
imago	articles	number: 12 to 19	antennae
imago	clypeus anterior margin	shape: straight, convex, or concave	clypeus
imago	clypeus	shape: subtrapezoidal	head
imago	labrum width	broader than labrum length; as broad as labrum length	head
imago	1+2 marginal tooth (M1+2)	position: at the base; as wide as 3rd marginal tooth (M3)	left mandible
imago	3rd marginal tooth (M3) anterior margin	as long as 1+2 marginal tooth (M1+2) posterior margin	left mandible
imago	2nd marginal tooth (M2) posterior margin	distinctly longer than molar plate	right mandible
imago	pronotum	narrower than head width; as wide as head width; slightly wider than head width	thorax
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	segments	number: four jointed	tarsus (hind legs)
imago	segments	number: four jointed	tarsus (middle legs)
imago	segments	number: four jointed	tarsus (fore legs)
imago	arolium	occurrence: often present	tarsus (hind legs)
imago	arolium	occurrence: often present	tarsus (middle legs)
imago	arolium	occurrence: often present	tarsus (fore legs)
imago	major veins	arising independently at wing suture	fore wings

Table 5.3: Morphological characters of the genus *Cryptotermes* extracted from the database according to Scheffrahn & Krecek (1999). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	radius (R)	development: simple	fore wings
imago	media (M)	colour: unsclerotized; development: weak; running midway between cubitus (Cu) and radial sector	fore wings

Genus *Eucryptotermes* Holmgren 1911

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Pest of: buildings and chambers (Constantino, 2002; Krishna *et al.*, 2013).

Distribution: South America (Krishna, 1961).

Table 5.4: Morphological characters of the genus *Eucryptotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head capsule	colour: blackish; texture: sometimes rugose; function: phragmotic; width: thick; length: short	head
soldier	head capsule sides	orientation: parallel; shape: fairly straight; texture: sometimes rugose	head capsule
soldier	head	position: region of antennae; shape: somewhat constricted	body
soldier	ridges	position: between frons and vertex and front and sides; shape: circular	head
soldier	front	ornamentation: no sculpturing; position: frontal area; texture: smooth; extending out mandibles	head
soldier	profile of front	orientation: steep	front
soldier	antennal socket	length: 1/3 to 1/2 of head length; position: length of head from front sides	antennae
soldier	eyes	width: narrow; development: indistinct; occurrence: present	head
soldier	articles	number: 11	antennae
soldier	3rd article	development: unmodified; shorter than 2nd article	articles
soldier	labrum	colour: black; development: not visible; position: front from above; shape: concave	head
soldier	mandibles	length: short; width: broad base	head
soldier	basal hump	development: distinct	mandibles
soldier	postmentum	length: short; shape: oval	head
soldier	pronotum anterior margin	shape: serrated	pronotum
soldier	femur	shape: not swollen	hind legs
soldier	femur	shape: not swollen	middle legs
soldier	femur	shape: not swollen	fore legs
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)

Table 5.4: Morphological characters of the genus *Eucryptotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: uniformly brownish yellow	body
imago	ocelli	touching eyes	head
imago	eyes	diameter: 0.43 mm	head
imago	articles	number: 14 to 16	antennae
imago	mandibles	as in <i>Glyptotermes</i>	head
imago	1+2 marginal tooth (M1+2)	equal to 3rd marginal tooth (M3)	left mandible
imago	2nd marginal tooth (M2) posterior margin	slightly longer than molar plate anterior margin	right mandible
imago	pronotum	narrower than head	thorax
imago	wing scale (tegula)	shape: very slightly convex, almost straight; as in <i>Glyptotermes</i> ; as in <i>Calcaritermes</i>	fore wings
imago	major veins	arising independently at wing suture	fore wings
imago	radius (R1)	development: weak	fore wings
imago	branches	number: 5 to 6	radial sector (fore wings)
imago	media (M)	as strongly sclerotized as radial sector; running very close to radial sector; running parallel to radial sector	fore wings
imago	veins	orientation: cross; position: between media and radial sector; occurrence: present	fore wings
imago	cubitus (Cu)	colour: unsclerotized; development: weak	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)

Genus *Glyptotermes* Froggatt 1897

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Pest of: Fruit trees, forest trees, buildings and chambers (Krishna *et al.*, 2013).

Distribution: Central and South America, west Indies, Puerto Rico (Krishna, 1961).

Table 5.5: Morphological characters of the genus *Glyptotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	length: more or less elongated; width: thick; function: sometimes phragmotic	body
soldier	profile of front	orientation: sloping quite steeply to vertical; shape: sometimes concave	front
soldier	frontal area	orientation: sloping quite steeply to vertical; shape: sometimes concave	front
soldier	lobes	number: 2; development: sometimes faint	head
soldier	depression	position: between lobes; shape: sometimes U-shape	head
soldier	eyes	colour: unpigmented	head
soldier	articles	number: 10 to 15	antennae
soldier	3rd article	development: unmodified; shorter than 2nd article	articles
soldier	mandibles	width: broad; length: short	head
soldier	basal hump	occurrence: absent	mandibles
soldier	pronotum	as broad as head; wider than head; slightly narrower than head	thorax
soldier	pronotum anterior margin	shape: concave	pronotum
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	colour: reddish brown to dark brown	body
imago	eyes	diameter: 0.29 to 0.48 mm	head
imago	ocelli	touching eyes	head
imago	articles	number: 11 to 17	antennae
imago	1+2 marginal tooth (M1+2)	equal to 3rd marginal tooth (M3) anterior margin	left mandible
imago	notch	development: distinct; occurrence: sometimes absent; position: between 1+2 marginal tooth (M1+2) and 3rd marginal tooth (M3)	left mandible

Table 5.5: Morphological characters of the genus *Glyptotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	2nd marginal tooth (M2) posterior margin	slightly longer than molar plate	right mandible
imago	pronotum	narrower than head; as wide as head	thorax
imago	wing scale (tegula)	position: anterior margin; shape: slightly convex, almost straight	fore wings
imago	wing membrane	colour: smoky brown	fore wings
imago	nodules	colour: pigmented; position: over wing membrane; shape: pimple-like; size: small; as in <i>Rugitermes</i> ; as in <i>Kalotermes</i>	hind wings
imago	nodules	colour: pigmented; position: over wing membrane; shape: pimple-like; size: small; as in <i>Rugitermes</i> ; as in <i>Kalotermes</i>	fore wings
imago	major veins	arising independently at wing suture	fore wings
imago	radius (R1)	length: short	fore wings
imago	radial sector	colour: heavily sclerotized; running parallel to costal border; running very close to costal border	fore wings
imago	branches	occurrence: absent	radial sector (fore wings)
imago	branches	orientation: cross; development: faint; position: between radial sector and media and between media and cubitus in distal end of wing	fore wings
imago	media (M)	colour: heavily sclerotized	fore wings
imago	cubitus (Cu)	development: weak	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)

Genus *Incisitermes* Krishna 1961

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Pest of: Coconut, buildings and chambers (Constantino, 2002; Krishna *et al.*, 2013)

Distribution: Central and South America, Galapagos Islands, the West Indies, western Mexico (Krishna, 1961).

Table 5.6: Morphological characters of the genus *Incisitermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	length: sometimes short; shape: dorsoventrally flattened	body
soldier	front	angle: approx. 20 degrees; orientation: sloping very slightly; position: frontal plane from plane of vertex	head
soldier	eyes	colour: sometimes pigmented	head
soldier	mandibles	length: short; development: massive	head
soldier	basal hump	occurrence: absent or present	mandibles
soldier	articles	number: 10 to 17	antennae
soldier	3rd article	length: longest; colour: darker; shape: often club-shaped	articles
soldier	pronotum	as broad as head; broader than head	thorax
soldier	pronotum sides	shape: evenly rounded	pronotum
soldier	pronotum anterior margin	shape: deeply angular	pronotum
soldier	femur	shape: usually swollen	hind legs
soldier	femur	shape: usually swollen	middle legs
soldier	femur	shape: usually swollen	fore legs
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	colour: sometimes dark brown; light brown	body
imago	eyes	diameter: 0.25 to 0.50 mm	head
imago	ocelli	usually touching eyes	head
imago	articles	number: 13 to 20	antennae
imago	3rd marginal tooth (M3) anterior margin	slightly longer than 1+2 marginal tooth (M1+2) posterior margin	left mandible
imago	molar plate	subequal to 2nd marginal tooth (M2) posterior margin	right mandible
imago	pronotum	as broad as head; broader than head	thorax
imago	wings	colour: transparent	wings

Table 5.6: Morphological characters of the genus *Incisitermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	major veins	arising independently at wing suture	fore wings
imago	branches	number: 3 to 8	radius (fore wings)
imago	media (M)	colour: unsclerotized; development: weak; running midway between radial sector and cubitus (Cu)	fore wings
imago	cubitus (Cu)	colour: unsclerotized; development: weak	fore wings
imago	branches	orientation: cross; position: between media and radial sector	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: sometimes absent	tarsus (hind legs)
imago	arolium	occurrence: sometimes absent	tarsus (middle legs)
imago	arolium	occurrence: sometimes absent	tarsus (fore legs)

Genus *Kalotermes* Hagen, 1853

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Table 5.7: Morphological characters of the genus *Kalotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	width: usually narrow; length: usually long; shape: sometimes dorsoventrally flat	body
soldier	head sides	orientation: parallel	head
soldier	front	angle: 40 to 45 degrees; orientation: sloping downward; position: to mandibles; shape: concave	head
soldier	eyes	colour: unpigmented; size: small; shape: faceted	head
soldier	articles	number: 11 to 18	antennae
soldier	3rd article	development: variable; longer than 2nd article; shorter than 2nd article	articles
soldier	mandibles	development: strong	head
soldier	marginal teeth	number: 2 to 4	left mandible
soldier	marginal teeth	number: 2	right mandible
soldier	pronotum	wider than head; as wide as head	thorax
soldier	pronotum anterior margin	shape: broadly emarginate	pronotum
soldier	femur	shape: sometimes slightly swollen	hind legs
soldier	femur	shape: sometimes slightly swollen	middle legs
soldier	femur	shape: sometimes slightly swollen	fore legs
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	colour: darkly pigmented; size: small	body
imago	eyes	size: small; diameter: 0.25 to 35 mm	head
imago	ocelli	almost touching eyes	head
imago	articles	number: 12 to 17	antennae
imago	1+2 marginal tooth (M1+2) posterior margin	equal to 3rd marginal tooth (M3) anterior margin	left mandible

Table 5.7: Morphological characters of the genus *Kaloterмес* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	2nd marginal tooth (M2) posterior margin	subequal to molar plate	right mandible
imago	pronotum	broader than head	thorax
imago	pronotum anterior margin	shape: concave	pronotum
imago	wing scale (tegula)	position: anterior margin; shape: convex	fore wings
imago	nodules	colour: pigmented; shape: pimple-like; density: densely covered; size: small	fore wings
imago	wings	width: broad; position: region between costal margin and radial sector	thorax
imago	veins	arising independently at wing suture	fore wings
imago	subcosta (Sc)	length: short	fore wings
imago	radius (R1)	development: simple; strong	fore wings
imago	radial sector	colour: strongly sclerotized	fore wings
imago	branches	number: approx. 12	radial sector (fore wings)
imago	media (M)	colour: unsclerotized; development: weak; running almost midway between cubitus (Cu) and radial sector	fore wings
imago	cubitus (Cu)	colour: unsclerotized; development: weak	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)

Genus *Neotermes* Holmgren, 1853

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Pest of: Cocoa, fruit trees (Constantino, 2002; Krishna *et al.*, 2013).

Distribution: Central and South America, Cocos Island, Mona Island, and the West Indies (Krishna, 1961).

Table 5.8: Morphological characters of the genus *Neotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	length: usually long	body
soldier	head sides	orientation: parallel	head
soldier	frons	angle: less 90 degrees; orientation: sloping; shape: faintly medially depressed	head
soldier	antennal carinae	shape: sometimes projecting; size: sometimes large	antennae
soldier	eyes	colour: sometimes pigmented	head
soldier	articles	number: 12 to 19	antennae
soldier	3rd article	shorter than 2nd article; longer than 2nd article	articles
soldier	mandibles	length: long; development: strong	head
soldier	pronotum	as broad as head	thorax
soldier	pronotum anterior margin	shape: usually widely emarginate	pronotum
soldier	femur	shape: sometimes swollen	hind legs
soldier	femur	shape: sometimes swollen	middle legs
soldier	femur	shape: sometimes swollen	fore legs
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	colour: castaneous brown to dark brown	body
imago	ocelli	close to eyes; touching eyes	head
imago	eyes	diameter: 0.46 to 0.78 mm.; size: large	head
imago	articles	number: 12 to 21	antennae
imago	mandibles	as in <i>Kaloterme</i> s	head
imago	1+2 marginal tooth (M1+2) posterior margin	equal to 3rd marginal tooth (M3) anterior margin	left mandible
imago	2nd marginal tooth (M2) posterior margin	subequal molar plate	right mandible

Table 5.8: Morphological characters of the genus *Neotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	pronotum	broader than head; wider than head; slightly narrower than head; as broad as head	thorax
imago	major veins	arising independently at wing suture	fore wings
imago	branches	number: variable	radial sector (fore wings)
imago	media (M)	colour: strongly sclerotized; running parallel to; running close to; as strongly sclerotized as radial sector	fore wings
imago	cubitus (Cu)	colour: unsclerotized; development: weak	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: sometimes absent	tarsus (hind legs)
imago	arolium	occurrence: sometimes absent	tarsus (middle legs)
imago	arolium	occurrence: sometimes absent	tarsus (fore legs)

Genus *Procryptotermes* Holmgren, 1910

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Distribution: Jamaica, Mona Island, Puerto Rico (Krishna, 1961).

Table 5.9: Morphological characters of the genus *Procryptotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	length: long	body
soldier	head sides	orientation: parallel	head
soldier	front	angle: 45 degrees; orientation: sloping; position: to clypeus	head
soldier	frontal flange	development: sometimes less prominent; position: between frons and vertex; occurrence: sometimes absent	front
soldier	median incision	position: between frons and vertex; shape: shallow	front
soldier	projection	number: two pairs; position: anterolateral region, one situated near lateral margin of post-clypeus, in front of antennal socket, the other formed by a prolongation of ventral genae in front and below antennal socket; in some the upper or lower projection absent or not so prominent, shape: horn-like	head
soldier	eyes	colour: unpigmented	head
soldier	articles	number: 11 to 16	antennae
soldier	3rd article	length: usually long; shape: club-shaped; usually longer than 2nd article; sometimes shorter than 2nd article	articles
soldier	mandibles	length: 1.28 to 1.58 mm	head
soldier	basal hump	occurrence: present	mandibles
soldier	mandibles basal region	width: thick	mandibles
soldier	teeth	occurrence: sometimes absent	left mandible
soldier	teeth	occurrence: sometimes absent	right mandible
soldier	pronotum	shape: markedly arched transversely; as broad as head; wider than head	thorax
soldier	pronotum anterior margin	shape: deeply emarginate	pronotum
soldier	femur	shape: usually swollen	hind legs
soldier	femur	shape: usually swollen	middle legs
soldier	femur	shape: usually swollen	fore legs
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)

Table 5.9: Morphological characters of the genus *Procryptotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	colour: reddish brown to brown	body
imago	eyes	diameter: 0.34 to 0.39 mm; size: small	head
imago	ocelli	touching eyes	head
imago	articles	number: 16 to 18	antennae
imago	1+2 marginal tooth (M1+2) base	much smaller than 3rd marginal tooth (M3)	left mandible
imago	3rd marginal tooth (M3) anterior margin	longer than 1+2 marginal tooth (M1+2) posterior margin	left mandible
imago	molar plate	distinctly shorter than 2nd marginal tooth (M2) posterior margin	right mandible
imago	pronotum	as broad as head; broader than head	thorax
imago	major veins	arising independently at wing suture	fore wings
imago	radius (R1)	development: simple	fore wings
imago	branches	number: 4 to 5	radial sector (fore wings)
imago	media (M)	colour: unsclerotized; development: weak; bending up to meet cubitus (Cu); running midway between cubitus (Cu) and radial sector	fore wings
imago	cubitus (Cu)	colour: unsclerotized; development: weak	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)

Genus *Proneotermes* Holmgren 1911

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Distribution: Central and South America (Krishna, 1961).

Table 5.10: Morphological characters of the genus *Proneotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	colour: nearly black	body
soldier	head capsule anterior margin	colour: nearly black; grading posteriorly to head capsule posterior margin	head capsule
soldier	head capsule posterior margin	colour: yellowish	head capsule
soldier	head sides	orientation: parallel	head
soldier	front	angle: approx. 45 degrees; orientation: sloping; position: front to clypeus; shape: truncate	head
soldier	front dorso lateral corners	orientation: slightly raised	front
soldier	ridges	development: very faint; position: between vertex and frons	head
soldier	head sides	position: above antennal socket; texture: roughened	head
soldier	projection	position: above and below antennal socket absent; occurrence: absent; shape: horn-like	head
soldier	eyes	colour: unpigmented; development: distinct	head
soldier	articles	number: 13 to 14	antennae
soldier	3rd article	shape: club-shaped, longer than 4th article; longer than 2nd article	articles
soldier	mandibles	development: strong	head
soldier	mandibles margins	shape: fairly rounded	mandibles
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
soldier	femur	width: thick; length: short	hind legs
soldier	femur	width: thick; length: short	middle legs
soldier	femur	width: thick; length: short	fore legs
imago	body	colour: yellowish	body
imago	eyes	diameter: 0.39 to 0.43 mm; size: fairly small	head
imago	ocelli	touching eyes; close to eyes	head
imago	articles	number: 17 to 18	antennae

Table 5.10: Morphological characters of the genus *Proneotermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	1+2 marginal tooth (M1+2) base	slightly shorter than 3rd marginal tooth (M3)	left mandible
imago	2nd marginal tooth (M2) posterior margin	slightly longer than molar plate	right mandible
imago	pronotum	slightly broader than head	thorax
imago	wing membrane	colour: hyaline	wings
imago	major veins	arising independently at wing suture	fore wings
imago	radius (R1)	length: simple; extending from wing suture length	fore wings
imago	branches	number: 4 to 6	radius (fore wings)
imago	branches	position: 1st branch; arising at wing suture	radius (fore wings)
imago	media (M)	weakly sclerotized than radial sector; running close to radial sector; running parallel to radial sector	fore wings
imago	veins	number: few; orientation: cross; position: between radial sector and media	fore wings
imago	cubitus (Cu)	colour: unsclerotized; development: weak	fore wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)

Genus *Rugitermes* Holmgren 1911

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Pest of: Fruit trees (Constantino, 2002; Krishna *et al.*, 2013).

Distribution: Central and South America (Krishna, 1961).

Table 5.11: Morphological characters of the genus *Rugitermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	width: narrow; length: long; shape: medially depressed	body
soldier	head sides	orientation: parallel	head
soldier	lobes	number: faintly bilobed	head
soldier	ridges	position: continuation of dorsal antennal ridge medially; forming a prominent ridge in front; shape: prominent	head
soldier	eyes	colour: unpigmented	head
soldier	articles	number: 12 to 18	antennae
soldier	3rd article	shape: clavate; longer than 2nd article	articles
soldier	mandibles	length: short; development: strong	head
soldier	mandibles outer margin	shape: rounded	mandibles
soldier	basal hump	occurrence: absent	mandibles
soldier	pronotum	slightly narrower than head; as broad as head; broader than head	thorax
soldier	pronotum anterior margin	shape: shallowly concave	pronotum
soldier	legs	shape: not swollen	thorax
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	colour: usually dark brown	body
imago	pronotum	colour: sometimes yellowish; as broad as head	thorax
imago	eyes	diameter: 0.29 to 0.43 mm; size: small	head
imago	ocelli	not touching eyes	head
imago	articles	number: 15 to 20	antennae
imago	mandibles	as in <i>Kalotermes</i>	head
imago	1+2 marginal tooth (M1+2) posterior margin	equal to 3rd marginal tooth (M3) anterior margin	left mandible

Table 5.11: Morphological characters of the genus *Rugitermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	2nd marginal tooth (M2) posterior margin	equal to molar plate	right mandible
imago	nodules	colour: pigmented; shape: pimple-like; size: small	pronotum
imago	major veins	arising independently at wing suture	fore wings
imago	radius (R1)	development: simple	fore wings
imago	branches	number: 7 to 8; position: anterior branches	fore wings
imago	cubitus (Cu)	colour: unsclerotized; development: weak	fore wings
imago	branches	orientation: cross; position: between radial sector and cubitus in distal end of wing	fore wings
imago	media (M)	occurrence: absent	hind wings
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	arolium	occurrence: present	tarsus (hind legs)
imago	arolium	occurrence: present	tarsus (middle legs)
imago	arolium	occurrence: present	tarsus (fore legs)

Genus *Tauritermes* Krishna 1961

Nesting: wood (Krishna, 1961).

Feeding: wood (Krishna, 1961; Constantino, 2002).

Pest of: Fruit trees, buildings and chambers (Constantino, 2002).

Distribution: South America (Krishna, 1961).

Table 5.12: Morphological characters of the genus *Tauritermes* extracted from the database according to Krishna (1961). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
nymph	mandibles	as in <i>Glyptotermes</i>	head
nymph	1+2 marginal tooth (M1+2) base	smaller than 3rd marginal tooth (M3)	left mandible
nymph	2nd marginal tooth (M2) posterior margin	distinctly longer than molar plate	right mandible
nymph	media (M)	colour: unsclerotized; development: weak	fore wings
soldier	head	function: phragmotic	body
soldier	head anterior region	colour: dark; shape: sculptured	head
soldier	profile of front	orientation: steep; colour: dark; shape: sculptured	front
soldier	prominence	number: 2; development: well developed	head
soldier	frons	position: between prominences; shape: widely concave	head
soldier	antennal carinae	development: prominent; shape: rounded	antennae
soldier	ridges	development: very faint; position: between frons and vertex	head
soldier	eyes	colour: unpigmented; development: distinct	head
soldier	articles	number: 10 to 11	antennae
soldier	3rd article	wider than 2nd article; longer than 2nd article	articles
soldier	mandibles	size: slender	head
soldier	basal hump	development: distinct	mandibles
soldier	pronotum	as broad as head	thorax
soldier	pronotum anterior margin	orientation: raised; shape: serrated; converging head posterior margin	pronotum
soldier	femur	shape: not swollen	hind legs
soldier	femur	shape: not swollen	middle legs
soldier	femur	shape: not swollen	fore legs
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)

5.1.2 Rhinotermitidae

Genus *Acorhinotermes* Emerson 1949

Feeding: wood (Constantino, 2002).

Table 5.13: Morphological characters of the genus *Acorhinotermes* extracted from the database according to Snyder *et al.* (1949). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor soldier	frontal gland opening	position: forward projection of the head; shape: projecting	frontal gland
minor soldier	head sides	position: from above; shape: conspicuously concave	head
imago	3rd article	development: unmodified; distinctly shorter than	articles

Genus *Coptotermes* Wasmann 1896

Nesting: wood, hypogeous (Bourguignon & Roisin, 2011).

Feeding: wood (Constantino, 2002; Bourguignon & Roisin, 2011).

Pest of: palm trees, eucalyptus, cassava, rubber tree, cocoa, coconut, forest trees, sugar cane, fruit trees, buildings and chambers (Constantino, 2002; Bourguignon & Roisin, 2011; Krishna *et al.*, 2013).

Distribution: All tropical region (Bourguignon & Roisin, 2011).

Table 5.14: Morphological characters of the genus *Coptotermes* extracted from the database according to Bourguignon & Roisin (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head capsule	shape: pyriform	head
soldier	hairs	density: slightly hairy	head
soldier	fontanelle	orientation: directed forward; size: very large	head
soldier	labrum	length: short; shape: triangular	head
soldier	mandibles	length: elongated; width: narrow	head
soldier	mandibles apex	shape: curved	mandibles
soldier	subsidiary tooth	occurrence: absent	right mandible
soldier	serrations	occurrence: absent	right mandible
soldier	basal tooth	occurrence: present	left mandible
soldier	serrations	occurrence: present	left mandible
soldier	articles	number: 12 to 16	antennae
imago	head	shape: circular	body
imago	setae	number: many; density: covered	head
imago	fontanelle	development: indistinct; position: middle of the head; shape: small spot; size: small	head
imago	ocelli	position: above eyes; size: large	head
imago	hairs	density: densely hairy	pronotum
imago	hairs	density: densely hairy	abdomen

Genus *Dolichorhinotermes* Snyder & Emerson 1949

Feeding: wood (Constantino, 2002).

Pest of: Buildings and chambers (Constantino, 2002; Krishna *et al.*, 2013).

Table 5.15: Morphological characters of the genus *Dolichorhinotermes* extracted from the database according to Engel & Krishna (2007). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor soldier	frontal gland opening	position: at front of head; shape: not projecting	frontal gland
minor soldier	mandibles	development: vestigial	head
minor soldier	mandibles margins	shape: rounded	mandibles
minor soldier	head sides	position: dorsal view; shape: convex	head
major soldier	labrum	length: distinctly elongate; extending to mandibles apex	head
imago	3rd article	shorter than 1st article	articles

Genus *Heterotermes* Froggatt 1897

Nesting: hypogeous, inquiline (Mathews, 1977)

Feeding: wood (Constantino, 2002; Mathews, 1977).

Pest of: passion fruit, maize, passion fruit, sugar cane, peach palm, eucalyptus (Constantino, 2002).

Table 5.16: Morphological characters of the genus *Heterotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	development: rarely dimorphic	body
soldier	head capsule	length: long; colour: orange to pale yellow; shape: subrectangular	head
soldier	ridges	orientation: sometimes raised; position: top of head above brain; shape: angular	head
soldier	knobs	position: top of head above brain; shape: rounded; separated by median depression	head capsule
soldier	frontal pore	development: visible; position: short distance behind ridge or knobs, near back of brain; size: small	frontal gland
soldier	frons	orientation: sloping forward	head
soldier	flange	development: distinct; position: upper margin; size: small; shape: round	antennal socket
soldier	articles	number: 15 to 17	antennae
soldier	labrum length	longer than labrum width	labrum
soldier	pronotum sides	shape: convex	pronotum
soldier	pronotum tip	shape: rounded	pronotum
soldier	mandibles	length: long; shape: tapering to a point; size: slender	head
soldier	mandibles apex	shape: hooked inwards	mandibles
soldier	projection	position: at base separated from main blade by deep; shape: rounded; size: large	left mandible
soldier	incision	shape: rounded	left mandible
soldier	teeth	position: near base of blade; shape: sinuous	left mandible
soldier	pronotum	shape: subcordate; slightly narrower than head; as broad as head; broader than head	thorax
soldier	legs	length: rather short	thorax
soldier	setae	development: clearly visible; orientation: row; position: longitudinal; shape: spine-like	tibia (fore legs)

Table 5.16: Morphological characters of the genus *Heterotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	setae	orientation: row; position: longitudinal; shape: spine-like	tibia (middle legs)
soldier	setae	orientation: row; position: longitudinal; shape: spine-like	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	head	length: elongated; colour: pale; shape: subrectangular	body
imago	apical tooth (A)	occurrence: present	left mandible
imago	cutting edge	shape: sharp; extending below	left mandible
imago	apical tooth (A)	occurrence: present	right mandible
imago	marginal teeth	number: 2	right mandible
imago	subsidiary tooth	angle: 90 degrees; position: at base of anterior margin of apical tooth; occurrence: present	right mandible
imago	fontanelle	occurrence: absent	head
imago	eyes	size: rather small	head
imago	ocelli	occurrence: sometimes absent; size: small; close to eyes; projecting a little from eyes; touching eyes	head
imago	articles	number: sometimes 18	antennae
imago	midline	development: distinct; shape: rather variable	postclypeus
imago	pronotum	length: fairly long; shape: somewhat trapezium; narrower than head	thorax
imago	mesonotum posterior margin	shape: sometimes convex	mesonotum
imago	metanotum posterior margin	shape: sometimes convex	metanotum
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	wings	colour: pale	thorax
imago	setae	position: ever surface; density: scattered	wings

Genus *Prorhinotermes* Silvestri 1909

Feeding: wood (Constantino, 2002).

Pest of: buildings and chambers (Krishna *et al.*, 2013).

Table 5.17: Morphological characters of the genus *Prorhinotermes* extracted from the database according to Ahmad (1965); Bourguignon & Roisin (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head	shape: variable	body
soldier	head anterior margin	larger than head posterior margin	head
soldier	fontanelle	width: narrow; placed at head anterior third	head
soldier	groove	position: in the middle from opening of fontanelle to clypeus	frons
soldier	eyes	development: more or less developed; colour: hyaline; shape: spot	head
soldier	articles	number: 13 to 20	antennae
soldier	pronotum	width: generally wide	thorax
soldier	mandibles	length: elongated	head
soldier	marginal tooth	length: short; position: mandible base	left mandible
soldier	marginal tooth	occurrence: absent	right mandible
imago	head	shape: oval to circular	body
imago	ocelli	not touching eyes; located before eyes	head
imago	eyes	development: well developed	head
imago	fontanelle	width: narrow; located before head	head
imago	articles	number: 19 to 22	antennae
imago	pronotum	slightly broader than head; narrower than head	thorax
soldier	head	colour: yellow; shape: oval	body
soldier	postclypeus anterior margin	colour: reddish brown	postclypeus
soldier	antennal carinae	colour: reddish brown	antennae
soldier	labrum	colour: brownish yellow	head
soldier	antennae	colour: brownish yellow	head
soldier	mandibles	length: long; colour: reddish brown; shape: saber shaped	head
soldier	mandibles base	colour: lighter	mandibles
soldier	pronotum	colour: pale	thorax
soldier	legs	colour: pale	thorax
soldier	abdomen	colour: pale	body
soldier	bristles	length: long; number: few; density: scattered	head

Table 5.17: Morphological characters of the genus *Prorhinotermes* extracted from the database according to [Ahmad \(1965\)](#); [Bourguignon & Roisin \(2011\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
soldier	bristles	occurrence: absent	postclypeus
soldier	hairs	occurrence: absent	labrum
soldier	bristles	length: short; number: 2; position: labrum tip	labrum
soldier	hairs	density: scantily hairy	proctodeal
soldier	head anterior margin	width: narrow	head
soldier	head basal third	width: widest	head
soldier	head posterior margin	size: slightly pronounced	head
soldier	fontanelle	shape: circular; size: small	head
soldier	groove	position: in front; occurrence: present	fontanelle
soldier	eyes	development: slightly bulging; shape: broadly oval	head
soldier	postclypeus width	as broad as postclypeus length	postclypeus
soldier	labrum lateral margins	shape: convex	labrum
soldier	labrum anterior margin	shape: broadly rounded	labrum
soldier	crenulations	position: mandibles base; occurrence: absent	left mandible
soldier	crenulations	position: mandibles base; occurrence: absent	right mandible
soldier	postmentum length	position: postmentum widest point as long as postmentum width	postmentum
soldier	waist	position: between posterior margin and widest point	postmentum
soldier	articles	number: 17 to 19	antennae
soldier	2nd article	colour: heavily sclerotized; shape: obconic; slightly shorter than 3rd article	articles
soldier	pronotum anterior margin	shape: convex	pronotum
soldier	pronotum anterior middle part	shape: notched	pronotum
soldier	pronotum posterior margin	shape: not emarginate	pronotum
soldier	pronotum sides	shape: broadly rounded	pronotum

Genus *Reticulitermes* Holmgren 1913

Feeding: wood (Constantino, 2002).

Pest of: Sugar cane and fruit trees Constantino (2002); Krishna *et al.* (2013).

Table 5.18: Morphological characters of the genus *Reticulitermes* extracted from the database according to Roonwal *et al.* (1989). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor worker	abdomen	as in major worker	body
minor worker	body	size: small	body
major worker	head capsule	shape: subsquarish	head
major worker	fontanelle	occurrence: absent	head
major worker	eyes	occurrence: absent	head
major worker	ocelli	occurrence: absent	head
major worker	articles	number: 16 to 18	antennae
major worker	anteclypeus	width: narrow; colour: hyaline	head
major worker	hairs	occurrence: absent	anteclypeus
major worker	postclypeus	shape: swollen	head
major worker	labrum	shape: tongue-shaped	head
major worker	labrum anterior margin	shape: rounded	labrum
major worker	pronotum	shape: flat	thorax
major worker	pronotum anterior margin	position: medially; shape: weakly to appreciably notched	pronotum
major worker	legs	as in minor worker	thorax
major worker	abdomen	as in minor worker	body
soldier	head capsule	shape: rectangular	head
soldier	head capsule sides	shape: substraight	head capsule
soldier	frontal area	orientation: raised	front
soldier	protuberance	number: 2; angle: 45 degrees; position: one on either side whence frons sloping in front at about an angle of 45 degrees or little more	front
soldier	fontanelle	position: mid-dorsum behind frontal protuberances; at about three-fourth of head-length from posterior margin; size: minute	head
soldier	articles	number: 14 to 18	antennae
soldier	3rd article	length: shortest; shape: ring-like	articles
soldier	eyes	occurrence: absent	head
soldier	ocelli	occurrence: absent	head
soldier	clypeus	shape: subtrapezoidal	head
soldier	hairs	density: hairy	clypeus
soldier	anteclypeus	colour: hyaline	head

Table 5.18: Morphological characters of the genus *Reticulitermes* extracted from the database according to Roonwal *et al.* (1989). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	postclypeus	darker than anteclypeus	head
soldier	hairs	occurrence: absent	postclypeus
soldier	labrum	shape: tongue-shaped	head
soldier	labrum apex	colour: transparent; shape: somewhat pointed	labrum
soldier	bristles	length: long; number: 2	labrum
soldier	mandibles	width: thick; colour: stout; shape: saber-shaped	head
soldier	crenulations	number: 3 to 4; development: sometimes prominent	left mandible
soldier	basal projection	position: left mandible basal half	left mandible
soldier	crenulations	number: 1 to 2; position: basally; size: minute	right mandible
soldier	postmentum	size: club-shaped	head
soldier	waist	width: narrow; length: long	postmentum
soldier	pronotum	shape: flat; narrower than head capsule	thorax
soldier	pronotum anterior part	width: wide	pronotum
soldier	pronotum anterior margin	position: medially; shape: weakly to deeply notched	pronotum
soldier	pronotum posterior margin	position: medially; shape: weakly to deeply notched	pronotum
soldier	legs	length: long; size: slender	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	segments	number: 4-jointed	tarsus (hind legs)
soldier	segments	number: 4-jointed	tarsus (middle legs)
soldier	segments	number: 4-jointed	tarsus (fore legs)
soldier	abdomen	length: oblong	body
soldier	cerci	number: 2-jointed	abdomen
soldier	styllus	number: single-jointed	abdomen
imago	segments	number: 4-jointed	tarsus (hind legs)
imago	segments	number: 4-jointed	tarsus (middle legs)
imago	segments	number: 4-jointed	tarsus (fore legs)
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	branches	number: 8 to 12	cubitus (Cu)
imago	cubitus (Cu)	development: weak	fore wings
imago	media (M)	development: weak; running medially in wing membrane	fore wings
imago	radius (R)	width: thick	fore wings
imago	subcosta (Sc)	width: thick	fore wings

Table 5.18: Morphological characters of the genus *Reticulitermes* extracted from the database according to Roonwal *et al.* (1989). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	microsculpture	number: numerous; colour: glossy; shape: pimples; size: minute; position: all over the membrane	wings
imago	microsculpture	number: 2 to 4; orientation: rows; position: front vein; shape: papillae	wings
imago	wings	size: slender	thorax
imago	pronotum	shape: flat; narrower than head	thorax
imago	3rd marginal tooth (M3) posterior margin	length: long; longer than molar plate	right mandible
imago	3rd marginal tooth (M3)	size: small	right mandible
imago	subsidiary tooth	position: lying at base of 2nd marginal tooth; occurrence: present	right mandible
imago	1st marginal tooth (M1)	size: small	right mandible
imago	apical tooth (A)	subequal to 2nd marginal tooth (M2); subequal to 2nd marginal tooth (M2)	right mandible
imago	3rd marginal tooth (M3) anterior margin	length: long; orientation: directed backwards	left mandible
imago	3rd marginal tooth (M3)	size: small	left mandible
imago	2nd marginal tooth (M2)	shape: pointed	left mandible
imago	apical tooth (A)	shape: pointed; equidistant to 2nd marginal tooth (M2); subequal to 2nd marginal tooth (M2)	left mandible
imago	1st marginal tooth (M1)	shape: pointed	left mandible
imago	marginal teeth	number: 3	right mandible
imago	marginal teeth	number: 3	left mandible
imago	mandibles	shape: subsquarish; as in worker	head
imago	hairs	density: hairy	postclypeus
imago	postclypeus	shape: faintly swollen	head
imago	hairs	occurrence: absent	head

Table 5.18: Morphological characters of the genus *Reticulitermes* extracted from the database according to Roonwal *et al.* (1989). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	anteclypeus	colour: hyaline; shape: sub-trapezoidal	head
imago	labrum	shape: tongue-shaped	head
imago	4th article	length: sometimes shortest	articles
imago	3rd article	length: sometimes shortest	articles
imago	articles	number: 16 to 18	antennae
imago	ocelli	colour: hyaline; shape: subcircular; size: small; not touching eyes; separated from eyes	head
imago	eyes	shape: bulging; size: medium	head
imago	fontanelle	orientation: slightly raised; size: small	head
imago	epicranial suture	development: faint; occurrence: present	head
imago	head capsule	shape: oval	head
imago	body	colour: generally dark	body
imago	arolium	occurrence: absent	tarsus (hind legs)
imago	arolium	occurrence: absent	tarsus (middle legs)
imago	arolium	occurrence: absent	tarsus (fore legs)
imago	abdomen	length: elongated	body
imago	cerci	number: 2-jointed	abdomen
imago	stylus	number: sometimes single-jointed	abdomen

Genus *Rhinotermes* Hagen 1858

Nesting: wood [Mathews \(1977\)](#)

Feeding: wood ([Mathews, 1977](#); [Constantino, 2002](#)).

Pest of: Buildings and chambers ([Krishna *et al.*, 2013](#)).

Table 5.19: Morphological characters of the genus *Rhinotermes* extracted from the database according to [Mathews \(1977\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor soldier	head	width: narrow; position: behind antennae	body
minor soldier	head sides	orientation: converging towards rear	head
minor soldier	head posterior margin	shape: rounded	head
minor soldier	frontal pore opening	development: inconspicuous; position: on narrow forward extension of frons	frontal pore
minor soldier	labrum	shape: double barrels of a gun but forked at tip; adjoins to frontal pore	head
minor soldier	articles	number: 14 to 16	antennae
minor soldier	3rd article	shape: clavate; longer than 3rd article	articles
minor soldier	mandibles	length: long; shape: sharp point; size: reduced	head
minor soldier	pronotum	shape: flat	thorax
minor soldier	pronotum anterior margin	position: in the middle; shape: convex	pronotum
major soldier	head	size: large	body
major soldier	head posterior region	shape: rounded; broader than head anterior region	head
major soldier	frontal pore	development: inconspicuous	frontal gland
major soldier	groove	orientation: little raised forward; position: from frontal pore	labrum
major soldier	articles	number: 16 to 17	antennae
major soldier	3rd article	length: long; width: narrow	articles
major soldier	mandibles	length: long; orientation: inward curved; shape: pointed	head
major soldier	teeth	number: 1 or 2; orientation: somewhat forward directed; size: large; shape: pointed	right mandible
major soldier	teeth	number: 1 or 2; orientation: somewhat forward directed; size: large; shape: pointed	left mandible
major soldier	labrum width	broader than labrum length	head
major soldier	groove	position: along upper surface	mandibles

Table 5.19: Morphological characters of the genus *Rhinotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: sometimes reddish; shape: rounded in plan	body
imago	1st marginal tooth (M1)	about the same size of apical tooth (A)	left mandible
imago	3rd marginal tooth (M3) posterior margin	distinctly shorter than molar plate	right mandible
imago	fontanelle	development: inconspicuous; position: well forward on head, level with front or middle of ocelli; shape: round spot; size: small	head
imago	eyes	size: small	head
imago	ocelli	size: medium to small; removed from eyes	head
imago	articles	number: 20	antennae
imago	3rd article	length: conspicuously long;	articles
imago	frontal marks	development: conspicuous; somewhat larger than ocelli	front
imago	frons	orientation: projecting conspicuously upwards; position: in front of fontanelle with medial groove	head
imago	postclypeus	orientation: projecting strongly forward; shape: as an extension of frons and also with medial groove	head
imago	postclypeus	position: in profile; shape: sort of hooked nose	head
imago	pronotum	shape: rather flat; somewhat narrower than head	thorax
imago	pronotum width	broader than pronotum length	pronotum
imago	pronotum anterior margin	shape: not indented in the middle	pronotum
imago	pronotum sides	shape: rounded	pronotum
imago	pronotum posterior margin	shape: indented in middle	pronotum
imago	wings	colour: colourless; shape: reticulate	thorax
imago	setae	occurrence: absent	wings
imago	branches	number: 20 to more	cubitus (Cu)
imago	setae	length: long; number: rather few	head

5.1.3 Serritermitidae

Genus *Glossotermes* Emerson 1950

Table 5.20: Morphological characters of the genus *Glossotermes* extracted from the database according to [Canello & DeSouza \(2004\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
soldier	head	shape: somewhat flat	body
soldier	eyes	development: distinct; position: each side of the head; shape: facettes; size: reduced	head
soldier	frontal gland opening	development: visible; position: well behind the level of the eyespots; size: minute; shape: oval	frontal gland
soldier	mandibles base	width: wide	mandibles
soldier	mandibles apex	shape: sharp	mandibles
soldier	notch	occurrence: present	left mandible
soldier	notch	occurrence: present	right mandible
soldier	right mandible inner edge	shape: tooth-like projection; size: approx. one-third of the length of mandible (from the base condyle); texture: smooth	right mandible
soldier	tooth	position: at the inner portion of the notch; size: minute	left mandible
soldier	tooth	position: at the inner portion of the notch; size: minute	right mandible
soldier	left mandible inner edge	position: below the tip; shape: finely serrate	left mandible
soldier	left mandible lower half	texture: coarse	left mandible
soldier	groove	position: mandible lower half to the base of the mandible; size: enlarges itself	left mandible
soldier	groove dorsal edge	position: mandible lower half to the base of the mandible; texture: smooth	left mandible
soldier	groove ventral edge	position: mandible lower half to the base of the mandible; shape: coarsely serrate	left mandible
soldier	projection	number: 4; shape: teeth-like	left mandible
soldier	mandibles in profile	orientation: slightly upward curved	mandibles
worker	apical tooth (A)	length: elongated; shape: sharp; larger than marginal teeth	left mandible
worker	apical tooth (A) posterior margin	shape: concave	left mandible
worker	molar region	shape: concave	left mandible

Table 5.20: Morphological characters of the genus *Glossotermes* extracted from the database according to [Canello & DeSouza \(2004\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	ridges	development: very well developed	molar region (left mandible)
worker	apical tooth (A)	length: elongated; shape: sharp	right mandible
worker	apical tooth (A) posterior margin	shape: concave	right mandible
worker	molar region	shape: concave	right mandible
worker	ridges	development: very well developed	molar region (right mandible)
worker	3rd marginal tooth (M3)	size: very large; much narrower than 1+2 marginal tooth (M1+2); much longer than 1+2 marginal tooth (M1+2)	left mandible
worker	gap	occurrence: absent; position: between 3rd marginal tooth (M3) and the molar prominence	left mandible
worker	molar tooth	development: visible	left mandible
worker	1st marginal tooth (M1)	size: large	right mandible
worker	1st marginal tooth (M1) posterior margin	size: slightly concave	right mandible
worker	2nd marginal tooth (M2)	occurrence: absent	right mandible
worker	molar plate	shape: looks like another tooth	right mandible
imago	apical tooth (A)	length: elongated; shape: sharp; larger than marginal teeth	left mandible
imago	apical tooth (A) posterior margin	shape: concave	left mandible
imago	molar region	shape: concave	left mandible
imago	ridges	development: very well developed	molar region (left mandible)
imago	apical tooth (A)	length: elongated; larger than marginal teeth	right mandible
imago	apical tooth (A) posterior margin	shape: concave	right mandible
imago	molar region	shape: concave	right mandible
imago	ridges	development: very well developed	molar region (right mandible)
imago	3rd marginal tooth (M3)	size: very large; much narrower than 1+2 marginal tooth (M1+2); much longer than 1+2 marginal tooth (M1+2)	left mandible

Table 5.20: Morphological characters of the genus *Glossotermes* extracted from the database according to [Canello & DeSouza \(2004\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	gap	occurrence: absent; position: between 3rd marginal tooth (M3) and the molar prominence	left mandible
imago	molar tooth	development: visible	left mandible
imago	1st marginal tooth (M1)	size: large	right mandible
imago	1st marginal tooth (M1) posterior margin	size: slightly concave	right mandible
imago	2nd marginal tooth (M2)	occurrence: absent	right mandible
imago	molar plate	shape: looks like another tooth	right mandible

Genus *Serritermes* Wasmann 1897

Nesting: inquiline (Constantino, 2015).

Feeding: specialized, feeds on organic matter accumulated inside the host's nest (Constantino, 2015).

Table 5.21: Morphological characters of the genus *Serritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head capsule	length: short	head
soldier	head capsule posterior region	width: broad	head capsule
soldier	head capsule sides	orientation: converging towards front; shape: straight	head capsule
soldier	head capsule posterior margin	shape: broadly rounded	head capsule
soldier	frontal pore	development: indistinct	frontal gland
soldier	articles	number: 11 to 12	antennae
soldier	labrum	reaching mandibles apex	head
soldier	labrum base	width: broad	labrum
soldier	labrum sides	shape: tapering to a point	labrum
soldier	mandibles	colour: chestnut brown ; orientation: bowed fairly strongly outward; size: rather slender; longer than head capsule	head
soldier	mandibles base	width: thick	mandibles
soldier	mandibles apex	orientation: inturned; shape: pointed	mandibles
soldier	teeth	number: 13; orientation: inward pointing; position: lower margins of mandibles	left mandible
soldier	teeth	number: 13; orientation: inward pointing; position: lower margins of mandibles	right mandible
soldier	pronotum length	as long as pronotum width	pronotum
soldier	pronotum anterior margin	shape: serrated	pronotum
soldier	lobes	number: 2; orientation: somewhat upward; position: each side of pronotum anterior and posterior margin; shape: broadly angular forward	pronotum
soldier	incision	position: pronotum anterior and posterior margin between lobes; shape: broadly V-shaped	pronotum

Table 5.21: Morphological characters of the genus *Serritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	femur	size: very much enlarged	hind legs
soldier	femur	size: much enlarged	middle legs
soldier	femur	size: much enlarged	fore legs
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	arolium	occurrence: present	tarsus (hind legs)
soldier	arolium	occurrence: present	tarsus (middle legs)
soldier	arolium	occurrence: present	tarsus (fore legs)
soldier	setae	number: very few	pronotum
soldier	setae	number: very few	head
soldier	head	colour: pale yellow to yellow white	body
soldier	pronotum	colour: pale yellow to yellow white; narrower than head width	thorax
imago	head capsule	colour: brown	head
imago	setae	occurrence: absent	wings
imago	setae	length: long; number: many	wing scale (tegula)
imago	setae	orientation: fringe; position: along pronotum margins	pronotum
imago	setae	length: rather long; number: many	pronotum
imago	setae	number: many; density: scattered; size: minute	head
imago	setae	length: medium length; number: 2; shape: paired	head
imago	setae	length: medium length; number: few; shape: paired	head
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	branches	number: approx. 19; shape: equally spaced	wings
imago	pronotum anterior angles	shape: rounded	pronotum
imago	pronotum sides	orientation: converging to rear; shape: somewhat depressed	pronotum
imago	pronotum posterior margin	shape: concave	pronotum
imago	pronotum width	greater than pronotum length	pronotum
imago	pronotum	narrower than head	thorax
imago	postclypeus in profile	shape: not strongly arched	postclypeus
imago	midline	development: clearly visible	postclypeus

Table 5.21: Morphological characters of the genus *Serritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	frontal marks	development: distinct; position: in front of ocelli	front
imago	articles	number: 14	antennae
imago	ocelli	shape: broadly oval; size: small; close to eyes	head
imago	eyes	development: not very prominent; size: small	head
imago	epicranial suture	development: visible	head
imago	mark	position: medial frons; shape: v-shape	fontanelle
imago	1st ridge	shape: tooth-like	molar plate (right mandible)
imago	ridges	length: long; number: 8; development: prominent; shape: sharp	molar plate (right mandible)
imago	2nd marginal tooth (M2)	development: obsolete	right mandible
imago	1st marginal tooth (M1)	size: obsolete	right mandible
imago	1st marginal tooth (M1)	size: obsolete	left mandible
imago	molar prominence middle	width: broad; shape: concavity	left mandible
imago	molar prominence posterior part	shape: broadly rounded	left mandible
imago	molar prominence anterior part	shape: tooth like point	left mandible
imago	molar prominence	development: strongly developed	left mandible
imago	3rd marginal tooth (M3)	development: visible; size: small; shape: point; hidden behind molar prominence	left mandible
imago	2nd marginal tooth (M2)	development: obsolete	left mandible
imago	apical tooth (A)	size: very large	right mandible
imago	apical tooth (A)	size: very large	left mandible
imago	postclypeus	colour: pale brown	head
imago	thoracic nota	colour: pale brown	thorax
imago	tergites	colour: white	abdominal sclerites
imago	sternites	colour: white	abdominal sclerites

Table 5.21: Morphological characters of the genus *Serritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	legs	colour: very pale brown to yellow white	thorax
imago	wing scale (tegula)	colour: very pale brown	hind wings
imago	wing scale (tegula)	colour: very pale brown	fore wings
imago	subcosta (Sc)	colour: sepia brown; position: near scale; running parallel to radial sector	hind wings
imago	subcosta (Sc)	colour: sepia brown; position: near scale; running parallel to radial sector	fore wings
imago	radial sector	colour: sepia brown; position: near scale	hind wings
imago	radial sector	colour: sepia brown; position: near scale	fore wings

5.1.4 Stolotermitidae

Genus *Porotermes* (Rambur, 1842)

Nesting: wood (Uys, 2002).

Feeding: wood (Uys, 2002).

Pest of: living trees (Uys, 2002).

Distribution: Argentina; Chile (Constantino, 2016).

Table 5.22: Morphological characters of the genus *Porotermes* extracted from the database according to Uys (2002). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	mandibles length	shorter than head length	mandibles
soldier	head capsule	length: elongate; shape: dorsoventrally flattened	head
soldier	head capsule sides	position: in the middle; shape: slight constriction	head capsule
soldier	eyes	colour: unpigmented	head
soldier	articles	number: 13 to 16	antennae
soldier	marginal teeth	number: 2	left mandible
soldier	marginal tooth	number: 1	right mandible

5.1.5 Termitidae

Apicotermitinae

Genus *Amplucruterme* Bourguignon & Roisin 2016

Etymology: name: *amplus* + *crus*, language: Latin, meaning: large legs (Bourguignon *et al.*, 2016).

Distribution: French Guiana (Constantino, 2016; Bourguignon *et al.*, 2016)

Table 5.23: Morphological characters of the genus *Amplucruterme* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head	colour: pale yellow; shape: rounded to slightly ovoid	body
worker	setae	number: approx. 60; density: fully covered	head
worker	fontanelle	development: indistinct	head
worker	tibia	shape: strongly inflated	fore legs
worker	tibia length	as long as tibia width	fore legs
worker	mixed segment	length: short	midgut
worker	mesenteric part	position: apically; shape: inflated	mixed segment
worker	diverticulum	colour: whitish; size: small	hindgut
worker	enteric valve (P2)	inserted into paunch (P3) extension	hindgut
worker	pads	length: elongated; number: 6	enteric valve (P2)
worker	spines	number: 15; colour: weakly sclerotized	enteric valve (P2)

Genus *Anoplotermes* Müller 1873

Nesting: hypogeous, inquiline, epigeal, arboreal (Constantino, 2015).

Feeding: humus, soil organic matter (Constantino, 2002).

Pest of: eucalyptus, sugar cane, forest trees and field crops (Constantino, 2002; Krishna *et al.*, 2013).

Table 5.24: Morphological characters of the genus *Anoplotermes* extracted from the database according to Bourguignon *et al.* (2010). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: pale to dark brown	body
imago	setae	number: thousands; density: covered; size: tiny	body
imago	bristles	length: long; number: more than one hundred; density: scattered covered	head
imago	notch	position: in front of ocelli; shape: deep	head
imago	eyes	size: medium	head
imago	ocelli	size: medium	head
imago	fontanelle	position: at the level of the posterior edge of eyes; size: very small	head
imago	pronotum from above	shape: semicircular	pronotum
imago	bristles	length: long; number: several dozen; density: covered	pronotum
imago	pronotum posterior margin	angle: rounded; shape: emarginated	pronotum
imago	mesonotum posterior margin	angle: rounded; shape: emarginated	mesonotum
imago	metanotum posterior margin	angle: rounded; shape: emarginated	metanotum
worker	body	size: small to medium	body
worker	head	colour: pale yellow; shape: rounded to slightly ellipsoid-shaped; size: 0.50 mm to 0.75 mm	body
worker	setae	number: many; density: fully covered; size: small	head
worker	fontanelle	development: almost indistinct; colour: white; size: small; shape: spot; position: posteriorly between the protocerebral lobes	head
worker	articles	number: 14	antennae
worker	apical tooth	length: short to moderately short	left mandible

Table 5.24: Morphological characters of the genus *Anoplotermes* extracted from the database according to Bourguignon *et al.* (2010). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	apical tooth	length: short to moderately short	right mandible
worker	apical tooth (A) apex	in line with marginal teeth apex	left mandible
worker	1st marginal tooth (M1)	distinctly longer than marginal teeth apex	left mandible
worker	apical tooth (A) apex	in line with marginal teeth apex	right mandible
worker	1st marginal tooth (M1)	distinctly longer than marginal teeth apex	right mandible
worker	anterior edge	angle: 90 degrees; position: between the 1st and 3rd marginal tooth	left mandible
worker	setae	number: many; orientation: erect; density: covered; size: small	body
worker	tibia	position: near middle; width_length_ratio: less than 0.35; size: enlarged	fore legs
worker	mesenteron	overlapping with proctodeum	midgut
worker	mixed segment	length: elongated; development: distinct	midgut
worker	diverticulum	position: internal side; shape: ball-shaped	mixed segment
worker	malpighian tubules	inserted on midgut ring; close to mixed segment suture; inserted into paunch (P3) intervention	abdomen
worker	paunch (P3) intervention	shape: bud-like	paunch (P3)
worker	cushions	shape: variable	enteric valve (P2)
worker	armature	shape: variable	enteric valve (P2)

Genus *Aparatermes* Fontes 1986

Etymology: name: apara, language: Tupi, refer: long and tortuous first proctodeal segment of the gut of the worker caste, meaning: tortuous or sinuous (Fontes, 1986).

Nesting: hypogeous (Constantino, 2015).

Feeding: leaf, grass (Constantino, 2002).

Pest of: rice (Constantino, 2002).

Table 5.25: Morphological characters of the genus *Aparatermes* extracted from the database according to Fontes (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mesenteron anterior end	position: inside the arch; shape: distinct swelling	mesenteron
worker	mesenteron extremities	orientation: overlapping; position: in dorsal or ventral views	mesenteron
worker	mesenteron	length: long	midgut
worker	stomodaeal valve apex	shape: weakly dilated	midgut
worker	stomodaeal valve	length: very long	midgut
worker	gizzard	development: poorly developed; position: laterally to dorso—laterally placed	foregut
worker	crop	size: voluminous	foregut
worker	salivary glands	position: foremost part of the abdominal cavity; size: small	digestive system
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	tibia	shape: weakly swollen; length_width_ratio: 6.07 to 6.53	legs
worker	legs	size: slender	thorax
worker	pronotum posterior margin	shape: not emarginate	pronotum
worker	pronotum anterior margin	orientation: raised; development: well developed; shape: not emarginate	pronotum
worker	articles	number: 14	antennae
worker	fontanelle	development: visible; colour: pale; position: behind brain; shape: patch	head
worker	ridges	occurrence: absent	right mandible
worker	molar plate	shape: strongly concave	right mandible
worker	2nd marginal tooth (M2)	development: developed	right mandible
worker	apical tooth (A) posterior margin	shape: weakly concave	right mandible

Table 5.25: Morphological characters of the genus *Aparatermes* extracted from the database according to Fontes (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	apical tooth (A)	little smaller than 1st marginal tooth (M1)	right mandible
worker	molar prominence apex	shape: rounded	left mandible
worker	ridges	occurrence: absent	left mandible
worker	molar prominence	size: small	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	molar tooth	development: partially visible; position: between M3 and the molar prominence	left mandible
worker	3rd marginal tooth (M3) apex	close to 1+2 marginal tooth (M1+2)	left mandible
worker	3rd marginal tooth (M3)	development: prominent	left mandible
worker	notch	position: between 1+2 marginal tooth (M1+2) posterior margin and 3rd marginal tooth (M3); shape: deep	left mandible
worker	1+2 marginal tooth (M1+2) posterior margin	position: convexity is near the middle; shape: convexity; longer than 1+2 marginal tooth (M1+2) anterior margin	left mandible
worker	apical tooth (A) posterior margin	shape: weakly concave; little longer than 1+2 marginal tooth (M1+2) anterior margin	left mandible
worker	apical tooth (A)	little smaller than 1+2 marginal tooth (M1+2)	left mandible
worker	left mandible	index: 0.46	mandibles
worker	midline	shape: very weakly depressed	postclypeus
worker	postclypeus	width_length_ratio: 1.74 to 2.00; shape: moderately inflated	head
worker	bristles	length: long; number: many; density: scattered	head
worker	bristles	length: long; number: few; density: scattered	head
worker	body sclerites	colour: whitish to yellowish	body
worker	abdominal sclerites	colour: transparent, coloured	abdomen
worker	body	development: rarely dimorphic	body
worker	mixed segment	placed at body axis; shorter than mesenteron width	midgut
worker	mesenteric lobe	development: not bulging; shape: swollen	mixed segment

Table 5.25: Morphological characters of the genus *Aparatermes* extracted from the database according to Fontes (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mesenteron sides	position: each side	mesenteron
worker	malpighian tubules	attached to mesenteron sides	abdomen
worker	1st proctodeal segment (P1)	length: long; shape: sinuous	proctodeal
worker	enteric valve (P2)	shape: weakly envaginated; inserted weakly into paunch (P3)	hindgut
worker	cushions	number: 6	enteric valve (P2)
worker	armature	occurrence: absent	enteric valve (P2)
worker	paunch (P3) anterior part	position: near the attachment of the enteric valve; shape: without dilatation	paunch (P3)
worker	paunch (P3) posterior part	orientation: coiling backwards; position: backwards on the dorsum; shape: narrow tube	paunch (P3)
worker	colon (P4)	length: long; orientation: coiling downwards; shape: tubular	hindgut
worker	rectum (P5)	size: voluminous	hindgut
alate	bristles	width: fine; length: very short; density: dense covering; shape: silky pelt	head capsule
alate	bristles	width: fine; length: very short; density: dense covering; shape: silky pelt	postclypeus
alate	bristles	width: fine; length: very short; density: dense covering; shape: silky pelt	thoracic sclerites
alate	bristles	width: fine; length: very short; density: dense covering; shape: silky pelt	abdominal sclerites
alate	bristles	width: fine; length: very short; density: dense covering; shape: silky pelt	legs
alate	head capsule surface	texture: coarse	head capsule
alate	postclypeus surface	texture: coarse	postclypeus
alate	pronotum surface	texture: coarse	pronotum
alate	bristles	length: long; density: scattered	head capsule
alate	bristles	length: long; density: scattered	postclypeus
alate	bristles	length: long; density: scattered	pronotum
alate	bristles	length: short; number: many; density: scattered	head capsule
alate	bristles	length: short; number: many; density: scattered	postclypeus

Table 5.25: Morphological characters of the genus *Aparatermes* extracted from the database according to Fontes (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
alate	bristles	length: short; number: many; density: scattered	pronotum
alate	head capsule	position: in plan; shape: broad	head
alate	head capsule posterior margin	shape: semi-circle	head capsule
alate	postclypeus	width_length_ratio: 2.12 to 2.23; shape: moderately inflated	head
alate	midline	shape: weakly depressed	postclypeus
alate	left mandible	index: 0.55	mandibles
alate	apical tooth (A)	size: large; smaller than 3rd marginal tooth (M3)	left mandible
alate	apical tooth (A)	size: large; smaller than 2nd marginal tooth (M2)	right mandible
alate	left mandible	Inde: 0.55	left mandible
alate	molar region	size: very small	left mandible
alate	molar region	size: very small	right mandible
alate	apical spurs	number: 2	tibia (hind legs)
alate	apical spurs	number: 2	tibia (middle legs)
alate	apical spurs	number: 2	tibia (fore legs)

Genus *Compositermes* Scheffrahn 2013

Etymology: name: compositus, language: Latin, refer: 15 or more pectinate paddles that form a circular ring around the S/P3 junction, meaning: aggregation, made up of parts (Scheffrahn, 2013).

Distribution: Bolivia; Brazil; French Guiana; Panama; Paraguay; Trinidad and Tobago (Constantino, 2016).

Table 5.26: Morphological characters of the genus *Compositermes* extracted from the database according to Scheffrahn (2013). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	tibia	shape: moderately inflated; length_width_ratio: 3.98	legs
worker	spines	number: 4 to 5; position: ventral surface; size: long	tibia (fore legs)
worker	mesenteron	orientation: complete 360 degrees loop; shape: tubular	midgut
worker	1st proctodeal segment (P1)	shape: C-shaped	proctodeal
worker	mesenteron conection	development: simple; orientation: diagonal; position: connection with 1st proctodeal segment (P1)	mesenteron
worker	mixed segment intervening	length: short; occurrence: sometimes absent	mixed segment
worker	enteric valve seating (S)	colour: yellowish; size: much enlarged; shape: tubular; width: wide; length: very long	enteric valve (P2)
worker	lobes	occurrence: absent	enteric valve (P2)
worker	enteric valve seating end (S)	angle: 90 degrees; orientation: curving anteriodorsally; position: where S meets dorsal center of P3	enteric valve (P2)
worker	colon (P4)	length: long	hindgut
worker	constriction	occurrence: absent	enteric valve (P2)
worker	cushions	number: 6; shape: egg-shaped	enteric valve (P2)
worker	paddles	colour: sclerotized; position: at the S/P3 junction; shape: pectinate	enteric valve (P2)
worker	apical tooth (A)	shape: sharply triangulate	left mandible
worker	marginal teeth	shape: sharply triangulate	left mandible
worker	apical tooth (A)	shape: sharply triangulate	right mandible
worker	marginal teeth	shape: sharply triangulate	right mandible

Genus *Disjunctitermes* Scheffrahn 2017

Etymology: name: disjunct, refer: derived from its current, widely disjunct distribution on Guadeloupe and Peru (Scheffrahn *et al.*, 2017).

Distribution: Guadeloupe (French); Peru (Scheffrahn *et al.*, 2017; Constantino, 2016).

Table 5.27: Morphological characters of the genus *Disjunctitermes* extracted from the database according to Scheffrahn *et al.* (2017). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: small	body
worker	head capsule	colour: yellowish	head
worker	setae	length: variable; density: covered	head capsule
worker	postclypeus	shape: moderately inflated	head
worker	fontanelle	development: barely discernible	head
worker	articles	number: 14	antennae
worker	apical tooth (A)	length: long; orientation: projecting well beyond line formed by M3 and molar prominence; well separated from 1st marginal tooth (M1)	left mandible
worker	subsidiary tooth	development: visible; position: above molar prominence in both dorsal and ventral view	left mandible
worker	apical tooth (A)	much longer than 1st marginal tooth (M1)	right mandible
worker	3rd marginal tooth (M'S)	shape: nearly symmetrical	right mandible
worker	tibia	shape: strongly inflated; length_width_ratio: 3x longer than at its widest (median) point	fore legs
worker	mesenteric tongue	shape: spheroidal	mixed segment
worker	enteric valve (P2)	entering through enteric valve seating (S)	hindgut
worker	enteric valve seating (S)	size: large	enteric valve (P2)
worker	lobes	number: 3; development: prominent	enteric valve (P2)
worker	pads	length: elongated; position: face the valve lumen	enteric valve (P2)
worker	enteric valve (P2) posterior end	orientation: projecting; position: approx. half way into S; shape: truncate	enteric valve (P2)

Genus *Dissimulitermes* Constantini & Canello 2020

Etymology: name: *dissimilatus*, language: Latin, refer: to the dehiscent organs which become invisible when the termite is fixed in alcohol, meaning: feign, disguise, hide (Constantini *et al.*, 2020).

Distribution: Brazil (Constantini *et al.*, 2020; Constantino, 2016).

Table 5.28: Morphological characters of the genus *Dissimulitermes* extracted from the database according to Constantini *et al.* (2020). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	fontanelle	size: large; shape: rounded	head
imago	eyes	size: small	head
imago	ocelli	size: medium	head
imago	apical tooth (A) apex	development: prominent	left mandible
imago	3rd marginal tooth (M'S)	shape: triangular	left mandible
imago	premolar process	development: inconspicuous	left mandible
imago	molar process	hidden by molar prominence	left mandible
imago	molar prominence	development: poorly developed	left mandible
imago	ridges	presence: absent	molar region (left mandible)
imago	apical tooth (A) apex	development: prominent	right mandible
imago	2nd marginal tooth (M2)	shape: triangular	right mandible
imago	molar plate	development: poorly developed	right mandible
imago	ridges	presence: absent	molar region (right mandible)
imago	pronotum	shape: subtrapezoidal; wider than long	thorax
imago	bristles	density: covered; length: long	head capsule
imago	hairs	density: covered; length: short	head capsule
imago	bristles	length: long	pronotum
imago	hairs	length: short	pronotum
imago	bristles	length: short	tergites
imago	hairs	length: short	tergites
imago	bristles	length: short	sternites
imago	hairs	length: short	sternites
imago	head capsule	colour: dark brown	head
imago	frontal marks	slightly lighter than head capsule	head
worker	head	shape: rounded, size: medium	body
worker	fontanelle	development: inconspicuous	head
worker	postclypeus	shape: inflated	head

Table 5.28: Morphological characters of the genus *Dissimulitermes* extracted from the database according to [Constantini et al. \(2020\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	apical tooth (A) apex	development: not prominent	left mandible
worker	incision	development: conspicuous	left mandible
worker	3rd marginal tooth (M'S)	shape: triangular	left mandible
worker	molar process	hidden by molar prominence	left mandible
worker	molar prominence	development: developed	left mandible
worker	ridges	presence: absent	molar region (left mandible)
worker	apical tooth (A) apex	development: not prominent	right mandible
worker	2nd marginal tooth (M2)	shape: triangular	right mandible
worker	molar plate	development: developed	right mandible
worker	molar region	shape: concave	right mandible
worker	ridges	presence: absent	right mandible
worker	tibia	length: long; shape: slender	tibia (fore legs)
worker	mixed segment	development: vestigial	midgut
worker	1st proctodeal segment (P1)	shape: uniform	proctodeal
worker	enteric valve (P2)	shape: bilateral	hindgut
worker	plates	number: 6	enteric valve (P2)
worker	folds	number: 6	enteric valve (P2)
worker	enteric valve seating (S)	shape: tubular	enteric valve (P2)
worker	bristles	density: sparse	head capsule
worker	bristles	length: long	pronotum
worker	bristles	length: long	tergites
worker	bristles	length: long	sternites
worker	bristles	number: 1	coxa (fore legs)
worker	head capsule	colour: yellowish	head
worker	fontanelle	colour: whitish	head

Genus *Echinotermes* Castro & Scheffrahn 2020

Etymology: name: echino, language: Latin, refer: describing the enteric valve armature, meaning: spiny (Castro *et al.*, 2018).

Nesting: hypogeous (Castro *et al.*, 2018).

Feeding: soil organic matter (Castro *et al.*, 2018).

Distribution: Colombia (Castro *et al.*, 2018; Constantino, 2016).

Table 5.29: Morphological characters of the genus *Echinotermes* extracted from the database according to Castro *et al.* (2018). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head capsule	colour: light yellowish	head
worker	antennae	colour: light yellowish	head
worker	pronotum	colour: pale yellow	thorax
worker	legs	colour: hyaline	thorax
worker	setae	length: 0.1 mm; number: approx. 100; density: covered	head capsule
worker	setae	length: 0.05 mm; number: approx. 100; density: covered	head capsule
worker	head capsule surface	position: lateral view; shape: slightly convex	head capsule
worker	postclypeus	shape: moderately inflated	head
worker	articles	number: 14	antennae
worker	setae	length: long; number: 4 to 5	pronotum
worker	hairs	length: short; number: many	pronotum
worker	apical tooth (A)	more prominent than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	more prominent than 1st marginal tooth (M1)	right mandible
worker	1+2 marginal tooth (M1+2)	shape: equilateral	left mandible
worker	3rd marginal tooth (M'S)	angle: right	left mandible
worker	molar prominence	position: in line with apical tooth; shape: projecting	left mandible
worker	right mandible	position: margin between M1 and M2; shape: concave	mandibles
worker	tibia	shape: moderately inflated	fore legs
worker	setae	length: long; number: approx. 60; position: pilosity denser apically; density: covered	tibia (fore legs)
worker	setae	length: short; number: approx. 40; position: pilosity denser apically; density: covered	tibia (fore legs)
worker	setae	number: approx. 20; density: sparse; size: large	femur (fore legs)
worker	setae	number: approx. 20; density: sparse; size: large	femur (middle legs)

Table 5.29: Morphological characters of the genus *Echinotermes* extracted from the database according to [Castro *et al.* \(2018\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	setae	number: approx. 20; density: sparse; size: large	femur (hind legs)
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	crop	size: very small; more voluminous than paunch (P3)	foregut
worker	mesenteron	orientation: complete 360 degrees loop	midgut
worker	mesenteric tongue	shape: truncate	mixed segment
worker	1st proctodeal segment (P1)	shape: equal diameter throughout	proctodeal
worker	lobes	number: 3	enteric valve (P2)
worker	lobes	number: 6; position: terminating at the opening to the P3; shape: spiny spheroids	enteric valve (P2)

Genus *Grigiotermes* Mathews 1977

Nesting: epigeal, hypogeous, inquiline (Constantino, 2015).

Feeding: humus (Constantino, 2002).

Pest of: rice (Constantino, 2002)

Distribution: Argentina; Brazil; French Guiana (Constantino, 2016).

Table 5.30: Morphological characters of the genus *Grigiotermes* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: dark brown	body
imago	setae	number: thousands; density: covered; size: tiny	body
imago	bristles	length: long; number: approx. 100; density: scattered	body
imago	eyes	size: large	head
imago	ocelli	size: large	head
imago	fontanelle	position: situated at the level of eyes; size: fairly small to medium size	head
imago	pronotum	length: elongated	thorax
imago	bristles	number: dozens; density: covered	pronotum
imago	mesonotum posterior margin	angle: strongly rounded; shape: slightly emarginated	mesonotum
imago	metanotum posterior margin	angle: strongly rounded; shape: slightly emarginated	metanotum
worker	body	size: large	body
worker	head	width: over 0.9 mm; colour: pale yellow; shape: rounded	body
worker	abdomen distal half	shape: subconical	abdomen
worker	digestive tube	length: elongated	digestive system
worker	setae	width: tiny; density: fully covered	head
worker	bristles	length: long; number: between 50 and 100; density: fully covered	head
worker	fontanelle	development: almost indistinct; size: small	head
worker	tibia	length: long; size: slender	fore legs
worker	paunch (P3) extension	length: short	paunch (P3)
worker	plates	number: 6; development: well-developed; shape: spiny	enteric valve (P2)
worker	pads	number: 6; shape: ovoid	enteric valve (P2)
worker	lobes	number: approx. 100; shape: scale-like	enteric valve (P2)

Table 5.30: Morphological characters of the genus *Grigiotermes* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mesenteric junction	length: slightly elongated; orientation: overlapping proctodeum; shape: small ball	mesenteron
worker	mixed segment	length: short; development: distinct	midgut
worker	1st proctodeal segment (P1)	length: short; development: distinct	proctodeal

Genus *Humutermes* Bourguignon & Roisin 2016

Distribution: Colombia; French Guiana; Costa Rica and Panama (Constantino, 2016).

Table 5.31: Morphological characters of the genus *Humutermes* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	eyes	size: medium size	head
imago	ocelli	size: medium	head
imago	fontanelle	position: between eyes; shape: elongated white dot; size: medium	head
imago	pronotum	shape: semicircular	thorax
imago	bristles	number: hundreds; density: covered; size: small	pronotum
imago	bristles	length: long; number: several dozen; density: covered	pronotum
imago	mesonotum posterior margin	angle: rounded; shape: slightly emarginated	mesonotum
imago	metanotum posterior margin	shape: rounded	metanotum
worker	body	size: very small to small	body
worker	head	width: 0.49 to 0.62 mm; colour: whitish	body
worker	setae	number: over 100; density: fully covered; size: small	head
worker	fontanelle	development: almost indistinct	head
worker	tibia	position: near the middle; size: enlarged	fore legs
worker	mesenteron	orientation: overlapping proctodeal	midgut
worker	mixed segment	length: elongated; development: distinct	midgut
worker	diverticulum	position: internal side; size: enlarged	mixed segment
worker	enteric valve (P2)	inserted into paunch (P3)	hindgut
worker	pads	number: 6; colour: sclerotized	enteric valve (P2)
worker	armature	colour: sclerotized; development: well-developed	enteric valve (P2)

Genus *Hydrecotermes* Bourguignon & Roisin 2016

Etymology: name: hidreco, refer: in honor of Hydreco station and its friendly staff (Bourguignon *et al.*, 2016).

Distribution: French Guiana (Constantino, 2016).

Table 5.32: Morphological characters of the genus *Hydrecotermes* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: dark brown	body
imago	setae	number: thousands; density: covered; size: tiny	body
imago	bristles	length: long; number: few; density: covered	head
imago	eyes	size: large	head
imago	ocelli	size: large	head
imago	fontanelle	position: posterior level of eyes; shape: spot devoid of setae; size: fairly large	head
imago	mesonotum posterior margin	angle: rounded; shape: strongly emarginated	mesonotum
imago	metanotum posterior margin	angle: rounded; shape: strongly emarginated	metanotum
worker	body	size: medium	body
worker	head	width: 0.6 to 0.8 mm; colour: pale yellow; shape: rounded	body
worker	digestive tube	size: slightly enlarged	digestive system
worker	bristles	number: 50 to 200; density: covered	head
worker	tibia length	as long as tibia width	legs
worker	armature	occurrence: absent	enteric valve (P2)
worker	cushions	shape: oval	enteric valve (P2)
worker	scales	number: approx. 50	enteric valve (P2)
worker	mesenteric junction	length: slightly elongated; orientation: overlapping the proctodeum; shape: ball; size: small	mesenteron
worker	mixed segment	length: short; development: distinct	midgut
worker	1st proctodeal segment (P1)	width: widened	proctodeal

Genus *Longustitermes* Bourguignon & Roisin 2010

Etymology: name: longus, language: Latin, refer: on account of its remarkably long workers, meaning: elongated (Bourguignon *et al.*, 2010).

Distribution: Bolivia; Brazil; Costa Rica; French Guiana; Honduras; Panama (Constantino, 2016).

Table 5.33: Morphological characters of the genus *Longustitermes* extracted from the database according to Bourguignon *et al.* (2010). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: dark brown	body
imago	setae	number: thousands; density: covered; size: tiny; shape: small clear dots	body
imago	bristles	length: long; number: approx. 100; density: scattered covered	head
imago	eyes	size: large	head
imago	ocelli	size: large	head
imago	fontanelle	position: at the level of the posterior level of eyes; size: very small	head
imago	pronotum	shape: elongated	thorax
imago	bristles	length: long; number: few dozen; density: covered	pronotum
imago	metanotum posterior margin	angle: strongly rounded; shape: slightly emarginated	metanotum
imago	mesonotum posterior margin	angle: strongly rounded; shape: slightly emarginated	mesonotum
worker	body	length: extremely elongated; development: monomorphic; shape: slender; size: very small	body
worker	head	width: approx. 0.5 mm; colour: pale yellow; shape: rounded to slightly ovoid	body
worker	setae	number: many; density: fully covered; size: small	head
worker	fontanelle	development: indistinct	head
worker	articles	number: 14	antennae
worker	apical tooth (A)	length: moderately short	left mandible
worker	apical tooth (A)	length: moderately short	right mandible
worker	anterior edge	angle: 90 degrees; position: between M1 and M'S	left mandible
worker	tibia	shape: strongly inflated	fore legs
worker	tibia length	as long as tibia width	fore legs
worker	paunch (P3) extension	length: short	paunch (P3)
worker	enteric valve (P2)	inserted into paunch (P3) extension	hindgut

Table 5.33: Morphological characters of the genus *Longustitermes* extracted from the database according to Bourguignon *et al.* (2010). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	armature	development: well developed; shape: resembling a wreath of hundreds of tiny, thin, parallel spines	enteric valve (P2)
worker	pads	number: 6; position: anterior portion of enteric valve; shape: ovoid	enteric valve (P2)
worker	lobes	number: approx. 20 to 25; shape: scale-like	enteric valve (P2)
worker	mesenteric junction	length: slightly elongated; orientation: overlapping the proctodeum	mesenteron
worker	mixed segment	length: short; development: distinct	midgut
worker	mesenteric part	position: internal side; apically; shape: slightly swollen	mixed segment
worker	malpighian tubules	close to mixed segment suture; inserted on midgut ring	abdomen
worker	midgut ring	position: outer side	midgut

Genus *Patawatermes* Bourguignon & Roisin 2016

Etymology: name: Patawa, refer: Camp Patawa and its managers (Bourguignon *et al.*, 2016).

Distribution: Bolivia; Ecuador; French Guiana; Guyana; Peru; Argentina; Brazil; Colombia; Paraguay (Constantino, 2016).

Table 5.34: Morphological characters of the genus *Patawatermes* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: dark brown	body
imago	setae	number: thousands; density: covered; size: tiny	body
imago	bristles	length: long; number: approx. 100; density: scattered	head
imago	eyes	size: large	head
imago	ocelli	size: large	head
imago	fontanelle	position: situated at the level of eyes; size: fairly small to medium size	head
imago	pronotum	length: elongated	thorax
imago	bristles	length: long; number: few dozens; density: covered	pronotum
imago	mesonotum posterior margin	angle: strongly rounded; shape: slightly emarginated	mesonotum
imago	metanotum posterior margin	angle: strongly rounded; shape: slightly emarginated	metanotum
worker	body	size: medium to large	body
worker	head	width: 0.69 to 1.1 mm; colour: pale yellow; shape: rounded	body
worker	setae	number: 50 to 200; density: scattered; size: minute	head
worker	bristles	length: long; number: approx. 100	head
worker	fontanelle	development: almost indistinct; size: small	head
worker	enteric valve (P2)	inserted into paunch (P3) extension	hindgut
worker	paunch (P3) extension	shape: tubular	paunch (P3)
worker	armature	development: well-developed	enteric valve (P2)
worker	pads	number: 6; shape: spiny	enteric valve (P2)
worker	cushions	number: 6; position: anterior portion of enteric valve; shape: ovoid	enteric valve (P2)
worker	scales	number: approx. 50 to 80	enteric valve (P2)
worker	scales	orientation: fringe; position: posterior spiny fringes; shape: spiny	enteric valve (P2)

Table 5.34: Morphological characters of the genus *Patawatermes* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mesenteric junction	length: slightly elongated; orientation: overlapping by proctodeum; shape: small ball	mesenteron
worker	mixed segment	length: short; development: distinct	midgut
worker	1st proctodeal segment (P1)	width: wide	proctodeal

Genus *Rubeotermes* Bourguignon & Roisin 2016
 Distribution: French Guiana; Peru (Constantino, 2016).

Table 5.35: Morphological characters of the genus *Rubeotermes* extracted from the database according to Bourguignon *et al.* (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	eyes	size: medium	head
imago	ocelli	size: medium	head
imago	fontanelle	size: small	head
imago	pronotum from above	shape: semicircular	pronotum
imago	bristles	length: long; number: hundreds; density: covered	pronotum
imago	mesonotum posterior margin	angle: rounded; shape: fairly emarginated	mesonotum
imago	metanotum posterior margin	angle: rounded; shape: fairly emarginated	metanotum
worker	body	colour: whitish; size: large	body
worker	head	width: approx. 1 mm	body
worker	setae	number: many; density: covered; size: small	head
worker	fontanelle	size: very small	head
worker	spines	length: long; number: few; similar size of tarsal spines	coxa (fore legs)
worker	tibia	size: slightly inflated	fore legs
worker	mesenteron conection	position: connection with 1st proctodeal segment (P1); shape: truncate	mesenteron
worker	mixed segment intervening	occurrence: absent	mixed segment
worker	enteric valve (P2)	inserted into enteric valve seating (S)	hindgut
worker	lobes	number: 3	enteric valve seating

Genus *Ruptitermes* Mathews 1977

Nesting: hypogeous, inquiline, arboreal (Constantino, 2015).

Feeding: leaf, litter (Constantino, 2015).

Distribution: Brazil; Guyana; Suriname; Peru; Venezuela; Paraguay; Trinidad and Tobago; Argentina; Bolivia (Constantino, 2016).

Table 5.36: Morphological characters of the genus *Ruptitermes* extracted from the database according to Acioli & Constantino (2015). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head	width: broad; colour: sometimes pale; shape: rounded	body
worker	fontanelle	development: conspicuous; colour: variable; shape: elliptical to rounded; size: small to large	head
worker	postclypeus	shape: flattened	head
worker	apical tooth (A)	shorter than 1st marginal tooth (M1)	left mandible
worker	3rd marginal tooth (M'S)	length: usually very short	left mandible
worker	notch	position: between M1 and M'S always present; shape: variable; size: variable	left mandible
worker	molar plate	shape: concave	right mandible
worker	ridges	occurrence: sometimes present	molar plate (right mandible)
worker	articles	number: 14	antennae
worker	bristles	umber: one to 2; orientation: row; shape: irregular	tibia (fore legs)
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	tibia	width: usually thin; length: usually thin; shape: sometimes inflated	fore legs
worker	crop	size: usually very small	foregut
worker	gizzard	shape: unarmed	foregut
worker	mixed segment intervening	length: short to very short	mixed segment
worker	mesenteric lobe	position: distally; shape: sometimes moderately inflated	mixed segment
worker	1st proctodeal segment (P1)	length: long; shape: tubular	proctodeal
worker	malpighian tubules	attached directly to midgut; at some distance from 1st proctodeal segment (P1)	abdomen

Table 5.36: Morphological characters of the genus *Ruptitermes* extracted from the database according to [Acioli & Constantino \(2015\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	enteric valve (P2)	position: P2 located dorsally at the right side; shape: bilateral symmetry	hindgut
worker	ridges	number: 6; colour: unsclerotized; position: 3 longer ones on one side and 3 shorter ones on the other side; shape: reticulated	enteric valve (P2)
worker	spines	occurrence: absent in most species	enteric valve (P2)
imago	head capsule	width: broad; length: short; position: dorsal view; shape: rounded	head
imago	hairs	length: short; density: densely covered	head capsule
imago	bristles	density: scattered	head capsule
imago	fontanelle	development: usually conspicuous; shape: elliptical to rounded	head
imago	ocelli	shape: elliptical; located before eyes; not touching eyes	head
imago	eyes	size: relatively small	head
imago	ecdysial line	development: inconspicuous	head
imago	postclypeus	shape: moderately inflated to inflated; size: relatively small to large	head
imago	midline	development: incomplete; shape: vanishing near anterior and posterior margins	postclypeus
imago	ridges	development: faint; occurrence: absent	molar plate (right mandible)
imago	pronotum posterior margin	width: narrow	pronotum
imago	pronotum sides	shape: nearly straight	pronotum
imago	articles	number: 15	antennae
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	micrasters	density: covered; shape: irregular	hind wings
imago	micrasters	density: covered; shape: irregular	fore wings
imago	arms	number: 2 to 4	micrasters
imago	hairs	quantity: few	fore wings
imago	hairs	quantity: few	hind wings
imago	hairs	position: along anterior and posterior borders; density: dense	fore wings

Table 5.36: Morphological characters of the genus *Ruptitermes* extracted from the database according to [Acioli & Constantino \(2015\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	hairs	position: along anterior and posterior borders; density: dense	hind wigs

Genus *Rustitermes* Constantini, Castro & Scheffrahn 2020

Etymology: name: *Rustitermes boteroi*, refer: named in honor of the Colombian artist Fernando Botero (Castro *et al.*, 2020).

Nesting: hypogeous, wood (Castro *et al.*, 2020).

Feeding: wood (Castro *et al.*, 2020).

Distribution: Argentina; Bolivia; Brazil; Ecuador; French Guiana; Paraguay; Peru; Trinidad and Tobago; Venezuela (Castro *et al.*, 2020; Constantino, 2016).

Table 5.37: Morphological characters of the genus *Rustitermes* extracted from the database according to Castro *et al.* (2020). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	fontanelle	shape: rounded; size: small	head
worker	postclypeus	shape: rather slightly inflated	head
worker	bristles	length: long; density: covered	head capsule
worker	apical tooth (A)	development: prominent	left mandible
worker	3rd marginal tooth (M'S)	shape: triangular	left mandible
worker	3rd marginal tooth (M'S) margins	angle: right/acute	left mandible
worker	molar process	not hidden behind molar prominence	left mandible
worker	bristles	length: long; position: concentrated along margin of anterior and posterior lobes	pronotum
worker	bristles	length: long; density: densely covered; position: along margin of anterior and posterior lobes	pronotum
worker	bristles	length: long; orientation: facing the posterior region or upwards; density: densely covered	tergites
worker	bristles	width: thick; number: 4 to 5; shape: set of	sternites
worker	bristles	length: long; number: 4 to 5; position: femur inner face; shape: set of	femur (fore legs)
worker	tibia	shape: moderately inflated	fore legs
worker	bristles	number: 6 to 7; shape: set of; width: thick; length: long; position: tibia inner face	tibia (fore legs)
worker	1st proctodeal segment (P1)	width: uniform; position: along entire length	proctodeal

Table 5.37: Morphological characters of the genus *Rustitermes* extracted from the database according to [Castro *et al.* \(2020\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	1st proctodeal segment (P1) ventral view	shape: inverted C	proctodeal
worker	armature	occurrence: absent	enteric valve (P2)
worker	enteric valve seating (S)	length: short; shape: tubular	enteric valve (P2)
imago	fontanelle	development: inconspicuous; shape: medium spot slightly conspicuous	head
imago	apical tooth (A)	little larger than 1+2 marginal tooth (M1+2)	left mandible
imago	3rd marginal tooth (M'S)	shape: triangular	left mandible
imago	3rd marginal tooth (M'S) margins	angle: obtuse	left mandible
imago	premolar process	development: inconspicuous	left mandible
imago	molar process	not hidden behind molar prominence	left mandible
imago	bristles	length: short; density: sparse	head capsule
imago	head capsule	colour: dark brown	head
imago	frontal marks	position: frontal marks margins; shape: poorly defined; colour: slightly lighter	front
imago	pronotum	shape: subhexagonal	thorax
imago	pronotum anterior margin	shape: straight	pronotum
imago	pronotum central incision	occurrence: absent	pronotum
imago	pronotum lateral margins	shape: well-marked	pronotum
imago	bristles	quantity: few; density: sparse	pronotum
imago	hairs	length: short; quantity: few	pronotum
imago	hairs	length: short; density: covered	tergites
imago	hairs	length: short; density: covered	sternites
imago	bristles	length: long; number: 4 to 5; development: prominent	coxa (fore legs)
imago	bristles	width: thick; number: 6 to 7; orientation: rows	tibia (fore legs)

Genus *Tetimatermes* Fontes 1986

Etymology: name: Tetima, language: Tupi, refer: the name is intended to remember the development of the worker foretibia, remarkably adapted for digging, meaning: leg (Fontes, 1986).

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: soil, humus (Fontes, 1986)

Distribution: Brazil (Fontes, 1986; Constantino, 2016).

Table 5.38: Morphological characters of the genus *Tetimatermes* extracted from the database according to Fontes (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	tibia base	size: slender; length_width_ratio: 2.77-3.33	fore legs
worker	pronotum posterior margin	shape: not emarginate	pronotum
worker	pronotum anterior margin	orientation: raised; develop- ment: well developed; shape: not emarginate	pronotum
worker	articles	number: 14	antennae
worker	fontanelle	colour: pale; development: al- most indistinct; size: small; shape: patch; position: behind brain	head
worker	molar plate lower mar- gin	position: in plan of mandible; shape: projecting	right mandible
worker	molar plate upper mar- gin	position: in plan of mandible; shape: projecting	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	molar plate	shape: strongly concave	right mandible
worker	2nd mar- ginal tooth (M2) apex	shape: rounded; more close to molar plate; close to 1st mar- ginal tooth (M1)	right mandible
worker	2nd mar- ginal tooth (M2)	development: prominent	right mandible
worker	1st marginal tooth (M1) posterior margin	as long as 1st marginal tooth (M1) anterior margin	right mandible
worker	right mand- ible	angle: acute; position: between apical tooth and first marginal tooth	mandibles
worker	apical tooth (A) posterior margin	shape: straight; longer than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	little smaller than 1+2 marginal tooth (M1+2)	left mandible

Table 5.38: Morphological characters of the genus *Tetimatermes* extracted from the database according to Fontes (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	molar prominence apex	shape: rounded; projecting well beyond molar tooth; projecting well beyond 3rd marginal tooth (M'S)	left mandible
worker	ridges	occurrence: absent	left mandible
worker	molar prominence	size: small	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	molar tooth	development: partially visible; position: between M'S and the molar prominence	left mandible
worker	3rd marginal tooth (M'S)	development: robust; close to molar prominence; more close to 1+2 marginal tooth (M1+2)	left mandible
worker	left mandible	angle: acute; position: between apical tooth and 1+2 marginal tooth	mandibles
worker	apical tooth (A) posterior margin	shape: nearly straight; little longer than 1+2 marginal tooth (M1+2) anterior margin; little longer than 1+2 marginal tooth (M1+2) anterior margin	right mandible
worker	apical tooth (A)	little smaller than 1+2 marginal tooth (M1+2)	right mandible
worker	left mandible	index: 0.40	mandibles
worker	midline	width_length_ratio: 1.66-1.94; shape: not depressed	postclypeus
worker	postclypeus	shape: inflated	head
worker	bristles	length: long; quantity: few	head
worker	bristles	orientation: erect; quantity: many; density: covered	head
worker	body sclerites	colour: whitish	body
worker	abdominal sclerites	colour: transparent	abdomen
worker	body	development: monomorphic	body
worker	tibia apex	size: slender; shape: spoon-like	fore legs
worker	tibia middle	shape: concave	fore legs
worker	tibia base	size: slender	middle legs
worker	tibia base	size: slender	hind legs
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	digestive tube	colour: very transparent	digestive system
worker	salivary glands	position: foremost part of the abdominal cavity; size: small	digestive system
worker	crop	size: very voluminous	foregut

Table 5.38: Morphological characters of the genus *Tetimatermes* extracted from the database according to [Fontes \(1986\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	gizzard	development: poorly developed; position: laterally placed	foregut
worker	mesenteron	length: short	midgut
worker	mesenteron extremities	orientation: not overlapping; position: in dorsal or ventral views	mesenteron
worker	mixed segment	placed at body axis; shorter than mesenteron width	midgut
worker	mesenteric lobe	position: at its extremity; shape: somewhat swollen	mixed segment
worker	1st proctodeal segment (P1)	length: long; shape: tubular	proctodeal
worker	paunch (P3) anterior part	length: elongated; size: voluminous	paunch (P3)
worker	paunch (P3)	position: near the attachment of the enteric valve; shape: weakly constricted	hindgut
worker	paunch (P3) posterior part	size: small	paunch (P3)
worker	colon (P4)	length: long; orientation: coiling downwards; position: at the level of the anterior end of the paunch; shape: tubular	hindgut
worker	rectum (P5)	size: voluminous	hindgut

Genus *Tonsuritermes* Canello & Constantini 2018

Etymology: name: tonsura, language: Latin, refer: “Tonsure” is named after Franciscan monks’ haircut, which the fontanelle resembles, particularly in the workers, meaning: clipping, trimming (Constantini *et al.*, 2018).

Distribution: Brazil; Colombia; French Guiana; Paraguay; Peru (Constantini *et al.*, 2018; Constantino, 2016).

Table 5.39: Morphological characters of the genus *Tonsuritermes* extracted from the database according to Constantini *et al.* (2018). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: dimorphic	body
worker	head capsule	position: in profile; shape: flattened dorsoventrally	head
worker	head capsule	position: dorsal view; shape: rounded	head
worker	fontanelle margins	shape: depressed; size: occupying 1/4 to 3/4 of the head capsule	fontanelle
worker	articles	number: 14	antennae
worker	postclypeus surface	shape: moderately to highly inflated	postclypeus
worker	apical tooth (A)	little longer than 1+2 marginal tooth (M1+2)	left mandible
worker	cutting edge	position: between M1+2 and incision; occurrence: present	left mandible
worker	incision	development: conspicuous	left mandible
worker	3rd marginal tooth (M'S)	shape: triangular	left mandible
worker	3rd marginal tooth (M'S) margins	angle: acute; position: with the tip	left mandible
worker	molar tooth	hidden beneath molar prominence	left mandible
worker	molar prominence	development: well developed	left mandible
worker	molar region	shape: concave	left mandible
worker	ridges	occurrence: absent	molar region (left mandible)
worker	apical tooth (A)	larger than 1s marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2)	angle: acute; shape: triangular	right mandible
worker	molar plate	development: well developed	right mandible
worker	molar region	shape: concave	right mandible
worker	ridges	occurrence: absent	molar region (right mandible)
worker	anterior lobe	much longer than posterior lobe	pronotum
worker	mesonotum	shape: subretangular	thorax

Table 5.39: Morphological characters of the genus *Tonsuritermes* extracted from the database according to [Constantini et al. \(2018\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	metanotum	shape: subretangular	thorax
worker	tibia	shape: resembling an interlocking raptorial leg	fore legs
worker	mixed segment intervening	development: vestigial	mixed segment
worker	1st proctodeal segment (P1)	diameter: uniform diameter throughout; shape: inverted C	proctodeal
worker	armature	occurrence: absent	enteric valve (P2)
worker	cushions	number: 6; shape: symmetrical	enteric valve (P2)
worker	scales	development: faint; density: covered; shape: polygonal	enteric valve (P2)
worker	spines	number: 3 to 5; shape: triangular; size: small; length: short; position: proximal region of the cushions	enteric valve (P2)
worker	enteric valve seating (S)	shape: tubular	enteric valve (P2)
worker	lobes	occurrence: absent	enteric valve (P2)
worker	paunch (P3a)	shape: pyriform	paunch (P3)
worker	paunch (P3b)	shape: S-shaped	paunch (P3)
worker	isthmus	development: conspicuous	hindgut
worker	colon (P4)	width: uniform	hindgut
worker	bristles	length: variable; orientation: variable; density: covered	head capsule
worker	bristles	length: long; orientation: variable; density: covered	pronotum
worker	bristles	length: short; orientation: variable; position: in the center of the plates	sternites
worker	bristles	length: short; orientation: variable; position: in the center of the plates	tergites
worker	bristles	width: thick; number: 7 to 11	coxa (fore legs)
worker	bristles	number: 2; orientation: rows	femur (fore legs)
worker	bristles	number: 6 to 16; orientation: rows; shape: spine-like; length: short; width: thick; position: inner margin	tibia (fore legs)
worker	head capsule	colour: whitish yellow	head
worker	fontanelle	colour: lighter	head

Table 5.39: Morphological characters of the genus *Tonsuritermes* extracted from the database according to [Constantini et al. \(2018\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	frontal marks	number: 2; position: located in dorsal view between the postclypeus and ocelli; above the antenna insertion; larger than ocelli	head
imago	frontal marks	number: 2; position: between the frontal marks and the fontanelle; shape: triangular; size: small	head
imago	fontanelle	shape: slightly depressed; size: occupying 1/2 of the head capsule in dorsal view	head
imago	eyes	shape: rounded; smaller than fontanelle	head
imago	ocelli	shape: elliptical; size: small	head
imago	postclypeus	shape: moderately inflated	head
imago	midline	development: conspicuous	postclypeus
imago	labrum distal margin	colour: hyaline	labrum
imago	apical tooth (A)	more prominent than 1+2 marginal tooth (M1+2)	left mandible
imago	incision	development: inconspicuous	left mandible
imago	3rd marginal tooth (M'S)	angle: acute; shape: triangular	left mandible
imago	molar tooth	not hidden beneath molar prominence	left mandible
imago	molar prominence	development: moderately developed	left mandible
imago	ridges	occurrence: absent	molar region (left mandible)
imago	apical tooth (A)	more prominent than 1st marginal tooth (M1)	right mandible
imago	2nd marginal tooth (M2)	angle: obtuse; shape: triangular	right mandible
imago	molar plate	development: moderately developed	right mandible
imago	ridges	occurrence: absent	molar plate (right mandible)
imago	pronotum	narrower than head	thorax
imago	pronotum anterior margin	shape: straight	pronotum
imago	pronotum lateral margins	orientation: converging posteriorly; shape: convex	pronotum
imago	micrasters	shape: asteroid	fore wings
imago	micrasters	shape: asteroid	hind wings

Table 5.39: Morphological characters of the genus *Tonsuritermes* extracted from the database according to [Constantini et al. \(2018\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	femur	shape: subcylindrical	fore legs
imago	tibia	width: thin; shape: not inflated	fore legs
imago	hairs	length: short; density: dense coverage	head capsule
imago	bristles	length: short; density: dense coverage	head capsule
imago	hairs	quantity: several	labrum
imago	bristles	length: long; number: 2	labrum
imago	hairs	length: short; position: mainly along the margins	pronotum
imago	bristles	occurrence: present	pronotum
imago	hairs	length: short; position: center of the plates	tergites
imago	bristles	length: short; position: center of the plates	tergites
imago	hairs	length: short; position: center of the plates	sternites
imago	bristles	length: short; position: center of the plates	sternites
imago	bristles	width: thick; number: 4 to 5	coxa (fore legs)
imago	bristles	length: variable; density: densely covered	femur (fore legs)
imago	bristles	width: thick; number: 10 to 12; orientation: rows	tibia (fore legs)
imago	hairs	density: densely covered	wings
imago	head capsule	colour: dark brown; position: in profile; shape: flattened; position: dorsal view; shape: trapezoidal	head
imago	frontal marks	colour: slightly lighter; shape: with poorly defined margins	head

Nasutitermitinae

Genus *Agnathotermes* Snyder 1926

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: soil organic matter (Fontes, 1982; Constantino, 2015).

Distribution: Brazil; Colombia; French Guiana; Paraguay; Peru (Constantino, 2016).

Table 5.40: Morphological characters of the genus *Agnathotermes* extracted from the database according to Fontes (1982). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	left mandible	index: 1.88	mandibles
worker	angle	angle: approx. straight; position: between the apical and first + second marginal teeth	left mandible
worker	cutting edge	position: between first + second marginal and third; shape: non-sinuuous marginal	left mandible
worker	ridges	number: 4; development: rudimentary	molar prominence (left mandible)
worker	apical tooth (A)	distinctly larger than 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2) apex	position: approximately halfway between the first marginal tooth tip and the molar plate	right mandible
worker	angles	angle: straight; position: between the apical and first marginal teeth	right mandible
worker	angles	angle: obtuse; position: between the first marginal and second marginal teeth	right mandible
worker	ridges	number: 4 to 5; orientation: transverse	molar plate (right mandible)
soldier	bristles	length: very short; density: sparse	head
soldier	bristles	length: long; quantity: few	head
soldier	head	length: enlarged; position: in dorsal view; in the middle	body
soldier	nasus	shape: cylindrical	head
soldier	mandibles apex	occurrence: absent	mandibles
imago	bristles	length: short; quantity: few	head
imago	bristles	length: short; quantity: few	proctodeal
imago	bristles	length: very short; quantity: few; distance: approx. bristles length	wings
imago	bristles	length: short; quantity: many	tergites
imago	bristles	length: long; quantity: many	sternites
imago	fontanelle	length: elongated; size: small	head

Table 5.40: Morphological characters of the genus *Agnathotermes* extracted from the database according to [Fontes \(1982\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	fontanelle anterior end	shape: forked	fontanelle
imago	ocelli	shape: broadly oval; size: small; close to eyes	head
imago	eyes	size: large	head
imago	postclypeus length	as long as postclypeus width	postclypeus
imago	molar plate	width: narrow	right mandible
imago	ridges	occurrence: absent	molar plate (right mandible)
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)

Genus *Angularitermes* Emerson 1925

Nesting: hypogeous, epigeal, inquiline (Mathews, 1977; Constantino, 2015).

Feeding: soil organic matter (Constantino, 2015).

Distribution: Brazil; Guyana; Trinidad and Tobago (Constantino, 2016).

Table 5.41: Morphological characters of the genus *Angularitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head	colour: pale yellow to yellow white	body
worker	body	colour: weakly sclerotized	body
worker	antennae distal part	colour: pale brown	antennae
worker	mandibles	as in imago	head
worker	2nd marginal tooth (M2)	position: on cutting edge posterior to M1; shape: convex	left mandible
worker	2nd marginal tooth (M2)	position: on posterior margin of M1; size: small; shape: angular projection	right mandible
worker	legs	length: long	thorax
worker	crop	size: voluminous	foregut
worker	midgut	width: fairly narrow	gut
worker	mixed segment	length: short	midgut
worker	malpighian tubules	attached opposite to midgut	abdomen
worker	1st proctodeal segment (P1)	slightly narrower than midgut	proctodeal
worker	paunch (P3)	shape: muscular; size: large	hindgut
worker	paunch (P3) posterior end	shape: tapering	paunch (P3)
soldier	nasus	width: narrow; development: extremely robust	head
soldier	head	position: in profile where nasus joins top of head; shape: concavity	body
soldier	articles	number: 14	antennae
soldier	antennae	longer than head	head
soldier	antennal socket	length: short; shape: tubular	antennae
soldier	postclypeus	projecting strongly below nasus	head
soldier	lobes	number: 2; shape: more or less hemispherical	postclypeus
soldier	mandibles	development: vestigial	head
soldier	mandibles apex	length: very long	mandibles

Table 5.41: Morphological characters of the genus *Angularitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	tooth	position: inner margin of the mandible; occurrence: sometimes present; size: minute	left mandible
soldier	pronotum anterior margin	development: very developed; orientation: raised	pronotum
soldier	legs	length: very long	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	apical tooth (A)	size: large	left mandible
imago	1st marginal tooth (M1)	size: large	left mandible
imago	2nd marginal tooth (M2)	development: more or less obsolete	left mandible
imago	3rd marginal tooth (M3)	development: more or less obsolete	left mandible
imago	molar prominence	orientation: raised; development: prominent	left mandible
imago	submolar tooth	development: visible; position: in the notch	left mandible
imago	left mandible	index: 0.77; development: modified	mandibles
imago	apical tooth (A)	size: large	right mandible
imago	1st marginal tooth (M1)	size: large	right mandible
imago	2nd marginal tooth (M2)	development: not visible	right mandible
imago	molar plate	width: broad; shape: strongly concave	right mandible
imago	ridges	occurrence: absent	molar plate (right mandible)
imago	fontanelle	shape: V—shaped	head
imago	eyes	development: prominent; size: medium to large	head
imago	ocelli	size: large; somewhat removed from eyes	head
imago	articles	number: 15	antennae
imago	antennae	length: long	head
imago	frontal marks	colour: pale; development: distinct	front
imago	postclypeus in profile	shape: strongly arched	postclypeus
imago	postclypeus width	wider than postclypeus length	postclypeus

Table 5.41: Morphological characters of the genus *Angularitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	midline	development: clearly visible; shape: not at all depressed	postclypeus
imago	pronotum	length: short; angle: rounded; shape: subtriangular	thorax
imago	pronotum anterior margin	shape: slightly concave	pronotum
imago	pronotum sides	orientation: converging strongly towards rear; shape: slightly concave	pronotum
imago	pronotum posterior margin	length: short; shape: without indentation	pronotum
imago	mesonotum posterior margin	shape: concave	mesonotum
imago	metanotum posterior margin	shape: concave	metanotum
imago	setae	length: long; colour: stout; quantity: many; shape: paired	head
imago	setae	width: fine; length: short; quantity: many	head
imago	setae	quantity: many; density: scattered	wings

Genus *Anhangatermes* Constantino 1990

Etymology: name: Anhanga, language: Tupi, meaning: a god or spirit of the forest (Constantino, 1990).

Nesting: soil organic matter Constantino (1990)

Distribution: Brazil (Constantino, 1990, 2016).

Table 5.42: Morphological characters of the genus *Anhangatermes* extracted from the database according to Constantino (1990). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head capsule	shape: rounded	head
worker	head capsule anterior region	width: wide	head capsule
worker	postclypeus	shape: moderately inflated	head
worker	articles	number: 14	antennae
worker	bristles	quantity: few	head
worker	apical tooth (A)	development: well developed	left mandible
worker	apical tooth (A) inner margin	shape: concave	left mandible
worker	apical tooth (A)	development: well developed	right mandible
worker	apical tooth (A) inner margin	shape: concave	right mandible
worker	cutting edge	shape: sinuous	left mandible
worker	3rd marginal tooth (M3)	size: small	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	molar prominence	shape: rounded; size: large	left mandible
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	3rd marginal tooth (M3)	development: vestigial; occurrence: almost absent	right mandible
worker	molar plate	shape: concave	right mandible
worker	abdomen distal half	development: showing gut contents; size: voluminous	abdomen
worker	abdominal sclerites	colour: transparent	abdomen
worker	membranes	colour: transparent	abdomen
worker	crop	shape: asymmetrical; size: voluminous	foregut
worker	armature	colour: sclerotized	gizzard
worker	spines	occurrence: absent	gizzard

Table 5.42: Morphological characters of the genus *Anhangatermes* extracted from the database according to Constantino (1990). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mixed segment	occurrence: present; shorter than mesenteron width	midgut
worker	1st proctodeal segment (P1)	shorter than mesenteron width	proctodeal
worker	enteric valve (P2)	position: ventro laterally placed	hindgut
worker	swellings	development: major; occurrence: absent	enteric valve (P2)
worker	1st order	orientation: longitudinal; alternating with 2nd order; larger than 2nd order	swellings enteric valve (P2)
worker	2nd order	orientation: longitudinal	swellings enteric valve (P2)
worker	spines	orientation: bowed line; size: large	enteric valve (P2)
worker	spines	density: scattered; size: small	enteric valve (P2)
worker	colon (P4)	length: long	hindgut
soldier	head capsule	width: narrow	head
soldier	nasus	length: long; shape: slender	head
soldier	labrum	length: short; development: not visible; position: in dorsal view	head
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	articles	number: 13	antennae
soldier	antennae	extending a little beyond nasus tip	head
soldier	pronotum width	narrower than head width	pronotum
soldier	head	pilosity: almost glabrous	body
soldier	bristles	quantity: few; position: on vertex	head
soldier	hairs	quantity: few; position: at tip of nasus	head
soldier	bristles	quantity: relatively few	body
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Antillitermes* Roisin, Scheffrahn & Krecek 1996

Etymology: name: Antillas, refer: recall the geographic distribution of the genera, by the Spanish Caribbean islands (Roisin *et al.*, 1996).

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: soil organic matter (Constantino, 2015).

Distribution: Cuba; Dominican Republic (Roisin *et al.*, 1996; Constantino, 2016).

Table 5.43: Morphological characters of the genus *Antillitermes* extracted from the database according to Roisin *et al.* (1996). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mesenteric tongue	length: short; shape: almost straight	mixed segment
worker	mixed segment	length: very long; much longer than mesenteron	midgut
worker	1st proctodeal segment (P1)	length: very long; position: on right side of abdomen; shape: wide loop	proctodeal
worker	cushions	number: 3; size: large	enteric valve (P2)
worker	apical tooth (A)	longer than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	longer than 1st marginal tooth (M1)	right mandible
worker	molar region	shape: concave	left mandible
worker	molar region	shape: concave	right mandible
worker	ridges	number: 6	molar plate (right mandible)
soldier	body	development: monomorphic	body
soldier	setae	length: short; orientation: parallel; position: leaning anteriorly; density: dense	head capsule
soldier	head capsule	position: behind antennae; shape: slightly constricted	head
soldier	nasus	shape: slender	head
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	articles	number: 12	antennae

Genus *Araujotermes* Fontes 1982

Feeding: soil organic matter (Fontes, 1982).

Distribution: Brazil; French Guiana; Guyana; Trinidad and Tobago; Panama (Constantino, 2016).

Table 5.44: Morphological characters of the genus *Araujotermes* extracted from the database according to Fontes (1982). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	bristles	length: medium to long; quantity: many	head
worker	bristles	length: long; quantity: few	head
worker	left mandible	index: 0.83	mandibles
worker	ridges	number: approx.5; orientation: transverse	molar prominence (left mandible)
worker	apical tooth (A)	little longer than 1st marginal tooth (M1) anterior margin	right mandible
worker	ridges	number: 5 to 6; orientation: transverse; development: rudimentary	molar plate (right mandible)
soldier	bristles	length: moderately long; quantity: many	head
soldier	bristles	length: long; quantity: few	head
soldier	bristles	length: short; quantity: many	nasus
soldier	head	width: not thin; position: in dorsal view; after the insertion of the antennae	body
soldier	head posterior region	shape: not bulbous	head
soldier	nasus	shape: almost cylindrical	head
soldier	mandibles apex	occurrence: absent	mandibles
imago	setae	length: long; quantity: many	head
imago	setae	length: long; quantity: many	pronotum
imago	setae	length: rather short; quantity: many	fore wings
imago	setae	length: rather short; quantity: many	hind wings
imago	bristles	length: medium to long; quantity: many	tergites
imago	bristles	length: medium to long; quantity: many	sternites
imago	fontanelle	position: anterior end; shape: slightly forked; size: small	head
imago	eyes	size: large	head
imago	mandibles	as in worker	head
imago	postclypeus length	as long as postclypeus width	postclypeus
imago	molar plate	width: narrow	right mandible
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)

Table 5.44: Morphological characters of the genus *Araujotermes* extracted from the database according to [Fontes \(1982\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	apical spurs	number: 2	tibia (fore legs)

Genus *Atlantitermes* Fontes 1979

Distribution: Brazil; Nicaragua; Panama; French Guiana; Guyana; Trinidad and Tobago (Constantino & DeSouza, 1997; Constantino, 2016).

Table 5.45: Morphological characters of the genus *Atlantitermes* extracted from the database according to Constantino & DeSouza (1997). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	cutting edge	position: between M1+2 and 3rd marginal tooth; shape: sinuous	left mandible
worker	2nd marginal tooth (M2)	development: conspicuous; much smaller than 1st marginal tooth (M1)	left mandible
worker	swellings	number: 6; colour: sclerotized	enteric valve (P2)
worker	spines	length: short	enteric valve (P2)
wide gap worker	gap	width: wide; index: approx. 0.68; position: between molar prominence and 3rd marginal tooth	left mandible
narrow gap worker	gap	width: narrow; index: approx. 0.77; position: between molar prominence and 3rd marginal tooth	left mandible
soldier	body	size: small	body
soldier	head	length: 0.9 to 1.7 mm; colour: pale yellow	body
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	head	development: slight to conspicuous; position: in dorsal view; behind antennae; shape: constriction	body
soldier	nasus	orientation: lightly to conspicuously upturned; position: relative to the longitudinal axis of head in profile	head
soldier	hairs	position: top of head; size: microscopic	head
soldier	articles	number: 11 to 12	antennae

Genus *Caetetermes* Fontes 1981

Etymology: name: caa, etc, language: Tupi, meaning: forest, true (Fontes, 1981).

Distribution: Brazil; Ecuador; French Guiana (Fontes, 1981; Constantino, 2016).

Table 5.46: Morphological characters of the genus *Caetetermes* extracted from the database according to Fontes (1981). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor worker	mandibles	similar to major worker	head
major worker	postclypeus	width_length_ratio: 3.66 to 4.89	head
major worker	left mandible	index: 0.49	mandibles
major worker	apical tooth (A)	shorter than 1+2 marginal tooth (M1+2)	left mandible
major worker	apical tooth (A) posterior margin	shape: almost straight; 1st marginal tooth (M1)	left mandible
major worker	3rd marginal tooth (M3)	development: developed	left mandible
major worker	3rd marginal tooth (M3) posterior margin	shape: convex	left mandible
major worker	4th marginal tooth (M4)	development: partially visible; position: between M3 and the molar prominence	left mandible
major worker	ridges	quantity: many; position: inside	molar prominence (left mandible)
major worker	apical tooth (A) posterior margin	shape: almost straight; shorter than 1st marginal tooth (M1)	right mandible
major worker	1st marginal tooth (M1) posterior margin	little longer than 1st marginal tooth (M1) anterior margin	right mandible
major worker	2nd marginal tooth (M2)	development: developed	right mandible
major worker	molar plate	shape: concave	right mandible
major worker	1st ridge	shape: tooth-like	molar plate (right mandible)
major worker	ridges	number: 7 to 9; development: clearly visible; size: diminishing towards base	molar plate (right mandible)
major worker	legs	length: long	thorax
major worker	coxa	development: weak; position: outer side; shape: hump	fore legs
major worker	apical spurs	number: 2	tibia (hind legs)
major worker	apical spurs	number: 2	tibia (middle legs)
major worker	apical spurs	number: 2	tibia (fore legs)

Table 5.46: Morphological characters of the genus *Caetetermes* extracted from the database according to Fontes (1981). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
major worker	crop	shape: sometimes not constricted; size: voluminous	foregut
major worker	rectum (P5)	size: voluminous	hindgut
soldier	body	development: monomorphic	body
soldier	bristles	length: long; quantity: few	head capsule
soldier	bristles	length: short; quantity: few; position: nasus apex	head capsule
soldier	head capsule	position: behind antennae; shape: sharply constricted	head
soldier	head capsule posterior margin	shape: bulbous	head capsule
soldier	nasus	length: long; shape: cypindrical	head
soldier	nasus base	size: not specially enlarged	head
soldier	postclypeus	shape: oblique	head
soldier	postclypeus in dorsal view	development: clearly visible	postclypeus
soldier	mandibles points	occurrence: absent	mandibles
soldier	antennae	distinctly longer than head	head
soldier	legs	length: long	thorax
soldier	coxa	development: prominent; position: outer side; shape: hump	fore legs

Genus *Caribitermes* Roisin, Scheffrahn & Krecek 1996

Distribution: Cuba; Dominican Republic; Haiti; Jamaica; Puerto Rico (Roisin *et al.*, 1996; Constantino, 2016).

Table 5.47: Morphological characters of the genus *Caribitermes* extracted from the database according to Roisin *et al.* (1996). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	as in <i>Parvitermes</i>	body
worker	head	as in <i>Parvitermes</i>	body
worker	mandibles	as in <i>Parvitermes</i>	head
worker	swellings	number: 3	enteric valve (P2)
worker	spines	width: thick; length: short; shape: triangular	enteric valve (P2)
worker	apical tooth (A)	slightly shorter than 1st marginal tooth (M1); as long as 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	slightly shorter than 1st marginal tooth (M1); as long as 1st marginal tooth (M1)	right mandible
worker	molar plate	shape: flat	right mandible
worker	ridges	number: 10 to 11	molar plate (right mandible)
worker	articles	number: 13 to 14	antennae
soldier	body	development: monomorphic	body
soldier	nasus	development: developed; shape: slender	head
soldier	head	position: behind antennae; shape: very slightly constricted	body
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: present	mandibles
soldier	articles	number: 12 to 13	antennae

Genus *Coatitermes* Fontes 1982

Etymology: name: Coati, refer: The name of the genus is a mention of the soldiers enormous nose, which resembles the snout of the coati (coati), carnivore mammal of the Procionidae family (Fontes, 1981)

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: soil organic matter (Constantino, 2015).

Distribution: Brazil; Bolivia; Guiana; Guyana; Panama (Fontes, 1981; Constantino, 2016).

Table 5.48: Morphological characters of the genus *Coatitermes* extracted from the database according to Fontes (1981). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	bristles	length: moderately long to long; quantity: many	head
worker	bristles	length: long; quantity: few	head
worker	left mandible	index: 1.13	mandibles
worker	cutting edge	position: between M1+2 and M3; shape: not sinuous	left mandible
worker	ridges	number: approx. 5; orientation: transverse; development: rudimentary	molar prominence (left mandible)
worker	apical tooth (A)	longer than 1st marginal tooth (M1)	right mandible
worker	right mandible	angle: acute; position: between the apical tooth and first marginal teeth	mandibles
worker	right mandible	angle: obtuse; position: between the first marginal tooth and second marginal tooth	mandibles
worker	ridges	number: 4 to 5; orientation: transverse; development: rudimentary	molar plate (right mandible)
soldier	bristles	length: moderately long; quantity: many	head
soldier	bristles	length: long; quantity: few	head
soldier	bristles	length: short; quantity: many	nasus
soldier	head	width: thin; position: in dorsal view, behind antennae	body
soldier	head posterior region	shape: not markedly bulbous	head
soldier	nasus	width: wide; shape: conical	head
soldier	mandibles apex	occurrence: absent	mandibles
alate	setae	length: moderately long; quantity: many	head
alate	setae	length: long; quantity: few	head
alate	setae	length: moderately long; quantity: many	pronotum

Table 5.48: Morphological characters of the genus *Coatitermes* extracted from the database according to [Fontes \(1981\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
alate	setae	length: long; quantity: few	pronotum
alate	setae	length: very short	wings
alate	setae	length: moderately long; quantity: many	tergites
alate	setae	length: moderately long; quantity: many	sternites
alate	fontanelle	length: elongated; position: posterior end; shape: forked	head
alate	fontanelle posterior end	length: elongated; shape: forked	fontanelle
alate	eyes	size: large	head
alate	postclypeus length	as long as postclypeus width	postclypeus
alate	mandibles	ain in worker	head
alate	apical tooth (A)	less developed than marginal teeth	left mandible
alate	apical tooth (A)	less developed than marginal teeth	right mandible
alate	left mandible	index: 0.85	mandibles
alate	molar plate	width: narrow	right mandible
alate	apical spurs	number: 2	tibia (hind legs)
alate	apical spurs	number: 2	tibia (middle legs)
alate	apical spurs	number: 2	tibia (fore legs)

Genus *Coendutermes* Fontes 1985

Etymology: name: Coendu, language: Tupi, refer: popular name for the Neotropical porcupine, meaning: neotropical porcupine (Fontes, 1985).

Distribution: Brazil; Suriname (Fontes, 1985; Constantino, 2016).

Table 5.49: Morphological characters of the genus *Coendutermes* extracted from the database according to Fontes (1985). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	colour: whitish to yellowish; development: apparently monomorphic	body
worker	abdominal sclerites	colour: transparent	abdomen
worker	bristles	length: long; quantity: few	head
worker	bristles	length: moderately long; quantity: many	head
worker	postclypeus	width_length_ratio: 2.90 to 3.25; shape: moderately inflated	head
worker	left mandible	index: 0.47	mandibles
worker	apical tooth (A)	shorter than 1+2 marginal tooth (M1+2)	left mandible
worker	apical tooth (A) posterior margin	shape: slightly concave; as long as 1+2 marginal tooth (M1+2) anterior margin	left mandible
worker	left mandible	angle: acute; position: between apical tooth and 1+2 marginal tooth	mandibles
worker	3rd marginal tooth (M3)	development: developed	left mandible
worker	3rd marginal tooth (M3) posterior margin	shape: convex	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	ridges	position: inside; size: more or less reduced	molar prominence (left mandible)
worker	molar prominence apex	shape: rounded; projecting well beyond 3rd marginal tooth (M3)	left mandible
worker	apical tooth (A)	as developed as 1st marginal tooth (M1)	right mandible
worker	apical tooth (A) posterior margin	shape: slightly concave; little longer than 1st marginal tooth (M1) anterior margin	right mandible
worker	2nd marginal tooth (M2)	development: distinct; size: reduced	right mandible

Table 5.49: Morphological characters of the genus *Coendutermes* extracted from the database according to Fontes (1985). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	2nd marginal tooth (M2) apex	shape: rounded	right mandible
worker	molar plate	shape: looks like another tooth	right mandible
worker	notch	position: front view; in molar plate basal end; shape: rounded	molar plate (right mandible)
worker	1st ridge	development: developed	molar plate (right mandible)
worker	ridges	development: clearly visible; size: reduced	molar plate (right mandible)
worker	tibia	size: slender	hind legs
worker	tibia	size: slender	middle legs
worker	tibia	size: slender	fore legs
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
soldier	body	development: monomorphic	body
soldier	bristles	colour: brownish; orientation: erect; development: well visible; quantity: many; density: scattered; shape: glandular; size: large; position: over dorsum and sides	head capsule
soldier	bristles	position: nasus apex; shape: non glandular	nasus
soldier	head capsule sides	orientation: parallel; position: anterior third	head capsule
soldier	nasus	orientation: slightly turned upwards; shape: conical	head
soldier	nasus tip	shape: pointed	nasus
soldier	postclypeus	angle: weakly oblique; development: visible	head
soldier	hump	development: discrete; position: apex	mandibles
soldier	mandibles apex	development: not developed	mandibles
soldier	antennae	length: very long	head
soldier	pronotum anterior margin	development: poorly developed; orientation: vertical	pronotum
soldier	legs	length: long	thorax
soldier	tibia	shape: slender	hind legs
soldier	tibia	shape: slender	middle legs
soldier	tibia	shape: slender	fore legs
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Constrictotermes* Holmgren 1910

Nesting: arboreal (Constantino, 2015; Mathews, 1977).

Feeding: scraper, lichens (Constantino, 2015).

Distribution: Bolivia; Brazil; French Guiana; Guyana; Peru; Suriname; Venezuela; Argentina; Paraguay; Cuba; Colombia; Ecuador (Constantino, 2016).

Table 5.50: Morphological characters of the genus *Constrictotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: dimorphic; size: medium	body
worker	head	colour: yellow brown	body
worker	head capsule	colour: pale; position: behind antennae at position of eyes and ocelli	head
worker	ecdysial line	colour: pale; development: distinct; shape: line; size: enlarged slightly; width: fine; position: at position of fontanelle	head
worker	apical tooth (A)	size: small	left mandible
worker	apical tooth (A)	size: small	right mandible
worker	1st marginal tooth (M1)	width: narrow; shape: finger-like	left mandible
worker	left mandible	index: 0.17 to 0.33	mandibles
worker	apical tooth (A) posterior margin	shape: weakly concave; as long as 1st marginal tooth (M1) posterior margin	right mandible
worker	molar plate	length: long; width: narrow	right mandible
worker	ridges	number: 11 to 12; orientation: transverse	right mandible
worker	molar plate posterior margin	position: near basal end; shape: tapering to point	right mandible
worker	crop	size: very large	foregut
worker	midgut	length: moderately long	gut
worker	mixed segment	longer than midgut diameter	midgut
worker	paunch (P3)	size: fairly large	hindgut
worker	paunch (P3) wall	width: thin	paunch (P3)
worker	plates	number: 3; colour: weakly chitinized	enteric valve (P2)
worker	spines	number: approx. 15; density: sparsely scattered; shape: fat; length: short; position: facing into the lumen	enteric valve (P2)

Table 5.50: Morphological characters of the genus *Constrictotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	development: monomorphic; colour: well sclerotized; size: medium	body
soldier	head capsule	position: in plan; behind level of antennae; shape: strongly constricted	head
soldier	head capsule posterior margin	width: narrowing strongly towards constriction	head capsule
soldier	head	position: in profile; shape: angular; colour: very dark	body
soldier	nasus	length: rather short; shape: very narrowly conical	head
soldier	antennae	size: very long; longer than head	head
soldier	articles	number: 14 to 15	antennae
soldier	mandibles	development: vestigial	head
soldier	mandibles points	length: long	mandibles
soldier	pronotum anterior margin	orientation: raised; development: well developed; shape: not indented	pronotum
soldier	legs	length: very long	thorax
soldier	setae	length: long; number: 4; position: at the base of nasus	head capsule
soldier	setae	length: long; number: 12; position: on vertex and sides of head; shape: paired	head capsule
soldier	setae	length: long	tergites
soldier	setae	length: long	thoracic nota
imago	body	size: medium	body
imago	1st marginal tooth (M1)	development: prominent	left mandible
imago	apical tooth (A)	development: prominent; equal to 1st marginal tooth (M1)	left mandible
imago	1st marginal tooth (M1)	development: prominent; slightly shorter than 2nd marginal tooth (M2)	right mandible
imago	apical tooth (A)	development: prominent; equal to 1st marginal tooth (M1)	right mandible
imago	3rd marginal tooth (M3)	development: distinct	left mandible
imago	left mandible	index: 0.45	mandibles
imago	molar tooth	development: not visible; position: between in gap between M3 and the molar prominence	left mandible

Table 5.50: Morphological characters of the genus *Constrictotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	apical tooth (A) posterior margin	shorter than 1s marginal tooth (M1) posterior margin	right mandible
imago	1st marginal tooth (M1) posterior margin	shape: somewhat sigmoid	right mandible
imago	molar plate	length: long; width: narrow	right mandible
imago	ridges	number: 12; orientation: transverse	molar plate (right mandible)
imago	molar plate posterior margin	position: near basal end; shape: tapering to point	right mandible
imago	fontanelle	colour: pale; development: distinct; shape: slit; width: narrow; length: long	head
imago	fontanelle apex	shape: forked	fontanelle
imago	eyes	development: prominent; size: small	head
imago	ocelli	size: medium; removed from eyes	head
imago	articles	number: 15	antennae
imago	postclypeus width	as broad as postclypeus length	postclypeus
imago	midline	colour: dark; development: sometimes distinct; shape: not appreciably depressed	postclypeus
imago	postclypeus in profile	shape: strongly arched	postclypeus
imago	pronotum	shape: somewhat trapezium	thorax
imago	pronotum width	narrower than pronotum length	pronotum
imago	pronotum anterior margin	shape: broadly rounded	pronotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	setae	length: long; orientation: erected; density: sparse	head
imago	setae	length: long; orientation: erected; density: sparse	postclypeus
imago	setae	length: short; occurrence: absent; density: rather dense	frons
imago	setae	length: long; density: scattered	proctodeal
imago	setae	length: short; orientation: inclined; density: dense	pronotum
imago	setae	length: long; density: scattered	sternites

Table 5.50: Morphological characters of the genus *Constrictotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	setae	length: short; orientation: inclined; density: dense	sternites
imago	setae	length: long; density: scattered	tergites
imago	setae	length: short; orientation: inclined; density: dense	tergites

Genus *Convexitermes* Holmgren 1910

Nesting: hypogeous (Constantino, 2015)

Feeding: wood, soil (Fontes, 1982; Constantino, 2002, 2015).

Pest of: buildings and chambers (Constantino, 2002; Krishna *et al.*, 2013).

Distribution: Brazil; Colombia; Peru; French Guiana; Guyana; Trinidad and Tobago (Constantino, 2016).

Table 5.51: Morphological characters of the genus *Convexitermes* extracted from the database according to Fontes (1982). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	cutting edge	position: between the first + second marginal and third marginal tooth; shape: non-sinuuous	left mandible
worker	ridges	number: 4; orientation: transversal; development: rudimentary	molar plate (right mandible)
worker	apical tooth (A)	distinctly larger than 1st marginal tooth (M1)	right mandible
worker	ridges	number: 4 to 5; orientation: transverse; development: rudimentary	molar prominence (left mandible)
soldier	bristles	length: very short; density: sparse	head
soldier	bristles	length: very short; quantity: few	head
soldier	head	position: in dorsal view; from the middle; size: enlarged	body
soldier	nasus	shape: cylindrical	head
soldier	mandibles points	occurrence: absent	mandibles
alate	bristles	length: short; quantity: many	head
alate	bristles	length: very short	wings
alate	bristles	length: short; quantity: many	pronotum
alate	bristles	length: long; quantity: many	sternites
alate	fontanelle	length: elongated	head
alate	fontanelle anterior end	shape: forked	fontanelle
alate	eyes	size: large	head
alate	postclypeus length	as long as postclypeus width	postclypeus
alate	molar plate	width: narrow; shape: stripped	right mandible
alate	apical spurs	number: 2	tibia (hind legs)
alate	apical spurs	number: 2	tibia (middle legs)
alate	apical spurs	number: 2	tibia (fore legs)

Genus *Cortaritermes* Mathews 1977

Nesting: epigeal (Constantino, 2015)

Feeding: wood, litter, grass (Mathews, 1977; Constantino, 2002, 2015).

Pest of: buildings and chambers (Constantino, 2002; Krishna *et al.*, 2013).

Distribution: Argentina; Brazil; Paraguay; Uruguay; Brazil; French Guiana; Guyana; Trinidad and Tobago (Mathews, 1977; Constantino, 2016).

Table 5.52: Morphological characters of the genus *Cortaritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: dimorphic; size: medium	body
worker	head	colour: sometimes shade of orange	body
worker	mandibles	as in imago	head
worker	molar plate	width: slightly broad	right mandible
worker	notch	position: near basal end in molar plate surface view; occurrence: absent; shape: slight notch	molar plate (right mandible)
soldier	body	size: medium	body
soldier	head	shape: rounded	body
soldier	head width	broader than head length	head
soldier	nasus	length: short; shape: rather conical	head
soldier	articles	number: 12 to 13	antennae
soldier	mandibles	development: vestigial	head
soldier	mandibles points	development: distinct	mandibles
soldier	legs	length: rather short	thorax
soldier	tibia length	longer than head length	hind legs
soldier	setae	length: short; quantity: many	head
soldier	setae	length: medium; quantity: few	head
soldier	setae	length: long; quantity: few	head
soldier	setae	length: short; quantity: many; position: apical half	nasus
soldier	setae	length: long; position: nasus tip	nasus
imago	cutting edge	position: between M1 and M3; shape: slightly sinuate	left mandible
imago	left mandible	index: 0.4	mandibles
imago	molar prominence	projecting no further than 3rd marginal tooth (M3)	left mandible
imago	submolar tooth	length: long; position: between M3 and molar prominence; shape: long sharp cutting edge; size: almost completely filling gap between M3 and molar prominence	left mandible

Table 5.52: Morphological characters of the genus *Cortaritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	1st marginal tooth (M1) posterior margin	slightly longer than 2nd marginal tooth (M2); about same length of 2nd marginal tooth (M2); about same length of apical tooth (A); slightly shorter than apical tooth (A)	right mandible
imago	molar plate	longer than 2nd marginal tooth (M2) posterior margin	right mandible
imago	ridges	number: 7; orientation: parallel; shape: straight	molar plate (right mandible)
imago	indentation	position: basal end; shape: slight	molar plate (right mandible)
imago	fontanelle	development: distinct; colour: pale; size: large	head
imago	ocelli	size: large; close to eyes	head
imago	eyes	size: medium	head
imago	articles	number: 15	antennae
imago	postclypeus width	as broad as postclypeus length	postclypeus
imago	setae	length: long; density: scattered	head
imago	setae	length: medium; density: dense	head
imago	setae	length: long; density: scattered	postclypeus
imago	setae	length: medium; density: dense	postclypeus

Genus *Cyranotermes* Araujo 1970

Nesting: hypogeous (Constantino, 2015).

Feeding: humus (Constantino, 2015).

Distribution: Brazil; French Guiana (Constantino, 2016).

Table 5.53: Morphological characters of the genus *Cyranotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	colour: weakly sclerotized; development: monomorphic	body
worker	head capsule	colour: pale yellow	head
worker	apical tooth (A)	size: very large	left mandible
worker	apical tooth (A)	size: large	right mandible
worker	1st marginal tooth (M1)	size: large	left mandible
worker	1st marginal tooth (M1)	size: large	right mandible
worker	3rd marginal tooth (M3)	development: distinct; size: small	left mandible
worker	cutting edge	position: joining M1 and M3; shape: somewhat concave	right mandible
worker	left mandible	index: 2.6	mandibles
worker	submolar tooth	development: prominent	left mandible
worker	2nd marginal tooth (M2)	development: obsolete	left mandible
worker	cutting edge	shape: concave	left mandible
worker	molar plate	width: broad; shape: strongly concave	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	crop	size: rather small	foregut
worker	midgut	length: fairly long; width: broad	gut
worker	mixed segment	occurrence: absent	midgut
worker	1st proctodeal segment (P1)	narrower than midgut; slightly shorter than midgut	proctodeal
worker	plates	number: 6; colour: strongly chitinized	enteric valve (P2)
soldier	body	development: monomorphic	body
soldier	head	shape: suboval	body

Table 5.53: Morphological characters of the genus *Cyranotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	nasus	length: very long; shape: rather narrowly conical	head
soldier	antennae length	same as head length	antennae
soldier	articles	number: 13	antennae
soldier	labrum	width: broad; length: short; shape: rounded	head
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent; shape: sometimes residual lump where points would have arisen	mandibles
soldier	pronotum anterior margin	development: well developed; orientation: raised	pronotum
soldier	legs	length: fairly short	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Diversitermes* Holmgren 1912

Nesting: hypogeous, inquiline (Mathews, 1977; Constantino, 2015).

Feeding: litter (Mathews, 1977; Constantino, 2015).

Distribution: Bolivia; Brazil; Paraguay; Argentina; French Guiana; Paraguay (Constantino, 2016).

Table 5.54: Morphological characters of the genus *Diversitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	vertex	colour: somewhat pale	head
worker	epicranial suture sides	colour: somewhat pale	head
worker	body	development: dimorphic; colour: weakly pigmented; size: medium to small	body
worker	apical tooth (A)	size: variable	left mandible
worker	apical tooth (A)	size: variable	right mandible
worker	apical tooth (A) posterior margin	sometimes same length of 1st marginal tooth (M1); sometimes distinctly shorter than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A) posterior margin	sometimes same length of 1st marginal tooth (M1); sometimes distinctly shorter than 1st marginal tooth (M1)	right mandible
worker	left mandible	angle: distinctly variable; position: angle between A and M1	mandibles
worker	right mandible	angle: distinctly variable; position: angle between A and M1	mandibles
worker	cutting edge	position: joining M1 and M3 in front of M3; shape: extra concavity	left mandible
worker	molar prominence	orientation: projected	left mandible
worker	molar plate	width: broad	right mandible
worker	ridges	number: 8 to 9	molar plate (right mandible)
worker	antennae	length: short	head
worker	tibia	shape: short	hind legs
worker	crop	size: medium	foregut
worker	midgut	size: medium	gut
worker	mixed segment	occurrence: absent	midgut
worker	paunch (P3a)	shape: not very thick walled; size: fairly large	paunch (P3)
worker	enteric valve (P2)	shape: weakly armed	hindgut
minor soldier	head	size: small; colour: somewhat pale	body

Table 5.54: Morphological characters of the genus *Diversitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor soldier	constriction	development: distinct; position: behind antennae	head
minor soldier	antennae	longer than head length	head
minor soldier	postclypeus	orientation: more or less strongly forward projected	head
minor soldier	mandibles	orientation: more or less strongly forward projected; development: vestigial	head
minor soldier	mandibles points	development: distinct	mandibles
minor soldier	pronotum	narrower than head width	thorax
minor soldier	pronotum anterior margin	orientation: raised; shape: slightly indented	pronotum
minor soldier	tibia length	sometimes same of head length; shorter than head length	hind legs
minor soldier	apical spurs	number: 2	tibia (hind legs)
minor soldier	apical spurs	number: 2	tibia (middle legs)
minor soldier	apical spurs	number: 2	tibia (fore legs)
minor soldier	body	colour: weakly pigmented	body
minor soldier	setae	length: long; quantity: many; position: top of head	head
minor soldier	setae	length: short; quantity: many; position: apical half of nasus	nasus
intermediate soldier	head	size: small; colour: somewhat pale	body
intermediate soldier	constriction	development: distinct; position: behind antennae	head
intermediate soldier	antennae	longer than head length	head
intermediate soldier	postclypeus	orientation: more or less strongly forward projected	head
intermediate soldier	mandibles	orientation: more or less strongly forward projected; development: vestigial	head
intermediate soldier	mandibles points	development: distinct	mandibles
intermediate soldier	pronotum	narrower than head width	thorax
intermediate soldier	pronotum anterior margin	orientation: raised; shape: slightly indented	pronotum
intermediate soldier	apical spurs	number: 2	tibia (hind legs)
intermediate soldier	apical spurs	number: 2	tibia (middle legs)
intermediate soldier	apical spurs	number: 2	tibia (fore legs)
intermediate soldier	body	colour: weakly pigmented	body

Table 5.54: Morphological characters of the genus *Diversitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
intermediate soldier	setae	length: long; quantity: many; position: top of head	head
intermediate soldier	setae	length: short; quantity: many; position: apical half of nasus	nasus
major soldier	head capsule	shape: subrectangular; size: large	head
major soldier	nasus	orientation: not pointed upward; shape: cylindrical; size: slender	head
major soldier	articles	number: 13	antennae
major soldier	antennae	longer than head length	head
major soldier	mandibles	development: vestigial	head
major soldier	mandibles points	development: distinct	mandibles
major soldier	pronotum width	narrower than head width	pronotum
major soldier	tibia length	shorter than head length	hind legs
major soldier	apical spurs	number: 2	tibia (hind legs)
major soldier	apical spurs	number: 2	tibia (middle legs)
major soldier	apical spurs	number: 2	tibia (fore legs)
major soldier	head	colour: reddish brown	body
major soldier	body	colour: weakly pigmented	body
major soldier	setae	length: short; quantity: many; position: along nasus	head
major soldier	setae	length: long; number: 6; position: top of head	head
major soldier	setae	length: very short; quantity: many; position: top of head; density: scattered	head
imago	apical tooth (A)	development: prominent; equal to 1st marginal tooth (M1)	left mandible
imago	1st marginal tooth (M1)	development: prominent	left mandible
imago	apical tooth (A)	development: prominent; equal to 1st marginal tooth (M1)	right mandible
imago	1st marginal tooth (M1)	development: prominent	right mandible
imago	cutting edge	position: between M1 and M3; shape: concave	left mandible
imago	3rd marginal tooth (M3)	development: distinct	left mandible
imago	left mandible	index: 0.35	mandibles
imago	submolar tooth	development: visible; position: between M3 and molar prominence	left mandible
imago	molar prominence	projecting well beyond 3rd marginal tooth (M3)	left mandible

Table 5.54: Morphological characters of the genus *Diversitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	apical tooth (A) posterior margin	equal to 2nd marginal tooth (M2) posterior margin equal to 1st marginal tooth (M1) posterior margin	right mandible
imago	1st marginal tooth (M1) posterior margin	equal to 2nd marginal tooth (M2) posterior margin	right mandible
imago	2nd marginal tooth (M2)	shape: rounded	right mandible
imago	molar plate	width: narrow; shape: irregular; as long as 2nd marginal tooth (M2) posterior margin	right mandible
imago	notch	position: near basal end	molar plate (right mandible)
imago	ridges	number: 9 to 10; orientation: transverse	molar plate (right mandible)
imago	1st ridge	shape: tooth-like; size: large	molar plate (right mandible)
imago	fontanelle	development: conspicuous; colour: pale; shape: broad slit; size: large	head
imago	ocelli	size: medium; well removed from eyes	head
imago	eyes	size: medium	head
imago	articles	number: 15	antennae
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	setae	length: short; density: dense	head
imago	setae	length: long; quantity: few	head
imago	setae	length: short; density: dense	pronotum
imago	setae	length: long; quantity: few	pronotum
imago	setae	length: short; density: dense	sternites
imago	setae	length: long; quantity: few	sternites
imago	setae	length: short; density: dense	tergites
imago	setae	length: long; quantity: few	tergites
imago	setae	length: short; density: sparsely scattered	wings
imago	punctations	density: densely covered	wings

Genus *Ereymatermes* Constantino 1991

Distribution: Brazil; Colombia; Panama (Constantino, 2016).

Table 5.55: Morphological characters of the genus *Ereymatermes* extracted from the database according to Constantino (1991). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
broad gap worker	left mandible	length: very long; position: between the third marginal tooth and the molar prominence	mandibles
broad gap worker	extra tooth	development: distinct; position: between the third marginal tooth and the molar prominence; size: small	left mandible
narrow gap worker	anterior edge	angle: acute; position: between apical tooth and first plus second marginal tooth	left mandible
narrow gap worker	cutting edge	shape: almost straight	left mandible
narrow gap worker	3rd marginal tooth (M3)	development: distinct	left mandible
narrow gap worker	molar tooth	hidden beneath molar prominence	left mandible
narrow gap worker	apical tooth (A)	larger than 1st marginal tooth (M1)	right mandible
narrow gap worker	2nd marginal tooth (M2)	size: small	right mandible
narrow gap worker	crop	size: very voluminous	foregut
narrow gap worker	armature	colour: weakly sclerotized	gizzard
narrow gap worker	spines	occurrence: absent	gizzard
narrow gap worker	mixed segment	length: short; position: ventrally placed	midgut
narrow gap worker	malpighian tubules base	size: enlarged	abdomen
narrow gap worker	1st proctodeal segment (P1)	shape: cylindrical; shorter than mesenteron	proctodeal
narrow gap worker	enteric valve (P2)	position: ventrally placed	hindgut
narrow gap worker	swellings	number: 6; colour: sclerotized	enteric valve (P2)
narrow gap worker	rectum (P5)	shape: coiling; size: voluminous	hindgut
worker	body	development: dimorphic	body
soldier	head capsule	width: broad; shape: without constriction	head

Table 5.55: Morphological characters of the genus *Ereymatermes* extracted from the database according to Constantino (1991). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	nasus	width: thin; length: long; orientation: slightly upward; shape: conico-cylindrical	head
soldier	labrum	size: small	head
soldier	labrum width	broader than labrum length	head
soldier	labrum sides	orientation: forward; shape: rounded	labrum
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	articles	number: 12	antennae
soldier	pronotum	much narrower than head	thorax
soldier	hairs	quantity: many; size: microscopic	head
soldier	hairs	quantity: many; size: microscopic	nasus
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	head	shape: rounded	body
imago	fontanelle	length: elongated; size: medium	head
imago	fontanelle apex	shape: forked	fontanelle
imago	eyes	size: large; shape: bulging	head
imago	ocelli	size: large; shape: oval	head
imago	postclypeus width	as broad as postclypeus length	postclypeus
imago	midline	development: visible; shape: inflated	postclypeus
imago	pronotum	angle: rounded; shape: trapezoid; narrower than head	thorax
imago	articles	number: 15	antennae
imago	bristles	length: long; quantity: few	head
imago	bristles	length: short; quantity: many	head
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)

Genus *Muelleritermes* Canello, Oliveira & Rocha 2015

Etymology: name: Fritz Müller (1821–1897), refer: in honor of the renowned naturalist (Oliveira *et al.*, 2015)

Distribution: Brazil (Oliveira *et al.*, 2015; Constantino, 2016).

Table 5.56: Morphological characters of the genus *Muelleritermes* extracted from the database according to Oliveira *et al.* (2015). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure	
broad worker	gap	ridges	development: conspicuous	molar plate (right mandible)
broad worker	gap	apical tooth (A)	equal to 1st marginal tooth (M1)	right mandible
broad worker	gap	ridges	development: conspicuous	molar prominence (left mandible)
broad worker	gap	molar tooth	hidden beneath molar prominence	left mandible
broad worker	gap	gap	position: between M3 and molar prominence; width: broad; size: large	left mandible
broad worker	gap	apical tooth (A)	larger than 1+2 marginal tooth (M1+2)	left mandible
narrow worker	gap	ridges	development: conspicuous	molar plate (right mandible)
narrow worker	gap	2nd marginal tooth (M2) anterior margin	size: reduced	right mandible
narrow worker	gap	apical tooth (A)	as long as 1st marginal tooth (M1)	right mandible
narrow worker	gap	ridges	development: conspicuous	molar prominence (left mandible)
narrow worker	gap	molar tooth	hidden beneath molar prominence	left mandible
narrow worker	gap	gap	position: between M3 and molar prominence; width: narrow	left mandible
narrow worker	gap	1+2 marginal tooth (M1+2) anterior edge	longer than	left mandible
narrow worker	gap	left mandible	position: region between apical tooth and 1st marginal tooth (M1) and 1+2 marginal tooth (M1+2); shape: subcave	left mandible
narrow worker	gap	apical tooth (A)	shorter than 1st marginal tooth (M1)	left mandible
minor worker		ridges	development: conspicuous	molar plate (right mandible)

Table 5.56: Morphological characters of the genus *Muelleritermes* extracted from the database according to Oliveira *et al.* (2015). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor worker	2nd marginal tooth (M2) anterior margin	size: reduced	right mandible
minor worker	apical tooth (A)	as long as 1st marginal tooth (M1)	right mandible
minor worker	ridges	development: conspicuous	molar prominence (left mandible)
minor worker	molar tooth	hidden beneath molar prominence	left mandible
minor worker	gap	position: between M3 and molar prominence; width: narrow	left mandible
minor worker	1+2 marginal tooth (M1+2) anterior edge	longer than	left mandible
minor worker	left mandible	position: region between apical tooth and 1st marginal tooth (M1) and 1+2 marginal tooth (M1+2); shape: subcave	left mandible
minor worker	apical tooth (A)	shorter than 1st marginal tooth (M1)	left mandible
worker	body	development: dimorphic; size: medium	body
worker	head	shape: rounded	body
worker	articles	number: 14	antennae
worker	postclypeus	shape: not inflated	head
worker	fontanelle	development: inconspicuous	head
worker	hairs	density: sparse	head
worker	bristles	density: sparse	head
worker	hairs	density: sparse	pronotum
worker	bristles	density: sparse	pronotum
worker	crop	development: well developed	foregut
worker	scales	density: covered; shape: finely pectinate	crop
worker	gizzard	shape: variable	foregut
worker	gizzard end	width: narrow; shape: neck	foregut
worker	mixed segment length	as long as mixed segment width	mixed segment
worker	enteric valve (P2)	position: on left side; after dorsal loop of mesenteron; shape: curved	hindgut
worker	paunch (P3)	size: large	hindgut
worker	protuberance	position: around P2; shape: protuberance	paunch (P3)
minor soldier	head capsule	length: elongate; width: narrow	head

Table 5.56: Morphological characters of the genus *Muelleritermes* extracted from the database according to Oliveira *et al.* (2015). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor soldier	constriction	development: sometimes conspicuous; position: behind antennae; occurrence: present; shape: constricted	head
minor soldier	mandibles points	development: easily visible	mandibles
minor soldier	nasus	shape: cylindrical	head
minor soldier	apical spurs	number: 2	tibia (hind legs)
minor soldier	apical spurs	number: 2	tibia (middle legs)
minor soldier	apical spurs	number: 2	tibia (fore legs)
intermediate soldier	head capsule	shape: slightly oval	head
intermediate soldier	mandibles points	development: easily visible	mandibles
intermediate soldier	nasus	shape: slightly conical	head
intermediate soldier	apical spurs	number: 2	tibia (hind legs)
intermediate soldier	apical spurs	number: 2	tibia (middle legs)
intermediate soldier	apical spurs	number: 2	tibia (fore legs)
major soldier	head capsule	width: broad; shape: slightly oval	head
major soldier	constriction	position: behind antennae; occurrence: sometimes present; shape: very slightly constricted	head
major soldier	ommatids	development: vestigial; quantity: few; shape: a kind of lens; reminiscent of a vestigial ocelli; position: behind antennae; between base of nasus and base of antennae; occurrence: present	head capsule
major soldier	nasus	shape: slightly conical	head
major soldier	apical spurs	number: 2	tibia (hind legs)
major soldier	apical spurs	number: 2	tibia (middle legs)
major soldier	apical spurs	number: 2	tibia (fore legs)
soldier	body	development: trimorphic	body
imago	head	width: broad; shape: rounded	body
imago	antennal carinae anterior region	position: dorsal surface; shape: half-moon ridge	antennae
imago	antennal carinae	width: narrow; position: in frontal view between ocelli; shape: inverted V	antennae

Table 5.56: Morphological characters of the genus *Muelleritermes* extracted from the database according to Oliveira *et al.* (2015). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	head capsule posterior margin	position: in dorsal view behind eyes; shape: semi-circular	head capsule
imago	head capsule	position: in front of each ocellus; shape: oval spot; size: sometimes small	head
imago	fontanelle	development: distinct; colour: pale; shape: cross	head
imago	postclypeus in profile	shape: moderately arched	postclypeus
imago	postclypeus in dorsal view	length: short	postclypeus
imago	midline	development: distinct	postclypeus
imago	ocelli	orientation: perpendicular; separated from eyes	head
imago	articles	number: 15	antennae
imago	pronotum	width: broad; length: long	thorax
imago	pronotum posterior margin	shape: very strongly emarginate	pronotum
imago	coxa	position: lateral surface; texture: rugose	fore legs
imago	wings	length: very long	thorax
imago	micrasters	density: densely covered; shape: asteroid	fore wings
imago	micrasters	density: densely covered; shape: asteroid	hind wings
imago	hairs	density: sparse; shape: curved	fore wings
imago	hairs	density: sparse; shape: curved	hind wings
imago	papillae	orientation: curved toward apex; density: covered	fore wings
imago	papillae	orientation: curved toward apex; density: covered	hind wings
imago	hairs	density: very hairy; size: variable	body
imago	bristles	orientation: erect; quantity: many	body

Genus *Nasutitermes* Dudley 1890

Etymology: name: nasus, language: latin, meaning: nose (Mathews, 1977)

Nesting: epigeal, hypogeous, arboreal (Mathews, 1977; Constantino, 2015).

Feeding: wood, litter (Constantino, 2002, 2015).

Pest of: eucalyptus, maize, tea, coffee, coccoa, coconut, sugar cane, fruit trees, grains, forest trees, buildings and chambers (Constantino, 2002; Krishna *et al.*, 2013).

Table 5.57: Morphological characters of the genus *Nasutitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: dimorphic; size: medium	body
worker	head	colour: well pigmented	body
worker	epicranial suture	colour: white; development: distinct	head
worker	fontanelle	width: broad; colour: white; shape: streak	head
worker	mandibles	as in imago	head
soldier	body	development: monomorphic; size: medium	body
soldier	head	colour: sometimes pale	body
soldier	nasus	width: often rather narrow; shape: never cylindrical	head
soldier	mandibles	development: vestigial	head
soldier	mandibles points	size: small	mandibles
soldier	head capsule	position: behind level of antennae; shape: constricted	head
soldier	articles	number: 11 to 15	antennae
soldier	antennae	slightly shorter than head length	head
soldier	pronotum	shorter than head length	thorax
imago	apical tooth (A)	slightly shorter 1st marginal tooth (M1); same length of 1st marginal tooth (M1)	left mandible
imago	left mandible	index: 0.35 to 0.50	mandibles
imago	2nd marginal tooth (M2)	development: obsolete	left mandible
imago	submolar tooth	development: visible; position: in gap between M3 and molar prominence; size: sometimes almost filling the gap	left mandible
imago	apical tooth (A)	slightly shorter 1st marginal tooth (M1); same length of 1st marginal tooth (M1)	right mandible
imago	molar plate	shape: not concave; as long as 2nd marginal tooth (M2) posterior margin	right mandible

Table 5.57: Morphological characters of the genus *Nasutitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	ridges	number: sometimes 7; 8; or 12; orientation: transverse	molar plate (right mandible)
imago	indentation	position: near the basal end in surface view; occurrence: absent; shape: rounded	molar plate (right mandible)
imago	fontanelle	colour: usually pale; development: sometimes obsolete; shape: broad streak	head
imago	fontanelle apex	shape: forked	fontanelle
imago	eyes	shape: flat to prominent; size: small to large	head
imago	ocelli	size: small to large; close to eyes; somewhat removed from eyes	head
imago	articles	number: 15	antennae
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	pronotum	narrower than head	thorax
imago	pronotum posterior margin	shape: sometimes indented	pronotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)

Genus *Ngauratermes* Constantino & Acioli 2009

Etymology: name: ngaura, language: Ticuna, refer: termite from the litter or litter inhabiting termite, meaning: litter (Constantino & Acioli, 2009).

Feeding: litter (Constantino & Acioli, 2009).

Distribution: Brazil (Constantino & Acioli, 2009).

Table 5.58: Morphological characters of the genus *Ngauratermes* extracted from the database according to Constantino & Acioli (2009). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
broad gap worker	head capsule	colour: dark	head
broad gap worker	body	size: slender	body
broad gap worker	gap	occurrence: present; position: between 3rd marginal tooth (M3) and the molar prominence	left mandible
broad gap worker	left mandible	length: elongated	mandibles
broad gap worker	marginal teeth	length: short	left mandible
broad gap worker	left mandible	index: 0.32	mandibles
broad gap worker	3rd article	as long as 2nd article; more sclerotized than 2nd article	articles
broad gap worker	legs	length: long	thorax
narrow gap worker	head capsule	shape: rounded	head
narrow gap worker	fontanelle	development: indistinct; shape: spot	head
narrow gap worker	articles	number: 14	antennae
narrow gap worker	4th article	length: very short; colour: unsclerotized	articles
narrow gap worker	apical tooth (A)	length: very short	left mandible
narrow gap worker	apical tooth (A)	length: very short	right mandible
narrow gap worker	4th marginal tooth (M4)	hidden beneath molar prominence	left mandible
narrow gap worker	cutting edge	position: between M1 and M3; shape: slightly convex	left mandible
narrow gap worker	gap	position: between M3 and molar prominence; occurrence: present	left mandible
narrow gap worker	left mandible	index: 0.35	left mandible
narrow gap worker	1st marginal tooth (M1)	larger than apical tooth (A)	right mandible

Table 5.58: Morphological characters of the genus *Ngaurotermes* extracted from the database according to Constantino & Acioli (2009). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
narrow gap worker	2nd marginal tooth (M2)	shorter than apical tooth (A)	right mandible
narrow gap worker	molar plate	width: broad; shape: concave	right mandible
narrow gap worker	ridges	development: weakly developed	molar plate (right mandible)
narrow gap worker	crop	size: relatively large	foregut
narrow gap worker	gizzard	development: moderately developed	foregut
narrow gap worker	mixed segment	length: short; shape: tubular	midgut
narrow gap worker	mesenteric tongue	number: 1; position: on the external face of mixed segment	mixed segment
narrow gap worker	1st proctodeal segment (P1)	development: simple; shape: tubular	proctodeal
narrow gap worker	terminal loop	occurrence: absent	proctodeal
narrow gap worker	enteric valve (P2)	position: located posteriorly and inserted into P3 at the dorsal left side; shape: curved	hindgut
narrow gap worker	paunch (P3) posterior part	shape: constricted	paunch (P3)
narrow gap worker	body	similar size of broad gap worker	body
minor soldier	head capsule	width: narrow	head
minor soldier	constriction	development: conspicuous; position: behind antennae	head
major soldier	head capsule	width: broad	head
major soldier	constriction	position: behind antennae	head
major soldier	head capsule sides	orientation: converging towards front	head capsule
soldier	body	development: dimorphic	body
soldier	mandibles points	development: distinct	mandibles
soldier	articles	number: 13	antennae
soldier	nasus base	width: narrow	head
soldier	nasus	shape: nearly cylindrical	head
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Obtusitermes* Snyder 1924

Distribution: Trinidad and Tobago; Venezuela; Colombia; Panama (Roisin *et al.*, 1996; Constantino, 2016).

Table 5.59: Morphological characters of the genus *Obtusitermes* extracted from the database according to Roisin *et al.* (1996). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	articles	number: 12	antennae
worker	gut	as in <i>Parvitermes</i>	digestive tube
worker	mixed segment	orientation: contiguous	midgut
worker	mesenteric part	position: ventrally rather	mixed segment
worker	armature	development: weak	enteric valve (P2)
worker	spines	development: hardly visible; size: tiny	enteric valve (P2)
worker	mandibles	similar to <i>Parvitermes</i>	head
worker	molar plate	shape: straight	right mandible
major soldier	body	size: very small	body
major soldier	mandibles	development: vestigial	head
major soldier	mandibles points	occurrence: absent	mandibles
major soldier	articles	Number: 11	antennae
minor soldier	body	size: very small	body
minor soldier	head	width: strongly narrow; position: posteriorly	body
minor soldier	mandibles	development: vestigial	head
minor soldier	mandibles points	occurrence: absent	mandibles
minor soldier	articles	number: 11	antennae

Genus *Paraconvexitermes* Canello & Noirot 2003

Nesting: wood (Canello & Noirot, 2003).

Feeding: soil, decayed wood (Canello & Noirot, 2003).

Distribution: Brazil; Guyana; Peru (Canello & Noirot, 2003; Constantino, 2016).

Table 5.60: Morphological characters of the genus *Paraconvexitermes* extracted from the database according to Canello & Noirot (2003). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
narrow gap worker	gap	width: very narrow; position: between M3 and molar prominence	right mandible
narrow gap worker	molar tooth	hidden beneath molar prominence	right mandible
broad gap worker	gap	width: much wide; position: between M3 and molar prominence	right mandible
broad gap worker	molar tooth	development: visible	right mandible
worker	u-turn	width: very narrow; length: long; shape: u-turn	colon (P4)
worker	sphincter	development: distinct circular musculature; position: between P3a and P3b	paunch (P3b)
worker	constriction	position: between P3a and P3b; shape: narrow constriction	paunch (P3)
worker	paunch (P3b)	development: developed; size: very prominent	paunch (P3)
worker	paunch (P3)	size: voluminous	hindgut
worker	armature	development: conspicuous	enteric valve (P2)
worker	1st proctodeal segment (P1)	width: very narrow; length: long	proctodeal
worker	mixed segment	occurrence: absent	midgut
worker	midgut-hindgut junction	shape: circular	midgut
worker	pulvilli I	orientation: overlapping approx. 2/3 of the columns	foregut
worker	pulvillar belt	development: developed	foregut
worker	columnar belt	size: short	foregut
worker	armature	colour: poorly sclerotized; development: complete	gizzard
worker	gizzard	size: relatively small	foregut
worker	ridges	occurrence: present	molar plate (right mandible)

Table 5.60: Morphological characters of the genus *Paraconvexitermes* extracted from the database according to [Canello & Noirot \(2003\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	2nd marginal tooth (M2) apex	close to 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2) posterior margin	shape: slightly concave	right mandible
worker	2nd marginal tooth (M2)	development: inconspicuous; size: small	right mandible
worker	apical tooth (A)	shape: concave; distinctly larger than 1st marginal tooth (M1)	right mandible
worker	ridges	development: more or less marked; occurrence: present	molar prominence (left mandible)
worker	3rd marginal tooth (M3)	much smaller than 1+2 marginal tooth (M1+2); smaller than 1+2 marginal tooth (M1+2)	left mandible
worker	cutting edge	position: between M1 +2 and M3; shape: strongly sinuous	left mandible
worker	apical tooth (A) posterior margin	shape: concave	right mandible
worker	apical tooth (A) posterior margin	shape: concave	left mandible
worker	apical tooth (A)	larger than marginal teeth	left mandible
worker	abdomen	colour: transparent	body
worker	antennae	colour: transparent	head
worker	hairs	number: many; density: densely covered	head
worker	bristles	number: many; density: densely covered	head
worker	hairs	number: many; density: densely covered	nasus
worker	bristles	number: many; density: densely covered	nasus
worker	hairs	length: short; density: densely covered	tergites
worker	bristles	position: posterior margin; density: densely covered	tergites
worker	hairs	length: short; density: densely covered	sternites
worker	bristles	position: perpendicular to body length; density: densely covered	sternites
worker	articles	number: 10 to 11	antennae
worker	fontanelle	shape: depressed	head

Table 5.60: Morphological characters of the genus *Paraconvexitermes* extracted from the database according to [Canello & Noirot \(2003\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head	colour: yellow whitish; shape: round	body
worker	body	size: small	body
worker	isthmus	development: not very distinct	hindgut
soldier	body	size: small	body
soldier	nasus	shape: conical; size: variable	head
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	articles	number: 10 to 11	antennae
soldier	hairs	number: many; density: densely covered	head
soldier	bristles	number: many; density: densely covered	head
soldier	hairs	number: many; density: densely covered	nasus
soldier	bristles	number: many; density: densely covered	nasus
soldier	hairs	length: short; density: densely covered	tergites
soldier	bristles	position: posterior margin; density: densely covered	tergites
soldier	hairs	length: short; density: densely covered	sternites
soldier	bristles	position: perpendicular to body length; density: densely covered	sternites
alate	head	length: elongated	body
alate	fontanelle	length: long; position: depressed area; shape: slit; colour: pale yellow	head
alate	eyes	size: very large	head
alate	ocelli	shape: nearly rounded; size: large; almost touching eyes	head
alate	postclypeus	shape: inflated; colour: lighter	head
alate	postclypeus anterior margin	shape: straight	postclypeus
alate	postclypeus posterior margin	shape: convex	postclypeus
alate	3rd article	size: very small; almost equal to 4th article	articles
alate	pronotum	colour: pale yellow; shape: sub-rectangular; narrower than head width	thorax
alate	pronotum posterior margin	shape: slightly emarginate	pronotum

Table 5.60: Morphological characters of the genus *Paraconvexitermes* extracted from the database according to [Canello & Noirot \(2003\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
alate	pronotum sides	shape: somewhat round	pronotum
alate	mesonotum posterior margin	shape: widely emarginate	mesonotum
alate	metanotum posterior margin	shape: widely emarginate	metanotum
alate	hairs	length: short; quantity: many	head
alate	bristles	orientation: variable; quantity: many	head
alate	bristles	length: long; quantity: few	head
alate	bristles	quantity: few	postclypeus
alate	hairs	length: short; quantity: few	postclypeus
alate	bristles	quantity: few	anteclypeus
alate	hairs	length: short; quantity: few	anteclypeus
alate	bristles	length: long; number: 2	labrum
alate	hairs	density: very hairy	postmentum
alate	hairs	density: very hairy	labrum
alate	hairs	length: short; quantity: many	pronotum
alate	bristles	quantity: many	pronotum
alate	hairs	length: short; quantity: many	tergites
alate	hairs	length: short; quantity: many	sternites
alate	head capsule	colour: pale brown	head
alate	labrum	colour: lighter	head
alate	fontanelle opening	number: 4; colour: lighter; orientation: row; shape: circular area; position: in front of fontanelle opening	fontanelle
alate	frontal marks	number: 2; position: in front of ocelli; shape: ellipsoid; larger than ocelli	front
alate	mesonotum	colour: pale yellow	thorax
alate	metanotum	colour: pale yellow	thorax

Genus *Parvitermes* Emerson 1949

Nesting: hypogeous (Constantino, 2015).

Feeding: litter, soil (Mathews, 1977; Constantino, 2015).

Pest of: sugar cane (Krishna *et al.*, 2013).

Distribution: Cuba; Dominican Republic; Haiti; Brazil; Bahamas; Guatemala; Honduras; Nicaragua; Mexico; Puerto Rico; Virgin Islands (British); Virgin Islands (USA) (Constantino, 2016).

Table 5.61: Morphological characters of the genus *Parvitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: small	body
worker	head	colour: pale yellow	body
worker	apical tooth (A)	little smaller than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	little smaller than 1st marginal tooth (M1)	right mandible
worker	cutting edge	length: long; position: between M1 and M3; shape: somewhat concave	left mandible
worker	submolar tooth	orientation: projected; development: visible; position: beyond M3	left mandible
worker	left mandible	index: 0.35	mandibles
worker	1st marginal tooth (M1) posterior margin	little longer than apical tooth (A) anterior margin	right mandible
worker	2nd marginal tooth (M2) posterior margin	equal to 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2) anterior margin	length: short	right mandible
worker	molar plate	shape: somewhat concave; as long as 2nd marginal tooth (M2) posterior margin	right mandible
worker	indentation	position: molar plate basal end; shape: strong	molar plate (right mandible)
worker	ridges	number: 8 to 9; orientation: transverse	molar plate (right mandible)
worker	1st ridge	position: separated; size: large	molar plate (right mandible)
worker	crop	size: small	foregut
worker	midgut	length: moderately long	gut

Table 5.61: Morphological characters of the genus *Parvitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mixed segment	length: very long; development: very well developed	midgut
worker	malpighian tubules	attached opposite to mesenteric tongue	abdomen
worker	1st proctodeal segment (P1)	length: very long	proctodeal
worker	paunch (P3)	size: large	hindgut
worker	wall	width: thin to thick; position: anteriorly to suddenly where it decreases in diameter at the rear	paunch (P3)
worker	plates	number: 6; colour: weakly sclerotized	enteric valve (P2)
worker	spines	number: approx. 15; colour: stout; density: sparsely scattered; length: short; position: into the lumen of the valve	enteric valve (P2)
soldier	body	development: monomorphic; size: small; colour: white; position: except thoracic nota and tergites	body
soldier	head	colour: rather weakly sclerotized; width: rather narrow; position: in dorsal view	body
soldier	constriction	development: distinct; position: behind antennae	head
soldier	nasus	shape: nearly cylindrical	head
soldier	antennae	length: short; slightly longer than	head
soldier	articles	number: 12 to 14	antennae
soldier	labrum	length: short; shape: rounded	head
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: present; size: small	mandibles
soldier	pronotum	narrower than head width	thorax
soldier	anterior lobe	development: not strongly developed	pronotum
soldier	legs	length: short	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	setae	colour: weakly sclerotized; quantity: many; density: scattered; width: fine; length: short	head
soldier	thoracic nota	colour: slightly pigmented	thorax
soldier	tergites	colour: slightly pigmented	abdominal sclerites

Genus *Rotunditermes* Holmgren 1910

Nesting: hypogeous (Mathews, 1977).

Feeding: wood (Mathews, 1977).

Distribution: Brazil; Ecuador; Peru (Constantino, 2016).

Table 5.62: Morphological characters of the genus *Rotunditermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: medium	body
worker	head	colour: yellow to pale white	body
worker	mandibles	as in imago	head
worker	molar plate width	smaller than molar plate length	right mandible
worker	ridges	number: 9; orientation: transverse	molar plate (right mandible)
worker	notch	position: extending nearly a third of the length of molar plate from its base in surface view	molar plate (right mandible)
worker	crop	size: medium	foregut
worker	midgut	length: moderately long	gut
worker	mixed segment	length: short; development: distinct	midgut
worker	1st proctodeal segment (P1)	narrower than midgut; somewhat shorter than midgut	proctodeal
worker	paunch (P3)	shape: fairly muscular	hindgut
worker	plates	number: 6; colour: weakly sclerotized; shape: somewhat rectangular	enteric valve (P2)
worker	spines	number: approx. 25 to 40; orientation: towards the rear; shape: conical; length: short; position: facing into the lumen	enteric valve (P2)
soldier	body	development: monomorphic; size: medium	body
soldier	head	shape: almost circular	body
soldier	nasus	width: very narrow; shape: almost cylindrical	head
soldier	postclypeus	orientation: somewhat protruding forward; development: partially visible; size: large	head
soldier	articles	number: 13	antennae
soldier	antennae length	little shorter than head length	antennae
soldier	mandibles	development: vestigial	head
soldier	pronotum anterior margin	width: narrowing rather strongly towards top; orientation: raised; shape: indented	pronotum

Table 5.62: Morphological characters of the genus *Rotunditermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	apical tooth (A)	projecting as much as 1st marginal tooth (M1); projecting more than 1st marginal tooth (M1)	left mandible
imago	apical tooth (A)	projecting as much as 1st marginal tooth (M1); projecting more than 1st marginal tooth (M1)	right mandible
imago	apical tooth (A) posterior margin	shape: concave	left mandible
imago	apical tooth (A) posterior margin	shape: concave	right mandible
imago	left mandible	angle: rounded; position: angle between A and M1	mandibles
imago	right mandible	angle: rounded; position: angle between A and M1	mandibles
imago	cutting edge	position: between M1 and M3; shape: concave	left mandible
imago	concavity	development: distinct; position: anterior to M3; shape: concave	left mandible
imago	left mandible	index: 0.5	mandibles
imago	submolar tooth	hidden beneath molar prominence	left mandible
imago	1st marginal tooth (M1) posterior margin	same length of apical tooth (A); somewhat shorter than apical tooth (A)	right mandible
imago	2nd marginal tooth (M2)	adjoining to 1st marginal tooth (M1)	right mandible
imago	2nd marginal tooth (M2) apex	shape: rounded	right mandible
imago	2nd marginal tooth (M2) anterior margin	length: very short; orientation: sloping towards rear	right mandible
imago	2nd marginal tooth (M2) posterior margin	longer than 1st marginal tooth (M1)	right mandible
imago	molar plate	shape: concave; longer than 2nd marginal tooth (M2)	right mandible
imago	indentation	position: near base in surface view; shape: somewhat concave	molar plate (right mandible)

Table 5.62: Morphological characters of the genus *Rotunditermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	ridges	number: approx 10; orientation: transverse	molar plate (right mandible)
imago	1st ridge	shape: tooth like	molar plate (right mandible)
imago	fontanelle	shape: somewhat triangular; size: large	head
imago	fontanelle sides	position: latero posterior; shape: somewhat concave	fontanelle
imago	ocelli	size: large; not touching eyes	head
imago	eyes	size: large	head
imago	articles	number: 15	antennae
imago	frontal marks	development: conspicuous; slightly smaller than ocelli	front
imago	postclypeus length	smaller than postclypeus width	postclypeus
imago	midline	development: moderately prominent; shape: depressed	postclypeus
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	setae	length: long; density: rather dense	head
imago	setae	length: long; density: rather dense	thorax
imago	setae	length: long; density: dense	costal veins
imago	setae	density: dense; length: short	wings
imago	setae	density: dense	abdominal sclerites

Genus *Rounditermes* Ensaf, Ponchel & Nel 2003

Etymology: name: round, refer: rounded form of soldier head (Ensaf *et al.*, 2003).

Distribution: French Guiana (Ensaf *et al.*, 2003; Constantino, 2016).

Table 5.63: Morphological characters of the genus *Rounditermes* extracted from the database according to Ensaf *et al.* (2003). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head	as in <i>Cortaritermes</i>	body
worker	mandibles	as in <i>Cortaritermes</i>	head
worker	midgut	as in <i>Cortaritermes</i>	gut
soldier	articles	number: 14	antennae
soldier	head	length: long; width: broad; shape: rounded	body
soldier	tibia	length: long	hind legs
soldier	tibia	length: long	middle legs
soldier	tibia	length: long	fore legs
soldier	nasus	length: short; shape: conical	head

Genus *Sandsitermes* Cuezco, Canello & Carrijo 2017

Etymology: name: Sands, refer: in tribute to Professor William A. Sands (Cuezco *et al.*, 2017).

Distribution: Brazil; Peru (Cuezco *et al.*, 2017; Constantino, 2016).

Table 5.64: Morphological characters of the genus *Sandsitermes* extracted from the database according to Cuezco *et al.* (2017). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	molar plate	shape: concave	right mandible
worker	armature	colour: weakly sclerotized	enteric valve (P2)
worker	plates	number: 2	enteric valve (P2)
worker	spines	shape: conical	enteric valve (P2)
soldier	nasus	length: long; shape: conical	head
imago	head	position: anterior to fontanelle; where the ocelli are situated; shape: slight elevation	body
imago	postclypeus	shape: slightly arched	head
imago	postclypeus anterior margin	shape: straight	postclypeus
imago	postclypeus posterior margin	shape: faintly convex	postclypeus
imago	molar plate	shape: distinctly concave	right mandible
imago	basal notch	development: distinct	molar plate (right mandible)
imago	ridges	development: faint	molar plate (right mandible)

Genus *Sinqasapatermes* Cuezco & Nickle 2011

Etymology: name: *sinqa* + *sapa*, language: Quechua, refer: the big nose of soldiers, meaning: nose + big (Cuezco & Nickle, 2011).

Distribution: Peru (Cuezco & Nickle, 2011; Constantino, 2016).

Table 5.65: Morphological characters of the genus *Sinqasapatermes* extracted from the database according to Cuezco & Nickle (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head capsule	shape: trapezoidal	head
worker	fontanelle	position: posterior third of head capsule; shape: depressed	head
worker	postclypeus	length: short; shape: moderately inflated	head
worker	midline	development: weakly defined	postclypeus
worker	articles	number: 12	antennae
worker	pronotum	shape: shallowly saddle-shaped	thorax
worker	pronotum anterior margin	shape: not emarginate	pronotum
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	apical tooth (A)	slightly prominent as 1+2 marginal tooth (M1+2) anterior margin; more prominent than 1+2 marginal tooth (M1+2) anterior margin	left mandible
worker	apical tooth (A) posterior margin	shape: truncate	left mandible
worker	left mandible	angle: acute; position: between posterior margin of apical tooth and anterior margin of M1+2	mandibles
worker	1+2 marginal tooth (M1+2) posterior margin	shape: slightly sinuous	left mandible
worker	3rd marginal tooth (M3)	development: reduced; shape: vestigial node	left mandible
worker	molar tooth	development: visible; position: at V-shaped gap	left mandible
worker	molar tooth apex	hidden beneath molar prominence	left mandible
worker	ridges	development: weakly-defined ridges	molar prominence (left mandible)
worker	apical tooth (A)	slightly prominent than 1st marginal tooth (M1)	right mandible

Table 5.65: Morphological characters of the genus *Sinqasapatermes* extracted from the database according to Cuzzo & Nickle (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	2nd marginal tooth (M2)	development: vestigial; shape: minute prominence	right mandible
worker	molar plate	shape: concave	right mandible
worker	ridges	development: weakly defined	molar plate (right mandible)
worker	notch	development: well defined	molar plate (right mandible)
worker	gut	shape: broad mass	digestive tube
worker	crop	development: partially visible; position: left half of abdomen; size: voluminous	foregut
worker	gizzard	development: partially visible; well separated from crop	foregut
worker	mesenteric-proctodeal junction	position: in right lateral view; shape: circular	midgut
worker	isthmus	development: conspicuous	hindgut
worker	u-turn	shape: dilated	colon (P4)
worker	colon (P4)	position: distal portion; shape: tubular	hindgut
soldier	body	development: monomorphic	body
soldier	head	position: behind base of antennae; shape: constricted	body
soldier	head capsule dorsal margin	position: to base of nasus; shape: weakly depressed	head capsule
soldier	nasus	width: narrow; length: very long; orientation: slanted slightly upward in profile; shape: conical	head
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	postclypeus	shape: moderately arcuate	head
soldier	labrum width	broader than labrum length	head
soldier	labrum antero lateral corners	shape: rounded	labrum
soldier	articles	number: 11	antennae
soldier	pronotum	shape: saddle-shaped	thorax
soldier	pronotum anterior margin	shape: not emarginate	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Subulitermes* Holmgren 1910

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: humus (Roisin, 1995; Constantino, 2002).

Pest of: eucalyptus (Constantino, 2002).

Distribution: Bolivia; Brazil; French Guiana; Guyana; Trinidad and Tobago; Costa Rica; Panama; Argentina; Paraguay; Peru (Roisin, 1995; Constantino, 2016).

Table 5.66: Morphological characters of the genus *Subulitermes* extracted from the database according to Roisin (1995). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	ridges	number: 3; development: vestigial; shape: round	molar prominence (left mandible)
worker	ridges	number: 4 to 5	molar plate (right mandible)
worker	left mandible	index: 1.02 to 1.12	mandibles
worker	armature	colour: weakly sclerotized; development: complete	enteric valve (P2)
worker	mesenteric junction	angle: oblique; position: mesentero-proctodeal junction	mesenteron
worker	mixed segment	occurrence: absent	midgut
worker	paunch (P3)	position: after junction of enteric valve; shape: not constricted	hindgut
worker	swellings	number: 6; shape: subequal	enteric valve (P2)
worker	spines	size: small	enteric valve (P2)
worker	colon (P4)	length: long; width: narrow	hindgut
soldier	body	development: monomorphic	body
soldier	nasus	size: large	head
soldier	rostrum	width: thin	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	head capsule	position: behind antennae; shape: not constricted	head

Genus *Tenuirostritermes* Holmgren 1912

Distribution: Honduras; Mexico; Nicaragua (Roisin *et al.*, 1996; Constantino, 2016).

Table 5.67: Morphological characters of the genus *Tenuirostritermes* extracted from the database according to Roisin *et al.* (1996). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: small	body
worker	digestive tube	similar to <i>Velocitermes</i>	digestive system
worker	mixed segment	length: long; wider than mesenteron	midgut
worker	left mandible	length: elongated	mandibles
worker	left mandible apex	shape: curved	left mandible
worker	right mandible	length: elongated	mandibles
worker	right mandible apex	shape: curved	right mandible
worker	mandibles	similar to <i>Velocitermes</i>	head
soldier	body	development: monomorphic; size: small	body
soldier	head	position: behind antennae; shape: strongly constricted	body
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: present	mandibles

Genus *Tiunatermes* Carrijo, Cuezco & Santos 2015

Etymology: name: ti + una, language: Tupi, refer: dark nose of soldiers, meaning: nose + dark (Carrijo *et al.*, 2015).

Distribution: Brazil (Carrijo *et al.*, 2015).

Table 5.68: Morphological characters of the genus *Tiunatermes* extracted from the database according to Carrijo *et al.* (2015). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head capsule	position: dorsal view; shape: subtrapezoidal	head
worker	head capsule posterior margin	shape: rounded	head capsule
worker	fontanelle	position: posterior third of the head capsule in dorsal view; shape: oval	head
worker	head capsule surface	position: at the fontanelle level in profile view; shape: not depressed	head capsule
worker	postclypeus in profile	shape: well curved	postclypeus
worker	articles	number: 14	antennae
worker	anterior lobe	more developed than posterior lobe	pronotum
worker	pronotum anterior margin	shape: not emarginate	pronotum
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	apical tooth (A)	more prominent than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	more prominent than 1st marginal tooth (M1)	right mandible
worker	apical tooth (A) posterior margin	shape: slightly concave	left mandible
worker	apical tooth (A) posterior margin	shape: slightly concave	right mandible
worker	right mandible	angle: acute; position: between apical tooth and first marginal tooth anterior margin	mandibles
worker	left mandible	angle: acute; position: between apical tooth and first marginal tooth anterior margin	mandibles
worker	1+2 marginal tooth (M1+2)	development: conspicuous	left mandible

Table 5.68: Morphological characters of the genus *Tiunatermes* extracted from the database according to [Carrizo *et al.* \(2015\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	1+2 marginal tooth (M1+2) anterior margin	shape: slightly sinuous	left mandible
worker	3rd marginal tooth (M3)	size: very reduced	left mandible
worker	molar tooth	development: slightly visible; position: beneath the molar prominence	left mandible
worker	molar prominence	shape: concave	left mandible
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	1st marginal tooth (M1)	development: conspicuous	right mandible
worker	2nd marginal tooth (M2)	development: not visible; occurrence: absent	right mandible
worker	molar plate	shape: concave	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	basal notch	development: well defined	molar plate (right mandible)
worker	gut	development: visible; position: through the abdominal wall	digestive tube
worker	crop	development: visible; position: ventral view; more developed than gizzard	foregut
worker	scales	shape: pectinated	crop
worker	armature	colour: sclerotized; development: complete; symmetry: hexaradial	gizzard
worker	pulvillar belt	more developed than columnar belt	foregut
worker	pulvilli I	development: well developed	foregut
worker	pulvilli II	development: reduced; texture: smooth	foregut
worker	columns I	position: anterior margin; shape: pointed; size: large	foregut
worker	mixed segment	length: short	midgut
worker	1st proctodeal segment (P1)	shape: tubular	proctodeal
worker	isthmus	development: conspicuous	hindgut
worker	dorsal torsion	development: developed	hindgut

Table 5.68: Morphological characters of the genus *Tiunatermes* extracted from the database according to [Carrizo *et al.* \(2015\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	u-turn	shape: tubular	colon (P4)
soldier	body	development: monomorphic	body
soldier	head capsule	width: broad; shape: not constricted	head
soldier	nasus	shape: conical	head
soldier	nasus base	width: broad	head
soldier	mandibles outer margin	development: not well defined	mandibles
soldier	articles	number: 13	antennae
soldier	postclypeus in profile	shape: slightly convex	postclypeus
soldier	labrum length	shorter than labrum width	labrum
soldier	labrum anterior margin	shape: rounded	labrum
soldier	labrum lateral margins	orientation: parallel	labrum
soldier	labrum anterior corners	shape: rounded	labrum
soldier	anterior lobe	as developed as posterior lobe; forming an angle with posterior lobe	pronotum
soldier	coxa	position: anterior surface; shape: no hump; shape: conical	fore legs
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	abdominal sclerites	colour: well sclerotized	abdomen

Genus *Triangularitermes* Mathews 1977

Nesting: hypogeous, inquiline (Constantino, 2015; Mathews, 1977).

Feeding: soil organic matter (Constantino, 2015).

Distribution: Brazil; Ecuador (Constantino, 2016).

Table 5.69: Morphological characters of the genus *Triangularitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: dimorphic; colour: white; position: except head; size: small	body
worker	head	colour: pale yellow to yellow white	body
worker	1st marginal tooth (M1)	orientation: projected	left mandible
worker	1st marginal tooth (M1)	orientation: projected	right mandible
worker	apical tooth (A)	orientation: projected; equally projected with 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	orientation: projected; equally projected with 1st marginal tooth (M1)	right mandible
worker	cutting edge	position: in front of M3; shape: distinct concavity	left mandible
worker	left mandible	index: 0.5	mandibles
worker	submolar tooth	development: not visible; position: in surface view of mandible	left mandible
worker	2nd marginal tooth (M2) posterior margin	shape: slightly concave; longer than 1st marginal tooth (M1) posterior margin	right mandible
worker	molar plate	shape: distinctly concave; longer than 2nd marginal tooth (M2) posterior margin	right mandible
worker	ridges	number: 9; orientation: transverse	molar plate (right mandible)
worker	indentation	position: near basal end; shape: deep	molar plate (right mandible)
soldier	head sides	orientation: converging towards front	head
soldier	head	colour: orange yellow; position: behind antennae; occurrence: sometimes absent; shape: slightly constricted	body
soldier	body	colour: weakly sclerotized; position: except head; size: small	body

Table 5.69: Morphological characters of the genus *Triangularitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	setae	length: long; number: 4; position: base of nasus	head
soldier	setae	length: long; number: 2; position: vertex	head
soldier	nasus	length: short; shape: conical	head
soldier	setae	number: 4; position: nasus tip	nasus
soldier	setae	length: short; position: apical third; density: dense	nasus
soldier	articles	number: 13	antennae
soldier	mandibles	development: vestigial	head
soldier	mandibles points	occurrence: absent	mandibles
soldier	legs	length: fairly short	thorax

Genus *Velocitermes* Holmgren 1912

Nesting: epigeal, hypogeous, inquiline (Constantino, 2002, 2015).

Feeding: grass, litter, humus (Mathews, 1977; Constantino, 2002, 2015).

Pest of: soil bean, cassava, forest trees (Constantino, 2002; Krishna *et al.*, 2013).

Distribution: Brazil; Panama; French Guiana; Guyana; Venezuela; Argentina; Paraguay; Bolivia; Peru (Constantino, 2016).

Table 5.70: Morphological characters of the genus *Velocitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: dimorphic; size: medium	body
worker	head	colour: sometimes redder	body
worker	apical tooth (A)	about same length of 1st marginal tooth (M1); somewhat longer than 1st marginal tooth (M1); somewhat shorter than 1st marginal tooth (M1)	left mandible
worker	cutting edge	position: between M1 and m3; shape: concave	left mandible
worker	3rd marginal tooth (M3)	size: small; development: distinct	left mandible
worker	left mandible	index: 0.29 to 0.50	mandibles
worker	molar prominence	orientation: projected rather strongly	left mandible
worker	submolar tooth	development: visible; position: between M3 and molar prominence; shape: sharp cutting edge; size: more than half filling the gap	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	apical tooth (A)	about same length of 1st marginal tooth (M1); somewhat shorter than 1st marginal tooth (M1)	right mandible
worker	apical tooth (A) posterior margin	about same length of 1st marginal tooth (M1) posterior margin; somewhat shorter than 1st marginal tooth (M1) posterior margin	right mandible
worker	molar plate length	longer than 2nd marginal tooth (M2) posterior margin	right mandible
worker	molar plate	width: rather broad; position: in plan of mandible	right mandible
worker	notch	position: near basal end in surface view; shape: angular notch	molar plate (right mandible)
worker	ridges	number: 9; orientation: transverse	molar plate (right mandible)

Table 5.70: Morphological characters of the genus *Velocitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	1st ridge	development: developed; orientation: set at an angle; size: markedly large	molar plate (right mandible)
worker	antennae	size: rather long;	head
worker	tibia	shape: rather short	hind legs
worker	midgut	size: medium	gut
worker	crop	size: medium	foregut
worker	mixed segment	position: where it joins the first part of the proctodeum.; occurrence: absent	midgut
worker	1st proctodeal segment (P1)	width: narrow; shorter than midgut	proctodeal
worker	paunch (P3)	size: rather small	hindgut
worker	paunch (P3) wall	width: thick	paunch (P3)
worker	armature	development: weak	enteric valve (P2)
worker	plates	number: approx. 6	enteric valve (P2)
minor soldier	head	colour: sometimes redder; smaller than major soldier; similar to intermediate soldier	body
minor soldier	antennae length	longer than head length	antennae
minor soldier	articles	number: 14	antennae
minor soldier	mandibles	development: vestigial	head
minor soldier	mandibles points	length: fairly long	mandibles
minor soldier	pronotum width	narrower than head width	pronotum
minor soldier	legs	length: long	thorax
minor soldier	legs length	as long as head length; slightly shorter than head length	legs
minor soldier	apical spurs	number: 2	tibia (hind legs)
minor soldier	apical spurs	number: 2	tibia (middle legs)
minor soldier	apical spurs	number: 2	tibia (fore legs)
minor soldier	setae	length: long; quantity: many; position: top of head	head
minor soldier	setae	length: long; number: 4; position: nasus apical portion	nasus
minor soldier	setae	length: short; position: nasus apical portion; density: dense	nasus
minor soldier	body	colour: well pigmented; position: rest of body except head	body
intermediate soldier	head	smaller than major soldier; colour: sometimes redder	body
intermediate soldier	nasus	little shorter than head	head
intermediate soldier	antennae length	longer than head length	antennae

Table 5.70: Morphological characters of the genus *Velocitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
intermediate soldier	articles	number: 14	antennae
intermediate soldier	mandibles	development: vestigial	head
intermediate soldier	mandibles points	shape: slender	mandibles
intermediate soldier	postclypeus	orientation: strongly forward; more projected than anteclypeus	head
intermediate soldier	pronotum width	narrower than head width	pronotum
intermediate soldier	legs	length: long	thorax
intermediate soldier	tibia length	longer than head length	hind legs
intermediate soldier	apical spurs	number: 2	tibia (hind legs)
intermediate soldier	apical spurs	number: 2	tibia (middle legs)
intermediate soldier	apical spurs	number: 2	tibia (fore legs)
intermediate soldier	setae	length: long; quantity: many; position: top of head	head
intermediate soldier	setae	length: long; number: 4; position: nasus apical portion	nasus
intermediate soldier	setae	length: short; position: nasus apical portion; density: dense	nasus
intermediate soldier	body	colour: well pigmented; position: rest of body except head	body
major soldier	body	colour: well pigmented; position: rest of body except head	body
major soldier	head	width: broad; colour: sometimes redder; position: behind antennae; shape: constricted	body
major soldier	nasus	shape: cylindrical	head
major soldier	antennae length	longer than head length	antennae
major soldier	articles	number: commonly 14	antennae
major soldier	mandibles	development: vestigial	head
major soldier	mandibles points	length: rather long; shape: slender	mandibles
major soldier	pronotum width	narrower than head width	pronotum
major soldier	pronotum anterior margin	orientation: raised; development: commonly rather weakly developed	pronotum
major soldier	legs	length: very long	thorax
major soldier	tibia length	longer than head length	hind legs
major soldier	apical spurs	number: 2	tibia (hind legs)
major soldier	apical spurs	number: 2	tibia (middle legs)

Table 5.70: Morphological characters of the genus *Velocitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
major soldier	apical spurs	number: 2	tibia (fore legs)
major soldier	setae	length: long; quantity: many; position: top of head	head
major soldier	setae	length: long; number: 4; position: nasus apical portion	nasus
major soldier	setae	length: short; position: nasus apical portion; density: dense	nasus
major soldier	postclypeus	orientation: forward	head
soldier	body	development: trimorphic; size: medium	body
imago	body	colour: well pigmented; size: medium	body
imago	wings	colour: dark	thorax
imago	setae	length: sometimes short; density: covered	wings
imago	setae	length: short; quantity: many; density: covered	wings
imago	punctations	quantity: many; occurrence: sometimes absent	wings
imago	fontanelle	size: medium	head
imago	mark	length: sometimes long; colour: pale; shape: bifurcate front	fontanelle
imago	ocelli	size: moderately large; well removed from eyes	head
imago	eyes	development: prominent to not very prominent; shape: pressed against head sides; size: large	head
imago	articles	number: 15	antennae
imago	antennae	length: very long	head
imago	postclypeus in profile	shape: weakly to rather strongly arched	postclypeus
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	midline	development: distinct; shape: depressed	postclypeus
imago	pronotum	length: rather long	thorax
imago	tibia	length: long	hind legs
imago	tibia	length: long	middle legs
imago	tibia	length: long	fore legs
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)

Syndermitinae

Genus Acangaobitermes Rocha, Canello & Cuezco 2011

Etymology: name: acangaobi, language: Tupi, refer: in reference to soldier head capsule shape in profile, meaning: funneled head (Rocha *et al.*, 2011).

Nesting: hypogeous, inquiline (Rocha *et al.*, 2011; Constantino, 2015).

Feeding: humus (Constantino, 2015).

Distribution: Brazil (Rocha *et al.*, 2011; Constantino, 2016).

Table 5.71: Morphological characters of the genus *Acangaobitermes* extracted from the database according to Rocha *et al.* (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	paunch (P3a)	position: proximal part	paunch (P3)
worker	1st proctodeal segment (P1)	more enlarged than mesenteron; diagonal to body axis	proctodeal
worker	malpighian tubules	position: one internal side to the mesenteric arch and the other external	abdomen
worker	mesenteric tongue	position: on the external side of the mesenteric arch	mixed segment
worker	mesenteric tongue	position: proximally; shape: slightly strangled	mixed segment
worker	mixed segment	occurrence: absent	midgut
worker	mesenteron	shape: tubular	midgut
worker	digestive tube	position: between columnar and pulvillar belt	digestive system
worker	3rd order	number: 12	fold (gizzard)
worker	2nd order	number: 6	fold (gizzard)
worker	1st order	number: 6	fold (gizzard)
worker	fold	number: 24; development: visible	gizzard
worker	constriction	position: between crop and gizzard; occurrence: absent	crop
worker	crop	shape: asymmetrical	foregut
worker	apical spurs	number: 2	tibia (fore legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (hind legs)
worker	abdominal sclerites	colour: transparent	abdomen
worker	body	length: elongated; development: monomorphic; size: slender	body
worker	projection	occurrence: absent	coxa (hind legs)
worker	projection	occurrence: absent	coxa (middle legs)
worker	projection	occurrence: absent	coxa (fore legs)
worker	coxa	texture: smooth	hind legs
worker	coxa	texture: smooth	middle legs

Table 5.71: Morphological characters of the genus *Acangaobitermes* extracted from the database according to Rocha *et al.* (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	coxa	texture: smooth	fore legs
worker	ridges	occurrence: absent	right mandible
worker	molar plate	shape: concave	right mandible
worker	2nd marginal tooth (M2)	development: clearly distinct	right mandible
worker	1st marginal tooth (M1)	development: clearly distinct	right mandible
worker	apical tooth (A)	larger than 1st marginal tooth (M1); larger than 2nd marginal tooth (M2)	right mandible
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	molar tooth	development: conspicuous; partially hidden by molar prominence	left mandible
worker	molar prominence	shape: concave	left mandible
worker	3rd marginal tooth (M3)	development: distinct; smaller than 1+2 marginal tooth (M1+2)	left mandible
worker	left mandible	position: margin between M1+2 and M3; shape: sinuate	mandibles
worker	apical tooth (A)	larger than 1+2 marginal tooth (M1+2)	left mandible
worker	articles	number: 14	antennae
worker	postclypeus	shape: inflated	head
worker	head capsule	shape: rounded	head
worker	1st proctodeal segment (P1)	about same size of paunch (P3a)	proctodeal
worker	1st proctodeal segment (P1)	width: narrow; position: prior to the attachment to P3; shape: neck	proctodeal
worker	paunch (P3)	position: between P3a and P3b; shape: slightly constricted	hindgut
worker	dorsal torsion	development: well-developed	hindgut
worker	colon (P4)	position: left side	hindgut
worker	paunch (P3)	joined to colon (P4)	hindgut
worker	isthmus	length: short; parallel to body length	hindgut
worker	colon (P4a)	shape: dilated	colon (P4)
worker	colon (P4b)	shape: tubular	colon (P4)
worker	u-turn	shape: tubular	colon (P4)
soldier	body	development: monomorphic	body

Table 5.71: Morphological characters of the genus *Acangaobitermes* extracted from the database according to Rocha *et al.* (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head capsule	shape: subquadrangular	head
soldier	head capsule lateral margins	distance: almost parallel	head capsule
soldier	salience	number: 2; development: very discrete; position: lateral corners	head capsule
soldier	microsculpture	development: conspicuous; quantity: many; density: covered; shape: set points; size: equal diameter	head
soldier	frontal tube	orientation: upturned; shape: conical	head
soldier	frontal tube apex	shape: relatively wide aperture surrounded by a white membrane apex	frontal tube
soldier	articles	number: 14	antennae
soldier	mandibles	orientation: upturned; shape: slender	head
soldier	tooth	position: base of blade; size: small	left mandible
soldier	tooth	position: base of blade; size: small	right mandible
soldier	molar plate	development: fully developed	right mandible
soldier	molar prominence	development: fully developed	left mandible
soldier	ridges	occurrence: absent	molar plate (right mandible)
soldier	ridges	occurrence: absent	molar prominence (left mandible)
soldier	clypeus	size: very reduced	head
soldier	labrum apex	shape: flat	labrum
soldier	postmentum	shape: subrectangular	head
soldier	postmentum antero-lateral margins	shape: slightly concave	postmentum
soldier	projection	orientation: pointing outwards; position: distal antero lateral margins; shape: kell	coxa (fore legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (hind legs)

Genus *Armitermes* Wasmann 1897

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: soil organic matter (Constantino, 2015).

Pest of: eucalyptus, forest trees (Constantino, 2002).

Distribution: Brazil; Panama (Rocha *et al.*, 2012; Constantino, 2016).

Table 5.72: Morphological characters of the genus *Armitermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head capsule	shape: rounded	head
worker	fontanelle	development: inconspicuous	head
worker	epicranial suture	development: inconspicuous	head
worker	articles	number: 14 to 15	antennae
worker	pronotum lateral margins	shape: serrated	pronotum
worker	mesonotum lateral margins	shape: serrated	mesonotum
worker	metanotum lateral margins	shape: serrated	metanotum
worker	abdomen	colour: transparent; shape: oval	body
worker	bristles	position: mainly on dorsal portion; density: sparse	head
worker	bristles	position: along anterior margin of pronotum	pronotum
worker	bristles	number: 1 pair; development: characteristic; position: anterolateral margins of posterior lobe	pronotum
worker	bristles	number: 1 pair; development: characteristic; position: posterior margin of pronotum	pronotum
worker	bristles	position: posterior margin of mesonotum	mesonotum
worker	bristles	position: posterior margin of metanotum	metanotum
worker	bristles	length: short; density: covering	hind legs
worker	hairs	length: short; density: covering	hind legs
worker	bristles	length: short; density: covering	middle legs
worker	hairs	length: short; density: covering	middle legs
worker	bristles	length: short; density: covering	fore legs
worker	hairs	length: short; density: covering	fore legs
worker	bristles	length: short; position: posterior margin of sternites; density: covering	sternites

Table 5.72: Morphological characters of the genus *Armitermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	hairs	length: short; position: posterior margin of sternites; density: covering	sternites
worker	bristles	length: short; position: posterior margin of tergites; density: covering	tergites
worker	hairs	length: short; position: posterior margin of tergites; density: covering	tergites
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	apical tooth (A)	larger than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	larger than 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2)	smaller than 1st marginal tooth (M1)	right mandible
worker	molar plate	shape: concave	right mandible
worker	molar prominence	shape: concave	left mandible
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	folds	number: 24; development: visible	gizzard
worker	1st order	number: 6	folds (gizzard)
worker	2nd order	number: 6	folds (gizzard)
worker	3rd order	number: 12	folds (gizzard)
worker	ornamentation	occurrence: absent	pulvilli
worker	mesenteric tongue	position: proximal portion; shape: filiform	mixed segment
worker	mesenteric tongue	position: distal portion; shape: oval; size: quite enlarged	mixed segment
worker	1st proctodeal segment (P1)	size: large; shape: globose	proctodeal
worker	constriction	shape: asymmetric	1st proctodeal segment (P1)
worker	enteric valve (P2)	shape: asymmetric	hindgut
worker	diverticulum	occurrence: sometimes present; size: small	paunch (P3)
worker	paunch (P3)	shape: almost tubular	hindgut
worker	paunch (P3) posterior part	position: dorsal view; shape: inverted C	paunch (P3)

Table 5.72: Morphological characters of the genus *Armitermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	isthmus	length: elongated; parallel to body axis	hindgut
worker	colon (P4)	length: long; shape: tubular	hindgut
soldier	body	development: monomorphic	body
soldier	head capsule	position: dorsal view; shape: sub-quadrate	head
soldier	frontal tube	position: dorsal view; shape: conical; extending beyond labrum	head
soldier	frontal tube	angle: 45 degrees; position: inferior margin of head capsule in lateral view	head
soldier	articles	number: 14 to 15	antennae
soldier	labrum	shape: nearly pentagonal	head
soldier	labrum apex	colour: hyaline; development: inconspicuous	labrum
soldier	labrum anterior margin	colour: hyaline	labrum
soldier	postmentum	shape: subrectangular	head
soldier	mandibles	shape: piercing	head
soldier	molar region	development: reduced	left mandible
soldier	molar region	development: reduced	right mandible
soldier	marginal teeth	number: 1 to 2	left mandible
soldier	marginal teeth	number: 1 to 2	right mandible
soldier	pronotum lateral margins	shape: serrated	pronotum
soldier	mesonotum lateral margins	shape: serrated	mesonotum
soldier	metanotum lateral margins	shape: serrated	metanotum
soldier	projection	occurrence: absent	coxa (fore legs)
soldier	bristles	position: mainly on dorsal portion; density: sparse	head
soldier	bristles	position: along anterior margin of pronotum	pronotum
soldier	bristles	number: 1 pair; development: characteristic; position: anterolateral margins of posterior lobe	pronotum
soldier	bristles	number: 1 pair; development: characteristic; position: posterior margin of pronotum	pronotum
soldier	bristles	position: posterior margin of mesonotum	mesonotum

Table 5.72: Morphological characters of the genus *Armitermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	bristles	position: posterior margin of metanotum	metanotum
soldier	bristles	length: short; density: covering	hind legs
soldier	hairs	length: short; density: covering	hind legs
soldier	bristles	length: short; density: covering	middle legs
soldier	hairs	length: short; density: covering	middle legs
soldier	bristles	length: short; density: covering	fore legs
soldier	hairs	length: short; density: covering	fore legs
soldier	bristles	length: short; position: posterior margin of sternites; density: covering	sternites
soldier	hairs	length: short; position: posterior margin of sternites; density: covering	sternites
soldier	bristles	length: short; position: posterior margin of tergites; density: covering	tergites
soldier	hairs	length: short; position: posterior margin of tergites; density: covering	tergites
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Cahuallitermes* Constantino 1994

Etymology: name: Cahualli, language: Nahuatl, meaning: an abandoned one (Constantino, 1994).

Distribution: Belize; Honduras; Mexico (Constantino, 1994, 2016).

Table 5.73: Morphological characters of the genus *Cahuallitermes* extracted from the database according to Constantino (1994). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
worker	head	shape: rounded	body
worker	postclypeus	shape: strongly inflated	head
worker	fontanelle	development: very conspicuous; shape: dome-shaped	head
worker	articles	number: 15	antennae
worker	bristles	number: 2; orientation: rows; length: long; width: thick; position: inner margin	femur (fore legs)
worker	bristles	number: 5 to 6; orientation: rows; shape: irregular; length: long; width: thick; position: inner margin	femur (fore legs)
worker	apical tooth (A)	length: short	left mandible
worker	apical tooth (A)	length: short	right mandible
worker	left mandible	index: approx. 0.5	mandibles
worker	cutting edge	shape: straight	left mandible
worker	molar plate	length: elongate; shape: concave	right mandible
worker	ridges	development: very developed	molar plate (right mandible)
worker	basal notch	development: very conspicuous	molar plate (right mandible)
worker	3rd marginal tooth (M3)	development: weakly developed	left mandible
worker	2nd marginal tooth (M2)	development: weakly developed	left mandible
worker	molar tooth	position: dorsal view; hidden by molar prominence	right mandible
worker	crop	size: small	foregut
worker	mixed segment	length: very long; shape: dilated	midgut
worker	enteric valve (P2)	width: wide; shape: weakly armed	hindgut
worker	paunch (P3)	development: well developed	hindgut
soldier	head capsule	length: moderately elongate	head
soldier	head capsule sides	shape: convex	head capsule

Table 5.73: Morphological characters of the genus *Cahuallitermes* extracted from the database according to Constantino (1994). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head length	equal to head width	head
soldier	frontal tube	shape: conical; shorter than head	head
soldier	frontal tube apex	width: broad	frontal tube
soldier	labral gland	colour: white; development: well-developed	labrum
soldier	postmentum surface	texture: densely rugose	postmentum
soldier	mandibles	development: well-developed; shape: curved	head

Genus *Cornitermes* Wasmann 1897

Nesting: epigeal, hypogeous (Mathews, 1977; Constantino, 2015).

Feeding: soil organic matter, grass, litter (Mathews, 1977; Constantino, 2002, 2015).

Pest of: eucalyptus, tea, coffee, sugar cane, pastures, forest trees, field crops (Mathews, 1977; Constantino, 2002; Krishna *et al.*, 2013)

Distribution: Argentina; Brazil; Paraguay; Colombia; Ecuador; Bolivia; French Guiana; Guyana; Peru; Suriname; Venezuela; Costa Rica; Panama (Mathews, 1977; Constantino, 2016).

Table 5.74: Morphological characters of the genus *Cornitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: medium to moderately large	body
worker	head	colour: pale yellow	body
worker	mandibles	very similar to <i>Syntermes</i>	head
worker	apical tooth (A)	size: large	left mandible
worker	apical tooth (A)	size: large	right mandible
worker	molar plate	width: broad; shape: somewhat concave; distinctly longer than 2nd marginal tooth (M2) posterior margin	right mandible
worker	notch	position: near molar plate basal end; shape: deep	molar plate (right mandible)
worker	ridges	number: 9 to 11; development: prominent	molar plate (right mandible)
worker	1st ridge	size: large	molar plate (right mandible)
worker	molar plate	position: between 1st ridge and the other ridges; shape: depressed	right mandible
worker	fontanelle	development: rather indistinct	head
worker	setae	number: commonly 16 to 21; orientation: row; position: inner margin of fore tibia; shape: spine like	tibia (fore legs)
soldier	body	size: medium to moderately large	body
soldier	head	size: moderately large	body
soldier	head sides	orientation: converging towards front; position: in plan; shape: convex	head
soldier	ridges	orientation: lateral longitudinal; position: underside of head; shape: not so sharp	head
soldier	frontal tube	length: short; development: quite distinct; overlapping post-clypeus base	head

Table 5.74: Morphological characters of the genus *Cornitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	articles	number: 15	antennae
soldier	lobes	colour: white; position: in middle at front of labrum; shape: rounded	labrum
soldier	mandibles	development: robust; orientation: somewhat curved; size: fairly large	head
soldier	notch	development: distinct; position: inner margin at base of apical portion	left mandible
soldier	notch	development: distinct; position: inner margin at base of apical portion	right mandible
soldier	pronotum	much narrower than head	thorax
soldier	anterior lobe	width: wide; orientation: raised; size: large	pronotum
soldier	anterior lobe margin	margin; shape: rounded; size: large	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	setae	number: commonly 16 to 21; orientation: row; position: inner margin of fore tibia; shape: spine like	tibia (fore legs)
imago	body	size: medium to moderately large	body
imago	apical tooth (A)	projecting about equally to 1st marginal tooth (M1)	left mandible
imago	apical tooth (A)	projecting about equally to 1st marginal tooth (M1)	right mandible
imago	mandibles	similar to <i>Syntermes</i>	head
imago	molar prominence	shape: projecting	left mandible
imago	2nd marginal tooth (M2) anterior margin	length: short; shape: curved	right mandible
imago	2nd marginal tooth (M2) posterior margin	about same length of 1st marginal tooth (M1) posterior margin; slightly shorter than 1st marginal tooth (M1) posterior margin	right mandible
imago	molar plate	width: narrow; length: long; shape: concave; about same length of 2nd marginal tooth (M2) posterior margin	right mandible
imago	ridges	number: approx. 13; orientation: transverse	molar plate (right mandible)

Table 5.74: Morphological characters of the genus *Cornitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	ridges	development: indistinct; position: near molar plate base	molar plate (right mandible)
imago	notch	position: near molar plate basal end; shape: rounded	molar plate (right mandible)
imago	molar plate lower margin	shape: not strongly projecting	right mandible
imago	fontanelle	development: conspicuous; shape: plate like; size: small to large	head
imago	frontal marks	development: visible; position: just in front of fontanelle; shape: spot	front
imago	ocelli	shape: broadly oval; size: medium to large; removed from eyes	head
imago	eyes	size: medium	head
imago	ocelli upper margin	orientation: raised; position: above head surface	ocelli
imago	ocelli lower margin	shape: depressed	ocelli
imago	articles	number: 15 to 16	antennae
imago	postclypeus	position: in profile; shape: strongly arched	head
imago	postclypeus length	as long as postclypeus width	postclypeus
imago	midline	development: visible	postclypeus
imago	pronotum	shape: somewhat flat; narrower than head	thorax
imago	pronotum sides	shape: round	pronotum
imago	pronotum hind margin	shape: not indented	pronotum
imago	mesonotum posterior margin	shape: widely concave	mesonotum
imago	metanotum posterior margin	shape: somewhat angular	metanotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	setae	length: fairly long; density: scattered	head
imago	setae	length: fairly long; density: scattered	pronotum
imago	setae	width: fine; length: short	wings

Genus *Curvitermes* Holmgren 1912

Nesting: hypogeous, inquiline (Carvalho & Constantino, 2011; Constantino, 2015).

Feeding: humus, soil (Carvalho & Constantino, 2011; Constantino, 2015).

Distribution: Bolivia; Brazil (Carvalho & Constantino, 2011; Constantino, 2016).

Table 5.75: Morphological characters of the genus *Curvitermes* extracted from the database according to Carvalho & Constantino (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	mandibles	similar to imago	head
worker	left mandible	index: 2.2 to 2.7	mandibles
worker	crop	size: small	foregut
worker	gizzard	development: moderately developed	foregut
worker	mixed segment	length: long; shape: cylindrical	midgut
worker	mesenteric lobe	number: single; position: on external face	mixed segment
worker	mesenteric lobe	position: distal portion; shape: not inflated	mixed segment
worker	1st proctodeal segment (P1)	size: large; shape: dilated	proctodeal
worker	enteric valve (P2)	position: located posteriorly; shape: ellipsoid; inserted into paunch (P3)	hindgut
worker	armature	development: developed	enteric valve (P2)
worker	cushions	width: narrow; number: 3; shape: elongate	enteric valve (P2)
worker	spines	quantity: many; shape: bristle like	enteric valve (P2)
worker	colon (P4)	size: large	hindgut
soldier	body	development: monomorphic	body
soldier	head capsule	width: broad	head
soldier	nasus	development: well developed; shape: conical	head
soldier	nasus tip	width: broad	nasus
soldier	bristles	density: sparse	nasus
soldier	hairs	quantity: many; size: microscopic	nasus
soldier	mandibles	length: long; shape: curved	head
soldier	tooth	orientation: backward pointing; shape: barb like	left mandible
soldier	tooth	orientation: backward pointing; shape: barb like	right mandible
soldier	molar region	size: very large	left mandible
soldier	molar region	size: very large	right mandible

Table 5.75: Morphological characters of the genus *Curvitermes* extracted from the database according to [Carvalho & Constantino \(2011\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	labrum	shape: roughly triangular; size: large	head
soldier	articles	number: 13 to 14	antennae
soldier	anterior lobe	development: well developed	pronotum
soldier	spines	occurrence: absent	coxa (fore legs)
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	head capsule	position: dorsal view; shape: oval	head
imago	ocelli	colour: pale; development: conspicuous	head
imago	postclypeus	shape: moderately	head
imago	apical tooth (A)	size: very large	left mandible
imago	apical tooth (A)	size: very large	right mandible
imago	1st marginal tooth (M1)	size: large	left mandible
imago	2nd marginal tooth (M2)	occurrence: absent	left mandible
imago	3rd marginal tooth (M3)	size: small	left mandible
imago	cutting edge	position: between M1 and M3; shape: concave	left mandible
imago	1st marginal tooth (M1)	size: large	right mandible
imago	2nd marginal tooth (M2)	size: very small	right mandible
imago	molar plate	shape: concave	right mandible
imago	ridges	occurrence: absent	molar plate (right mandible)
imago	articles	number: 15	antennae
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	hairs	quantity: many; density: dense	wings
imago	microsculpture	position: most parts of the wing; occurrence: absent	wings
imago	tubercles	position: on the proximal region; especially on the major veins and between the costal margin and R S; occurrence: present	wings

Genus *Cyrillitermes* Fontes 1985

Nesting: subterranean, inquiline (Constantino & Carvalho, 2012).

Feeding: soil, humus (Constantino, 2015).

Distribution: Brazil; French Guiana; Suriname (Constantino, 2016).

Table 5.76: Morphological characters of the genus *Cyrillitermes* extracted from the database according to Constantino & Carvalho (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head capsule	shape: hemi ellipsoid	head
worker	head capsule anterior region	width: wide	head capsule
worker	postclypeus	shape: inflated	head
worker	midline	development: distinct	postclypeus
worker	apical tooth (A)	size: very large	left mandible
worker	apical tooth (A)	size: very large	right mandible
worker	1st marginal tooth (M1)	size: large	left mandible
worker	2nd marginal tooth (M2)	occurrence: absent	left mandible
worker	3rd marginal tooth (M3)	size: small	left mandible
worker	cutting edge	position: between M1 and M3; shape: moderately concave	left mandible
worker	1st marginal tooth (M1)	size: large	right mandible
worker	2nd marginal tooth (M2)	size: very small	right mandible
worker	molar plate	shape: concave	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	left mandible	index: 1.9 to 2.1	mandibles
worker	articles	number: 14	antennae
worker	crop	size: small	foregut
worker	gizzard	development: moderately developed	foregut
worker	1st proctodeal segment (P1)	size: large; shape: dilated	proctodeal
worker	enteric valve (P2)	shape: oval	hindgut

Table 5.76: Morphological characters of the genus *Cyrrillitermes* extracted from the database according to [Constantino & Carvalho \(2012\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	development: monomorphic; size: medium	body
soldier	head capsule	shape: angular	head
soldier	head capsule sides	shape: convex	head capsule
soldier	nasus	development: well developed; shape: subcylindrical; texture: wrinkled	head
soldier	ridges	orientation: transverse	nasus
soldier	nasus tip	shape: broadening abruptly	nasus
soldier	hairs	length: short; quantity: many; position: surrounding frontal pore	frontal pore
soldier	bristles	length: long	head
soldier	bristles	length: long	thorax
soldier	hairs	density: sparse; size: microscopic	head
soldier	hairs	quantity: many; size: microscopic	nasus
soldier	mandibles	length: short; shape: strongly curved	head
soldier	marginal teeth	number: 2	right mandible
soldier	marginal teeth	number: 2	left mandible
soldier	1st marginal tooth (M1)	length: short	left mandible
soldier	1st marginal tooth (M1)	length: short	right mandible
soldier	2nd marginal tooth (M2)	size: large	left mandible
soldier	2nd marginal tooth (M2) apex	shape: rounded	right mandible
soldier	molar region	development: well developed; shape: worker like	left mandible
soldier	molar region	development: well developed; shape: worker like	right mandible
soldier	midline	shape: not inflated	postclypeus
soldier	labrum	shape: roughly triangular	head
soldier	articles	number: 14	antennae
soldier	antennae	shorter than head	head
soldier	coxa	position: anterior part; shape: shallow process	fore legs
soldier	spines	occurrence: absent	fore legs
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Table 5.76: Morphological characters of the genus *Cyrrillitermes* extracted from the database according to [Constantino & Carvalho \(2012\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	head capsule	position: dorsal view; shape: oval	head
imago	bristles	length: long; density: scattered	head capsule
imago	hairs	quantity: many; size: microscopic	head capsule
imago	coronal branch	development: conspicuous	coronal branch
imago	frontal branches	development: conspicuous	front
imago	eyes	size: large	head
imago	ocelli	size: large	head
imago	fontanelle	development: inconspicuous; size: large; little paler than head capsule	head
imago	midline	development: visible; shape: moderately inflated	postclypeus
imago	articles	number: 15	antennae
imago	pronotum	angle: rounded; shape: trapezoidal	thorax
imago	mesonotum posterior margin	shape: angular	mesonotum
imago	metanotum posterior margin	shape: angular	metanotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	hairs	length: short; density: dense	wings
imago	microsculpture	position: most parts of the wing; occurrence: absent	wings
imago	tubercles	position: on the proximal region; especially on the major veins and between the costal margin and RS; size: tiny	wings
imago	molar plate	narrower than worker	right mandible

Genus *Embiratermes* Fontes 1985

Etymology: name: Embira, language: Tupi, meaning: the one that was born from Fontes (1985).

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: soil organic matter (Constantino, 2002, 2015).

Pest of: eucalyptus (Constantino, 2002).

Distribution: Bolivia; Venezuela; Brazil; French Guiana; Guyana; Costa Rica; Nicaragua; Panama; Argentina; Paraguay; Peru; Suriname; Ecuador (Constantino, 2016).

Table 5.77: Morphological characters of the genus *Embiratermes* extracted from the database according to Fontes (1985). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	abdomen	development: showing gut contents; size: voluminous to greatly voluminous	body
worker	tergites	colour: transparent	abdominal sclerites
worker	sternites	colour: transparent	abdominal sclerites
worker	postclypeus	shape: inflated	head
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	left mandible	index: approx. 1.25	mandibles
worker	cutting edge	shape: sinuous	left mandible
worker	3rd marginal tooth (M3)	development: distinct	left mandible
worker	3rd marginal tooth (M3) posterior margin	shape: convex	left mandible
worker	molar tooth	development: visible; position: between M3 and molar prominence	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	molar prominence	projecting well beyond 3rd marginal tooth (M3)	left mandible
worker	right mandible	angle: acute; position: angle between A and M1	mandibles
worker	1st marginal tooth (M1) posterior margin	longer than 1st marginal tooth (M1) anterior margin	right mandible
worker	2nd marginal tooth (M2)	development: distinct	right mandible

Table 5.77: Morphological characters of the genus *Embiratermes* extracted from the database according to [Fontes \(1985\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	2nd marginal tooth (M2) posterior margin	shape: weakly concave	right mandible
worker	molar plate	shape: concave	right mandible
worker	notch	development: visible; position: basal end; shape: rounded	molar plate (right mandible)
soldier	body	development: monomorphic	body
soldier	head capsule	shape: elongated	head
soldier	nasus	shape: conical; extending well beyond	head
soldier	postclypeus	shape: not inflated	head
soldier	postclypeus width	wider than postclypeus length	postclypeus
soldier	labrum	development: clearly visible; orientation: directed forwards; size: small	head
soldier	labrum sides	shape: sometimes weakly angular	labrum
soldier	labrum apex	colour: whitish	labrum
soldier	mandibles	length: sometimes long; orientation: sometimes curved inwards; development: usually robust; shape: sometimes slender	head
soldier	articles	number: 14	antennae
soldier	antennae	extending a little beyond nasus apex	head
soldier	pronotum	narrower than head	thorax
soldier	pronotum anterior margin	orientation: raised; position: base; narrower than pronotum posterior margin	pronotum
soldier	pronotum posterior margin	orientation: horizontal	pronotum
soldier	postmentum	length: long; shape: inflated	head
soldier	postmentum anterolateral margins	shape: sharp ridge	postmentum
soldier	legs	length: long	thorax
soldier	tibia	shape: slender	hind legs
soldier	tibia	shape: slender	middle legs
soldier	tibia	shape: slender	fore legs
soldier	projection	position: outside apical part; shape: conical; size: small	coxa (fore legs)
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)

Table 5.77: Morphological characters of the genus *Embiratermes* extracted from the database according to [Fontes \(1985\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	apical spurs	number: 2	tibia (fore legs)
alate	mandibles	similar to worker	head
alate	postclypeus	width_length_ratio: 1.75 to 2.00; shape: inflated	head

Genus *Ibitermes* Fontes 1985

Etymology: name: Ibi, language: Tupi, meaning: earth or soil (Fontes, 1985).

Distribution: Brazil (Fontes, 1985; Constantino, 2016).

Table 5.78: Morphological characters of the genus *Ibitermes* extracted from the database according to Fontes (1985). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: rarely dimorphic	body
worker	abdomen	colour: transparent; development: contents showing through; shape: oval	body
worker	tergites	colour: transparent	abdominal sclerites
worker	sternites	colour: transparent	abdominal sclerites
worker	bristles	length: very short; density: scattered	head
worker	bristles	length: long; quantity: few	head
worker	postclypeus	width_length_ratio: 2.27 to 2.43; shape: moderately inflated	head
worker	apical tooth (A)	position: inner margin; shape: concave	right mandible
worker	apical tooth (A)	position: inner margin; shape: concave	left mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	left mandible	index: 0.93	mandibles
worker	cutting edge	position: posterior cutting edge; shape: weakly sinuate	left mandible
worker	3rd marginal tooth (M3)	development: developed; shape: rounded	left mandible
worker	molar tooth	development: partially visible; position: between the third marginal tooth and the molar prominence	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	molar prominence	shape: rounded; size: large	left mandible
worker	molar prominence apex	shape: rounded; projecting well beyond 3rd marginal tooth (M3)	left mandible
worker	1st marginal tooth (M1) posterior margin	longer than 1st marginal tooth (M1) anterior margin	right mandible

Table 5.78: Morphological characters of the genus *Ibitermes* extracted from the database according to [Fontes \(1985\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	2nd marginal tooth (M2)	development: reduced; position: midway between the first marginal tooth and the molar plate; shape: broad rounded projection	right mandible
worker	2nd marginal tooth (M2) posterior margin	shape: concave	right mandible
worker	molar plate	shape: strongly concave	right mandible
worker	notch	development: visible; position: basal end; shape: rounded	molar plate (right mandible)
soldier	head capsule	pilosity: almost glabrous; shape: elongated	head
soldier	nasus	position: dorsal view; shape: conical; extending beyond postclypeus apex	head
soldier	postclypeus	orientation: strongly projected forward; position: between bases of mandibles; shape: convex	head
soldier	postclypeus in dorsal view	shape: more or less triangular	postclypeus
soldier	postclypeus in profile	shape: hemispherical	postclypeus
soldier	postclypeus width	wider than postclypeus length	postclypeus
soldier	labrum	orientation: oriented downward; colour: sclerotized; size: small; hidden by postclypeus	head
soldier	labrum sides	shape: rounded	labrum
soldier	mandibles	shape: sinuate	head
soldier	mandibles base	shape: very enlarged	mandibles
soldier	mandibles points	orientation: projected inwards	mandibles
soldier	teeth	occurrence: absent	left mandible
soldier	teeth	occurrence: absent	right mandible
soldier	articles	number: 14	antennae
soldier	antennae	extending beyond nasus tip	head
soldier	postmentum	shape: moderately inflated	head
soldier	postmentum anterior part	shape: flattened	postmentum
soldier	postmentum lateral margins	shape: more or less sharp ridge	postmentum

Table 5.78: Morphological characters of the genus *Ibitermes* extracted from the database according to [Fontes \(1985\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	postmentum posterior part	shape: weakly convex	postmentum
soldier	pronotum	slightly narrower than head	thorax
soldier	pronotum anterior margin	development: well developed	pronotum
soldier	legs	length: long	thorax
soldier	tibia	shape: slender	hind legs
soldier	tibia	shape: slender	middle legs
soldier	tibia	shape: slender	fore legs
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Labiotermes* Holmgren 1912

Etymology: name: labium, language: Latin, refer: to the enlarged labrum of the soldiers of some species, meaning: lip (Constantino, 2006).

Nesting: hypogeous, inquiline, arboreal (Constantino, 2006).

Feeding: humus, soil (Constantino, 2006).

Distribution: Argentina; Paraguay; Bolivia; Brazil; Colombia; Ecuador; French Guiana; Guyana; Peru; Trinidad and Tobago; Venezuela (Constantino, 2016).

Table 5.79: Morphological characters of the genus *Labiotermes* extracted from the database according to Constantino (2006). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: large	body
worker	head capsule	colour: light	head
worker	abdomen	colour: transparent; development: showing gut content; size: very large	body
worker	left mandible	index: 0.8 to 1;4	mandibles
worker	1st marginal tooth (M1)	development: conspicuous; size: large	left mandible
worker	2nd marginal tooth (M2)	occurrence: absent	left mandible
worker	3rd marginal tooth (M3)	smaller than 2nd marginal tooth (M2)	left mandible
worker	cutting edge	position: between M1 and M3; shape: sinuous	left mandible
worker	4th marginal tooth (M4)	hidden beneath molar prominence	left mandible
worker	1st marginal tooth (M1)	development: conspicuous; size: large	right mandible
worker	2nd marginal tooth (M2)	size: small	right mandible
worker	molar plate	width: wide; shape: concave	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	articles	number: 15 to 16	antennae
worker	anterior lobe	orientation: strongly raised	pronotum
worker	spines	orientation: row; position: mesonotum lateral margins; size: minute	mesonotum
worker	spines	orientation: row; position: metanotum lateral margins; size: minute	metanotum
worker	lateral projection	occurrence: present; position: near coxa base	coxa (fore legs)

Table 5.79: Morphological characters of the genus *Labiotermes* extracted from the database according to [Constantino \(2006\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	bristles	width: thick; length: short; quantity: many; position: dorsal side	femur (fore legs)
worker	bristles	width: thick; length: short; quantity: many; position: dorsal side	femur (middle legs)
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	crop	size: small	foregut
worker	mesenteric lobe	number: 2; size: one large, one small (small sometimes vestigial)	mixed segment
worker	proctodeum	size: very large	hindgut
worker	1st proctodeal segment (P1)	shape: strongly dilated	proctodeal
worker	enteric valve (P2)	width: wide	hindgut
worker	ridges	size: irregular	enteric valve (P2)
worker	spines	length: short; orientation: straight; shape: hair like	enteric valve (P2)
worker	spines	length: long; orientation: curved; shape: hair like	enteric valve (P2)
soldier	body	development: dimorphic; size: large	body
soldier	head capsule	shape: subrectangular; size: large	head
soldier	frontal tube	length: short	head
soldier	articles	number: 15 to 16	antennae
soldier	labrum	length: long; shape: tongue shaped	head
soldier	labrum sides	shape: convex	labrum
soldier	labrum apex	colour: hyaline	labrum
soldier	mandibles	development: robust	head
soldier	marginal teeth	number: 2; development: sometimes vestigial; size: sometimes large	left mandible
soldier	marginal teeth	number: 1 or 2; position: close to mandible base	right mandible
soldier	anterior lobe	orientation: strongly raised	pronotum
soldier	spines	orientation: row; position: mesonotum lateral margins; size: minute	mesonotum
soldier	spines	orientation: row; position: metanotum lateral margins; size: minute	metanotum

Table 5.79: Morphological characters of the genus *Labioterme*s extracted from the database according to [Constantino \(2006\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	projection	position: lateral part of coxa, near coxa base; occurrence: absent	coxa (fore legs)
soldier	bristles	width: thick; length: short; quantity: many; position: dorsal side	femur (fore legs)
soldier	bristles	width: thick; length: short; quantity: many; position: dorsal side	femur (middle legs)
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	head capsule	shape: rounded	head
imago	eyes	size: medium to large	head
imago	ocelli	development: conspicuous	head
imago	fontanelle	shape: elongate	head
imago	postclypeus	shape: moderately to strongly inflated	head
imago	midline	development: conspicuous	postclypeus
imago	molar plate	width: narrow	right mandible
imago	articles	number: 16 to 18	antennae
imago	pronotum	as wide as head	thorax
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	mandibles	narrower than	head

Genus *Macuxitermes* Canello & Bandeira 1992

Etymology: name: Macuxi, refer: an Indian people from Roraima state, Brazil (Canello & Bandeira, 1992).

Distribution: Colombia; Brazil (Canello & Bandeira, 1992; Constantino, 2016).

Table 5.80: Morphological characters of the genus *Macuxitermes* extracted from the database according to Canello & Bandeira (1992). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head	shape: rounded	body
worker	postclypeus	shape: moderately inflated	head
worker	postmentum	length: short	head
worker	articles	number: 15	antennae
worker	spines	length: short; quantity: many; position: lateral and latero-posterior margins of pronotum; shape: irregular	pronotum
worker	spines	length: short; quantity: many; position: lateral margins of mesonotum; shape: irregular	mesonotum
worker	spines	length: short; quantity: many; position: lateral margins of metanotum; shape: irregular	metanotum
worker	legs	shape: slender	thorax
worker	tibia	width: slightly thick	fore legs
worker	apical tooth (A)	larger than 1st marginal tooth (M1)	left mandible
worker	apical tooth (A)	larger than 1st marginal tooth (M1)	right mandible
worker	apical tooth (A) inner margin	shape: slightly concave	left mandible
worker	apical tooth (A) inner margin	shape: slightly concave	right mandible
worker	ridges	occurrence: absent	molar region (right mandible)
worker	ridges	occurrence: absent	molar region (left mandible)
minor soldier	head	width: relatively broad; length: short; shape: peculiar	body
minor soldier	protuberance	number: 2; development: conspicuous	head
minor soldier	nasus	orientation: upturned; shape: funneled; extending beyond mandibles	head
minor soldier	nasus base	width: broad; texture: rugose	head
minor soldier	mandibles	shape: slender	head
minor soldier	articles	number: 15	antennae
minor soldier	head sides	shape: swollen	head

Table 5.80: Morphological characters of the genus *Macuxitermes* extracted from the database according to [Canello & Bandeira \(1992\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
minor soldier	wrinkles	orientation: transversal; position: on the surface of the swollen sides of head and below antennal sockets	head
minor soldier	wrinkles	orientation: horizontal; position: in the frons-postclypeus region	head
minor soldier	microsculpture	position: on head surface; shape: punctuated	head
minor soldier	labrum	orientation: downwards	head
minor soldier	labrum apex	position: between mandibles; shape: blunt	labrum
minor soldier	mesonotum	as in major soldier	thorax
minor soldier	metanotum	as in major soldier	thorax
minor soldier	legs	shape: slender	thorax
major soldier	elevations	number: 2; position: on either side of the median line; shape: pimple like	head
major soldier	head sides	shape: convex	head
major soldier	protuberance	development: visible; position: anteriorly in profile	head
major soldier	nasus	development: robust; shape: curved; extending beyond mandibles	head
major soldier	nasus apex	orientation: slightly curved downwards; position: in profile	nasus
major soldier	frons	position: from base of nasus to postclypeus; shape: convex	head
major soldier	mandibles	orientation: strongly curved inward; development: robust	head
major soldier	articles	number: 15	antennae
major soldier	postclypeus width	broader than postclypeus length	postclypeus
major soldier	labrum	width: broad; length: short; orientation: forwards	head
major soldier	labrum sides	shape: rounded	labrum
major soldier	labrum apex	shape: blunt	labrum
major soldier	postmentum	length: very short; shape: inflated	head
major soldier	pronotum	narrower than head	thorax
major soldier	anterior lobe	length longer than posterior lobe width	pronotum
major soldier	posterior lobe	width: wide; length: short	pronotum
major soldier	spines	length: short; quantity: many; position: lateral and lateroposterior margins; shape: irregular	pronotum
major soldier	spines	length: short; position: lateral margins	mesonotum

Table 5.80: Morphological characters of the genus *Macuxitermes* extracted from the database according to [Cancello & Bandeira \(1992\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
major soldier	spines	length: short; position: lateral margins	metanotum
soldier	body	development: dimorphic	body

Genus *Mapinguaritermes* Rocha & Canello 2012

Etymology: name: Mapinguari, refer: folkloric ground-dwelling sloth-like creature with red fur that's supposed to live in the Amazon rainforests, Brazil (Rocha *et al.*, 2012).

Distribution: Brazil; Guyana; Colombia; Peru (Rocha *et al.*, 2012; Constantino, 2016).

Table 5.81: Morphological characters of the genus *Mapinguaritermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head capsule	shape: rounded	head
worker	epicranial suture	development: not evident	head
worker	fontanelle	development: very discreet; shape: oval	head
worker	postclypeus	shape: little inflated	head
worker	articles	number: 14	antennae
worker	abdomen	colour: translucent; shape: oval	body
worker	bristles	position: entire surface of anterior lobe; density: covered	pronotum
worker	bristles	position: entire surface of posterior lobe; density: covered	pronotum
worker	bristles	position: on mesonotum posterior margin; density: covered	mesonotum
worker	bristles	position: on metanotum posterior margin; density: covered	metanotum
worker	bristles	density: sparse	hind legs
worker	bristles	density: sparse	middle legs
worker	bristles	density: sparse	fore legs
worker	hairs	length: short	hind legs
worker	hairs	length: short	middle legs
worker	hairs	length: short	fore legs
worker	hairs	length: short	tergites
worker	hairs	length: short	sternites
worker	bristles	length: short; position: sternites posterior margin	sternites
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	apical tooth (A)	larger than 1+2 marginal tooth (M1+2); equal to 1+2 marginal tooth (M1+2)	left mandible
worker	cutting edge	development: well defined; position: between M1 + 2 and M3; shape: straight	left mandible
worker	3rd marginal tooth (M3)	size: approx. half of M1+2	left mandible

Table 5.81: Morphological characters of the genus *Mapinguaritermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	molar tooth	partially hidden beneath molar prominence	left mandible
worker	apical tooth (A)	slightly larger than 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2) posterior margin	much smaller than 1st marginal tooth (M1)	right mandible
worker	molar plate	shape: concave	right mandible
worker	molar prominence	shape: concave	left mandible
soldier	body	development: monomorphic	body
soldier	head capsule	shape: oval	head
soldier	frontal tube	length: 4/5 of head capsule; orientation: almost parallel to the base of head capsule; shape: conical	head
soldier	articles	number: 15	antennae
soldier	labrum	shape: almost pentagonal	head
soldier	labrum anterior margin	colour: hyaline	labrum
soldier	labrum apex	occurrence: absent	labrum
soldier	postmentum sides	shape: convex	postmentum
soldier	mandibles	shape: symmetrical; shape: piercing	head
soldier	marginal tooth	number: 1; angle: acute; orientation: inward	left mandible
soldier	marginal tooth	number: 1; angle: acute; orientation: inward	right mandible
soldier	molar region	size: reduced	left mandible
soldier	molar region	size: reduced	right mandible
soldier	pronotum sides	shape: angular	pronotum
soldier	projection	occurrence: absent	coxa (fore legs)
soldier	head	pilosity: varying	body
soldier	bristles	position: entire surface of anterior lobe; density: covered	pronotum
soldier	bristles	position: entire surface of posterior lobe; density: covered	pronotum
soldier	bristles	position: on mesonotum posterior margin; density: covered	mesonotum
soldier	bristles	position: on metanotum posterior margin; density: covered	metanotum
soldier	bristles	density: sparse	hind legs
soldier	bristles	density: sparse	middle legs
soldier	bristles	density: sparse	fore legs

Table 5.81: Morphological characters of the genus *Mapinguaritermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	hairs	length: short	hind legs
soldier	hairs	length: short	middle legs
soldier	hairs	length: short	fore legs
soldier	hairs	length: short	tergites
soldier	hairs	length: short	sternites
soldier	bristles	length: short; position: sternites posterior margin	sternites
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Noirotitermes* Canello & Myles 2000

Etymology: name: Noirot, refer: named in honor of Dr. Charles Noirot, French termitologist (Canello & Myles, 2000).

Nesting: hypogeous (Constantino, 2015).

Feeding: humus (Constantino, 2015).

Distribution: Brazil (Canello & Myles, 2000; Constantino, 2015, 2016).

Table 5.82: Morphological characters of the genus *Noirotitermes* extracted from the database according to Canello & Myles (2000). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head	shape: rounded	body
worker	postclypeus	shape: slightly arched	head
worker	apical tooth (A)	larger than marginal teeth	left mandible
worker	apical tooth (A)	larger than marginal teeth	right mandible
worker	apical tooth (A) inner margin	shape: concave	left mandible
worker	apical tooth (A) inner margin	shape: concave	right mandible
worker	molar region	shape: concave	left mandible
worker	molar region	shape: concave	right mandible
worker	ridges	occurrence: absent	molar region (left mandible)
worker	ridges	occurrence: absent	molar region (right mandible)
worker	tibia	shape: slightly inflated	fore legs
worker	esophagus	width: narrow	digestive tube
worker	crop	size: small; shape: asymmetrical	foregut
worker	crop middle	width: wide	foregut
worker	crop anterior end	shape: rounded	foregut
worker	crop	position: above insertion of esophagus; shape: projecting	foregut
worker	1st proctodeal segment (P1)	size: large	proctodeal
worker	rectum (P5)	size: large	hindgut
soldier	body	development: monomorphic	body
soldier	head sides	shape: convex	head
soldier	mandibles	orientation: upturned; shape: strongly curved inward	head
soldier	tooth	position: approx. on the proximal third of the mandible; size: small	left mandible

Table 5.82: Morphological characters of the genus *Noirotitermes* extracted from the database according to [Cancello & Myles \(2000\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	tooth	position: approx. on the proximal third of the mandible; size: small	right mandible
soldier	clypeus	shape: slightly bulging; size: very reduced	head
soldier	labrum	length: very short; shape: triangular	head
soldier	postmentum	size: greatly reduced	head
soldier	pronotum	shape: no saddle shape	thorax
soldier	lobes	angle: not marked; position: between anterior and posterior lobes	pronotum
soldier	anterior lobe	shape: strongly emarginate; about same size of posterior lobe	pronotum
soldier	tibia	shape: strongly inflated	fore legs
soldier	coxa	shape: hump	fore legs
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	setae	quantity: scarce; density: scattered	head
soldier	setae	quantity: scarce; density: scattered	fontanelle

Genus *Paracurvitermes* Constantino & Carvalho 2011

Etymology: name: para + *Curvitermes*, language: Greek, refer: indicating the superficial similarity between these two genera, meaning: near to genus *Curvitermes* (Constantino & Carvalho, 2011).

Nesting: hypogeous, inquiline (Constantino & Carvalho, 2011; Constantino, 2015).

Feeding: humus (Constantino & Carvalho, 2011; Constantino, 2015).

Distribution: Bolivia; Brazil (Constantino & Carvalho, 2011; Constantino, 2016).

Table 5.83: Morphological characters of the genus *Paracurvitermes* extracted from the database according to Constantino & Carvalho (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	left mandible	index: 2.5 to 3	mandibles
worker	apical tooth (A)	size: very large	left mandible
worker	apical tooth (A)	size: very large	right mandible
worker	1st marginal tooth (M1)	size: large	left mandible
worker	2nd marginal tooth (M2)	occurrence: absent	left mandible
worker	3rd marginal tooth (M3)	size: small	left mandible
worker	left mandible	index: 2.1	mandibles
worker	4th marginal tooth (M4)	development: partially visible; position: between M3 and the molar prominence	left mandible
worker	4th marginal tooth (M4) apex	hidden beneath molar prominence	left mandible
worker	1st marginal tooth (M1)	size: large	right mandible
worker	2nd marginal tooth (M2)	development: vestigial	right mandible
worker	molar plate	width: broad; shape: concave	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	crop	size: relatively small	foregut
worker	gizzard	development: moderately developed	foregut
worker	pulvilli I	partially covering columns; shorter than columns	foregut
worker	mixed segment	length: short; shape: nearly conical	midgut

Table 5.83: Morphological characters of the genus *Paracurvitermes* extracted from the database according to [Constantino & Carvalho \(2011\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mesenteric lobe	number: 1; position: on the external face of mixed segment; shape: not inflated	mixed segment
worker	1st proctodeal segment (P1)	size: large; shape: dilated	proctodeal
worker	enteric valve (P2)	position: located posteriorly and inserted into P3 at the dorsal left side	hindgut
worker	armature	development: well developed	enteric valve (P2)
worker	swellings	number: 3; shape: finger like	enteric valve (P2)
worker	spines	width: fine; length: long; orientation: straight; quantity: many	enteric valve (P2)
worker	paunch (P3)	larger than 1st proctodeal segment (P1)	hindgut
worker	colon (P4)	length: large	hindgut
soldier	body	development: monomorphic	body
soldier	head	width: broad	body
soldier	nasus	development: very well developed; shape: conical	head
soldier	nasus tip	width: broad	nasus
soldier	bristles	quantity: few; density: sparse	head
soldier	hairs	quantity: many; size: microscopic	head
soldier	mandibles	length: long; shape: curved	head
soldier	marginal tooth	position: near the middle of the mandible; shape: triangular	left mandible
soldier	marginal tooth	position: near the middle of the mandible; shape: triangular	right mandible
soldier	molar region	size: relatively large	left mandible
soldier	molar region	size: relatively large	right mandible
soldier	labrum	shape: nearly triangular; size: large	head
soldier	articles	number: 14	antennae
soldier	anterior lobe	development: very well developed	pronotum
soldier	legs	length: short	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	head capsule	shape: rounded	head
imago	eyes	shape: large	head
imago	ocelli	development: conspicuous	head
imago	fontanelle	shape: oval; paler than head capsule	head
imago	postclypeus	shape: moderately inflated	head
imago	apical tooth (A)	size: very large	left mandible

Table 5.83: Morphological characters of the genus *Paracurvitermes* extracted from the database according to [Constantino & Carvalho \(2011\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	apical tooth (A)	size: very large	right mandible
imago	1st marginal tooth (M1)	size: large	left mandible
imago	2nd marginal tooth (M2)	occurrence: absent	left mandible
imago	3rd marginal tooth (M3)	size: small	left mandible
imago	left mandible	index: 2.1	mandibles
imago	4th marginal tooth (M4)	development: partially visible; position: between M3 and the molar prominence	left mandible
imago	4th marginal tooth (M4) apex	hidden beneath molar prominence	left mandible
imago	1st marginal tooth (M1)	size: large	right mandible
imago	2nd marginal tooth (M2)	development: vestigial	right mandible
imago	molar plate	width: broad; shape: concave	right mandible
imago	ridges	occurrence: absent	molar plate (right mandible)
imago	articles	number: 15	antennae
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	hairs	length: short; quantity: many; density: covered	wings
imago	microsculpture	position: most part of the wing; occurrence: absent	wings
imago	tubercles	position: on the proximal part of the costal region; especially on the major veins; size: tiny	wings

Genus *Procornitermes* Emerson 1949

Nesting: epigeal, hypogeous (Constantino, 2015).

Feeding: soil organic matter (Constantino, 2002, 2015).

Pest of: eucalyptus, rice, pineapple, sugar cane, coffee, maize (Constantino, 2002).

Distribution: Bolivia; Argentina; Brazil; Paraguay; Uruguay (Constantino, 2016).

Table 5.84: Morphological characters of the genus *Procornitermes* extracted from the database according to Cancellato (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	apical tooth (A)	slightly longer than 1st marginal tooth (M1)	right mandible
worker	apical tooth (A) anterior margin	shape: curved	right mandible
worker	apical tooth (A) posterior margin	shape: straight	right mandible
worker	1st marginal tooth (M1)	shape: triangular	right mandible
worker	1st marginal tooth (M1) margins	shape: straight	right mandible
worker	2nd marginal tooth (M2)	much smaller than 1 marginal tooth (M1)	right mandible
worker	path	position: between the tip of M2 and the molar plate; shape: straight	right mandible
worker	molar plate	shape: variable; size: variable	right mandible
worker	1st ridge	development: well marked; position: just below the apical thickening	molar plate (right mandible)
worker	ridges	position: molar plate basal region; shape: not prominent	molar plate (right mandible)
worker	apical tooth (A)	about same size of 1+2 marginal tooth (M1+2)	left mandible
worker	apical tooth (A) anterior margin	shape: curved	left mandible
worker	apical tooth (A) posterior margin	shape: straight	left mandible
worker	3rd marginal tooth (M3)	orientation: straight; shape: tabique shape	left mandible
worker	molar tooth	development: well developed	left mandible
soldier	head	shape: rectangular to subrectangular; colour: pale yellow to orange-brown	body
soldier	frontal tube	length: moderately long to long; shape: somewhat conical	head

Table 5.84: Morphological characters of the genus *Procornitermes* extracted from the database according to Cancellato (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	frontal tube apex	orientation: slightly facing up	frontal tube
soldier	labrum	shape: tricuspid	head
soldier	labrum apex	shape: sharp	labrum
soldier	postmentum	shape: straight	head
soldier	postmentum base	width: narrow	postmentum
soldier	articles	number: 13 to 15	antennae
soldier	anterior lobe	shape: not emarginated	pronotum
soldier	posterior lobe	shape: not emarginated	pronotum
soldier	tergites margins	shape: rounded	tergites
soldier	projection	occurrence: absent	coxa (hind legs)
soldier	projection	occurrence: absent	coxa (middle legs)
soldier	projection	occurrence: absent	coxa (fore legs)
soldier	bristles	density: sparse	head
soldier	hairs	size: microscopic	head
soldier	bristles	length: long	labrum
soldier	bristles	length: long	clypeus
soldier	hairs	size: microscopic	postmentum
soldier	bristles	number: 1 to 4; position: postmentum anterior margin	postmentum
soldier	hairs	position: frontal tube tip; around its opening; shape: tuft of hairs	frontal tube
soldier	bristles	position: pronotum margins and surface	pronotum
soldier	hairs	length: short; position: pronotum margins and surface	pronotum
soldier	bristles	quantity: few	tergites
soldier	hairs	length: short; quantity: many	tergites
soldier	bristles	quantity: few	sternites
soldier	hairs	length: short; quantity: many	sternites
soldier	bristles	quantity: few	hind legs
soldier	bristles	quantity: few	middle legs
soldier	bristles	quantity: few	fore legs
soldier	hairs	length: short	hind legs
soldier	hairs	length: short	middle legs
soldier	hairs	length: short	fore legs
soldier	bristles	occurrence: present	tibia (hind legs)
soldier	bristles	occurrence: present	tibia (middle legs)
soldier	bristles	occurrence: present	tibia (fore legs)
soldier	spines	occurrence: present	tibia (hind legs)
soldier	spines	occurrence: present	tibia (middle legs)
soldier	spines	occurrence: present	tibia (fore legs)
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Table 5.84: Morphological characters of the genus *Procornitermes* extracted from the database according to Cancellato (1986). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
alate	head	shape: oval; colour: light brown to dark brown	body
alate	fontanelle	development: sometimes prominent; position: located in a flat or depressed area; shape: rounded; colour: lighter	head
alate	epicranial suture	development: not visible	head
alate	eyes	diameter: 0.27 to 0.44 mm; shape: nearly rounded	head
alate	ocelli	shape: half moon; away from fontanelle	head
alate	labrum	shape: rounded	head
alate	articles	number: 15	antennae
alate	postclypeus	shape: strongly arched	head
alate	central suture	development: well marked	postclypeus
alate	anteclypeus	position: central region; shape: V shape	head
alate	apical tooth (A)	equal to 1+2 marginal tooth (M1+2)	right mandible
alate	1+2 marginal tooth (M1+2)	shape: triangular	right mandible
alate	posterior lobe	shape: not emarginate	pronotum
alate	fore wings	length: 13.30 to 19.16 mm; width: 3.44 to 5.00 mm	wings
alate	setae	density: sparse	head
alate	hairs	size: microscopic	head
alate	hairs	length: short; size: microscopic	pronotum
alate	setae	position: pronotum margins and surface	pronotum
alate	hairs	length: short	pronotum
alate	hairs	length: short	tergites
alate	hairs	length: long	tergites
alate	hairs	length: short	sternites
alate	hairs	length: long	sternites
alate	hairs	length: short	legs
alate	hairs	length: long	legs
alate	spines	number: 10; position: inner margin	hind legs
alate	spines	number: 10; position: inner margin	middle legs
alate	spines	number: 10; position: inner margin	fore legs
alate	apical spurs	number: 2	tibia (hind legs)
alate	apical spurs	number: 2	tibia (middle legs)
alate	apical spurs	number: 2	tibia (fore legs)

Table 5.84: Morphological characters of the genus *Procornitermes* extracted from the database according to [Cancello \(1986\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
alate	hairs	length: very short; density: covered	wings
alate	frontal marks	colour: lighter	front

Genus *Rhynchotermes* Holmgren 1912

Nesting: hypogeous, inquiline (Constantino, 2015).

Feeding: leaf, grass, litter (Constantino, 2002, 2015).

Pest of: eucalyptus (Constantino, 2002).

Distribution: Argentina; Bolivia; Brazil; Paraguay; Peru; Belize; Colombia; Costa Rica; Ecuador; Guatemala; Panama (Constantini & Canello, 2016).

Table 5.85: Morphological characters of the genus *Rhynchotermes* extracted from the database according to Constantini & Canello (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	bristles	length: long; quantity: variable; position: distributed throughout extension of legs	hind legs
worker	bristles	length: long; quantity: variable; position: distributed throughout extension of legs	middle legs
worker	bristles	length: long; quantity: variable; position: distributed throughout extension of legs	fore legs
worker	digestive tube	development: visible	digestive system
worker	bristles	number: variable; position: anterior margin	metanotum
worker	bristles	number: variable; position: anterior margin	mesonotum
worker	bristles	number: variable; position: anterior margin	pronotum
worker	bristles	orientation: whorl; position: distal portion; size: variable	articles
worker	bristles	number: 6	labrum
worker	bristles	number: 2 to 4	postclypeus
worker	bristles	length: long; number: 2; position: adjacent to fontanelle	head capsule
worker	bristles	length: short; quantity: many	head capsule
worker	bristles	length: long; number: approx. 10	head capsule
worker	colon (P4)	position: after u-turn on right; in dorsal view; shape: tubular	hindgut
worker	paunch (P3b)	position: in dorsal view; shape: S shape	paunch (P3)
worker	paunch (P3a)	position: on right side of dorsal view; shape: globular	paunch (P3)
worker	scales	development: distinguishable	pulvilli
worker	ornamentation	occurrence: absent	pulvilli
worker	3rd order	number: 12	folds (gizzard)
worker	2nd order	number: 6	folds (gizzard)
worker	1st order	number: 6	folds (gizzard)
worker	folds	number: 24	gizzard
worker	armature	development: complete	gizzard
worker	coxa	development: inconspicuous; position: fore coxa process	fore legs

Table 5.85: Morphological characters of the genus *Rhynchotermes* extracted from the database according to Constantini & Canello (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
worker	tergites posterior margin	colour: not dark	tergites
worker	mesonotum	as in soldier	thorax
worker	ridges	number: 5 to 6	molar plate (right mandible)
worker	ridges	number: 5 to 6	molar prominence (left mandible)
worker	2nd marginal tooth (M2)	development: robust	right mandible
worker	right mandible	angle: acute; position: between A and M1	mandibles
worker	apical tooth (A)	almost equal to 1st marginal tooth (M1)	right mandible
worker	1st marginal tooth (M1)	development: robust	right mandible
worker	apical tooth (A)	size: small; slightly shorter than 1+2 marginal tooth (M1+2)	left mandible
worker	labrum margins	colour: hyaline	labrum
worker	labrum	shape: subpentagonal	head
worker	line	colour: dark; occurrence: sometimes absent	postclypeus
worker	postclypeus	shape: inflated	head
worker	4th article	shorter than 2nd article	articles
worker	1st article	longer than 2nd article	articles
worker	3rd article	longer than 2nd article	articles
worker	articles	length: increases in length; number: 14	antennae
worker	fontanelle	development: inconspicuous; shape: rounded	head
worker	head capsule	colour: orange to reddish-brown; shape: fattened dorso-ventrally	head
worker	mandibles base	colour: yellowish	mandibles
worker	teeth	colour: brown	right mandible
worker	teeth	colour: brown	left mandible
worker	body	colour: yellow to pale yellow	body
soldier	body	development: dimorphic; colour: yellow to pale yellow	body
soldier	head capsule	shape: rounded to pear shape; colour: orange to reddish-brown	head
soldier	articles	length: short; number: 14	antennae
soldier	4th article	shorter than 2nd article	articles
soldier	1st article	longer than 2nd article	articles
soldier	3rd article	longer than 2nd article	articles
soldier	labrum	shape: tongue-shaped	head

Table 5.85: Morphological characters of the genus *Rhynchotermes* extracted from the database according to Constantini & Canello (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	frontal tube	shape: subcylindrical; longer than postclypeus; same length of postclypeus	head
soldier	postclypeus	covered by frontal tube	head
soldier	mandibles	shape: strongly curved	head
soldier	mandibles apical portion	shape: sharp	mandibles
soldier	mandibles inner margin	shape: not serrated	mandibles
soldier	marginal tooth	shape: conical	left mandible
soldier	marginal tooth	shape: conical	right mandible
soldier	mesonotum lateral margins	shape: rounded	mesonotum
soldier	metanotum lateral margins	shape: rounded	metanotum
soldier	coxa	position: fore coxa process; shape: subcylindrical	fore legs
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	digestive tube	development: visible	digestive system
soldier	microsculpture	shape: points	head capsule
soldier	microsculpture	shape: points	postmentum
soldier	microsculpture	shape: points	pronotum
soldier	microsculpture	shape: points	coxa (fore legs)
soldier	bristles	number: 2 to 10	head capsule
soldier	bristles	number: 2 to 4	labrum
soldier	bristles	orientation: whorls; position: posterior portion of articles; size: variable	articles
soldier	bristles	length: short; orientation: surround; quantity: couple	frontal pore
soldier	bristles	occurrence: absent	pronotum
soldier	bristles	number: 1 to 6; position: on anterior lobe	pronotum
soldier	bristles	position: anterolateral angle; occurrence: sometimes 1	mesonotum
soldier	bristles	position: anterolateral angle; occurrence: sometimes 1	metanotum
soldier	bristles	number: 1; orientation: erect; position: on fore coxa process; occurrence: sometimes absent	coxa (fore legs)

Table 5.85: Morphological characters of the genus *Rhynchotermes* extracted from the database according to Constantini & Canello (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	bristles	quantity: variable; position: posterior margin	tergites
soldier	bristles	quantity: many	sternites
soldier	bristles	length: long; quantity: variable; position: distributed throughout extension of legs	hind legs
soldier	bristles	length: long; quantity: variable; position: distributed throughout extension of legs	middle legs
soldier	bristles	length: long; quantity: variable; position: distributed throughout extension of legs	fore legs
soldier	mandibles base	colour: yellowish	mandibles
soldier	mandibles distal portion	colour: orange to reddish-brown	mandibles
imago	head capsule	shape: rounded; colour: brown	head
imago	ocelli	near to eyes; smaller than eyes	head
imago	eyes	colour: yellowish; position: near lower margin of head capsule; size: large	head
imago	fontanelle	colour: pale; shape: rounded to sub-oval; size: medium	head
imago	2nd marginal tooth (M2)	size: very small	right mandible
imago	mandibles	as in worker	head
imago	articles	length: increases in length; number: 14	antennae
imago	3rd article	longer than 2nd article	articles
imago	4th article	shorter than 2nd article	articles
imago	1st article	longer than 2nd article	articles
imago	postclypeus	shape: inflated	head
imago	line	colour: dark	postclypeus
imago	pronotum anterolateral margin	orientation: projected slightly downward	pronotum
imago	pronotum anterocentral margin	orientation: not projected upward	pronotum
imago	labrum	shape: subpentagonal	head
imago	labrum apex	colour: hyaline; shape: rounded	labrum
imago	coxa	position: margin; shape: slightly elevated	fore legs
imago	wings	texture: membranous	thorax
imago	costal margin	development: conspicuous	wings

Table 5.85: Morphological characters of the genus *Rhynchotermes* extracted from the database according to Constantini & Canello (2016). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	radial sector	development: conspicuous; colour: brown	wings
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 3	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	bristles	colour: light base; position: all over the head capsule; density: spread	head capsule
imago	bristles	number: 4; colour: highlighted	postclypeus
imago	bristles	length: short; quantity: several	postclypeus
imago	bristles	quantity: variate	labrum
imago	bristles	quantity: some; position: anterior margin; size: medium	pronotum
imago	bristles	quantity: some; position: anterolateral angles; size: long	pronotum
imago	hairs	quantity: covered; occurrence: sometimes absent	wings
imago	bristles	quantity: many	abdomen
imago	bristles	quantity: many	legs
imago	pronotum	colour: brown	thorax
imago	eyes	colour: black	head
imago	subcosta (Sc)	colour: brown	wings

Genus *Silvestritermes* Rocha & Canello 2012

Etymology: name: Silvestri, refer: in honor of Dr. Filippo Silvestri, the Italian entomologist who made important contributions to the knowledge of termites (Rocha *et al.*, 2012).

Nesting: epigeal, hypogeous (Constantino, 2015).

Feeding: soil organic matter (Constantino, 2015).

Distribution: Paraguay; Bolivia; Colombia; Peru; Trinidad and Tobago; Venezuela; Brazil; Ecuador; French Guiana; Guyana (Rocha *et al.*, 2012; Constantino, 2016).

Table 5.86: Morphological characters of the genus *Silvestritermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head capsule	shape: rounded	head
worker	epicranial suture	development: inconspicuous	head
worker	fontanelle	development: inconspicuous; shape: oval	head
worker	postclypeus	as in imago	head
worker	articles	number: 13 to 14	antennae
worker	projection	position: lateral; occurrence: absent	coxa (fore legs)
worker	abdomen	colour: translucent; shape: oval	body
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	apical tooth (A)	similar size of 1+2 marginal tooth (M1+2)	left mandible
worker	cutting edge	position: between M1+2 and M3; shape: sinuous	left mandible
worker	3rd marginal tooth (M3) anterior margin	smaller than 1+2 marginal tooth (M1+2) posterior margin	left mandible
worker	molar tooth	development: conspicuous; hidden beneath molar prominence	left mandible
worker	apical tooth (A)	same size of 1st marginal tooth (M1); larger than 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2)	development: conspicuous; smaller than 1st marginal tooth (M1)	right mandible
worker	molar prominence	shape: concave	left mandible
worker	molar plate	shape: concave	right mandible
worker	ridges	orientation: continuous; occurrence: almost always absent; size: small	molar plate (right mandible)

Table 5.86: Morphological characters of the genus *Silvestritermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	ridges	orientation: continuous; occurrence: almost always absent; size: small	molar prominence (left mandible)
soldier	body	development: monomorphic	body
soldier	head capsule	shape: rounded	head
soldier	head capsule lateral margins	shape: sometimes rounded	head capsule
soldier	head capsule latero-posterior corners	shape: sometimes angular	head capsule
soldier	frontal tube	shape: conical	head
soldier	articles	number: 13 to 14	antennae
soldier	labrum	orientation: not projected; shape: almost pentagonal	head
soldier	labrum margins	colour: hyaline	labrum
soldier	postmentum	shape: sub-rectangular	head
soldier	mandibles	shape: piercing	head
soldier	mandibles outer margin	position: in the middle and along entire length of the mandibles; shape: slightly angled to continuous and uniform	mandibles
soldier	molar region	development: well developed; similar to worker	left mandible
soldier	molar region	development: well developed; similar to worker	right mandible
soldier	marginal tooth	orientation: perpendicular; shape: sinuous	left mandible
soldier	1st marginal tooth (M1)	shape: blunt	right mandible
soldier	2nd marginal tooth (M2)	development: very reduced; position: near the mandible base	right mandible
soldier	projection	position: upper margins; occurrence: absent	coxa (fore legs)
soldier	bristles	position: mainly on dorsal region; density: sparse	head
soldier	bristles	position: along margins and on entire posterior lobe surface	pronotum
soldier	bristles	position: along posterior margin	mesonotum
soldier	bristles	position: along posterior margin	metanotum
soldier	bristles	density: covered	hind legs
soldier	bristles	density: covered	middle legs
soldier	bristles	density: covered	fore legs
soldier	hairs	length: short; density: sparse	hind legs

Table 5.86: Morphological characters of the genus *Silvestritermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	hairs	length: short; density: sparse	middle legs
soldier	hairs	length: short; density: sparse	fore legs
soldier	hairs	length: short; density: sparse	tergites
soldier	bristles	position: posterior margin	tergites
soldier	hairs	length: short; density: covered	sternites
soldier	bristles	position: posterior margin	sternites
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	head capsule	shape: rounded	head
imago	eyes	position: near lower margin of head capsule; diameter: 1/3 to 1/2 of head capsule length; shape: semi-spherical	head
imago	ocelli	orientation: lightly projected	head
imago	fontanelle	shape: sometimes triangular	head
imago	mandibles	as in worker	head
imago	pronotum	shape: sub-trapezoidal	thorax
imago	bristles	density: sparse	head
imago	hairs	density: covered; size: microscopic	postclypeus
imago	bristles	length: short; shape: layer; density: dense	hind legs
imago	bristles	density: sparse	hind legs
imago	hairs	length: short; shape: layer; density: dense	middle legs
imago	bristles	density: sparse	middle legs
imago	hairs	length: short; shape: layer; density: dense	fore legs
imago	bristles	density: sparse	fore legs
imago	hairs	length: short; density: covered	tergites
imago	hairs	length: short; density: covered	sternites
imago	bristles	orientation: row; position: posterior margin	sternites
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)

Genus *Syntermes* Holmgren 1909

Nesting: epigeal, hypogeous (Constantino, 1995).

Feeding: leaf, grass, litter (Constantino, 1995)

Pest of: eucalyptus, rice, sugar cane, fruit trees, grains, pastures, forest trees, field crops, (Constantino, 1995, 2002; Krishna *et al.*, 2013)

Table 5.87: Morphological characters of the genus *Syntermes* extracted from the database according to Constantino (1995). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
large worker	head	colour: yellow-brown; shape: nearly rounded to moderated elongate	body
large worker	hairs	orientation: straight; quantity: few to numerous	head
large worker	fontanelle	development: conspicuous; shape: slightly elongate; paler than head capsule	head
large worker	molar region	wider than imago; much larger than imago	left mandible
large worker	molar region	wider than imago; much larger than imago	right mandible
large worker	ridges	development: conspicuous	molar region (left mandible)
large worker	ridges	development: conspicuous	molar region (right mandible)
large worker	articles	number: 19 to 21	antennae
large worker	points	orientation: upturned; shape: sharp	pronotum
large worker	thoracic nota	shape: angular; developed into points; developed into spines	thorax
large worker	hairs	length: short to long; quantity: few; density: scattered to dense	tibia (hind legs)
large worker	bristles	development: conspicuous; quantity: numerous; shape: spine-like; width: thick; length: short; position: inner margin	tibia (middle legs)
large worker	hairs	length: short to long; quantity: few; density: scattered to dense	tibia (fore legs)
large worker	bristles	development: conspicuous; quantity: numerous; shape: spine-like; width: thick; length: short; position: inner margin	tibia (hind legs)
large worker	hairs	length: short to long; quantity: few; density: scattered to dense	tibia (middle legs)
large worker	bristles	development: conspicuous; quantity: numerous; shape: spine-like; width: thick; length: short; position: inner margin	tibia (fore legs)
large worker	apical spurs	number: 2	tibia (hind legs)
large worker	apical spurs	number: 3	tibia (middle legs)
large worker	apical spurs	number: 2	tibia (fore legs)

Table 5.87: Morphological characters of the genus *Syntermes* extracted from the database according to Constantino (1995). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
large worker	crop	size: small; not separated from gizzard	foregut
large worker	armature	length: approx. 1/10 that of abdomen; development: well-developed	gizzard
large worker	stomodeal valve	length: short	midgut
large worker	midgut	length: relatively short	gut
large worker	midgut-hindgut junction	number: 2; shape: unequal extensions of midgut tissue; forming a mixed segment	midgut
large worker	malpighian tubules	number: 2 pairs; attached to midgut-hindgut junction	abdomen
large worker	1st proctodeal segment (P1)	size: very large. much broader than midgut	proctodeal
large worker	enteric valve (P2)	width: very wide	hindgut
large worker	musculature	development: reinforced	enteric valve (P2)
large worker	armature	occurrence: absent	enteric valve (P2)
large worker	paunch (P3)	development: well-developed; about same volume of 1st proctodeal segment (P1)	hindgut
soldier	head	length: sometimes elongate; width: broad; colour: yellow brown; size: large	body
soldier	head sides	orientation: converging towards front; shape: straight	head
soldier	hairs	length: short to long; quantity: few; density: scattered to dense	head
soldier	frontal tube	length: very short	head
soldier	labrum	shape: conspicuously three-pointed	head
soldier	lobes	colour: white; position: median	labrum
soldier	labral gland	occurrence: present	labrum
soldier	articles	number: 19 to 21	antennae
soldier	mandibles	development: robust; shape: variable; size: large	head
soldier	marginal teeth	number: 2	left mandible
soldier	1st marginal tooth (M1)	position: sometimes close to the base of the mandible	left mandible
soldier	2nd marginal tooth (M2)	position: near the base of the mandible; size: small	left mandible
soldier	marginal teeth	number: 2; development: sometimes vestigial; occurrence: sometimes absent; size: small	right mandible
soldier	anterior lobe	orientation: raised; size: large	pronotum

Table 5.87: Morphological characters of the genus *Syntermes* extracted from the database according to Constantino (1995). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
soldier	points	orientation: upturned; shape: sharp	pronotum
soldier	thoracic nota	shape: angular; developed into points; developed into spines	thorax
soldier	legs	length: usually long	thorax
soldier	bristles	quantity: numerous; shape: spine-like; width: thick; length: short; position: inner margin	tibia (fore legs)
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	head	colour: light chestnut to dark brown; shape: rounded	body
imago	hairs	length: short to long; quantity: very few to numerous	head
imago	eyes	size: variable	head
imago	ocelli	size: variable	head
imago	fontanelle	length: sometimes elongated; development: conspicuous; shape: sometimes concave; size: sometimes small	head
imago	articles	number: 19 to 21	antennae
imago	apical tooth (A)	almost equal to 1st marginal tooth (M1)	left mandible
imago	2nd marginal tooth (M2)	development: absent	left mandible
imago	3rd marginal tooth (M3)	length: short; development: conspicuous	left mandible
imago	cutting edge	length: long; position: between M1 and M3; shape: straight	left mandible
imago	apical tooth (A)	sometimes little longer than 1st marginal tooth (M1); almost equal to 1st marginal tooth (M1)	right mandible
imago	molar plate	width: very narrow; shape: concave; size: small	right mandible
imago	ridges	number: 7; orientation: transverse	molar plate (right mandible)
imago	basal notch	angle: right; development: distinct	molar plate (right mandible)
imago	postclypeus	shape: weakly inflated	head
imago	midline	development: visible	postclypeus
imago	pronotum width	sometimes narrower than head width; width about same as head width; sometimes wider than head width	pronotum
imago	pronotum anterior margin	orientation: raised; position: in the middle	pronotum

Table 5.87: Morphological characters of the genus *Syntermes* extracted from the database according to Constantino (1995). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	lateral projection	shape: rounded	pronotum
imago	pronotum posterior margin	shape: emarginate	pronotum
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	wings	colour: hyaline	thorax

Genus *Uncitermes* Rocha & Canello 2012

Etymology: name: unci, language: Latin, refer: in reference to the hook-shaped mandibles of the soldier caste, meaning: hook (Rocha *et al.*, 2012).

Distribution: Ecuador; Bolivia; Brazil; Colombia; French Guiana; Guyana; Venezuela (Rocha *et al.*, 2012; Constantino, 2016).

Table 5.88: Morphological characters of the genus *Uncitermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic	body
worker	head capsule	shape: rounded	head
worker	epicranial suture	development: inconspicuous	head
worker	fontanelle	development: little visible; shape: oval	head
worker	articles	number: 15	antennae
worker	projection	occurrence: absent	coxa (fore legs)
worker	abdomen	colour: translucent; shape: oval	body
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	apical tooth (A)	smaller than 1+2 marginal tooth (M1+2)	left mandible
worker	cutting edge	orientation: straight; position: between M1+2 and M3	left mandible
worker	3rd marginal tooth (M3)	smaller than 1+2 marginal tooth (M1+2)	left mandible
worker	molar tooth point	hidden beneath molar prominence	left mandible
worker	apical tooth (A)	smaller than 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2)	smaller than 1st marginal tooth (M1)	right mandible
worker	molar plate	shape: concave	right mandible
worker	molar prominence	shape: concave	left mandible
worker	folds	number: 24; development: visible	gizzard
worker	1st order	number: 6; development: visible	folds (gizzard)
worker	2nd order	number: 6; development: visible	folds (gizzard)
worker	3rd order	number: 12; development: visible	folds (gizzard)
worker	ornamentation	occurrence: absent	pulvilli

Table 5.88: Morphological characters of the genus *Uncitermes* extracted from the database according to Rocha *et al.* (2012). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	mesenteric tongue proximal portion	shape: filiform	mixed segment
worker	mesenteric tongue distal portion	position: reach P1 dilated portion; shape: oval	mixed segment
worker	constriction	position: between P3a and P3b; occurrence: absent	paunch (P3)
worker	paunch (P3a)	shape: globose	paunch (P3)
worker	paunch (P3b)	shape: almost tubular	paunch (P3)
worker	paunch (P3b) posterior part	orientation: open turn; shape: inverted C	paunch (P3)
worker	isthmus	length: elongated; position: parallel to body axis	hindgut
worker	colon (P4)	development: totally visible	hindgut
soldier	body	development: monomorphic	body
soldier	head capsule	position: dorsal view; shape: rounded	head
soldier	frontal tube	length: same of head capsule; angle: 45 degrees with base of head; shape: conical	head
soldier	articles	number: 15	antennae
soldier	labrum	shape: rounded	head
soldier	labrum anterior margin	colour: hyaline	labrum
soldier	postmentum	shape: sub-rectangular	head
soldier	mandibles	shape: hooked	head
soldier	mandibles apex	orientation: pointing posteriorly in rest position	mandibles
soldier	marginal tooth	number: 1; angle: quite acute; orientation: perpendicular	left mandible
soldier	marginal tooth	number: 1; angle: quite acute; orientation: perpendicular	right mandible
soldier	molar region	development: indistinct	right mandible
soldier	molar region	development: indistinct	left mandible
soldier	projection	occurrence: absent	coxa (fore legs)
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Termitinae

Genus *Amitermes* Silvestri 1901

Nesting: hypogeous (Constantino, 2015)

Feeding: leaf, grass, decayed wood (Constantino, 2002, 2015).

Pest of: peanut, soybean, cassava, cashew, passion fruit, sugar cane, buildings, chambers (Constantino, 2002; Krishna *et al.*, 2013).

Table 5.89: Morphological characters of the genus *Amitermes* extracted from the database according to Chhotani (1997). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head capsule	shape: subcircular	head
worker	articles	number: 14 to 15	antennae
worker	postclypeus	shape: swollen	head
worker	postclypeus length	as long as postclypeus width	postclypeus
worker	pronotum	shape: saddle-shaped	thorax
worker	mandibles	as in imago	head
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 3	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	segments	number: 4-jointed	tarsus (hind legs)
worker	segments	number: 4-jointed	tarsus (middle legs)
worker	segments	number: 4-jointed	tarsus (fore legs)
worker	dorsal spur	development: sometimes absent	tibia (fore legs)
soldier	head	shape: rectangular oval to broadly oval	body
soldier	front	width: narrowed	head
soldier	frons	orientation: sharply sloping in front	head
soldier	articles	number: usually 14 to 15	antennae
soldier	fontanelle	position: anteriorly on frontal slope	head
soldier	lobes	number: bilobed	postclypeus
soldier	mandibles	orientation: strongly incurved from middle inwards; shape: saber-shaped	head
soldier	tooth	orientation: backward; shape: pointed	mandibles
soldier	postmentum	shape: subrectangular	head
soldier	pronotum	shape: saddle-shaped	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
soldier	dorsal spur	development: sometimes indistinct	tibia (fore legs)
soldier	segments	number: 4-jointed	tarsus (hind legs)
soldier	segments	number: 4-jointed	tarsus (middle legs)
soldier	segments	number: 4-jointed	tarsus (fore legs)

Table 5.89: Morphological characters of the genus *Amitermes* extracted from the database according to Chhotani (1997). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	body	colour: dark brown; size: medium	body
imago	hairs	density: densely hairy	body
imago	head	shape: subcircular	body
imago	eyes	size: medium	head
imago	ocelli	shape: oval; separated from eyes	head
imago	articles	number: 14 to 16	antennae
imago	postclypeus	shape: fairly swollen	head
imago	postclypeus length	as long as postclypeus width	postclypeus
imago	fontanelle	size: small to fairly large; shape: extended	head
imago	apical tooth (A) posterior margin	length: long	left mandible
imago	1st marginal tooth (M1) posterior margin	length: long	left mandible
imago	1st marginal tooth (M1) posterior margin	length: long; slightly longer than 2nd marginal tooth (M2) anterior margin	right mandible
imago	2nd marginal tooth (M2) anterior margin	orientation: straight	right mandible
imago	pronotum	shape: saddle-shaped	thorax
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	segments	number: 4-jointed	tarsus (hind legs)
imago	segments	number: 4-jointed	tarsus (middle legs)
imago	segments	number: 4-jointed	tarsus (fore legs)

Genus *Cavitermes* Emerson 1925

Nesting: inquiline (Mathews, 1977; Constantino, 2015).

Feeding: organic soil of the host mounds (Mathews, 1977; Constantino, 2015).

Distribution: Brazil; French Guiana; Guyana; Trinidad and Tobago; Venezuela (Constantino, 2016).

Table 5.90: Morphological characters of the genus *Cavitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: medium	body
worker	head	colour: yellow white	body
soldier	body	size: medium	body
soldier	head	shape: roughly rectangular	body
soldier	head	position: in profile; shape: deeply concave	body
soldier	head apex	orientation: forward pointing; shape: cap	head
soldier	head anterior region	shape: more or less concave	head
soldier	head sides	orientation: overlapping; position: base of antennae	head
soldier	head middle	orientation: upturned; shape: sharp point	head
soldier	frontal pore opening	development: obscure; position: in anterior surface of cap	frontal pore
soldier	antennal socket anterior margin	development: distinct; position: on each side of postclypeus; shape: projected	antennae
soldier	articles	number: 14	antennae
soldier	labrum anterior margin	development: distinct; shape: lateral points	labrum
soldier	labrum middle	shape: convexity; size: small	labrum
soldier	labrum sides	orientation: converging towards base	labrum
soldier	mandibles	length: long; orientation: downward curved; size: slender	head
soldier	mandibles apex	orientation: inwards; shape: pointed	mandibles
soldier	basal projection	length: elongated	mandibles
soldier	tooth	development: distinct; position: short distance from the base; normally hidden by labrum	left mandible
soldier	tooth	development: distinct; position: short distance from the base; normally hidden by labrum	right mandible
soldier	apical spurs	number: 2	tibia (hind legs)

Table 5.90: Morphological characters of the genus *Cavitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)

Genus *Cornicapritermes* Emerson 1950

Distribution: Brazil; French Guiana; Guyana (Krishna, 1968; Constantino, 2016).

Table 5.91: Morphological characters of the genus *Cornicapritermes* extracted from the database according to Krishna (1968). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	apical tooth (A)	length: long	left mandible
worker	1+2 marginal tooth (M1+2) posterior margin	length: long	left mandible
worker	3rd marginal tooth (M3)	occurrence: absent	left mandible
worker	molar tooth	development: partially visible; partially hidden beneath molar plate	right mandible
worker	2nd marginal tooth (M2)	development: extremely rudimentary	right mandible
soldier	bristles	quantity: numerous; position: on frontal projection; density: dense	head
soldier	head	width: thick; length: elongate	body
soldier	head sides	shape: faintly convex	head
soldier	frontal projection	development: prominent; orientation: upturned; shape: pointed; extending beyond mandibles distal portion	head
soldier	frontal gland opening	position: below frontal projection on small hump	frontal gland
soldier	labrum	shape: slightly asymmetrical	head
soldier	labrum anterior margin	shape: broadly V-Shaped	labrum
soldier	mandibles	shape: asymmetrical	head
soldier	left mandible	position: in the middle; shape: twisted	mandibles
soldier	left mandible apex	shape: blunt	left mandible
soldier	projection	development: prominent; position: in the region of the base of the mandible	mandibles
soldier	right mandible	orientation: straight	mandibles
soldier	right mandible anterior inner margin	shape: concave	right mandible

Table 5.91: Morphological characters of the genus *Cornicapritermes* extracted from the database according to Krishna (1968). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	articles	number: 14	antennae
soldier	2nd article	subequal to 3rd article	articles
soldier	4th article	slightly shorter than 3rd article	articles
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
soldier	bristles	number: 2; shape: spine-like	tibia (middle legs)

Genus *Crepititermes* Emerson 1925

Nesting: hypogeous, inquiline (Mathews, 1977; Constantino, 2015).

Feeding: humus (Mathews, 1977; Constantino, 2015).

Distribution: Brazil; Ecuador; French Guiana; Guyana; Peru; Trinidad and Tobago, (Constantino, 2016).

Table 5.92: Morphological characters of the genus *Crepititermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs to.

Semaphoront	Structure	Character	Higher level structure
soldier	body	size: small	body
soldier	head	shape: shallow	body
soldier	head sides	orientation: nearly parallel	head
soldier	frontal process	occurrence: absent	head
soldier	articles	number: 13	antennae
soldier	mandibles	length: long; shape: slender	head
soldier	mandibles apex	orientation: strongly inturned	mandibles
soldier	mandibles base	position: blades arise close together near middle of front of head; shape: somewhat steeply conical	mandibles
soldier	pronotum	shape: saddle-shaped	thorax
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	abdomen	length: elongated	body
imago	1st marginal tooth (M1)	size: large; shape: rather sharply pointed	left mandible
imago	3rd marginal tooth (M3)	development: obsolete	left mandible
imago	molar tooth point	partially hidden beneath molar plate	right mandible
imago	left mandible	index: 2.5	mandibles
imago	1st marginal tooth (M1)	size: large; shape: pointed	right mandible
imago	2nd marginal tooth (M2)	development: obsolete	right mandible
imago	fontanelle	size: small; shape: oval; about same colour of head; darker than head	head
imago	ocelli	development: hardly protruding from surface of head; size: medium; well removed from eyes	head
imago	eyes	development: standing out little from sides of head; size: medium to small	head

Table 5.92: Morphological characters of the genus *Crepititermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	articles	number: 14	antennae
imago	postclypeus	position: in profile; shape: weakly arched	head
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	midline	development: distinct	postclypeus
imago	pronotum	length: rather long; narrower than head	thorax
imago	pronotum length	narrower than pronotum width	pronotum
imago	pronotum anterior margin	orientation: straight	pronotum
imago	pronotum sides	orientation: nearly parallel; position: in front; shape: curving round into hind margin	pronotum
imago	pronotum posterior margin	shape: indented	pronotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	setae	number: 2; position: tibia apex opposite the spurs; shape: spine-like	tibia (middle legs)
imago	setae	length: medium; colour: stout; density: dense	head
imago	setae	length: medium; colour: stout; density: dense	pronotum
imago	punctations	density: many	fore wings
imago	setae	length: short; position: along margins and on radius sector	fore wings

Genus *Cylindrotermes* Holmgren 1906

Nesting: hypogeous (Constantino, 2015).

Feeding: wood (Constantino, 2002; Rocha & Canello, 2007).

Pest of: sugar cane, eucalyptus (Constantino, 2002).

Distribution: Bolivia; Costa Rica; Panama; Brazil; Ecuador; French Guiana; Guyana; Venezuela (Constantino, 2016).

Table 5.93: Morphological characters of the genus *Cylindrotermes* extracted from the database according to Rocha & Canello (2007). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
alate	head	length: slightly elongated; position: in dorsal view; shape: rounded	body
alate	ocelli	development: not very prominent; shape: elliptical to circular; not touching eyes	head
alate	eyes	development: not very prominent; shape: semi-spherical; size: medium	head
alate	articles	number: 11 to 13	antennae
alate	3rd article	development: completely or incompletely divided	articles
alate	pronotum	shape: trapezoidal	thorax
alate	mesonotum posterior margin	shape: tapered	mesonotum
alate	metanotum posterior margin	shape: tapered	metanotum
alate	apical spurs	number: 2	tibia (hind legs)
alate	apical spurs	number: 2	tibia (middle legs)
alate	apical spurs	number: 3	tibia (fore legs)
alate	spines	number: 2; position: one spine at tibia the distal end and another slightly above	tibia (middle legs)
alate	spines	number: 1; position: at tibia the distal end	tibia (hind legs)
alate	wings	length: long	thorax
alate	hairs	length: sometimes microscopic; density: variable	head
alate	bristles	length: short; density: variable	head
alate	hairs	length: short; density: sparse	fore wings
alate	hairs	length: short; occurrence: sometimes absent; density: sparse	hind wings
alate	head capsule	colour: dark brown; texture: punctated	head
alate	bristles	position: at the base of bristles; shape: small spots	head capsule
alate	hairs	length: short	head capsule
alate	mandibles base	colour: lighter	mandibles

Table 5.93: Morphological characters of the genus *Cylindrotermes* extracted from the database according to Rocha & Canello (2007). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
alate	mandibles	colour: darkened	head
alate	labrum	colour: dark brown	head
alate	antennae	colour: dark brown	head
alate	patches	number: 2; colour: light; position: between the postclypeous and ocelli; size: large	head
alate	pronotum	colour: light; position: between the postclypeus and ocelli; size: large	thorax
alate	tergites	colour: lighter; texture: punctated	abdominal sclerites
alate	sternites	colour: lighter; texture: punctated	abdominal sclerites
alate	bristles	colour: light; position: at the base o bristles; shape: small spots	tergites
alate	hairs	colour: light; position: at the base o hairs; shape: small spots	tergites
alate	hairs	length: short	tergites
alate	bristles	colour: light; position: at the base o bristles; shape: small spots	sternites
alate	hairs	colour: light; position: at the base o hairs; shape: small spots	sternites
alate	hairs	length: short	sternites
alate	sternites	colour: lighter; position: central region	abdominal sclerites
alate	legs	colour: lighter; position: central region	thorax
worker	head	shape: rounded	body
worker	apical tooth (A)	angle: acute; position: between A and M1+2; about same size of 1st marginal tooth (M1)	left mandible
worker	cutting edge	position: between M1+2 and M3; shape: flat	left mandible
worker	3rd marginal tooth (M3)	smaller than 1+2 marginal tooth (M1+2); very close to molar prominence	left mandible
worker	left mandible	position: between M1+2 and M3; shape: flat	mandibles
worker	ridges	development: visible	molar prominence (left mandible)
worker	2nd marginal tooth (M2)	smaller than 1st marginal tooth (M1)	right mandible
worker	ridges	number: 5; development: well visible	molar plate (right mandible)
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 3	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)

Table 5.93: Morphological characters of the genus *Cylindrotermes* extracted from the database according to Rocha & Cancellato (2007). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head capsule	colour: yellowish	head
worker	thorax	colour: whitish	body
worker	legs	colour: whitish	thorax
worker	abdomen	colour: transparent	body
soldier	head	length: elongated; shape: usually pentagonal labyrinth	body
soldier	frontal pore	length: elongated; shape: usually pentagonal labyrinth	frontal gland
soldier	frontal pore opening	position: in the first anterior quarter of the head; just behind the inserts of the antennae	frontal pore
soldier	postmentum	length: elongated; size: 3/4 of head length	head
soldier	mandibles	shape: arched	head
soldier	tooth	number: 1; position: variable according to the specie	left mandible
soldier	tooth	number: 1; position: variable according to the specie	right mandible
soldier	molar region	development: visible	left mandible
soldier	molar region	development: visible	right mandible
soldier	pronotum	angle: 180 degrees; position: between the anterior and posterior lobe	thorax
soldier	anterior lobe	shape: semicircular	pronotum
soldier	posterior lobe	shape: semicircular	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 3	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	spines	number: 2; position: one spine at tibia the distal end and another slightly above	tibia (middle legs)
soldier	spines	number: 1; position: at tibia the distal end	tibia (hind legs)
soldier	head capsule	colour: yellowish	head
soldier	thorax	colour: whitish	body
soldier	legs	colour: whitish	thorax
soldier	abdomen	colour: transparent	body

Genus *Dentispicoterme*s Emerson 1949

Nesting: hypogeous (Mathews, 1977; Constantino, 2015).

Feeding: humus (Mathews, 1977; Constantino, 2015).

Distribution: Brazil; French Guiana; Guyana; Suriname (Constantino, 2016).

Table 5.94: Morphological characters of the genus *Dentispicoterme*s extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	size: medium	body
soldier	head	shape: somewhat rectangular	body
soldier	frontal process	orientation: upward; shape: rounded	head
soldier	frontal gland	development: obscure; position: probably at the top of process	head
soldier	articles	number: 14 to 15	antennae
soldier	mandibles	length: long; orientation: straight	head
soldier	mandibles apex	orientation: inward; shape: hooked	mandibles
soldier	tooth	development: distinct; occurrence: sometimes present; position: at the base of the hooked part of the mandible; shape: pointed	right mandible
soldier	tooth	position: half way along inner margins of the mandible; occurrence: sometimes present; size: small	left mandible
soldier	pronotum	length: short; markedly narrower than head	thorax
soldier	pronotum anterior margin	orientation: strongly raised	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	setae	length: long; quantity: few; density: scattered	head
imago	head	width: broad	body
imago	apical tooth (A)	size: large	left mandible
imago	1st marginal tooth (M1)	size: large	left mandible
imago	3rd marginal tooth (M3)	development: conspicuous; size: small	left mandible
imago	left mandible	index: 0.8 to 1.2	mandibles
imago	submolar tooth point	development: distinctly visible; position: in front of molar prominence	left mandible

Table 5.94: Morphological characters of the genus *Dentispicotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	apical tooth (A)	size: large	right mandible
imago	1st marginal tooth (M1)	size: large	right mandible
imago	2nd marginal tooth (M2)	little smaller than 1st marginal tooth (M1)	right mandible
imago	molar plate	shape: strongly concave	right mandible
imago	ridges	occurrence: absent	molar plate (right mandible)
imago	fontanelle	shape: plate like; size: large	head
imago	eyes	shape: broadly oval	head
imago	fontanelle	position: where it joints frons; shape: sharp angle	head
imago	midline	development: distinct	postclypeus
imago	pronotum	narrower than head	thorax
imago	pronotum anterior margin	orientation: somewhat raised	pronotum
imago	pronotum posterior margin	shape: broadly indented	pronotum
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	setae	length: long; quantity: few	head
imago	setae	length: long; quantity: many	pronotum

Genus *Dihoplotermes* Araujo 1961

Nesting: hypogeous (Mathews, 1977; Constantino, 2015).

Feeding: humus (Mathews, 1977; Constantino, 2015).

Distribution: Argentina; Brazil (Mathews, 1977; Constantino, 2016)

Table 5.95: Morphological characters of the genus *Dihoplotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor worker	head	width: narrow; length: short; orientation: tapering a little towards front	body
minor worker	frontal projection	length: short; orientation: raised more above head; not totally covering labrum	head
minor worker	spines	development: distinct; position: in front of near side of the mandibles; size: small	mandibles
minor worker	lobes	number: 2; development: weak	labrum
minor worker	articles	number: 14	antennae
minor worker	mandibles	length: short; shape: very weakly asymmetrical	head
minor worker	pronotum anterior margin	orientation: raised; position: in the middle; shape: incised	pronotum
minor worker	apical spurs	number: 3	tibia (hind legs)
minor worker	apical spurs	number: 2	tibia (middle legs)
minor worker	apical spurs	number: 2	tibia (fore legs)
major worker	head	width: narrow; length: long	body
major worker	head sides	orientation: parallel	head
major worker	frontal projection	length: long; orientation: forward projecting	head
major worker	frontal projection tip	orientation: upturned; extending beyond mandibles; ; completely covering labrum	head
major worker	spines	development: distinct; position: in front of near side of the mandibles; size: small	mandibles
major worker	articles	number: 14	antennae
major worker	mandibles	length: rather short; colour: stout; shape: not strongly asymmetrical	head
major worker	lobes	number: 2	labrum
major worker	pronotum anterior margin	orientation: raised; position: in the middle; shape: incised	pronotum
major worker	apical spurs	number: 3	tibia (hind legs)
major worker	apical spurs	number: 2	tibia (middle legs)
major worker	apical spurs	number: 2	tibia (fore legs)
imago	apical tooth (A)	size: large	left mandible

Table 5.95: Morphological characters of the genus *Dihoplotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	1st marginal tooth (M1)	size: large	left mandible
imago	apical tooth (A)	size: large	right mandible
imago	1st marginal tooth (M1)	size: large	right mandible
imago	3rd marginal tooth (M3)	development: not developed	left mandible
imago	1st marginal tooth (M1) posterior margin	position: ending in notch in front of submolar tooth; shape: sigmoid	left mandible
imago	submolar tooth	development: prominent	left mandible
imago	submolar tooth point	position: well in front of molar prominence in plan	left mandible
imago	left mandible	index: approx 1.0	mandibles
imago	2nd marginal tooth (M2)	development: not developed	right mandible
imago	1st marginal tooth (M1) posterior margin	shape: concave; as long as apical tooth (A); longer than apical tooth (A)	right mandible
imago	molar plate	shape: concave	right mandible
imago	molar plate upper margin	position: at front; shape: tooth-like	right mandible
imago	fontanelle	shape: elliptic; slightly longer than ocelli	head
imago	eyes	development: fairly prominent; size: medium	head
imago	articles	number: 15	antennae
imago	frontal marks	development: distinct; size: large	front
imago	postclypeus width	as broad as postclypeus length	postclypeus
imago	pronotum	narrower than head	thorax
imago	pronotum anterior margin	orientation: straight	pronotum
imago	pronotum sides	orientation: converging towards rear; shape: convex	pronotum
imago	setae	density: rather dense	head
imago	setae	density: rather dense	pronotum

Genus *Divinotermes* Carrijo & Canello 2011

Etymology: name: Divino, refer: named in honor of Brazilian termitologist Dr. Divino Brandão (Carrijo & Canello, 2011).

Nesting: inquiline (Carrijo & Canello, 2011; Constantino, 2015).

Feeding: humus (Carrijo & Canello, 2011; Constantino, 2015).

Distribution: Brazil (Carrijo & Canello, 2011; Constantino, 2016).

Table 5.96: Morphological characters of the genus *Divinotermes* extracted from the database according to Carrijo & Canello (2011). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head capsule	shape: rounded	head
worker	fontanelle	development: inconspicuous	head
worker	postclypeus	development: very prominent	head
worker	articles	number: 14	antennae
worker	anterior lobe	width: narrow in highest; shape: very high	pronotum
worker	spines	orientation: row; position: anterior margin of pronotum	pronotum
worker	projection	position: at the lateral edges of pronotum; size: small	pronotum
worker	apical tooth (A)	development: prominent; size: large	left mandible
worker	apical tooth (A)	development: prominent; size: large	right mandible
worker	apical tooth (A) posterior margin	shape: strongly concave	left mandible
worker	apical tooth (A) posterior margin	shape: strongly concave; size: large	right mandible
worker	3rd marginal tooth (M3)	development: reduced	left mandible
worker	molar tooth	hidden beneath molar prominence	left mandible
worker	molar prominence	development: conspicuous; shape: convex	left mandible
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	2nd marginal tooth (M2)	occurrence: absent	right mandible
worker	molar plate	shape: concave	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	setae	number: 7 to 9; position: inner margin of lacinia	lacinia
worker	bristles	orientation: variable; density: covered; size: variable	head

Table 5.96: Morphological characters of the genus *Divinotermes* extracted from the database according to [Carrijo & Canello \(2011\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	bristles	orientation: variable; density: covered; size: variable	postclypeus
worker	bristles	orientation: variable; density: covered; size: variable	labrum
worker	bristles	orientation: variable; density: covered; size: variable	pronotum
worker	hairs	orientation: variable; density: covered; size: variable	head
worker	hairs	orientation: variable; density: covered; size: variable	postclypeus
worker	hairs	orientation: variable; density: covered; size: variable	labrum
worker	hairs	orientation: variable; density: covered; size: variable	pronotum
worker	crop	size: large	foregut
worker	gizzard	inserted into midgut	foregut
worker	midgut	size: enlarged; position: beginning of the midgut	gut
worker	mesenteric tongue	length: long; position: external	mixed segment
worker	rectum (P5)	size: large	hindgut
soldier	mandibles base	colour: light brown	mandibles
soldier	head	colour: pale brown	body
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	bristles	density: covered	legs
soldier	hairs	length: short; density: covered	legs
soldier	bristles	position: anterior margin of sternites; density: covered; size: large	sternites
soldier	hairs	length: short; position: anterior margin of sternites; density: covered	sternites
soldier	bristles	position: tergites posterior margin; density: densely covered	tergites
soldier	bristles	position: metanotum posterior margin; density: densely covered	metanotum
soldier	bristles	position: mesonotum posterior margin; density: densely covered	mesonotum
soldier	hairs	length: short; position: tergites posterior margin; density: densely covered	tergites
soldier	hairs	length: short; position: metanotum posterior margin; density: densely covered	metanotum

Table 5.96: Morphological characters of the genus *Divinotermes* extracted from the database according to [Carrijo & Canello \(2011\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	hairs	length: short; position: mesonotum posterior margin; density: densely covered	mesonotum
soldier	bristles	position: mainly on the pronotum margins	pronotum
soldier	hairs	length: short; position: mainly on the pronotum margins	pronotum
soldier	bristles	number: 12 to 20; orientation: usually four to ten straight and the others pointed forward	labrum
soldier	hairs	size: microscopic; quantity: few	postmentum
soldier	bristles	number: 6; shape: crown	antennae
soldier	hairs	length: short; position: entire surface of antennae	antennae
soldier	bristles	position: dorsal surface of head; more concentrated on the frontal projection; density: sparse	head
soldier	hairs	position: across the surface; density: scattered; size: microscopic	head capsule
soldier	projection	position: pronotum lateral edges	pronotum
soldier	spines	length: short; orientation: row; position: pronotum anterior margin	pronotum
soldier	pronotum anterior margin	shape: elevated	pronotum
soldier	2nd article	about same size of 5th article	articles
soldier	3rd article	about same size of 5th article	articles
soldier	7th article	slightly longer than 5th article	articles
soldier	6th article	almost equal to 7th article; slightly longer than 5th article; almost equal to 8th article	articles
soldier	4th article	length: short	articles
soldier	8th article	slightly longer than 5th article	articles
soldier	1st article	size: large	articles
soldier	articles	length: very long	antennae
soldier	labrum anterior margin	shape: concave	labrum
soldier	labrum anterior portion	width: slightly wide	labrum
soldier	labrum	length: very long	head
soldier	marginal tooth	number: 1; position: near the base of the mandible	right mandible
soldier	marginal tooth	number: 1; position: near the base of the mandible	left mandible

Table 5.96: Morphological characters of the genus *Divinotermes* extracted from the database according to [Carrijo & Canello \(2011\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	mandibles	shape: slightly asymmetrical	head
soldier	frontal projection	orientation: rises as a continuum with the dorsal contour of head; without a marked angle; position: side view	head
soldier	frontal projection tip	number: 3; development: somewhat prominent; shape: sharp; size: small	head
soldier	dorsal lumps	position: posterior last third part of the head	head
soldier	posterior lumps	position: ventrolateral corners of the head	head
soldier	head capsule	position: posteriorly; shape: slightly concave; size: enlarged	head
soldier	head capsule sides	position: dorsal view; shape: sinuous	head capsule
soldier	mandibles apex	colour: dark	mandibles
soldier	body	colour: pale yellow	body

Genus *Genuotermes* Emerson 1950

Nesting: inquiline, hypogeous (Constantino, 2015).

Feeding: humus (Constantino, 2015).

Distribution: Brazil (Mathews, 1977; Constantino, 2016).

Table 5.97: Morphological characters of the genus *Genuotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	size: fairly small	body
worker	apical tooth (A)	size: large	left mandible
worker	apical tooth (A)	size: large	right mandible
worker	left mandible	index: 3.0	mandibles
worker	2nd marginal tooth (M2)	development: obsolete; size: reduced	right mandible
worker	1st marginal tooth (M1) posterior margin	shape: concave	right mandible
worker	1st proctodeal segment (P1)	shape: swollen	proctodeal
soldier	body	size: fairly small	body
soldier	head capsule	shape: rectangular	head
soldier	head capsule posterior margin	shape: somewhat curved	head capsule
soldier	projection	orientation: slightly upturned tip; position: in front of head; shape: conical	head
soldier	articles	number: 15	antennae
soldier	mandibles	orientation: turned somewhat inward; similar to <i>Orthognathotermes</i>	head
soldier	apical tooth (A)	orientation: two thirds straight beyond outward bent elbow	left mandible
soldier	apical tooth (A)	orientation: two thirds straight beyond outward bent elbow	right mandible
soldier	mandibles apex	orientation: somewhat inward curved; shape: pointed	mandibles
soldier	pronotum	width: narrow; shape: saddle shape	thorax
soldier	pronotum anterior margin	orientation: raised	pronotum

Table 5.97: Morphological characters of the genus *Genuotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: sometimes 4	tibia (fore legs)
imago	apical tooth (A)	size: very large	left mandible
imago	1st marginal tooth (M1)	size: large	left mandible
imago	apical tooth (A)	size: very large	right mandible
imago	1st marginal tooth (M1)	size: large	right mandible
imago	3rd marginal tooth (M3)	development: distinct	left mandible
imago	cutting edge	position: between M1 and M3; shape: concave	left mandible
imago	left mandible	index: 2.5	mandibles
imago	submolar tooth	hidden beneath molar prominence	left mandible
imago	bulge	position: posterior margin of M1 with M2; size: small; shape: bulge	right mandible
imago	fontanelle	size: small	head
imago	eyes	size: medium	head
imago	ocelli	size: small; close to eyes	head
imago	articles	number: 16	antennae
imago	frontal marks	development: visible; position: in front of ocelli	front
imago	postclypeus	shape: fairly strongly arched	head
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	pronotum anterior margin	shape: slightly concave	pronotum
imago	pronotum posterior margin	position: in the middle of pronotum posterior margin; shape: indented slightly	pronotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	setae	length: long; quantity: many; size: medium	head
imago	setae	length: long; quantity: many; size: medium	pronotum
imago	setae	quantity: many	wings

Genus *Gnathamitermes* Light 1932

Distribution: Mexico (Light, 1932; Constantino, 2016).

Table 5.98: Morphological characters of the genus *Gnathamitermes* extracted from the database according to Light (1932). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	size: relatively large	body
soldier	head	width: +1.10 mm; index: approx. 0.95; orientation: low; shape: subrectangular	body
soldier	head width	as wide as head length	head
soldier	mandibles	length: long; shape: somewhat not strongly curved	head
soldier	teeth	position: set in shallow notch in mandible; shape: variable; size: relatively small	left mandible
soldier	teeth	position: set in shallow notch in mandible; shape: variable; size: relatively small	right mandible
alate	body	length: +13 mm; colour: brown; size: large	body
alate	postclypeus length	as long as postclypeus width	postclypeus
alate	fontanelle	shape: oval; more or less obscured by posterior infuscation	head
alate	line	width: narrow; colour: yellowish in contact with postclypeus posterior margin	postclypeus
alate	articles	number: 16	antennae
alate	pronotum length	as long as pronotum width	pronotum

Genus *Hoplotermes*

Distribution: Costa Rica; Guatemala; Mexico; Nicaragua (Constantino, 2016).

Table 5.99: Morphological characters of the genus *Hoplotermes* extracted from the database according to Light (1933). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	u-turn	length: short	colon (P4)
worker	isthmus	development: marked	hindgut
worker	paunch (P3)	development: developed; orientation: protruded	hindgut
worker	cushions	development: weakly marked; number: 3; length: elongated	enteric valve (P2)
worker	1st proctodeal segment (P1)	shape: strongly dilated	proctodeal
worker	mesenteric tongue	number:1; development: developed	mixed segment
worker	mesenteron	shape: tubular	midgut
worker	pulvilli II	development: inconspicuous	foregut
worker	folds	Number: 24	gizzard
worker	armature	development: complete	gizzard
worker	crop	shape: asymmetrical; size: medium	foregut

Genus *Inquilinitermes* Mathews 1977

Nesting: inquiline (Mathews, 1977; Constantino, 2015).

Feeding: organic matter accumulated inside the host nest (Mathews, 1977; Constantino, 2015).

Distribution: Bolivia; Brazil; Guyana (Mathews, 1977; Constantino, 2016).

Table 5.100: Morphological characters of the genus *Inquilinitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	size: medium to small	body
worker	mandibles	as in imago	head
worker	left mandible	index: 3.3 to 3.6	mandibles
soldier	body	size: medium to small	body
soldier	head capsule	length: short; shape: subrectangular	head
soldier	articles	number: 14 to 15	antennae
soldier	antennal carinae	width: thickened; shape: somewhat projected	antennae
soldier	mandibles	length: long; orientation: down curved; size: slender	head
soldier	mandibles apex	orientation: hooked inwards	mandibles
soldier	pronotum anterior margin	orientation: raised	pronotum
soldier	pronotum	narrower than head	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	apical spurs	number: 2	tibia (middle legs)
imago	body	size: medium to small	body
imago	apical tooth (A)	size: large	left mandible
imago	apical tooth (A)	size: large	right mandible
imago	1st marginal tooth (M1)	width: rather narrow; shape: finger-like	left mandible
imago	3rd marginal tooth (M3)	development: inconspicuous; size: small	left mandible
imago	cutting edge	position: between M1 and M3; shape: concave	left mandible
imago	notch	width: very narrow; position: between M3 and molar prominence	left mandible
imago	submolar tooth	development: prominent	left mandible
imago	submolar tooth anterior margin	development: partially visible; position: in front of molar prominence in surface view	left mandible

Table 5.100: Morphological characters of the genus *Inquilinitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	left mandible	index: approx. 2.7 to 3.0	mandibles
imago	1st marginal tooth (M1)	size: large	right mandible
imago	1st marginal tooth (M1) posterior margin	shape: concave	right mandible
imago	2nd marginal tooth (M2)	development: obsolete	right mandible
imago	molar plate upper margin	position: at front of molar plate; shape: tooth-like prominence	right mandible
imago	molar plate	shape: concave	right mandible
imago	ridges	width: fine; orientation: transverse	molar plate (right mandible)
imago	ocelli	size: medium; removed from eyes	head
imago	fontanelle	position: shallow depression; shape: distinctly slit shaped; as long as ocelli	head
imago	fontanelle middle	shape: somewhat dilated	fontanelle
imago	eyes	development: moderately prominent; size: small; shape: circular	head
imago	articles	number: 15 to 17	antennae
imago	frontal marks	development: distinct; position: each side of medial frons spot; shape: other oblique to linear	front
imago	postclypeus	shape: not strongly inflated	head
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	midline	development: distinct	postclypeus
imago	pronotum width	about same of head width	pronotum
imago	pronotum anterior margin	shape: concave	pronotum
imago	pronotum posterior margin	length: short; shape: indented	pronotum
imago	pronotum sides	orientation: converging rather strongly towards rear	pronotum
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	3rd spur	development: weakly developed	tibia (middle legs)

Table 5.100: Morphological characters of the genus *Inquilinitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	setae	length: sometimes long; orientation: inclined; density: dense	head
imago	setae	length: sometimes long; orientation: inclined; density: dense	pronotum
imago	setae	position: along costal border and hind margin; density: dense	wings

Genus *Microcerotermes* Silvestri 1901

Nesting: arboreal (Mathews, 1977; Constantino, 2015).

Feeding: wood (Mathews, 1977; Constantino, 2002, 2015).

Pest of: fruit trees (Constantino, 2002).

Table 5.101: Morphological characters of the genus *Microcerotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
minor worker	body	size: rather small	body
minor worker	head	colour: dark sepia brown	body
minor worker	epicranial suture	colour: pale; development: distinct	head
major worker	body	size: rather small	body
major worker	head	colour: yellow white	body
major worker	frons	colour: deeply pigmented	head
soldier	body	size: rather small	body
soldier	head	shape: rather rectangular	body
soldier	head sides	orientation: more or less parallel	head
soldier	head posterior margin	shape: convex	head
soldier	top of head	orientation: raised; colour: darkly pigmented; shape: sculptured; texture: roughened; position: above frons	head
soldier	ridges	number: 1; orientation: transverse; development: visible; shape: more or less rounded; position: top of head	head
soldier	frons	orientation: sloping forward	head
soldier	articles	number: 13	antennae
soldier	labrum	length: elongate; shape: spatulate	head
soldier	labrum basal end	width: wide	labrum
soldier	mandibles	length: moderately long; width: broad; orientation: gently inward curved; shape: flattened	head
soldier	mandibles apex	orientation: inward curved	mandibles
soldier	serrations	position: along mandible inner margins; shape: irregular; size: small	mandibles
soldier	pronotum	much narrower than head	thorax
soldier	pronotum anterior margin	orientation: raised; position: in the middle of pronotum	pronotum
soldier	pronotum sides	orientation: extending forward; position: either side as lobes	pronotum
soldier	apical spurs	Number: 2	tibia (hind legs)

Table 5.101: Morphological characters of the genus *Microcerotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	apical spurs	number: 4	tibia (middle legs)
soldier	apical spurs	Number: 3	tibia (fore legs)
soldier	4th spine	size: very small; position: above 3rd spine	tibia (middle legs)
imago	body	size: rather small	body
imago	head capsule	length: elongated; shape: sub-rectangular	head
imago	mandibles	orientation: set well in from sides of head	head
imago	cutting edge	orientation: continuous; position: between M1 and M3; shape: concave	right mandible
imago	3rd marginal tooth (M3)	as prominent as 1st marginal tooth (M1)	left mandible
imago	cutting edge	orientation: straight; development: partially visible	left mandible
imago	submolar tooth	hidden beneath molar prominence	left mandible
imago	left mandible	index: 0.45	mandibles
imago	1st marginal tooth (M1) posterior margin	about equal to apical tooth (A) posterior margin	right mandible
imago	molar plate	somewhat longer than 2nd marginal tooth (M2) posterior margin	right mandible
imago	ridges	number: 7 to 9; orientation: transverse	molar plate (right mandible)
imago	notch	position: near basal end in surface view; shape: angular	molar plate (right mandible)
imago	fontanelle	shape: plate like; size: large	head
imago	eyes	shape: rather flattened against sides of head	head
imago	ocelli	size: small	head
imago	articles	number: 12 to 15	antennae
imago	frontal marks	development: not conspicuous	front
imago	postclypeus	shape: little inflated	head
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	postclypeus posterior margin	shape: strongly concave	postclypeus
imago	midline	development: distinct; shape: depressed	postclypeus
imago	pronotum	shape: trapezium shaped; narrower than head	thorax

Table 5.101: Morphological characters of the genus *Microcerotermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	pronotum posterior margin	shape: indented	pronotum
imago	mesonotum posterior margin	shape: slightly indented	mesonotum
imago	metanotum posterior margin	shape: slightly indented	metanotum
imago	legs	length: fairly long	thorax
imago	apical spurs	Number: 2	tibia (hind legs)
imago	apical spurs	Number: 4	tibia (middle legs)
imago	apical spurs	Number: 3	tibia (fore legs)
imago	extra spine	position: above 3rd spine	tibia (middle legs)
imago	setae	width: fine; length: medium length; quantity: many	head
imago	setae	width: fine; length: medium length; quantity: many	pronotum
imago	setae	width: fine; length: medium length; quantity: many	body
imago	setae	orientation: fringe; position: along margins; radius sector; sometimes over surface; dens- ity: sometimes scattered	wings

Genus *Neocapritermes* Holmgren 1912

Nesting: hypogeous, inquiline (Mathews, 1977; Constantino, 2015).

Feeding: soil organic matter (Mathews, 1977; Constantino, 2002, 2015).

Pest of: eucalyptus, sugar cane (Constantino, 2002).

Distribution: Brazil; Colombia; French Guiana; Guyana; Suriname; Trinidad and Tobago; Venezuela; Costa Rica; Panama; Argentina; Bolivia; Ecuador; Paraguay; Peru (Constantino, 2016)

Table 5.102: Morphological characters of the genus *Neocapritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	size: medium to large	body
soldier	head	length: elongated; shape: sometimes narrowing towards front	body
soldier	frontal process	occurrence: absent	head
soldier	fontanelle	position: well back from antennae; shape: circular mark; size: sometimes large	head
soldier	epicranial suture	development: distinct; position: hind margin of head	head
soldier	articles	number: 15	antennae
soldier	labrum	orientation: thrust to right; shape: asymmetrical	head
soldier	mandibles	length: long; colour: stout; shape: asymmetrical	head
soldier	left mandible	orientation: arched downwards in apical quarter; shape: very weakly S-shaped	mandibles
soldier	right mandible	orientation: upward arched	mandibles
soldier	pronotum	shape: saddle	thorax
soldier	anterior lobe	orientation: turned upwards	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	size: medium to large	body
imago	apical tooth (A)	little smaller than 1st marginal tooth (M1); less prominent than 1st marginal tooth (M1)	left mandible
imago	apical tooth (A)	little smaller than 1st marginal tooth (M1); less prominent than 1st marginal tooth (M1)	right mandible
imago	cutting edge	position: between M1 and M3	left mandible
imago	3rd marginal tooth (M3)	development: distinct; shape: broadly convex	left mandible
imago	submolar tooth	hidden beneath molar prominence	left mandible
imago	molar prominence	development: prominent	left mandible

Table 5.102: Morphological characters of the genus *Neocapritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	left mandible	index: 0.35	mandibles
imago	1st marginal tooth (M1) posterior margin	about same length of 2nd marginal tooth (M2) posterior margin	right mandible
imago	2nd marginal tooth (M2)	shape: somewhat concave; straighter than 1st marginal tooth (M1)	right mandible
imago	molar plate	width: rather narrow; shape: concave	right mandible
imago	ridges	number: 8 or more; orientation: transverse; development: weakly developed	molar plate (right mandible)
imago	notch	position: in basal end; size: large; shape: angular	molar plate (right mandible)
imago	fontanelle	shape: plate like; size: large	head
imago	eyes	development: prominent; size: small	head
imago	ocelli	size: medium to large; not touching eyes	head
imago	articles	number: 16 to 17	antennae
imago	postclypeus	shape: fairly weakly arched	head
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	midline	development: more or less distinct	postclypeus
imago	mesonotum posterior margin	shape: deeply incised	mesonotum
imago	metanotum posterior margin	shape: deeply incised	metanotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	setae	length: sometimes long; orientation: sometimes inclined; occurrence: usually absent; density: sometimes covered	head
imago	setae	density: densely covering	pronotum
imago	setae	quantity: very few; occurrence: sometimes absent	wings
imago	wings	colour: transparent	thorax

Genus *Onkotermes* Constantino 2002

Etymology: name: onkos, language: Greek, refer: shape of the soldier mandible, meaning: hook barb (Constantino *et al.*, 2002).

Nesting: hypogeous (Constantino *et al.*, 2002).

Feeding: wood (Constantino *et al.*, 2002).

Distribution: Argentina; Brazil; Chile (Constantino *et al.*, 2002; Constantino, 2016).

Table 5.103: Morphological characters of the genus *Onkotermes* extracted from the database according to Constantino *et al.* (2002). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
large worker	mandibles	narrower than	head
worker	body	development: dimorphic	body
worker	head capsule	shape: trapezoid	head
worker	head capsule anterior region	width: wide	head capsule
worker	articles	number: 13 to 14	antennae
worker	fontanelle	development: inconspicuous	head
worker	eyes	occurrence: absent	head
worker	ocelli	occurrence: absent	head
worker	coxa	shape: slightly flattened	fore legs
worker	bristles	position: anterior surface; occurrence: absent; shape: spine-like	coxa (fore legs)
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 3	tibia (fore legs)
worker	cerci	length: short; number: two-jointed	abdomen
worker	stylus	occurrence: absent	abdomen
worker	apical tooth (A)	about same length of 1st marginal tooth (M1)	left mandible
worker	1st marginal tooth (M1) anterior edge	longer than 1st marginal tooth (M1) posterior edge	left mandible
worker	2nd marginal tooth (M2)	occurrence: absent	left mandible
worker	3rd marginal tooth (M3)	development: distinct; little shorter than 1st marginal tooth (M1)	left mandible
worker	4th marginal tooth (M4)	development: visible; position: between M3 and the molar prominence	left mandible
worker	molar tooth point	hidden by molar prominence	left mandible
worker	1st marginal tooth (M1)	little longer than apical tooth (A)	right mandible

Table 5.103: Morphological characters of the genus *Onkotermes* extracted from the database according to [Constantino et al. \(2002\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	1st marginal tooth (M1) anterior margin	development: protuberant; position: near the base; shape: rounded	right mandible
worker	2nd marginal tooth (M2)	development: conspicuous; shorter than 1st marginal tooth (M1)	right mandible
worker	notch	angle: right; development: distinct; position: proximal end of molar plate	molar plate (right mandible)
worker	ridges	number: 6; development: developed; shape: concave	molar plate (right mandible)
worker	crop	size: small	foregut
worker	armature	colour: sclerotized	gizzard
worker	mesenteron	length: short; oriented transversely to body axis	midgut
worker	mixed segment	formed by mesenteron extension	midgut
worker	mesenteron extension	number: 1; shape: inflated	mesenteron
worker	1st proctodeal segment (P1)	shape: tubular	proctodeal
worker	1st proctodeal segment (P1) distal portion	width: narrow	proctodeal
worker	enteric valve (P2)	width: narrow; colour: unsclerotized; shape: tubular; inserted into paunch (P3)	hindgut
worker	paunch (P3) extension	shape: rounded	paunch (P3)
worker	paunch (P3)	size: large; shape: oval	hindgut
soldier	head capsule	shape: subrectangular	head
soldier	head capsule sides	orientation: parallel	head capsule
soldier	articles	number: 13 to 14	antennae
soldier	frontal pore	development: inconspicuous; shape: rounded; size: small	frontal gland
soldier	labrum	shape: subrectangular	head
soldier	labrum width	wider than labrum length	head
soldier	postclypeus	shape: flatly arched	head
soldier	midline	development: conspicuous	postclypeus
soldier	postclypeus anterior margin	shape: convex	postclypeus

Table 5.103: Morphological characters of the genus *Onkotermes* extracted from the database according to [Constantino *et al.* \(2002\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	eyes	occurrence: absent	head
soldier	ocelli	occurrence: absent	head
soldier	mandibles	development: robust; shape: strongly curved	head
soldier	tooth	development: conspicuous; orientation: backward; shape: pointed	left mandible
soldier	tooth	development: conspicuous; orientation: backward; shape: pointed	right mandible
soldier	thoracic nota sides	shape: rounded	thorax
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
soldier	segments	number: four jointed	tarsus (hind legs)
soldier	segments	number: four jointed	tarsus (middle legs)
soldier	segments	number: four jointed	tarsus (fore legs)
soldier	cerci	length: short; number: two-jointed	abdomen
soldier	styllus	occurrence: absent	abdomen

Genus *Orthognathotermes* Holmgren 1910

Etymology: name: orthos + gnathos, language: Greek, refer: in reference to soldier's straight and elongated mandibles, meaning: rectilinear mandibles (Rocha & Canello, 2009).

Nesting: epigeal, hypogeous, inquiline (Rocha & Canello, 2009; Constantino, 2015).

Feeding: humus (Rocha & Canello, 2009; Constantino, 2015).

Distribution: Brazil; Guyana; Bolivia; Paraguay; Colombia; Panama (Rocha & Canello, 2009; Constantino, 2016).

Table 5.104: Morphological characters of the genus *Orthognathotermes* extracted from the database according to Rocha & Canello (2009). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head	shape: rounded	body
worker	epicranial suture	development: not evident	head
worker	articles	number: 14 to 15	antennae
worker	postclypeus	orientation: elevated; position: lateral view; shape: convex	head
worker	anterior lobe	shape: slightly emarginate; slightly larger than posterior lobe	pronotum
worker	apical spurs	number: 2	tibia (hind legs)
worker	apical spurs	number: 2	tibia (middle legs)
worker	apical spurs	number: 2	tibia (fore legs)
worker	fontanelle	development: visible; shape: rounded	head
worker	hairs	length: very short; quantity: few; density: scattered	head
worker	bristles	density: covered	head
worker	hairs	length: short; position: concentrated in anterior and posterior margins	pronotum
worker	bristles	position: concentrated in anterior and posterior margins	pronotum
worker	hairs	length: short; position: posterior margin	mesonotum
worker	bristles	position: posterior margin	mesonotum
worker	hairs	length: short; density: densely covered	metanotum
worker	bristles	position: posterior margin; density: densely covered	metanotum
worker	hairs	length: short; density: densely covered	tergites
worker	bristles	position: posterior margin; density: densely covered	tergites
worker	hairs	length: short; density: scattered covered	sternites
worker	bristles	density: scattered covered	sternites
worker	bristles	density: scattered covered	legs

Table 5.104: Morphological characters of the genus *Orthognathotermes* extracted from the database according to Rocha & Canello (2009). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	hairs	density: scattered covered; length: short	legs
worker	apical tooth (A)	larger than 1+2 marginal tooth (M1+2)	left mandible
worker	3rd marginal tooth (M3)	much smaller than 1+2 marginal tooth (M1+2)	left mandible
worker	molar tooth	development: conspicuous	left mandible
worker	molar prominence	shape: very concave	left mandible
worker	ridges	occurrence: absent	molar prominence (left mandible)
worker	apical tooth (A)	larger than 1st marginal tooth (M1)	right mandible
worker	2nd marginal tooth (M2)	much smaller than 1st marginal tooth (M1)	right mandible
worker	molar plate	shape: strongly concave	right mandible
worker	ridges	occurrence: absent	molar plate (right mandible)
worker	crop	development: developed; shape: not constricted	foregut
worker	fold	number: 24; development: visible	gizzard
worker	2nd order	number: 6	fold (gizzard)
worker	mesenteric tongue	length: long; position: dorsally placed in right lateral view of the tube in situ	mixed segment
worker	1st proctodeal segment (P1)	length: long	proctodeal
worker	paunch (P3)	size: large	hindgut
worker	paunch (P3a)	size: voluminous	paunch (P3)
worker	paunch (P3b)	shape: funneled	paunch (P3)
worker	colon (P4)	length: long	hindgut
soldier	head capsule	position: dorsal view; shape: sub rectangular	head
soldier	head capsule sides	orientation: parallel	head capsule
soldier	head capsule anterior region	position: sometimes slightly convergent	head capsule
soldier	head capsule posterior margin	orientation: longitudinal; occurrence: sometimes absent; shape: furrow	head capsule

Table 5.104: Morphological characters of the genus *Orthognathotermes* extracted from the database according to Rocha & Canello (2009). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	head capsule	position: in profile; shape: lump	head
soldier	flange	position: near antennal socket	antennal socket
soldier	frontal pore	development: indistinct	frontal gland
soldier	frontal gland	development: indistinct	head
soldier	mandibles	length: very long; width: narrow; colour: ferruginous to black; orientation: curving downward	head
soldier	projection	position: near the middle or at proximal half; shape: tooth like	left mandible
soldier	projection	position: near the middle or at proximal half; shape: tooth like	right mandible
soldier	mandibles apex	shape: hooked inward	mandibles
soldier	basal tooth	number: 2	left mandible
soldier	basal tooth	number: 1	right mandible
soldier	cutting edge	position: mandibles inner margin; size: extends from the tooth-like projection to near tip; shape: sharp	left mandible
soldier	lobes	development: distinct; position: in the middle	labrum
soldier	articles	number: 15	antennae
soldier	6th article	longer than 5th article	articles
soldier	3rd article	smaller than 2nd article	articles
soldier	4th article	equal to 2nd article	articles
soldier	5th article	equal to 2nd article	articles
soldier	2nd article	smaller than 1st article	articles
soldier	1st article	length: long	articles
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
soldier	hairs	length: short; density: covered	antennae
soldier	bristles	density: covered	antennae
soldier	bristles	number: variable; orientation: erected; density: sparse	labrum
soldier	hairs	length: short; number: variable; density: covered	body
soldier	bristles	number: variable; density: covered	body
soldier	bristles	number: 2; position: near anterior margin; shape: clusters	postmentum
soldier	hairs	length: short; density: covered	postmentum
soldier	hairs	length: short; density: scattered	postmentum
soldier	bristles	density: scattered	legs
soldier	hairs	density: scattered	legs
soldier	spines	position: internal margin of tibia	tibia (hind legs)

Table 5.104: Morphological characters of the genus *Orthognathotermes* extracted from the database according to Rocha & Canello (2009). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	spines	position: internal margin of tibia	tibia (middle legs)
soldier	spines	position: internal margin of tibia	tibia (fore legs)
soldier	head	colour: sometimes brown to yellow	body
soldier	body	colour: pale yellow	body
imago	head	shape: rounded	body
imago	mandibles	as in worker	head
imago	fontanelle	width: narrow; position: at the level of eyes; size: small to large	head
imago	eyes	size: small	head
imago	ocelli	width: narrowed; shape: subtriangular; size: large; touching eyes; not touching eyes	head
imago	postclypeus	orientation: elevated; position: lateral view; shape: convex	head
imago	articles	number: 17	antennae
imago	3rd article	smaller than 2nd article	articles
imago	7th article	larger than 8th article	articles
imago	4th article	larger than 3rd article	articles
imago	2nd article	smaller than 1st article	articles
imago	6th article	larger than 7th article	articles
imago	pronotum	shape: subtrapezoidal	thorax
imago	pronotum anterior margin	shape: slightly concave	pronotum
imago	pronotum posterior margin	shape: emarginated	pronotum
imago	mesonotum posterior margin	shape: emarginated	mesonotum
imago	metanotum posterior margin	shape: emarginated	metanotum
imago	apical spurs	number: 3	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	wings	longer than body length	thorax
imago	bristles	density: scattered	pronotum
imago	hairs	density: variable	pronotum
imago	bristles	density: densely covered	sternites
imago	hairs	length: short; density: densely variable	sternites
imago	bristles	orientation: row; position: tergites posterior margin	sternites
imago	bristles	density: densely covered	tergites
imago	hairs	length: short; density: densely variable	tergites

Table 5.104: Morphological characters of the genus *Orthognathotermes* extracted from the database according to Rocha & Canello (2009). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	bristles	orientation: row; position: tergites posterior margin	tergites
imago	bristles	density: covered	legs
imago	hairs	length: short	legs
imago	spines	position: internal margin	tibia (fore legs)
imago	spines	position: internal margin	tibia (middle legs)
imago	spines	position: internal margin	tibia (hind legs)
imago	bristles	density: covered	wings
imago	hairs	length: short; position: on wing surface	wings
imago	spot	number: 3; colour: pale; position: two in front of the ocelli and one above the fontanelle	head capsule

Genus *Palmitermes* Hellemans & Roisin 2017

Distribution: Brazil; French Guiana (Hellemans *et al.*, 2017; Constantino, 2016).

Table 5.105: Morphological characters of the genus *Palmitermes* extracted from the database according to Hellemans *et al.* (2017). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	head capsule	shape: rounded	head
worker	apical tooth (A) inner margin	size: very large	left mandible
worker	apical tooth (A) inner margin	size: very large	right mandible
worker	marginal teeth	size: reduced	left mandible
worker	marginal teeth	size: reduced	right mandible
worker	molar region	shape: concave	left mandible
worker	molar region	shape: concave	right mandible
worker	ridges	occurrence: absent	molar region (left mandible)
worker	ridges	occurrence: absent	molar region (right mandible)
worker	left mandible	index: 2.5 to 2.8	mandibles
worker	crop	development: developed	foregut
worker	gizzard	size: small	foregut
worker	folds	number: 24; development: visible	gizzard
worker	1st order	number: 6	folds (gizzard)
worker	2nd order	number: 6	folds (gizzard)
worker	3rd order	number: 12	folds (gizzard)
worker	spines	length: short; size: variable	gizzard
worker	mesenteric part	position: distally; shape: slightly inflated	mixed segment
worker	1st proctodeal segment (P1)	shape: cylindrical	proctodeal
worker	enteric valve (P2)	inserted dorsally into paunch (P3)	hindgut
worker	cushions	length: elongated; number: 6; shape: ovoid	enteric valve (P2)
worker	paunch (P3)	width: broad	hindgut
worker	paunch (P3) anterior part	width: narrow	paunch (P3)
worker	colon (P4)	broader than paunch (P3)	hindgut
soldier	head capsule	shape: rectangular	head

Table 5.105: Morphological characters of the genus *Palmitermes* extracted from the database according to [Hellemans et al. \(2017\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	frontal prominence	size: large; shape: humped	head capsule
soldier	frontal prominence apex	orientation: pointing upwards	head capsule
soldier	bristles	size: small	frontal prominence
soldier	fontanelle	position: anterodorsal base of frontal prominence; size: small	head
soldier	labrum anterior margin	width: wide; shape: concave	labrum
soldier	labrum anterolateral corners	shape: pointed	labrum
soldier	mandibles	shape: symmetrical; longer than head capsule	head
soldier	mandibles apex	shape: hooked	mandibles
soldier	articles	number: 14	antennae
soldier	postmentum	length: elongated	head
soldier	postmentum sides	shape: concave	postmentum
soldier	postmentum posterior border	position: near posterior edge; shape: tubercle	postmentum
soldier	pronotum	shape: saddle shaped	thorax
soldier	pronotum middle	shape: slightly notched	pronotum
soldier	anterior lobe	larger than posterior lobe	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	abdomen	colour: dark	body
imago	head capsule	shape: rounded behind	head
imago	eyes	development: little prominent	head
imago	fontanelle	colour: hyaline; size: small; shape: spot	head
imago	postclypeus	shape: slightly bulging	head
imago	apical tooth (A)	length: elongated	left mandible
imago	apical tooth (A)	length: elongated	right mandible
imago	marginal teeth	development: reduced	left mandible
imago	marginal teeth	development: reduced	right mandible
imago	articles	number: 15	antennae
imago	pronotum	shape: almost semicircular	thorax

Table 5.105: Morphological characters of the genus *Palmitermes* extracted from the database according to [Hellemans *et al.* \(2017\)](#). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	pronotum anterior margin	shape: slightly concave	pronotum
imago	wings	colour: dark smoky	thorax

Genus *Planicapritermes* Emerson 1949

Distribution: Bolivia; Brazil; French Guiana; Guyana; Venezuela (Mathews, 1977; Constantino, 2016).

Table 5.106: Morphological characters of the genus *Planicapritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
soldier	body	size: rather small	body
soldier	head	length: short; width: broad; shape: very flattened	body
soldier	head sides	orientation: converging towards front	head
soldier	lobes	number: 3; position: posterior margin of head	head
soldier	frontal process	occurrence: absent	head
soldier	frontal gland	occurrence: absent	head
soldier	articles	number: 14	antennae
soldier	mandibles	shape: asymmetrical	head
soldier	pronotum	width: narrow	thorax
soldier	anterior lobe	orientation: slightly upturned	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 2	tibia (fore legs)
imago	body	size: rather small	body
imago	apical tooth (A)	size: small	left mandible
imago	apical tooth (A)	size: small; equally prominent with 1st marginal tooth (M1)	right mandible
imago	1st marginal tooth (M1)	more prominent than apical tooth (A)	left mandible
imago	3rd marginal tooth (M3)	development: distinct	left mandible
imago	cutting edge	position: between M1 and M3; shape: concave	left mandible
imago	submolar tooth anterior margin	development: visible; position: between M3 and molar prominence	left mandible
imago	left mandible	index: 0.41	mandibles
imago	1st marginal tooth (M1) posterior margin	shorter than 2nd marginal tooth (M2) posterior margin	right mandible

Table 5.106: Morphological characters of the genus *Planicapritermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	2nd marginal tooth (M2) anterior margin	position: into posterior margin; shape: rounded	right mandible
imago	molar plate	width: rather narrow; shape: concave	right mandible
imago	ridges	number: 8 to 9; development: not prominent; orientation: transverse; shape: deep	molar plate (right mandible)
imago	notch	position: near the basal end in plan view of molar plate; shape: somewhat angular	molar plate (right mandible)
imago	fontanelle	colour: pale; shape: circular; size: small	head
imago	eyes	development: fairly prominent; size: large	head
imago	ocelli	shape: projected; size: large	head
imago	articles	number: 12 to 15	antennae
imago	postclypeus	shape: weakly arched	head
imago	postclypeus width	as broad as postclypeus length	postclypeus
imago	pronotum	narrower than head	thorax
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 2	tibia (fore legs)
imago	setae	number: many	head
imago	setae	number: many	pronotum

Genus *Spinitermes* Wasmann 1897

Nesting: hypogeous, inquiline (Mathews, 1977; Constantino, 2015).

Feeding: soil organic matter (Mathews, 1977; Constantino, 2015).

Distribution: Argentina; Bolivia; Brazil; Paraguay; Bolivia; Guyana; Peru; Suriname; French Guiana; Venezuela (Constantino, 2016).

Table 5.107: Morphological characters of the genus *Spinitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	size: medium	body
worker	mandibles	as in imago	head
worker	head capsule	colour: yellow white	head
soldier	body	size: medium	body
soldier	head capsule	shape: subrectangular	head
soldier	head capsule sides	orientation: sometimes sinuate	head capsule
soldier	protuberance	orientation: projecting upwards; position: on the top of head near the front; shape: process or cap; size: large	head
soldier	articles	number: 14	antennae
soldier	labrum sides	number: 2; shape: points	labrum
soldier	pronotum anterior part	orientation: raised	pronotum
soldier	pronotum anterior margin	shape: sometimes slightly indented	pronotum
soldier	apical spurs	number: 2	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (fore legs)
soldier	apical spurs	number: 3	tibia (middle legs)
imago	body	size: medium	body
imago	apical tooth (A)	shape: pointed; size: large	left mandible
imago	apical tooth (A)	shape: pointed; size: large	right mandible
imago	1st marginal tooth (M1)	size: large	left mandible
imago	3rd marginal tooth (M3)	size: small	left mandible
imago	molar prominence	size: large	left mandible
imago	left mandible	index: 4.0 to 4.5	mandibles
imago	1st marginal tooth (M1)	size: large	right mandible
imago	molar plate	shape: concave	right mandible
imago	ridges	occurrence: absent	molar plate (right mandible)

Table 5.107: Morphological characters of the genus *Spinitermes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	notch	position: near basal end; occurrence: absent	molar plate (right mandible)
imago	fontanelle	shape: slit shaped	head
imago	eyes	size: medium to medium	head
imago	ocelli	size: small; well removed from eyes; ; touching eyes	head
imago	articles	number: 15	antennae
imago	postclypeus width	as broad as postclypeus length	postclypeus
imago	midline	development: distinct	postclypeus
imago	pronotum	wider than head; as wide as head	thorax
imago	pronotum anterior margin	shape: concave	pronotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	setae	length: short; quantity: many	head
imago	setae	length: short; colour: stout; position: at least along margins and on larger veins	wings

Genus *Termes* Linnaeus 1758

Nesting: epigeal (Constantino, 2002, 2015).

Feeding: decaying wood, soil organic matter (Constantino, 2002, 2015).

Pest of: fruit trees, sugar cane (Constantino, 2002).

Distribution: Argentina; Bolivia; Brazil; French Guiana; Costa Rica; Cuba; Dominican Republic; Grenada; Guadeloupe (French); Guyana; Haiti; Jamaica; Martinique (French); Montserrat; Nicaragua; Panama; Puerto Rico; Trinidad and Tobago; Venezuela; Virgin Islands (USA); Belize; Cayman Islands; Paraguay (Constantino, 2016).

Table 5.108: Morphological characters of the genus *Termes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
worker	body	development: monomorphic; size: medium	body
worker	apical tooth (A)	size: large	left mandible
worker	apical tooth (A)	size: large	right mandible
worker	left mandible	index: 3.5	mandibles
soldier	body	size: medium	body
soldier	head capsule	length: long; shape: subrectangular	head
soldier	head capsule posterior margin	shape: rounded	head capsule
soldier	frontal projection	orientation: upturned; position: on the top of head; shape: conical; size: large	head
soldier	frontal pore	development: obscured	frontal gland
soldier	articles	number: 14	antennae
soldier	mandibles	length: long; orientation: down curved of the snapping sort; size: slender	head
soldier	mandibles apex	orientation: hooked inwards	mandibles
soldier	pronotum	shape: broadly saddle shaped, narrower than head	thorax
soldier	apical spurs	number: 3	tibia (hind legs)
soldier	apical spurs	number: 2	tibia (middle legs)
soldier	apical spurs	number: 3	tibia (fore legs)
imago	body	size: medium	body
imago	apical tooth (A)	size: large	left mandible
imago	apical tooth (A)	size: large	right mandible
imago	1st marginal tooth (M1)	development: prominent; size: large	left mandible

Table 5.108: Morphological characters of the genus *Termes* extracted from the database according to Mathews (1977). Columns headings: Semaphoront = stage of development of the individual contained in the sample; Structure = termite body part used to define the genera; Character = specific morphological features; Higher level structure = body part that the structure belongs.

Semaphoront	Structure	Character	Higher level structure
imago	3rd marginal tooth (M3)	development: prominent; less prominent than 1st marginal tooth (M1)	left mandible
imago	cutting edge	position: joining M1 and M3; shape: concave	left mandible
imago	submolar tooth anterior margin	development: visible	left mandible
imago	molar tooth point	hidden beneath molar prominence	left mandible
imago	left mandible	index: 1.2 to 2.0	mandibles
imago	1st marginal tooth (M1)	size: large	right mandible
imago	fontanelle	size: small; shape: slit	head
imago	ocelli	size: small to medium; almost touching eyes	head
imago	eyes	development: not prominent; size: medium	head
imago	articles	number: 15	antennae
imago	postclypeus	orientation: fairly weakly arched	head
imago	postclypeus width	broader than postclypeus length	postclypeus
imago	midline	development: visible; shape: not depressed	postclypeus
imago	pronotum sides	shape: broadly rounded	pronotum
imago	pronotum rear	shape: broadly rounded	pronotum
imago	pronotum anterior margin	angle: rather distinct; orientation: sinuate	pronotum
imago	apical spurs	number: 2	tibia (hind legs)
imago	apical spurs	number: 2	tibia (middle legs)
imago	apical spurs	number: 3	tibia (fore legs)
imago	setae	shape: spine like; number: 1 or 2; position: opposite the two spurs	tibia (hind legs)
imago	setae	length: medium; position: along costal border; density: covered	wings

5.2 Template of terms for the Neotropical termite's genera morphological ontology.

Table 5.109: Template of terms for the Neotropical termite's genera morphological ontology. Columns headings: body part = structure of the termite body; Definition = a statement of the meaning of a termite morphological character; Type = class or category of structures which share similar characteristics, *part of* = linking verb between nodes that indicates to which part of the body the structure belongs.

Body part	Definition	Type	<i>part of</i>
body	the physical structure of an animal, the principal region of the insect that represents the individual	individual unity	
body sclerites	any of the large or small sclerotized areas of the body wall; in arthropods, a hard, generally external plate bounded by sutures; a tanned, cuticular part	sclerites	body
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	body
hairs	a very fine chitinized thread	structure	body
setae	a hairlike unicellular external process of the body wall or of any derivative of the latter; a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	body
head	the anterior region of the insect body believed to have been fused together by six, according to others by seven, primary segments known as pre-antennary, intercalary, mandibular (superligual), maxillary and labial, bearing the mouth structures and a pair of antennae	tagma	body
bristles	long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	head
hairs	a very fine chitinized thread	structure	head
ridges	a linear projection or projecting structure; a crest	structure	head

Table 5.109 continued from previous page

Body part	Definition	Type	part of
setae	a hairlike unicellular external process of the body wall or of any derivative of the latter; a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	head
constriction	a narrow part on the head	structure	head
frontal process	a plate which forms part of the lateral boundary of the nose	structure	head
frontal projection	a thing or part that extends outward beyond a prevailing line or surface on the frontal part of the head	structure	head
lobes	a rounded projection	structure	head
projection	a thing or part that extends outward beyond a prevailing line or surface of the head	structure	head
protuberance	a solid convex shape that juts out from head	structure	head
patches	a small piece of material affixed to another, larger piece to conceal, reinforce, or repair a worn area, hole, or tear	structure	head
wrinkles	a small furrow, ridge, or crease on a normally smooth surface, caused by crumpling, folding, or shrinking	structure	head
lump	an irregularly shaped mass or piece	structure	head
head capsule	the fused compact cephalic plates that comprise the head, excluding the eyes, antennae and mouthparts	structure	head
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	head capsule
constriction	a narrow part on the head capsule	structure	head capsule
frontal ridge (flange)	a protruding rim, edge, rib, or collar	structure	head capsule
hairs	a very fine chitinized thread	structure	head capsule
notch	a V-shaped cut	structure	head capsule
ommatids	one of the optical units, consisting of photoreceptors and usually one or more lenses, that make up a compound eye of an insect	structure	head capsule
projection	a thing or part that extends outward beyond a prevailing line or surface of the head capsule	structure	head capsule
protuberance	a solid convex shape that juts out from head capsule	structure	head capsule

Table 5.109 continued from previous page

Body part	Definition	Type	part of
ridges	a long, narrow, or crested part of the body	structure	head capsule
setae	a hairlike unicellular external process of the body wall or of any derivative of the latter; a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	head capsule
antennae	the paired, usually multiple jointed, sensory organs articulating on the procephalic region of the head capsule; its highly versatile sensory structures are capable to detect the various environmental stimuli	head appendix	head
antennal carinae	An external ridge on a sclerite; a keel-like elevation (or ridge) on the body-wall of an insect	structure	antennae
antennal socket	the paired holes in the frons, in which the antenna bases are set	structure	antennae
articles	small segments of the antennae containing many specialised sensory cells	segment	antennae
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	antennae
hairs	a very fine chitinized thread	structure	antennae
coronal branch	The dorsal Y-shaped suture of the cranium, including the median coronal suture of the vertex, and the divergent frontal sutures of the facial region; the membranous line between two metameric segments	structure	head
eyes	in general a photoreceptor, but usually meaning one of the more complex types of light-perceptive organs; the bilateral visual organs on the head	structure	head
ocelli	a simple visual organ of insects, two of which appear on the vertical and one on the frontal plate (occasionally only two ocelli are present)	structure	head
front	one of the anterior parts of the head capsule between the vertex and the clypeus bounded laterally by the frontal suture, bearing a median ocellus	structure	head
frontal flange	a protruding rim, edge, rib, or collar	structure	front
lobes	a rounded projection	structure	front

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
prominence	a small projection or protuberance	structure	front
protuberance	a solid convex shape that juts out from front	structure	front
ridges	a long, narrow, or crested part of the body	structure	front
frons	the facial area of the cranium between the frontal and epistomal sutures, or the corresponding area when the sutures are absent, bearing the median ocellus and the origins of the labral muscles	structure	head
prominence	a small projection or protuberance	structure	frons
ridges	a long, narrow, or crested part of the body	structure	frons
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	frons
epicranial suture	The dorsal Y-shaped suture of the cranium, including the median coronal suture of the vertex, and the divergent frontal sutures of the facial region; the membranous line between two metameric segments; the medial suture dividing the vertex into two halves, extending from the frons to the occiput	structure	head
ecdysial line	The median dorsal arm of the epicranial suture	structure	head
clypeus	the facial area of the cranium just above the labrum, usually separated from the frons by an epistomal suture, and sometimes divided into an anteclypeus and a postclypeus; a sclerite at the anterior part of the head and at the base of the mouthparts, which articulates with the labrum	structure	head
anteclypeus	the apical part of the clypeus separated from the postclypeus by a transverse line	structure	head
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	anteclypeus
hairs	a very fine chitinized thread	structure	anteclypeus
postclypeus	the upper part of the clypeus, adjacent to the frons, separated from the anteclypeus by the transverse line of the clypeus	structure	head

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	postclypeus
hairs	a very fine chitinized thread	structure	postclypeus
lobes	a rounded projection	structure	postclypeus
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	postclypeus
labrum	the upper, unpaired mouthpart of the insect head, below the clypeus, partly covering the mandibles and the rest of the mouthparts	structure	head
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	labrum
hairs	a very fine chitinized thread	structure	labrum
lobes	a rounded projection	structure	labrum
rostrum	a long chitinous process on the frons or clypeus of the insect head	structure	head
vertex	the upper part of the head capsule, extending from the occiput anteriorly and may be separated into pre-, meso- and metavertex, frequently carrying paired ocelli	structure	head
postmentum	the basal half of the labium, usually composed of the mentum and the submentum, separated from the prementum by the submental suture	structure	head
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	postmentum
hairs	a very fine chitinized thread	structure	postmentum
frontal tube	an extension in front of the cephalic capsule that forms a long nose at the tip of which the frontal gland opens	structure	head
hairs	a very fine chitinized thread	structure	frontal tube
nasus	a conical extension in front of the cephalic capsule that forms a long nose at the tip of which the frontal gland opens	structure	head
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	nasus
hairs	a very fine chitinized thread	structure	nasus
ridges	a long, narrow, or crested part of the body	structure	nasus

Table 5.109 continued from previous page

Body part	Definition	Type	part of
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	nasus
frontal gland	the group of glandular cells in the head capsule, secreting a milky liquid that is discharged through the frontal pore onto the surface of the frons	structure	head
frontal pore	the small opening on the surface of the frons, through which a milky liquid is discharged	structure	frontal gland
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	frontal pore
hairs	a very fine chitinized thread	structure	frontal pore
fontanelle	the light coloured, shallow spot on the frons of termite soldiers, where the frontal gland discharges its milky fluid through the frontal pore	structure	head
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	fontanelle
lacinia	the paired inner lobate structures sitting on the apical margin of the maxillary stipes; the inner endite lobe of a maxilla, provided with a muscle arising in the stipes, and often with a second muscle arising on the cranial wall; an inner lobe of the maxilla, which articulates with the stipes	structure	head
setae	A hairlike unicellular external process of the body wall or of any derivative of the latter; a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	lacinia
labial palps	the paired sensory appendages of the labium borne on the palpiger generally consisting of three joints (three types are shown below)	structure	head
hairs	a very fine chitinized thread	structure	labial palps
mandibles	the heavily chitinized, robust upper jaw in the anterior lower part of the head capsule, frequently dentate on its inner margin, used for seizing a prey or cutting up food	head appendix	head

Table 5.109 continued from previous page

Body part	Definition	Type	part of
left mandible	the mouthpart appendage on the left side of the head capsule that, in insects, lie anterior to the maxilla and that are usually involved in chewing; biting jawlike organs in their generalized form; the heavily chitinized, robust upper jaw in the left anterior lower part of the head capsule, frequently dentate on its inner margin, used for seizing a prey or cutting up food	head appendix	mandibles
apical tooth (A)	the tooth on distal points of the mandible	structure	left mandible
basal projection	a thing or part that extends outward beyond a prevailing line or surface on the basal part of the left mandible	structure	left mandible
molar region	the proximal region of the inner margin of the mandible	structure	left mandible
ridges	a long, narrow, or crested part of the body	structure	molar region (left mandible)
molar tooth	one of the grinding teeth on the inner margin of the mandible close to the base	structure	left mandible
projection	a thing or part that extends outward beyond a prevailing line or surface of the left mandible	structure	left mandible
tooth	tip of about triangular shape present on the inside of the mandibles	structure	left mandible
right mandible	The mouthpart appendage on the right side of the head capsule that, in insects, lie anterior to the maxilla and that are usually involved in chewing; biting jawlike organs in their generalized form; the heavily chitinized, robust upper jaw in the right anterior lower part of the head capsule, frequently dentate on its inner margin, used for seizing a prey or cutting up food	head appendix	mandibles
apical tooth (A)	the tooth on distal points of the mandible	structure	right mandible
molar plate	flattened file-like edge	structure	right mandible
ridges	a long, narrow, or crested part of the body	structure	molar plate
molar region	the proximal region of the inner margin of the mandible	structure	right mandible

Table 5.109 continued from previous page

Body part	Definition	Type	part of
ridges	a long, narrow, or crested part of the body	structure	molar region (right mandible)
tooth	tip of about triangular shape present on the inside of the mandibles	structure	right mandible
thorax	the main middle section of the insect body comprising three thoracic rings, the pro-, the meso- and the metathoraces which are more or less well fused and cask-like sometimes having on the upper lateral part one of two pairs of wings, while on the ventrolateral part each thoracic ring bears a pair of legs	tagma	body
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	thorax
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	thorax
thoracic sclerites	small, chitinized plates of the thorax	sclerit	thorax
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	thoracic sclerites
pronotum	the dorsal part of the prothorax	sclerit	thorax
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	pronotum
hairs	a very fine chitinized thread	structure	pronotum
lobes	a rounded projection	structure	pronotum
projection	a thing or part that extends outward beyond a prevailing line or surface of the pronotum	structure	pronotum
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	pronotum
spines	a multicellular external process of the body wall; a hornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	pronotum
mesonotum	the upper, dorsal part of the usually wingless mesothorax	sclerit	thorax
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	mesonotum
hairs	a very fine chitinized thread	structure	mesonotum

Table 5.109 continued from previous page

Body part	Definition	Type	part of
spines	a multicellular external process of the body wall; a hornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	mesonotum
metanotum	the upper, dorsal part of the usually wingless metathorax	sclerite	thorax
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	metanotum
hairs	a very fine chitinized thread	structure	metanotum
spines	a multicellular external process of the body wall; a hornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	metanotum
legs	paired locomotory organ on the ventrolateral side of the thoracic segment	thorax appendix	thorax
bristles	long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	legs
hairs	a very fine chitinized thread	structure	legs
setae	A hairlike unicellular external process of the body wall or of any derivative of the latter; a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	legs
fore legs	the paired locomotory organs on the ventrolateral side of the prothoracic segment	thorax appendix	legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	fore legs
hairs	a very fine chitinized thread	structure	fore legs
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	fore legs
coxa	the first, basalmost part of the thoracic leg, which either directly adjoining to the thorax, or indirectly through the subcoxa and the epimeron	segment	fore legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	coxa (fore legs)
projection	a thing or part that extends outward beyond a prevailing line or surface of the coxa	structure	coxa (fore legs)

Table 5.109 continued from previous page

Body part	Definition	Type	part of
spines	a multicellular external process of the body wall; a hornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	coxa (fore legs)
femur	the third member of the thoracic leg between the trochanter and the tibia	segment	fore legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	femur (fore legs)
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	femur (fore legs)
tibia	the fourth joint of the thoracic leg between the femur and the tarsus	segment	fore legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tibia (fore legs)
hairs	a very fine chitinized thread	structure	tibia (fore legs)
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tibia (fore legs)
spines	a multicellular external process of the body wall; a thornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	tibia (fore legs)
spurs	the pointed and hard spine that is movable at the apex of the tibia	structure	tibia (fore legs)
arolium	the single, large adhesive surface between the claws at the apex of the tarsus	structure	tarsus (fore legs)
spines	a multicellular external process of the body wall; a thornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	tarsus (fore legs)
middle legs	the paired locomotory organs on the ventrolateral side of the mesothoracic segment	thorax appendix	legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	middle legs
hairs	a very fine chitinized thread	structure	middle legs
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	middle legs

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
coxa	the first, basalmost part of the thoracic leg, which either directly adjoining to the thorax, or indirectly through the subcoxa and the epimeron	segment	middle legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	coxa (middle legs)
projection	a thing or part that extends outward beyond a prevailing line or surface of the coxa	structure	coxa (middle legs)
spines	a multicellular external process of the body wall; a thornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	coxa (middle legs)
femur	the third member of the thoracic leg between the trochanter and the tibia	segment	middle legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	femur (middle legs)
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	femur (middle legs)
tibia	the fourth joint of the thoracic leg between the femur and the tarsus	segment	middle legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tibia (middle legs)
hairs	a very fine chitinized thread	structure	tibia (middle legs)
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tibia (middle legs)
spines	a multicellular external process of the body wall; a thornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	tibia (middle legs)
spurs	the pointed and hard spine that is movable at the apex of the tibia	structure	tibia (middle legs)
arolium	the single, large adhesive surface between the claws at the apex of the tarsus	structure	tarsus (middle legs)
hind legs	the paired locomotory organs on the ventrolateral side of the mesothoracic segment	thorax appendix	legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	hind legs

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
hairs	a very fine chitinized thread	structure	hind legs
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	hind legs
coxa	the first, basalmost part of the thoracic leg, which either directly adjoining to the thorax, or indirectly through the subcoxa and the epimeron	segment	hind legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	coxa (hind legs)
projection	a thing or part that extends outward beyond a prevailing line or surface of the coxa	structure	coxa (hind legs)
spines	a multicellular external process of the body wall; a thornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	coxa (hind legs)
femur	the third member of the thoracic leg between the trochanter and the tibia	segment	hind legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	femur (hind legs)
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	femur (hind legs)
tibia	the fourth joint of the thoracic leg between the femur and the tarsus	segment	hind legs
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tibia (hind legs)
hairs	a very fine chitinized thread	structure	tibia (hind legs)
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tibia (hind legs)
spines	a multicellular external process of the body wall; a thornlike, sclerotized structure on the cuticle that does not have a socketed base	structure	tibia (hind legs)
spurs	the pointed and hard spine that is movable at the apex of the tibia	structure	tibia (hind legs)
arolium	the single, large adhesive surface between the claws at the apex of the tarsus	structure	tarsus (hind legs)
wings	the paired membranous organ of insects on the dorsolateral margin of the meso- and/or metathorax	structure	thorax

Table 5.109 continued from previous page

Body part	Definition	Type	part of
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	wings
hairs	a very fine chitinized thread	structure	wings
scales	variously shaped chitinized small plates	structure	wings
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	wings
veins	the longitudinal or transverse chitinized tubes fortifying the wing membrane	structure	wings
wing scale (tegula)	a large, scale-like lobe overlapping the base of the forewing in some insects; usually represented by a small setigerous pad or lobe at the anterior root of the wing base; the small squamiform sclerite covering the extreme base of the costal vein; A small lobe which is more or less sclerotized at the antero-medial margin of each wing base lies, which bears a specialized set of sensory structures referred to as the tegular organ	structure	wings
fore wings	The first paired membranous organ of insects on the dorsolateral margin of the meso- and/or metathorax	structure	wings
costal margin	the thickening of the costal border is not preceded by a tracheal branch. If a tracheal branch of the costa is present at all, it is greatly reduced and is not the foundation for a true vein visible beyond the humeral suture of either the forewing or the hind wing	structure	fore wings
cubitus (Cu)	the usual fifth vein of the wing	structure	fore wings
hairs	a very fine chitinized thread	structure	fore wings
media (M)	the usual fourth vein of the wing; its base, when not united with radius, associated with the median plates of the wing base along the fold of the plica basalis	structure	fore wings
micrasters	a type of wing-sculpturing; the cuticular structures of minute size found all over the dorsal and ventral wing-surface	structure	fore wings

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
radial sector	this is the major vein in the termite wing that gives rigidity for the function of flight, often serving together with the thickened costal margin and other associated veins. In primitive wings the radial sector has a variable number of superior branches that join the costal border, and it may also have a few inferior branches, particularly in the Hodotermitinae. In the advanced families, the radial sector is unbranched. It reaches close to the tip of the wing in all termites. The radial sector and its branches (if present) are preceded by tracheal branches, and its position and branching in the wing in relation to the costal border and to the media may be diagnostic of genera and related groups of genera	structure	fore wings
radius (R)	the third vein of the wing; its base flexibly attached to the second axillary	structure	fore wings
radius (R1)	this vein is present in the forewing and some hind wings of numerous primitive termites, but is in some instances absent from the hind wing when it is present in the forewing; It may be separated from the other branches of the radius beyond the humeral suture, or it may be joined with the second and third radius; When present, it is preceded by a tracheal branch of the radius; Although more stable than the second and third radius, there is a great variation in its occurrence within the same genus; It is longer than the subcosta and occasionally may be branched; It is usually a short vein, but in some individuals of the same species it may extend more than half of the length of the wing before joining the costal border	structure	fore wings

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	fore wings
subcosta (Sc)	the usual second vein of the wing, associated basally with the anterior end of the first axillary sclerite; This vein is preceded by a tracheal branch in termites; It is either short in the forewing of primitive termites or absent from derivative genera; It may extend more than half of the length of the hind wing, with a series of short superior veinlets, or may be short without veinlets; It may be single or branched in termites, but is not so long as it is in the Protorthoptera; The subcosta arises separately from the radius both in the wing scale and beyond the humeral suture of the forewing and hind wing	structure	fore wings
veins	the tubular thickenings of the wings springing from the wing base and branching distally; the longitudinal or transverse chitinized tubes fortifying the wing membrane	structure	fore wings
wing membrane	the thin, soft layer of the wing without the veins	structure	fore wings
wing scale (tegula)	a large, scale-like lobe overlapping the base of the forewing in some insects; usually represented by a small setigerous pad or lobe at the anterior root of the wing base; the small squamiform sclerite covering the extreme base of the costal vein; A small lobe which is more or less sclerotized at the antero-medial margin of each wing base lies, which bears a specialized set of sensory structures referred to as the tegular organ	structure	fore wings
hind wings	the second paired membranous organ of insects on the dorsolateral margin of the meso- and/or metathorax	structure	wings
hairs	a very fine chitinized thread	structure	hind wings

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
media (M)	the usual fourth vein of the wing; its base, when not united with radius, associated with the median plates of the wing base along the fold of the plica basalis	structure	hind wings
micrasters	a type of wing-sculpturing; the cuticular structures of minute size found all over the dorsal and ventral wing-surface	structure	hind wings
radial sector	this is the major vein in the termite wing that gives rigidity for the function of flight, often serving together with the thickened costal margin and other associated veins. In primitive wings the radial sector has a variable number of superior branches that join the costal border, and it may also have a few inferior branches, particularly in the Hodotermitinae. In the advanced families, the radial sector is unbranched. It reaches close to the tip of the wing in all termites. The radial sector and its branches (if present) are preceded by tracheal branches, and its position and branching in the wing in relation to the costal border and to the media may be diagnostic of genera and related groups of genera	structure	hind wings
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	hind wings

Table 5.109 continued from previous page

Body part	Definition	Type	part of
subcosta (Sc)	the usual second vein of the wing, associated basally with the anterior end of the first axillary sclerite; This vein is preceded by a tracheal branch in termites; It is either short in the forewing of primitive termites or absent from derivative genera; It may extend more than half of the length of the hind wing, with a series of short superior veinlets, or may be short without veinlets; It may be single or branched in termites, but is not so long as it is in the Protorthoptera; The subcosta arises separately from the radius both in the wing scale and beyond the humeral suture of the forewing and hind wing	structure	hind wings
wing scale (tegula)	a large, scale-like lobe overlapping the base of the forewing in some insects; usually represented by a small setigerous pad or lobe at the anterior root of the wing base; the small squamiform sclerite covering the extreme base of the costal vein; A small lobe which is more or less sclerotized at the antero-medial margin of each wing base lies, which bears a specialized set of sensory structures referred to as the tegular organ	structure	hind wings
abdomen	the third large region of the insect body, which originally comprises twelve segments, each segment is usually formed by a dorsal tergite and a ventral sternite and carries on both sides a spiracle	tagma	body
hairs	a very fine chitinized thread	structure	abdomen
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	abdomen
abdominal sclerites	any of the large or small sclerotized areas of the body wall; in arthropods, a hard, generally external plate bounded by sutures; a tanned, cuticular part	sclerit	abdomen
tergites	dorsal sclerite; the real, unmodified dorsal plates of the abdomen collectively	sclerit	abdominal sclerites

Table 5.109 continued from previous page

Body part	Definition	Type	part of
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tergites
hairs	a very fine chitinized thread	structure	tergites
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	tergites
sternites	a ventral sclerite; the real, unmodified ventral plates of the abdomen collectively	sclerit	abdominal sclerites
bristles	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	sternites
hairs	a very fine chitinized thread	structure	sternites
setae	a long setiform outgrowth that is strongly chitinized and may be in connection with a sensory nerve	structure	sternites
cerci	the pair of sensory appendages at the end of the insect abdomen; the generally short, unsegmented paired process at the end of the abdomen, sometimes variously modified or comprising many joints forming a thread-like filament	abdomen ap- pendages	abdomen
stylus	a slender appendage	abdomen ap- pendages	abdomen
malpighian tubules	the excretory tubules opening into the anterior end of the proctodaeum; the most important structure of the insects excretory organ, which may comprise cystiform or labyrinthine highly versatile tubules having their outlet into the initial section of the rectum	structure	abdomen
digestive system	the collective name for all the organs taking part in the process of digestion	structure	abdomen
salivary glands	the usual salivary glands of insects, opening by a median duct between the base of the hypopharynx and the labium, or on the hypopharynx; a complex glandular organ secreting digestive liquid material	structure	digestive system
digestive tube	a long enclosed coiled tube called the alimentary canal which runs lengthwise through the body	structure	digestive system

Table 5.109 continued from previous page

Body part	Definition	Type	part of
esophagus	the part of the cephalic section of the alimentary canal between the mouth and the crop; a tubular part of the stomodaeum between the pharynx and crop, or sometimes extending to the stomach	structure	digestive tube
gut	the main digestive organ of insects	structure	digestive tube
foregut	the anterior ectodermal part of the alimentary canal, the histological structure is simple with an external circular muscle sheath, generally conspicuous and with some longitudinal muscle fibers less prominent, a monolayered epithelium covered with a cuticle	structure	gut
crop	an enlargement of the oesophageal region of the stomodaeum; a diverticulum in the insect digestive system attached posteriorly to the esophagus, which stores food; the dilated esophageal region of the stomodaeum before the gizzard	structure	foregut
gizzard	the proximal sac-like part of the intestine, the inner surface of which is armed with many small chitinized teeth	structure	foregut
midgut	that part of the alimentary canal which lies between the gizzard and the hind intestine (the greatest portion lies in the abdomen)	structure	gut
mesenteron	the endodermal stomach, or ventriculus, of the insect; that part of the alimentary canal which lies between the gizzard and the hind intestine (the greatest portion lies in the abdomen)	structure	midgut
mixed segment	the overlap between the junction between the mesenteron and proctodeum	structure	midgut
stomodaeal valve	the cylindrical or funnel-shaped invagination of the posterior end of the stomodaeum into the cardiac part of the ventriculus	structure	midgut
hindgut	the most developed part of the gut, is quite complex and convoluted	structure	gut
ileum	the anterior part of the anterior intestine, between the ventriculus or pylorus and the colon; small intestine	structure	hindgut

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Body part	Definition	Type	part of
proctodeum	the posterior ectodermal part of the alimentary canal; the third, last section of the intestine comprising three principal sections: the small intestine, the large intestine and the rectum	structure	hindgut
1st proctodeal segment (P1)	the anterior part of the anterior intestine, between the ventriculus or pylorus and the colon; small intestine	structure	proctodeum
enteric valve (P2)	valve present in the posterior part of the termite digestive tube that may contain a cuticular structure with plates and spines; A short segment partly invaginated in the paunch(P3) and provided with a strong, mainly circular, musculature	structure	hindgut
enteric valve seating (S)	a rounded projection on the enteric valve	structure	enteric valve (P2)
paunch (P3)	the third hindgut segment, dilated after the enteric valve and its course is mostly postero-anterior such as to enter the midgut ring where the terminal part dorsally protudes	structure	hindgut
paunch (P3a)	part of the paunch that laying in the posterior part of the abdomen	structure	paunch (P3)
paunch (P3b)	part of the paunch that is more or less protruding dorsally above the midgut ring	structure	paunch (P3)
protuberance	a solid convex shape that juts out from paunch	structure	paunch (P3)
sphincter	a ring of muscle surrounding the opening of a hollow organ or body and contracting to close it	structure	paunch (P3)
isthmus	elongated sphincter separating paunch (P3) and colon (P4)	structure	hindgut
dorsal torsion	junction between paunch (P3), colon (P4) and isthmus	structure	hindgut
colon (P4)	the posterior part of the anterior intestine, between the ileum and the rectum; large intestine	structure	hindgut
colon (P4a)	the first segment of colon (P4)	structure	colon (P4)
colon (P4b)	the second segment of colon (P4)	structure	colon (P4)

Table 5.109 continued from previous page

Body part	Definition	Type	<i>part of</i>
rectum (P5)	the posterior intestine, including the rectal sac and the posterior, narrow rectum proper opening at the anus; the somewhat dilated, final section of the proctodaeum	structure	hindgut

Bibliography

- Acioli, AN, & Constantino, REGINALDO. 2015. A taxonomic revision of the neotropical termite genus *Ruptitermes* (Isoptera, Termitidae, Apicotermitinae). *Zootaxa*, **4032**(5), 451–492.
- Ahmad, M. 1965. Termites (Isoptera) of Thailand. *Bulletin American Museum of Natural History*, **131**, 1–113.
- Bourguignon, Thomas, & Roisin, Yves. 2011. Revision of the termite family Rhinotermitidae (Isoptera) in New Guinea. *ZooKeys*, 55.
- Bourguignon, Thomas, Scheffrahn, Rudolf H, Křeček, Jan, Nagy, Zoltán T, Sonet, Gontran, & Roisin, Yves. 2010. Towards a revision of the Neotropical soldierless termites (Isoptera: Termitidae): redescription of the genus *Anoplotermes* and description of *Longustitermes*, gen. nov. *Invertebrate Systematics*, **24**(4), 357–370.
- Bourguignon, Thomas, Scheffrahn, Rudolf H, Nagy, Zoltán Tamás, Sonet, Gontran, Host, Benoît, & Roisin, Yves. 2016. Towards a revision of the Neotropical soldierless termites (Isoptera: Termitidae): redescription of the genus *Grigiotermes* Mathews and description of five new genera. *Zoological Journal of the Linnean Society*, **176**(1), 15–35.
- Canello, E., & DeSouza, O. 2004. A New Species of *Glossotermes* (Isoptera): Reappraisal of the Generic Status with Transfer from the Rhinotermitidae to the Serritermitidae. *Sociobiology*, **44**(3), 1–20.
- Canello, E. M. 1986. Revisão de *Proconitermes* Emerson (Isoptera, Termitidae, Nasutitermitinae). *Papéis Avulsos de Zoologia*, **36**(19), 189–236.
- Canello, E. M., & Bandeira, A. G. 1992. *Macuxitermes triceratops* (Isoptera, Termitidae, Nasutitermitinae), a new genus and species from island of Maracá, Roraima. *Papéis Avulsos de Zoologia*, **38**(1), 1–8.
- Canello, E. M., & Myles, T. G. 2000. *Noirotitermes noiroti* (Isoptera, Termitidae, Nasutitermitinae): a new genus and new species from Northeastern Brazil. *Sociobiology*, **36**(3), 531–546.
- Canello, E. M., & Noirot, C. 2003. *Paraconvexitermes acangapua* (Isoptera: Termitidae, Nasutitermitinae), a new genus and new species of the so-called “small Neotropical soil-feeding nasutes” from South America. *Ann. Soc. Entomol. Fr.*, **39**(2), 187–193.
- Carrijo, T. F., & Canello, E. M. 2011. *Divinotermes* (Isoptera, Termitidae, Termitinae), A New Genus From South America. *Sociobiology*, **58**(3), 537–556.
- Carrijo, Tiago F, Cuezze, Carolina, & Santos, Rafaella G. 2015. *Tiunatermes mariuzani* gen. nov. et sp. nov., a new nasute termite from the Brazilian savannah (Isoptera: Termitidae). *Austral Entomology*, **54**(4), 358–365.
- Carvalho, S. H. C., & Constantino, R. 2011. Taxonomic Revision of the Neotropical Termite Genus *Curvitermes* Holmgren (Isoptera: Termitidae: Syntermitinae). *Sociobiology*, **57**(3), 643–657.

- Castro, Daniel, Scheffrahn, Rudolf H, & Carrijo, Tiago F. 2018. *Echinotermes biriba*, a new genus and species of soldierless termite from the Colombian and Peruvian Amazon (Termitidae, Apicotermatinae). *ZooKeys*, 21.
- Castro, Daniel, Constantini, Joice P, Scheffrahn, Rudolf H, Carrijo, Tiago F, & Canello, Eliana M. 2020. *Rustitermes boteroi*, a new genus and species of soldierless termites (Blattodea, Isoptera, Apicotermatinae) from South America. *ZooKeys*, **922**, 35.
- Chhotani, OB. 1997. *The Fauna of India and the Adjacent Countries. Isoptera (Termites):(Family Termifidae)-Vol. 2.*
- Constantini, Joice, Janei, Vanelize, Costa-Leonardo, Ana Maria, & Canello, Eliana M. 2020. *Dissimulitermes*, a new soldierless termite genus (Blattaria: Isoptera: Termitidae: Apicotermatinae) from the Neotropics and the histology of its dehiscent organ. *Insect Systematics & Evolution*, **52**(4), 412–427.
- Constantini, Joice P, & Canello, Eliana M. 2016. A taxonomic revision of the Neotropical termite genus *Rhynchotermes* (Isoptera, Termitidae, Syntermitinae). *Zootaxa*, **4109**(5), 501–522.
- Constantini, Joice P, Carrijo, Tiago Fernandes, Palma-Onetto, Valeria, Scheffrahn, Rudolf, Carnohan, Lucas Paul, Šobotník, J, & Canello, Eliana M. 2018. *Tonsuritermes*, a new soldierless termite genus and two new species from South America (Blattaria: Isoptera: Termitidae: Apicotermatinae). *Zootaxa*, **4531**(3), 383–394.
- Constantino, R. 1990. *Anhangatermes macarthuri*, a New Genus and Species of Soil-feeding Nasute Termite from Amapá, Brazil (Isoptera, Termitidae, Nasutitermitinae). *Goeldiana Zoologia*, 1–6.
- Constantino, R. 1991. *Ereymatermes rotundiceps*, new genus and species of termite from the Amazon Basin (Isoptera, Termitidae, Nasutitermitinae). *Goeldiana Zoologia*, 1–11.
- Constantino, R. 1994. A New Genus of Nasutitermitinae with Mandibulate Soldiers from Tropical North America (Isoptera: Termitidae). *Sociobiology*, **25**(2), 1–10.
- Constantino, R. 1995. Revision of the Neotropical Termite Genus *Syntermes* Holmgren (Isoptera: Termitidae). *The University of Kansas Science Bulletin*, **55**(13), 455–518.
- Constantino, R. 2002. The pest termites of South America: taxonomy, distribution and status. *Journal of Applied Entomology*, **126**(7-8), 355–365.
- Constantino, R. 2015. *Cupins do Cerrado*. Technical Books.
- Constantino, R., & Acioli, A. N .S. 2009. *Ngauratermes arue*, new genus and species of nasute termite (Isoptera: Termitidae) from the Amazon. *Zootaxa*, **2239**, 22–30.
- Constantino, R., & Carvalho, S. H. C. 2011. *Paracurvitermes*, a new genus of Syntermitinae (Isoptera: Termitidae). *Sociobiology*, **57**(2), 377–388.
- Constantino, R., & Carvalho, S. H. C. 2012. A taxonomic revision of the Neotropical termite genus *Cyrrillotermes* Fontes (Isoptera, Termitidae, Syntermitinae). *Zootaxa*, **3186**, 25–41.

- Constantino, R., & DeSouza, O. 1997. Key to the soldiers of *Atlantitermes* Fontes 1979, with a new species from Brazil (Isoptera, Termitidae, Nasutitermitinae). *Tropical Zoology*, **10**, 205–213.
- Constantino, R., Liotta, J., & Giacosa, B. 2002. A Reexamination of the Systematic Position of *Amitermes brevicorniger*, with the Description of a New Genus (Isoptera, Termitidae, Termitinae). *Sociobiology*, **39**(3), 1–11.
- Constantino, R. et al. 2006. A taxonomic revision of the Neotropical termite genera *Labiotermes* Holmgren and *Paracornitermes* Emerson (Isoptera: Termitidae: Nasutitermitinae). *Zootaxa*, **1340**, 1–44.
- Constantino, Reginaldo. 2016. *Termite Database*. Available from: <<http://termitologia.net>>: Departamento de Zoologia, Universidade de Brasília. Updated in Sept 2020.
- Cuezzo, C., & Nickle, D. A. 2011. A new genus and species of termites (Isoptera, Termitidae, Nasutitermitinae) from the rainforest of northern Peru. *ZooKeys*, **159**, 1–9.
- Cuezzo, Carolina, Canello, Eliana M, Carrijo, Tiago F, et al. 2017. *Sandsitermes* gen. nov., a new nasute termite genus from South America (Isoptera, Termitidae, Nasutitermitinae). *Zootaxa*, **4221**(5), 562–574.
- Engel, M. S., & Krishna, K. 2007. New *Dolichorhinotermes* from Ecuador and in Mexican Amber (Isoptera: Rhinotermitidae). *Amer*, **3592**, 1–8.
- Ensaf, A., Ponchel, Y., & Nel, A. 2003. *Rounditermes dechambrei*, new genus and species of Nasutitermitinae from French Guiana. *Bulletin de la Société Entomologique de France*, **108**(1), 49–53.
- Fontes, L. R. 1981. *Caetetermes taquarussu*, a new genus and species of ecuadorian nasute (Isoptera, Termitidae, Nasutitermitinae). *Revista Brasileira de Entomologia*, **25**(2), 135–140.
- Fontes, L. R. 1982. Novos taxons e novas combinações nos cupins nasutos geófagos da região Neotropical (Isoptera, Termitidae, Nasutitermitinae). *Revista Brasileira de Entomologia*, **26**(1), 99–108.
- Fontes, L. R. 1985. New genera and new species of Nasutitermitinae from the neotropical region (Isoptera: Termitidae). *Revista Brasileira de Zoologia*, **3**(1), 7–25.
- Fontes, L. R. 1986. Two New Genera of Soldierless Apicotermitinae From the Neotropical Region (Isoptera, Termitidae). *Sociobiology*, **12**(2), 285–297.
- Hellemans, Simon, Bourguignon, Thomas, Kyjaková, Pavlína, Hanus, Robert, & Roisin, Yves. 2017. Mitochondrial and chemical profiles reveal a new genus and species of Neotropical termite with snapping soldiers, *Palmitermes impostor* (Termitidae: Termitinae). *Invertebrate Systematics*, **31**(4), 394–405.
- Krishna, K. 1961. A generic revision and phylogeny study of the family Kalotermitidae (Isoptera). *Bulletin American Museum of Natural History*, **122**, 303–408.

- Krishna, K. 1962. New Species and a Hitherto Undescribed Imago Caste of the Genus *Calcaritermes* Snyder (Isoptera, Kalotermitidae). *American Museum Novitates*, **2098**, 1–14.
- Krishna, K. 1968. Phylogeny and Generic Reclassification of the *Capritermes* Complex (Isoptera, Termitidae, Termitinae). *Bulletin American Museum of Natural History*, **138**(5), 261–324.
- Krishna, Kumar, Grimaldi, David A, Krishna, Valerie, & Engel, Michael S. 2013. Treatise on the Isoptera of the world. (Bulletin of the American Museum of Natural History, no. 377).
- Light, S.F. 1933. *Termites of Western Mexico, by S.F. Light*. University of California.
- Light, Sol Felty. 1932. *Contribution Toward a Revision of the American Species of "Amitermes Silvestri"*. University of California Press.
- Mathews, A. G. A. 1977. *Estudies on termites from the Mato Grosso State, Brazil*. Academia Brasileira de Ciências.
- Oliveira, DANILO E, Rocha, Mauricio R, & Canello, Eliana M. 2015. *Muelleritermes*: A new termite genus with two species from the Brazilian Atlantic Forest (Isoptera: Termitidae: Nasutitermitinae). *Zootaxa*, **4012**(2), 258–270.
- Rocha, M. M., & Canello, E. M. 2007. Estudo Taxonômico de *Cylindrotermes Holmgren* (Isoptera, Termitidae, Termitinae). *Papéis Avulsos de Zoologia*, **47**(10), 137–152.
- Rocha, M. M., & Canello, E. M. 2009. Revision of the Neotropical termite genus *Orthognathotermes* Holmgren (Isoptera: Termitidae: Termitinae). *Zootaxa*, **2280**, 1–26.
- Rocha, Mauricio M, Canello, Eliana M, & Cuezso, Carolina. 2011. A new genus and species of mandibulate nasute termite (Isoptera, Termitidae, Syntermitinae) from Brazil. *ZooKeys*, 125.
- Rocha, Mauricio Martins, Canello, Eliana Marques, & Carrijo, Tiago Fernandes. 2012. Neotropical termites: revision of *Armitermes* Wasmann (Isoptera, Termitidae, Syntermitinae) and phylogeny of the Syntermitinae. *Systematic Entomology*, **37**(4), 793–827.
- Roisin, Y., Scheffrahn, R. H., & Krecek, J. 1996. Generic Revision of the Smaller Nasute Termites of The Greater Antilles (Isoptera: Termitidae: Nasutitermitinae). *Annals of Entomological Society of America*, **89**(6), 775–787.
- Roisin, Yves. 1995. Humivorous nasute termites (Isoptera: Nasutitermitinae) from the Panama Canal area. *Belgian Journal of Zoology*, **125**, 283–300.
- Roonwal, M. L. (Mithan Lal), of India, Zoological Survey, Roonwal, M. L. (Mithan Lal), 1908, & Chhotani, O. B. 1989. *The Fauna of India and the adjacent countries. Isoptera (Termites)*. Calcutta. ISBN 8185874026 (v.2).

- Scheffrahn, R. H., & Krecek, J. 1999. Termites of the genus *Cryptotermes* Banks (Isoptera: Kalotermitidae) from the West Indies. *Insecta Mundi*, **13**(3-4), 111–171.
- Scheffrahn, Rudolf H. 2013. *Compositermes vindai* (Isoptera: Termitidae: Apicotermitinae), a new genus and species of soldierless termite from the Neotropics. *Zootaxa*, **3652**(3), 381–391.
- Scheffrahn, Rudolf H, Carrijo, Tiago F, Postle, Anthony C, & Tonini, Francesco. 2017. *Disjunctitermes insularis*, a new soldierless termite genus and species (Isoptera, Termitidae, Apicotermitinae) from Guadeloupe and Peru. *ZooKeys*, 71.
- Snyder, Thomas Elliott, *et al.* 1949. Catalog of the termites (Isoptera) of the world. *Catalog of the Termites (Isoptera) of the World*.
- Uys, V. M. 2002. *A guide to the termite genera of Southern Africa*. Plant Protection Research Institute.