Zootaxa 1340: 1–44 (2006)
www.mapress.com/zootaxa/

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

1340

A taxonomic revision of the Neotropical termite genera *Labiotermes* Holmgren and *Paracornitermes* Emerson (Isoptera: Termitidae: Nasutitermitinae)

REGINALDO CONSTANTINO[1], AGNO N.S. ACIOLI[2], KAREN SCHMIDT[1], CAROLINA CUEZZO[3], SÉRGIO H.C. CARVALHO[1] & ALEXANDRE VASCONCELLOS[4]

[1]*Depto de Zoologia, Universidade de Brasília, 70910-900 Brasília, DF, Brazil. E-mail: constant@unb.br*
[2]*PPG Entomologia, INPA, Cx. Postal 478, 69011-970 Manaus, AM, Brazil. E-mail: acioli@inpa.gov.br*
[3]*Instituto Superior de Entomología Dr. A. Willink, Miguel Lillo 205, T4000JFE - San Miguel de Tucumán, Argentina. E-mail: carolinacuezzo@csnat.unt.edu.ar*
[4]*Depto de Botânica, Ecologia e Zoologia, Universidade Federal do Rio Grande do Norte, 59072-970, Natal, RN, Brazil. E-mail: alexvasconcellos@yahoo.com.br*

Table of contents

Accepted by S. Kambhampati: 4 Sept. 2006; published: 23 Oct. 2006

Abstract

The taxonomy of the South American termite genus *Labiotermes* Holmgren (*sensu novo*) is revised, including identification keys to soldiers and workers, and distribution maps for all 10 species. *Paracornitermes* Emerson is treated as a new synonym of *Labiotermes*. Two new species are described: *L. guasu*, from the Amazon rain forest and *L. oreadicus*, from the Cerrado of central Brazil. *Paracornitermes caapora* Bandeira & Cancello and *P. hirsutus* Araujo are placed under the synonymy of *L. orthocephalus*. The imagos of *L. emersoni* and *L. orthocephalus* are described for the first time. The workers of all species are described and illustrated, including the enteric valve armature and the mixed segment. The soldiers of the species previously included in *Paracornitermes* are redescribed.

Key words: Isoptera, Termitidae, *Labiotermes*, *Paracornitermes*, revision, new species, new synonymy

Introduction

Labiotermes and *Paracornitermes* are large soil-feeding termites endemic to South America. Most species are subterranean, live in savannas and forests and are relatively difficult to find and collect. The only exception is *Labiotermes labralis*, which builds a conspicuous arboreal nest and can reach high densities in some parts of the Amazon rain forest.

The first species of this group were described by Silvestri (1901; 1903) and placed in the genus *Cornitermes* Wasmann: *C. laticephalus*, *C. longilabius* and *C. orthocephalus*, all from the Cerrado of Mato Grosso, Brazil. Holmgren (1906) described *Cornitermes labralis* from the Amazon forest of Peru. Later, Holmgren (1912) placed these four species in his new subgenus *Labiotermes*. Emerson (in Snyder 1949) transferred *C. laticephalus* and *C. orthocephalus* from *Labiotermes* to the new genus *Paracornitermes*. Araujo (1954) redescribed the genus *Paracornitermes* and described two new species from Brazil, *P. emersoni* and *P. hirsutus*. Emerson & Banks (1965) revised the taxonomy of *Labiotermes*, describing two additional species: *L. brevilabius*, from Brazil, and *L. pelliceus*, from Guyana.

Mathews (1977), in a faunistic study on the termites of Mato Grosso, Brazil, redescribed the genera *Labiotermes* and *Paracornitermes* and described a new species, *L. leptothrix*. He also noted the strong similarities between these genera and argued that they should be merged into a single genus. They form a very distinct and homogeneous group of species, with similar morphology and habits.

In this paper we revise the taxonomy of *Labiotermes* and *Paracornitermes*, including the description of two new species, one from the Cerrado of central Brazil and the other from the Amazon rain forest. *Paracornitermes* is treated as a synonym of *Labiotermes*. We describe the workers of all species and the previously unknown imagos of *L. emersoni* and

L. orthocephalus, and provide identification keys to both soldiers and workers. Soldiers of species previously included in *Paracornitermes* are redescribed.

Material and methods

Drawings were prepared with a camera lucida attached to a stereoscopic microscope. Enteric valves were dissected and examined under a stereoscopic microscope, and, in most cases, also mounted on slides for examination in a compound microscope.

The terminology used for imago and worker mandibles follows Sands (1998), and is indicated in Fig. 12A. The left mandible has 4 marginal teeth: M1, M2 (absent or reduced in most Termitidae), M3, and M4 (marginal subsidiary or molar tooth). The right mandible has only 2 marginal teeth: M1 and M2. The left mandible index is the ratio between the distance from A to M1 and the distance from M1 to M3.

Terms used for pilosity are comparative. Bristles are stiff hairs with well-marked bases (usually trichoid sensillae). Fine hairs are finer than bristles, usually curved or curly and with inconspicuous bases. Microscopic hairs are very short and only visible with high magnification, usually 40X or more (e.g. in *Labiotermes leptothrix*). Spines are short conical processes.

Measurements presented in Tables 1–3 were taken with a micrometric reticle on the eyepiece of a dissection microscope. A description of these measurements can be found in Roonwal (1970) and his respective numbers are indicated in parentheses: LH: length of head to side base of mandibles (5); WH: width of head without eyes, if present (18); LM: length of left mandible (37); LT: length of hind tibia (85); WP: width of pronotum (68); LP: length of pronotum (65); DE: diameter of eye (48); LO: length of ocellus (55). All available imagos as well as most soldiers were measured; workers were selected for measurement from most samples and all localities.

The distribution maps were prepared with the Generic Mapping Tools (Wessel & Smith 1998) based on the material examined and on published records from Silvestri (1903), Holmgren (1906), Emerson (1925), Snyder (1926), Araujo (1954), Emerson & Banks (1965), Mathews (1977), Bandeira *et. al.* (2003), and Torales *et. al.* (2005). The records of *Labiotermes emersoni* and *L. longilabius* in Paraguay were provided by Y. Roisin (pers. comm.). The list of localities and their respective coordinates are in the Appendix.

The following entomological collections are mentioned in this work. **AMNH**: American Museum of Natural History, New York, USA. **DEZA**: Dipartimento di Entomologia e Zoologia Agraria dell'Università, Portici, Italy. **DSEC**: Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, João Pessoa, Brazil. **IFML**: Instituto-Fundación Miguel Lillo, Tucumán, Argentina. **INPA**: Instituto Nacional de Pesquisas da Amazonia, Manaus, Brazil. **MCSN**: Museo Civico di Storia Naturale Giacomo Doria, Genova, Italy. **MPEG**: Museu Paraense Emílio Goeldi, Belém, Brazil.

MZSP: Museu de Zoologia da Universidade de São Paulo, Brazil. **NHRS**: Naturhistoriska riksmuseet, Stockholm, Sweden. **UFVB**: Departamento de Biologia Animal, Universidade Federal de Viçosa, Brazil. **UnB**: Departamento de Zoologia, Universidade de Brasília, Brazil.

The list of material examined is sorted by country (uppercase and bold), state or province (italics), and locality. Collection data is listed as follows: castes present (s.= soldier, w.= worker, im.= imago); date; name of the collector; collection and lot number, if any, in parentheses.

Genus *Labiotermes* Holmgren

Cornitermes (*Labiotermes*) Holmgren, 1912: 50
Labiotermes Holmgren in Sjöstedt 1926: 150 [part]; Emerson & Banks 1965 [revision]; Mathews 1977: 207–208 [redescription]

Type-species: *Cornitermes labralis* Holmgren, designated by Sjöstedt (1926: 150).

New synonym: *Paracornitermes* Emerson (in Snyder 1949: 333). Type-species: *Cornitermes laticephalus* Silvestri, 1901; Mathews 1977: 203–207 [redescription].

Etymology: Holmgren (1912) does not mention the etymology. Based on his diagnosis, the name *Labiotermes* apparently comes from the Latin word *labium*, lip, and refers to the enlarged labrum of the soldiers of some species, especially *L. labralis*.

Imago. Head capsule rounded. Eyes medium to large. Ocelli conspicuous. Fontanelle triangular, eliptical or elongate. Postclypeus moderately to strongly inflated; median line conspicuous. Mandibles similar to workers, except that the molar plate is narrow. Antennae with 16–18 articles. Pronotum almost as wide as head with eyes. Tibial spurs 2:2:2.

Soldier. Monomorphic or dimorphic. Head capsule large and subrectangular in dorsal view. Frontal tube short, never reaching the labrum. Antennae with 15–16 articles. Labrum long, tongue-shaped, with convex sides and a hyaline tip. Mandibles robust. Left mandible with two marginal teeth, large in some species and vestigial in others. Right mandible with one or two marginal teeth close to its base. Pronotum with strongly raised anterior lobe. Meso- and metanotum with a row of minute spines on lateral margins. Front coxa with or without a lateral projection near base. Front and middle femur with numerous short and thick bristles on dorsal side. Tibial spurs 2:2:2.

Worker. Monomorphic. Head capsule light colored. Abdomen very large and transparent, showing dark gut content. Left mandible: left mandible index 0.8–1.4; M1 large and conspicuous; M2 absent; M3 smaller than M1; cutting edge between M1 and M3 sinuous; distance from M3 to M4 more than half the distance from M1 to M3; M4 hidden under the molar prominence in dorsal view. Right mandible: M1 large and conspicuous; M2 small; molar plate wide and concave, without ridges. Antennae with 15–16 articles.

Pronotum with strongly raised anterior lobe. Meso- and metanotum with a row of minute spines on lateral margins. Front coxa with or without a lateral projection near base. Front and middle femur with numerous short and thick bristles on dorsal side. Tibial spurs 2:2:2.

Gut morphology (worker). Crop small. Mixed segment with one large and one small mesenteric lobe (the small one is vestigial in *L. brevilabius*). Malpighian tubules inserted in two pairs at the junction of mesenteron and proctodeum, between the mesenteric lobes. Proctodeum very large. First segment (P1) strongly dilated, about the same size as the third (P3 or paunch). Enteric valve wide. Armature with 1–6 ridges of irregular sizes covered with short and straight or long and curved, hair-like spines.

Comparisons. *Labiotermes* belongs to a group which also includes *Syntermes*, *Procornitermes* and *Cornitermes*. They share similar soldiers, with more or less rectangular head capsule, short frontal tube and strong mandibles, and similar gut morphology. Soldiers and workers of *Labiotermes* can be readily identified by the presence of a line of minute spines on the lateral margins of both the meso- and metanotum. The imagos of 4 species of *Labiotermes* remain unknown, and the same is true for several species among the related genera. The imagos of *Syntermes* have antennae with 19–21 articles and their tibial spurs are 3:2:2. The imagos of both *Syntermes* and *Cornitermes* have mandibles with short apical teeth and conspicuous molar ridges. The imagos of *Procornitermes* are more difficult to distinguish because some species have antennae with 15–16 articles and mandibles without molar ridges. They can be differentiated by the narrower gap between M3 and M4 on left mandible. *Armitermes* and *Embiratermes* are heterogeneous, probably non-monophyletic genera and the imagos of many species remain unknown. They are generally smaller and have antenna with 15 articles, but the mandibles of their imagos are very similar to those of *Labiotermes*.

Remark 1. The new synonymy is justified because these species comprise a relatively small, very uniform and clearly monophyletic group. The separation of *Paracornitermes* from *Labiotermes* was based only on the larger teeth of soldier mandibles of the former. The dentition of soldier mandibles, however, can be quite variable between different species of the same genus (Fig. 11) and often shows significant intra-specific variation.

Remark 2. Neither Holmgren (1912) nor Emerson & Banks (1965) presented a diagnosis or formal description of *Labiotermes*, and the original description of *Paracornitermes* was very brief. Araujo (1954) redescribed *Paracornitermes* in a little more detail. The most detailed previous descriptions of both genera were those presented by Mathews (1977), who argued that they should be merged into a single genus.

Remark 3. The following species were previously included in *Labiotermes* but are clearly unrelated: *Cornitermes corniferous* Sjöstedt, *Cornitermes rhinoceros* Sjöstedt and *Ceratotermes valens* Silvestri (Holmgren 1912; Sjöstedt 1926). Their soldiers are superficially similar to those of *Labiotermes*, but the worker morphology show a completely different pattern (Sands 1998). Snyder (1949) lists these African species in the genus *Ceratotermes*, subfamily Termitinae. The taxonomic position of *Ceratotermes* is

discussed by Emerson (1952: 481–482), who argues that it is not related to *Labiotermes*. Later, Krishna (1963) transferred these three species to the genus *Foraminitermes* Holmgren.

Remark 4. *Labiotermes* and *Paracornitermes* have been included in Nasutitermitinae by most previous authors. Engel & Krishna (2004) transferred *Labiotermes* to their new subfamily Syntermitinae, which also includes *Syntermes*, *Cornitermes* and *Procornitermes*. However, they did not mention *Paracornitermes* nor the other 9 genera of mandibulate nasutes (*Armitermes*, *Cahuallitermes*, *Curvitermes*, *Cyrilliotermes*, *Embiratermes*, *Ibitermes*, *Macuxitermes*, *Noirotitermes* and *Rhynchotermes*). The phylogenetic relations of the mandibulate nasutes are not clear (Donovan *et al.* 2000), and according to Miller (1986) they form a paraphyletic group. In our opinion, the separation of these 4 genera in a new subfamily is not a satisfactory solution. Three questions remain unanswered: 1) are the mandibulate nasutes a monophyletic or paraphyletic group? 2) is subfamily Nasutitermitinae monophyletic or polyphyletic including the mandibulate nasutes? 3) how are *Syntermes*, *Cornitermes*, *Procornitermes*, and *Labiotermes* related to the other 9 genera of mandibulate nasutes? In any case, the removal of these four genera from Nasutitermitinae will not solve any real problem nor improve the classification.

Habits. All species of *Labiotermes* are humivores and live either in savannas or forests. Their workers have large abdomens and particles of mineral soil are easily visible in the gut content. The nest of *L. labralis* is arboreal, while the nests of the other species are subterranean, or sometimes found inside termitaria built by other species, such as *Cornitermes* spp.

Geographic distribution. *Labiotermes* occurs in most South American countries, with a southern limit near 26S. It also occurs in Trinidad, but does not reach Central America. The absence of records from Ecuador is certainly due to limited sampling.

Economic importance. There are a few records of *Labiotermes* spp. present in agricultural systems (e.g. Calderon & Constantino, in press), but there is no direct observation of damage. Since they are humivores, they are certainly not structural pests.

Key to the soldiers of *Labiotermes*

1. Left mandible with two conspicuous marginal teeth (Fig. 11B) 2
- Left mandible with vestigial teeth (Fig. 11A) 6
2. Front coxa with a distinct projection on outer margin near base (Fig. 9E) 3
- Front coxa without a distinct projection near base (Fig. 3F) 5
3. Cutting margin of apical tooth on left mandible C-shaped (Fig. 11I) *L. orthocephalus*
- Cutting margin of apical tooth on left mandible S-shaped (Fig. 11B) 4
4. Frontal tube distinctly conical, with a narrow tip oriented anteriorly; dimorphic (Fig. 5) ..... *L. laticephalus*
- Frontal tube short with a broad tip oriented upward; monomorphic (Fig. 2) .....

..... *L. emersoni*

5. Head with numerous hairs; front femur without short spines (Fig. 8) .... *L. oreadicus*, **new species**
- Head with very few hairs; front femur with an irregular row of short spines (Fig. 3) ... . *L. guasu*, **new species**
6. Head densely covered with microscopic hairs (Fig. 6A) or with long, fine hairs 7
- Head with sparse bristles but without fine or microscopic hairs (Figs. 1A, 7A) 8
7. Head densely covered with fine long hairs ..... *L. pelliceus*
- Head densely covered with microscopic hairs (Fig. 6) ..... *L. leptothrix*
8. Right mandible with two distinct marginal teeth (Fig. 11D); sides of head convex and converging towards front; part of labrum with hyaline border elongate and with 2 distinct bristles near tip ..... *L. labralis*
- Right mandible with a single marginal tooth (Figs. 11A, 11G); sides of head nearly straight and parallel; part of labrum with hyaline border short and with 4 bristles along the line between sclerotized part and hyaline part 9
9. Labrum clearly longer than wide; head with only a few sparse bristles (Fig. 7); front coxa with a small and rounded projection near base ..... *L. longilabius*
- Labrum about as wide as long; head with numerous bristles of variable size (Fig. 1); front coxa with a conspicuous conical projection near base ..... *L. brevilabius*

Key to the workers of *Labiotermes*

Workers of *Labiotermes* can be readily identified by the presence of a row of short spines on lateral margins of meso- and metanotum (Fig. 4C) and the enlarged abdomen. Identification to species level usually requires examination of the enteric valve armature (Fig. 16).

1. Front coxae rounded, without any projection near base (Figs. 3J, 4D, 8J) 2
- Front coxae with a rounded or conical projection near base (Figs. 1G, 7F) 4
2. Enteric valve with 3 large and one small ridge covered with short spines (Fig. 16D) ... . *L. labralis*
- Enteric valve with 3 or 6 ridges partially covered with dense, long hairs (Figs 16C, 16H) 3
3. Head with very few hairs (Fig. 3G); enteric valve with 6 distinct ridges (Fig. 16C) .... *L. guasu*, **new species**
- Head with numerous hairs (Fig. 8G); enteric valve with 3 distinct ridges of unequal and 3 vestigial ridges (Fig. 16H) ..... *L. oreadicus*, **new species**
4. Projection on front coxae conical, with a sharp point (Fig. 1G) 5
- Projection on front coxae without a sharp point (Fig. 2O, 6F) 6
5. Enteric valve with a single ridge covered with very short spines (Fig. 16A); width of head 0.95–1.2mm ..... *L. brevilabius*

- Enteric valve with 6 distinct ridges of irregular shape, covered with long, fine and straight spines (Fig. 16I); width of head 1.25–1.7mm ..... *L. orthocephalus*

6. Head and body densely covered with fine, long hairs (Fig. 10); enteric valve with 6 ridges covered with long and curved spines (Fig. 16J) ..... *L. pelliceus*

- Head with numerous short hairs (Figs. 2L, 5M); enteric valve with 4–6 ridges covered with straight spines (Fig. 16B, E–G) 7

7. Mandibles with very large apical teeth; left mandible index ca. 1.4; enteric valve with 5 elongate ridges (Fig. 16F) ..... *L. leptothrix*

- Left mandible index less than 1.1; enteric valve with 4–6 ridges 8

8. Front and middle trocanters with small spines; enteric valve with 6 finger-like ridges (Fig. 16G) ..... *L. longilabius*

- Front and middle trocanters without small spines; enteric valve with 4–6 ridges (usually 4) 9

9. Posterior margin of mesonotum with only a few lateral hairs (Fig. 2M); head and postclypeus with sparse hairs (Fig. 2L); length of hind tibia 1.2–1.5mm ..... *L. emersoni*

- Posterior margin of mesonotum with a line of 8 or more hairs (Fig. 5N); head and postclypeus with dense hairs (Fig. 5M); length of hind tibia 1.5–1.7mm ... *L. laticephalus*

Labiotermes brevilabius Emerson & Banks

Labiotermes brevilabius Emerson & Banks, 1965: 24–28 [imago (Fig. 7), soldier (Fig. 8)]; Fontes 1998: 374 [gut, figs. 21–24]

Holotype: soldier (AMNH), not examined.

Type-locality: Brazil: São Paulo, Novo Horizonte.

Imago (Fig. 12A) Described and illustrated by Emerson & Banks 1965: 24–26. Additional measurements are presented in Table 1.

Soldier (Figs. 1A–C, 11A). Described by Emerson & Banks 1965: 26–27. Additional measurements are presented in Table 2.

Comparisons. The most similar species is *L. longilabius*, which has fewer bristles on the head, labrum more elongate and with a distinct shape of the hyaline tip, and projection on front coxa small and rounded. *L. leptothrix* is also similar, but its head is densely covered with microscopic hairs. The other species are conspicuously larger.

Worker (Figs. 1D–G, 13A, 15A–B, 16A). Head capsule and postclypeus with numerous straight bristles. Pronotum with numerous bristles on anterior lobe and a few bristles on posterior margin. Mesonotum with a line of bristles on posterior margin. Front coxawith a conspicuous lateral conical projection near base. Antenna with 15 articles. Fontanelle large and rounded. Enteric valve with a single, wide and flat ridge, covered with minute spines. Mixed segment with a single, elongate, mesenteric lobe; small lobe vestigial. Measurements in Table 3.

TABLE 1. Measurements of imagos of *Labiotermes*. WH= width of head; LH= length of head; WP= width of pronotum; LT= length of hind tibia; LP= length of pronotum; DE= diameter of eye; LOc= length of ocelus; n= number of specimens measured.

	WH		LH		LT		LP	
	range	mean	range	mean	range	mean	range	mean
L. brevilabius	1.15–1.5	1.27	0.9–1.35	1.11	1.55–1.9	1.76	0.7–0.9	0.78
L. emersoni	1.45–1.75	1.63	1.1–1.35	1.27	1.8–2.3	2.17	0.75–1.0	0.91
L. labralis	1.35–1.65	1.49	1.2–1.35	1.25	2.35–2.8	2.49	0.8–1.05	0.94
L. orthocephalus	1.55–2.0	1.78	1.35–1.6	1.46	2.6–3.2	2.94	0.95–1.45	1.20

continued.

	WP		DE		LOc		
	range	mean	range	mean	range	mean	n
L. brevilabius	1.15–1.5	1.31	0.4–0.55	0.48	0.15–0.25	0.19	65
L. emersoni	1.45–1.75	1.60	0.4–0.55	0.49	0.20	0.20	46
L. labralis	1.45–1.65	1.53	0.6–0.75	0.67	0.25–0.3	0.25	16
L. orthocephalus	1.6–2.2	2.00	0.6–0.95	0.76	0.25–0.3	0.27	15

Comparisons. The enteric valve armature and the mixed segment are distinct from all other species of *Labiotermes*.

Geographical distribution. *L. brevilabius* shows a peculiar geographic pattern, occurring only in the eastern portion of the Cerrado biome, including some patches of cerrado vegetation in northeastern Brazil (Fig. 17). Most samples come from cerrado vegetation (savanna), but there are also records from urban areas and *Eucalyptus* plantations.

Material examined

BRAZIL. *Ceará*. Crato: s., w., im., 10.xi.1975, R.L. Araujo (MZSP-6388). *Distrito Federal*. Fazenda Água Limpa: s., w., 26.v.1994, R. Constantino (UnB-0002). Reserva Ecológica do IBGE: s., w., im., 18.ix.1998, R. Constantino (UnB-1278, 1284, 1290, 1299). *Goiás*. Minaçu, UHE Serra da Mesa: s., w., 26.ii.1997, R. Constantino (UnB-0237, 0238). *Minas Gerais*. Araguari: s., w., im., 08.xi.1972, R.L. Araujo (MZSP-5685). Bocaiúva: s., 20.xi.1998, N.R.A. Castro (UnB-1779). Paracatu, Fazenda Rossato: s., w., im., 27.x.2001, R. Constantino (UnB-3089). Paracatu, Fazenda Susano: s., w., 28.x.2001, R. Constantino (UnB-3132); s., w., 01.xi.2001, R. Constantino (UnB-3258). Guarda-Mor: s., 29.x.2001, R. Constantino (UnB-3139). Buritis, Fazenda São Miguel: s., w., 01.viii.2002, R.A. Calderon (UnB-4796, 4846, 4848, 4856). Lagoa Santa: s., w., im., 12.xi.1992, M.P. Andrade (UnB-2339); s., w., im., 01.x.1992, T.A. Gontijo (UnB-2340). Parque Nacional Grande Sertão Veredas: s., w., 17.iv.2000, J. Dalponte (UnB-2713). *Piauí*. Corrente: s., w., 27.xi.1991, E.M. Cancello (MZSP-10166). Parque Nacional de Sete Cidades: s., w.,

12.xii.1976, R.L. Araujo (MZSP-7176). *Tocantins*. Dianópolis, Fazenda Novo Iguaçu: s., w., 25.ix.2003, D.L. Bernardo (UnB-5115); s., w., 28.ix.2003, F. Godoy (UnB-5147, 5148).

TABLE 2. Measurements of soldiers of *Labiotermes.* WH= width of head; LH= length of head; LM= length of left mandible; LT= length of hind tibia; WP= width of pronotum; n= number of specimens measured.. *L. laticephalus* has two soldiers: major (1) and minor (2).

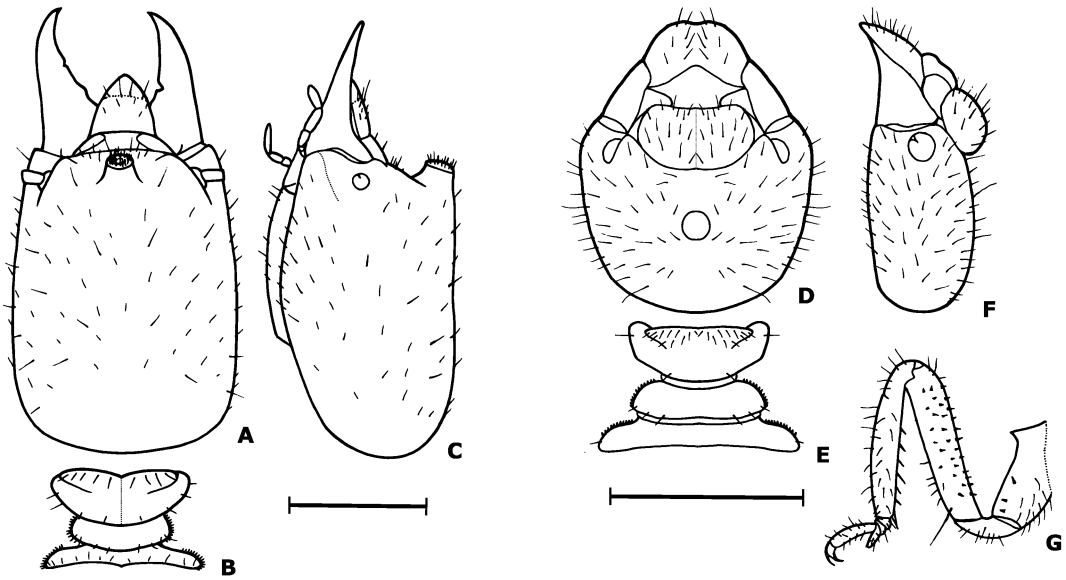
	WH		LH		LM	
	range	mean	range	mean	range	mean
L. brevilabius	1.45–1.8	1.63	1.95–2.4	2.19	0.8–1.1	0.99
L. emersoni	2.1–3.05	2.55	2.6–3.5	3.10	1.1–1.55	1.43
L. guasu	3.1–3.9	3.54	3.35–4.3	4.00	2.15–2.6	2.39
L. labralis	1.9–2.8	2.41	2.2–3.4	2.80	1.1–1.6	1.42
L. laticephalus 1	3.4–3.7	3.57	3.65–4.0	3.84	1.5–1.75	1.62
L. laticephalus 2	2.6–3.2	2.92	2.9–3.7	3.31	1.35–1.6	1.51
L. leptothrix	1.95–2.45	2.26	2.35–2.95	2.72	1.0–1.35	1.25
L. longilabius	1.5–2.3	1.94	1.7–2.55	2.34	0.8–1.3	1.13
L. oreadicus	-	3.67	-	4.13	-	1.95
L. orthocephalus	2.3–3.4	2.88	2.9–3.8	3.41	1.2–1.75	1.54
L. pelliceus	2.2–2.6	2.45	2.5–3.05	2.87	1.25–1.5	1.35

continued.

	LT		WP		
	range	mean	range	mean	n
L. brevilabius	1.2–1.5	1.30	0.9–1.1	1.01	95
L. emersoni	1.65–2.1	1.92	1.1–1.6	1.39	120
L. guasu	2.7–3.2	3.01	2.5–2.9	2.74	17
L. labralis	1.4–2.5	2.08	1.2–1.8	1.64	204
L. laticephalus 1	2.2–2.5	2.32	1.7–1.9	1.79	7
L. laticephalus 2	1.95–2.3	2.16	1.35–1.8	1.56	12
L. leptothrix	1.55–1.8	1.70	1.2–1.5	1.36	42
L. longilabius	1.35–1.8	1.60	0.85–1.3	1.12	84
L. oreadicus	-	2.50	-	2.11	1
L. orthocephalus	2.0–2.4	2.25	1.35–1.8	1.71	166
L. pelliceus	1.85–2.0	1.92	1.3–1.6	1.46	37

TABLE 3. Measurements of workers of *Labiotermes*. WH= width of head; LT= length of hind tibia; WP= width of pronotum; n= number of specimens measured.

	WH		WP		LT		
	range	mean	range	mean	range	mean	n
L. brevilabius	0.95–1.2	1.08	0.5–0.75	0.60	0.95–1.2	1.04	138
L. emersoni	1.15–1.65	1.44	0.7–0.9	0.80	1.2–1.55	1.42	257
L. guasu	1.55–1.8	1.70	1.0–1.25	1.16	1.95–2.3	2.10	54
L. labralis	1.1–1.55	1.34	0.6–0.95	0.79	1.15–1.6	1.45	297
L. laticephalus	1.35–1.7	1.52	0.7–1.05	0.90	1.45–1.75	1.62	70
L. leptothrix	1.15–1.4	1.28	0.7–0.85	0.76	1.15–1.4	1.30	87
L. longilabius	1.0–1.4	1.20	0.6–0.85	0.71	0.85–1.45	1.23	122
L. oreadicus	1.55–1.75	1.64	1.09–1.2	1.12	2.0–2.1	2.10	10
L. orthocephalus	1.25–1.7	1.48	0.7–1.25	0.94	1.4–1.9	1.72	332
L. pelliceus	1.2–1.4	1.31	0.65–0.85	0.78	1.25–1.35	1.32	67



FIGURES 1. *Labiotermes brevilabius*. Soldier: A, head in dorsal view; B, thorax; C, head in profile. Worker: D, head in dorsal view; E, thorax; F, head in profile; G, right front leg. Scale bars = 1.0 mm.

Labiotermes emersoni (Araujo), new combination

Paracornitermes emersoni Araujo, 1954: 183 [soldier]; Fontes 1998: 374 [gut, figs. 17–20]

Holotype: soldier (MZSP), examined.

Type-locality: Brazil: São Paulo.

Imago (Figs. 2H–K, 12B). Head capsule rounded; fontanelle conspicuous, elliptical, about the same size as antennal socket. Eyes oval, moderately large, separated from the lower margin of head capsule by about 1/5 of its diameter; ocelli small, elliptical, smaller than antennal socket. Postclypeus moderately arched in profile. Pronotum about the same width as head without eyes. Mesonotum and metanotum with deeply emarginate hind margins. Left mandible: distance from M3 to M4 about the same as distance fromM1 to M3; distance from A to M1 shorter than the distance from M1 to M3; M3 conspicuously smaller than M1. Right mandible: distance from A to M1 about the same as distance from M1 to M2; M2 small. Antenna with 16 articles. Head capsule light brown; postclypeus brownish yellow; fontanelle yellow; pronotum and tergites lighter than head capsule; sternites brownish yellow; wings transparent, brownish. Head capsule and postclypeus with sparse, straight and long bristles; pronotum with numerous straight, shorter bristles near margins and a few longer bristles on surface; tergites and sternites densely covered with bristles and hairs of variable size; wings densely covered with minute hairs. Measurements in Table 1.

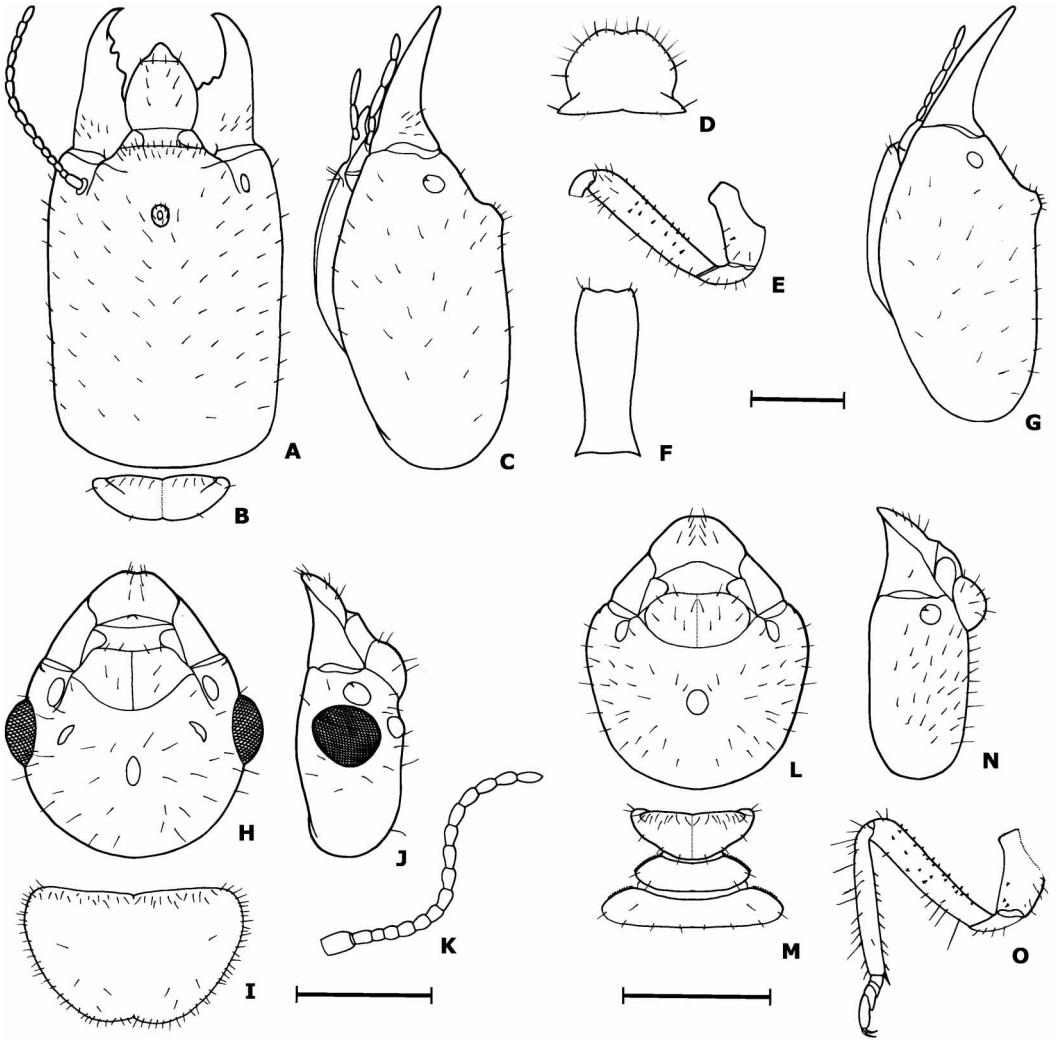
Comparisons. The imago of *L. emersoni* can be recognized by the comparatively small apical tooth on both mandibles, and their straight posterior edge. All other known species have larger eyes and ocelli and smaller fontanelle and most, except *L. brevilabius*, have antenna with 17 articles or more. The head of *L. leptothrix* is densely covered with very short hairs.

Soldier (Figs. 2A–G, 11B). Head capsule subrectangular, with parallel sides in dorsal view; sides slightly convex. Frontal tube very short, upturned; fontanelle posterior to line of antennal sockets. Top of head in profile almost straight. Antenna with 15 articles. Labrum longer than broad; sides convex. Mandibles short, robust and curved. Left mandible: cutting edge between apical and 1st marginal S-shaped; cutting edge between marginal teeth concave. Right mandible with two marginal teeth, about the same size and grouped together near base. Front coxa with a lateral conical projection near base. Head capsule and labrum brownish yellow; thorax and legs lighter than head capsule; tergites and sternites yellowish. Head capsule with numerous short and straight bristles of unequal size; postmentum with a few bristles on anterior margin; pronotum with a row of numerous bristles on anterior margin and few bristles on posterior margin; tergites and sternites densely covered with bristles and fine hairs. Measurements in Table 2.

Comparisons. The soldier of *L. emersoni* can be recognized by the shape of the mandibles and the frontal tube. The most similar species is *L. laticephalus*, which is larger (on average, but there is some overlap), more hairy and has a more conspicuous frontal tube with narrow tip.

Worker (Figs. 2L–O, 13B, 15C–D, 16B). Head capsule and postclypeus with numerous straight bristles. Pronotum with numerous bristles on anterior lobe and a few bristles on posterior margin. Mesonotum with 4 bristles on posterior margin, distant from

the middle. Front coxa with a lateral conical projection near base. Antenna with 15 articles. Fontanelle rounded. Enteric valve typically with 4 finger-like ridges of different sizes covered with fine spines. Rarely with 5–6 ridges. Mixed segment with two mesenteric lobes; large lobe elongate, proximal part narrow; small lobe oval, much smaller, its proximal part very narrow. Measurements in Table 3.



FIGURES 2. *Labiotermes emersoni*. Soldier from Minas Gerais: A, head in dorsal view; B, pronotum in dorsal view; C, head in profile; D, pronotum in posterior view; E, right front leg; F, postmentum. Soldier from Rondonia: G, head in profile. Imago: H, head in dorsal view; I, pronotum; J, head in profile; K, antenna. Worker: L, head in dorsal view; M, thorax; N, head in profile; O, right front leg. Scale bars = 1.0 mm.

Comparisons. The worker of *L. emersoni* is very similar and difficult to differentiate from *L. laticephalus*. The mandibles and enteric valve are almost identical considering the observed intra-specific variation. *L. laticephalus* is larger on average, but there is some

overlap. The only consistent difference observed is the greater number of hairs on the head and thorax of *L. laticephalus*.

Geographical distribution. *L. emersoni* occurs in Brazil (Cerrado and Caatinga) and in the Chaco of northern Argentina and Paraguay (Fig. 18). It probably occurs also in southern Bolivia. It has been reported from the following habitats: cerrado vegetation, dry forest, pasture, and urban areas. Soldiers from the western part of its geographic range tend to be smaller.

Material examined

ARGENTINA. *Chaco*. Parque Nacional Chaco: s., w., 13.xii.2000, C. Szumick & F. Cuezzo (IFML-109); s., w., 13.xii.2000, C. Szumick & F. Cuezzo (IFML-110). *Santiago del Estero*. Copo, Parque Nacional Copo: w., 24.x.2003, F. Cuezzo *et al.* (IFML-151). Copo, Ruta Nacional 16: s., w., 16.xii.2000, C. Szumick & F. Cuezzo (IFML-111). **BRAZIL**. *Ceará*. Aiuaba: s., w., 29.x.2004, A. Vasconcellos (DSEC). Crato: s., w., 18.x.2004, A. Vasconcellos (DSEC). *Distrito Federal*. Fazenda Água Limpa: s., w., 26.viii.1986, R. Constantino (MPEG-2617). Jardim Botânico de Brasília: s., w., 26.viii.1986, R. Constantino (UnB-3537). *Goiás*. São Domingos, Monte Alto: s., w., 01-07.ix.2003, D.L. Bernardo (UnB-4255, 4269, 4270, 4312, 4366, 4380, 4422). *Mato Grosso*. Alto Garças: s., w., 08.vii.1965, Goodland (MZSP-10827). Chapada dos Guimarães, Rio Manso: s., w., 14.i.1999, R. Constantino (UnB-0818). *Minas Gerais*. Bocaiúva: s., w., 25.vii.1975, R.L. Araujo (MZSP-5934). Curvelo: s., w., 03.x.1956, R.L. Araujo (MZSP-4459, 4460). Diamantina: s., w., im., 23.viii.1971, R.L. Araujo (MZSP-4942). Morro da Garça: s., w., im., 20.x.1964, Exp. Dep. Zool. (MZSP-2016). Poços de Caldas: s., w., im., 04-13.ix.1967, R.L. Araujo (MZSP-504, 505, 507, 508, 509, 512, 513). Rio Pardo de Minas: s., w., 10.i.1952, R.L. Araujo (MZSP-4308). Sete Lagoas: s., w., 28.iii.1985, D.J. Domingos (UnB-2298). *Paraíba*. Sumé, Fazenda Almas: s., w., 07.iii.2003, A. Vasconcellos (DSEC). *Rondonia*. Pimenta Bueno: s., w., 21.vii.2000, R. Constantino (UnB-2421); s., w., 21-24.vii.2000, R. Constantino (UnB-2423, 2518). *São Paulo*. São Paulo: s., w., im., 25.x.1907, H. Luederwaldt (MZSP-216). *Tocantins*. Dianópolis, Fazenda Novo Iguaçu: s., w., 22.ix.2003, D.L. Bernardo (UnB-5027). Paraná, Fazenda São João: s., w., 12-18.ix.2003, D.L. Bernardo (UnB-4879, 4961, 4970, 4978, 4987); s., w., 27-28.iii.2004, G.C. Costa (UnB-5412, 5429, 5458).

Labiotermes guasu Constantino & Acioli, new species

Holotype: soldier, part of lot UnB-5829, 22.iii.2004, A.N.S. Acioli

Type-locality: BRAZIL. *Amazonas State*. Benjamin Constant, Nova Aliança.

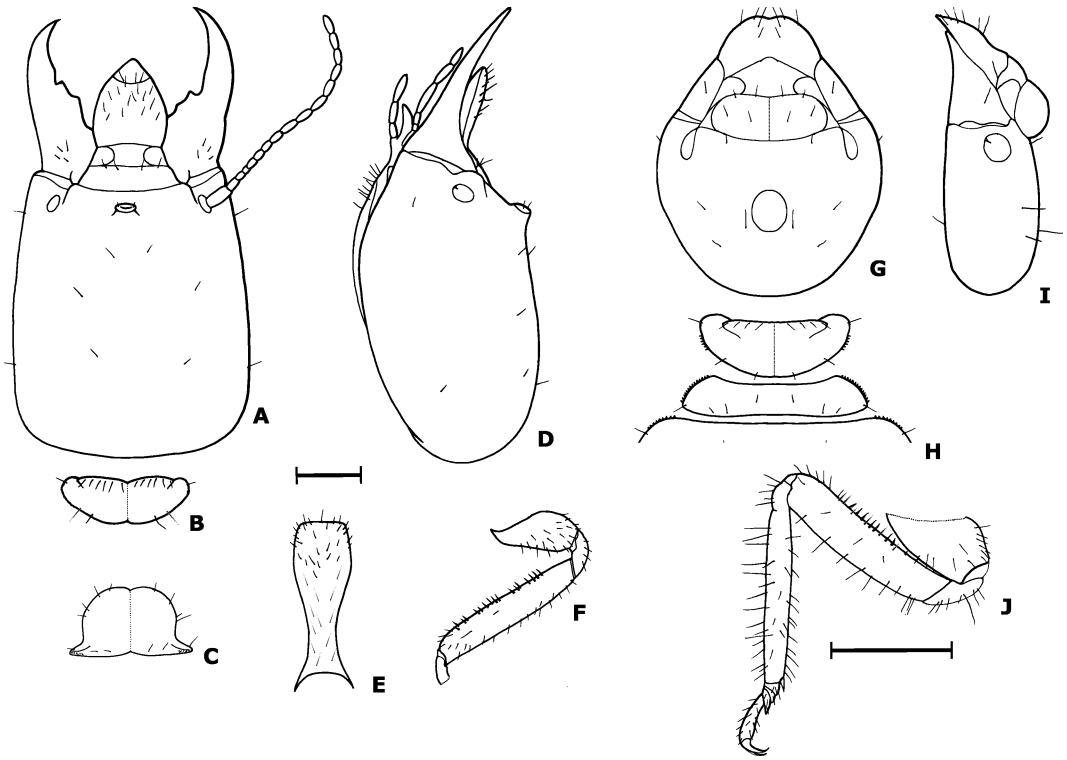
Paratypes: BRAZIL. *Amazonas*. Benjamin Constant, Nova Aliança: s., w., 22.iii.2004, A.N.S. Acioli (UnB-5829); s., w., 26.iii.2004, A.N.S. Acioli (UnB-5950). *Mato Grosso*. Iquê-Juruena: s., w., 22.ix.1980, A.E. Mill (MPEG-1331). **PERU**. *Ucayali*. Pucalpa: s., w., no date, G. Lamas (MZSP-11157). Río Aguaytía: s., w., 31.vii.1955, W.

Weyrauch (MZSP-1148).

Etymology: The word *guaçu* means large in the Tupi language. In the latinized form, the "ç" was converted to "s".

Imago. Unknown.

Soldier (Figs. 3A–F, 11C). Head capsule subrectangular in dorsal view; sides converging slightly towards front. Frontal tube small, oriented anteriorly. Top of head in profile slightly convex. Antenna with 16 articles. Labrum longer than broad; sides convex. Mandibles long and strongly curved. Left mandible: cutting edge between apical and 1st marginal slightly S-shaped; cutting edge between marginal teeth slightly concave. Right mandible with two marginal teeth; 1st marginal larger than 2nd. Front coxa without a lateral projection near base. Latero-posterior margins of pronotum with small protuberances. Head capsule and labrum brownish yellow; thorax and legs lighter than head capsule; tergites and sternites yellowish. Head capsule with a few short and straight bristles of relatively uniform size; postmentum with numerous bristles on anterior third; anterior margin of pronotum with a row of bristles; posterior margin with a few bristles; tergites and sternites densely covered with bristles and fine hairs. Measurements in Table 2.



FIGURES 3. *Labiotermes guasu*, new species. Soldier: A, head in dorsal view; B, pronotum in dorsal view; C, pronotum in posterior view; D, head in profile; E, postmentum; F, right front leg. Worker: G, head in dorsal view; H, thorax; I, head in profile; J, right front leg. Scale bars = 1.0 mm.

Comparisons. The soldier of *L. guasu* is easily recognizable by its large size, with proportionally long mandibles and legs and the head with very few hairs.

Worker (Figs. 3G–J, 13C, 14A, 15E–F, 16C). Head capsule and postclypeus with very few, sparse bristles. Pronotum with numerous bristles on anterior lobe and a few bristles on posterior margin. Latero-posterior margins of pronotum with small protuberancesand a few minute spines like those present on the meso- and metanotum. Mesonotum with a line of bristles on posterior margin. Front coxa without any projection near base. Front and middle femur and with numerous thick and short bristles on dorsal side. Antenna with 16 articles. Fontanelle very large and rounded. P1 conspicuously smaller than P3. Enteric valve with 6 elongate ridges of different sizes, covered with numerous long, fine, hair-like spines. Mixed segment with two elongate mesenteric lobes; small lobe about half the length of the large one. Measurements in Table 3.

Comparisons. The worker of *Labiotermes guasu* can be recognized by its large size, the small number of hairs on the head and the absence of a projection on anterior coxa. The most similar species in external morphology is *L. labralis*, which is conspicuously smaller. The enteric valve is also distinct from all other species.

Geographical distribution. *Labiotermes guasu* is recorded from only 4 localities (Fig. 20), all of them in the Amazon region of Brazil and Peru.

Labiotermes labralis (Holmgren)

Cornitermes labralis Holmgren, 1906: 553–557, 657–658 [imago (Fig. N), soldier (Fig. O), worker (Fig. P), nest]; Holmgren 1909: 175, 193 [morphology, Fig. 65]; Holmgren 1912: 50 (*Cornitermes* subgenus *Labiotermes*); Sjöstedt 1926: 150 (*Eutermes*); Emerson & Banks 1965: 12 (*Labiotermes*) [imago, soldier, Fig. 2–4]; Mathews 1977: 207–208 [nest (Pl. 45), enteric valve (Pl. 48)]; Noirot 2001: 439 [enteric valve, fig. 7-D].

Lectotype: soldier, designated by Emerson & Banks 1965: 19 (NHRS), not examined.

Type-locality: Peru: Chaquimayo.

Synonym: *Labiotermes labralis boreus* Emerson (in Snyder 1949: 334); Emerson 1925: 363–365 (as *Cornitermes labralis*) [imago, soldier, Fig. 47]. Holotype: soldier (AMNH). Type-locality: Guyana, Kartabo. Synonymized by Emerson & Banks 1965: 12, 18–19.

Imago. Described and illustrated by Emerson & Banks 1965: 13–15. Additional measurements are presented in Table 1.

Soldier (Figs. 4A–B, 11D). Described by Emerson & Banks 1965: 15–18. Additional measurements are presented in Table 2.

Comparisons. The soldier of *L. labralis* can be recognized by the small number of hairs on the head, absence of a projection on the front coxa and the very large and sclerotized labrum with two bristles near tip. The head capsule is also more rounded than in the other species.

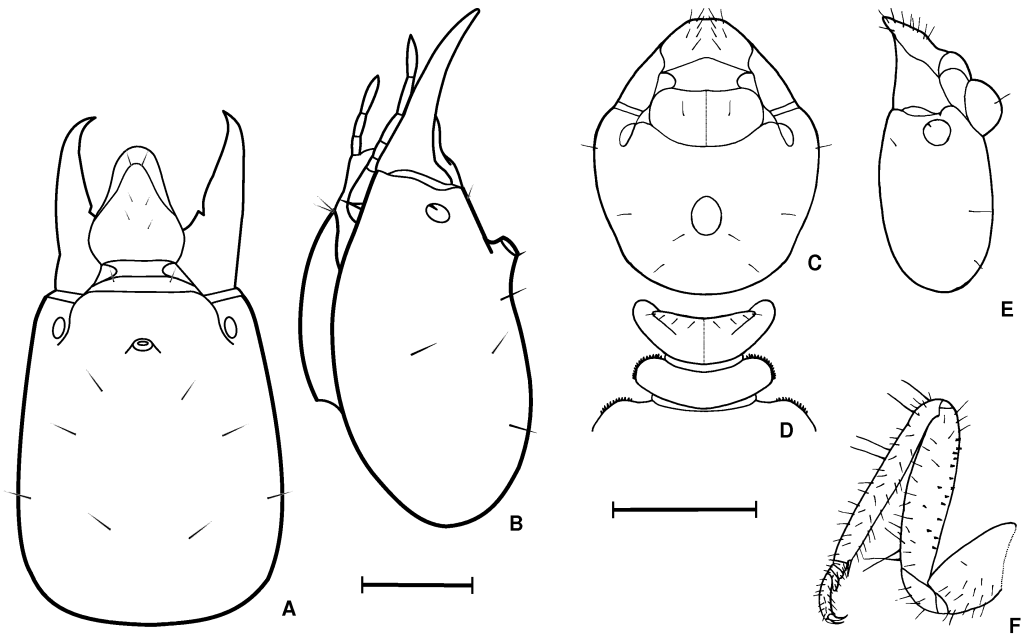
Worker (Figs. 4, 13D, 14B, 15G–H, 16D). Head capsule with very few, sparse bristles. Postclypeus with 2 bristles. Pronotum with a row of bristles on anterior margin and no bristles on posterior margin. Mesonotum without bristles. Front coxa without a lateral projection near base. Antenna with 15–16 articles. Fontanelle large and oval. Enteric valve with 4 ridges, 3 large and a very small one, covered with short spines. Mixed segment with two elongate mesenteric lobes; large one with a broad tip; small lobe about half the length of the large one. Measurements in Table 3.

Comparisons. The worker of *L. labralis* can be recognized by the small number of hairs on the head and the absence of a projection on anterior coxa. The most similar species in external morphology is *L. guasu*, which is conspicuously larger. The enteric valve is also distinct from all other species, with 3 large ridges and one small.

Remarks. Mathews (1977: 207–208) mentions only 3 plates in the enteric valve of *L. labralis*. However, the small plate is visible in his figure (page 233, Plate 48), and is also clearly visible in Noirot's (2001: 439) figure.

Habits. *L. labralis* occurs only in rainforest. It builds a large, dark, arboreal nest of irregular shape, made with a mixture of soil and fecal material. The internal surface is sculptured in a peculiar pattern, described and illustrated by Mathews (1977: 208 and plate 45). Martius & Ribeiro (1996) report a density of 10 nests/ha near Manaus.

Geographical distribution. *L. labralis* occurs in the whole Amazon region, and is also found in Trinidad and in the Brazilian Atlantic forest as far south as 21S (Fig. 19). The absence of records from Ecuador is probably due to lack of collecting. The distribution is apparently disjunct between the Amazon and the Atlantic forest.



FIGURES 4. *Labiotermes labralis*. Soldier: A, head in dorsal view; B, head in profile. Worker: C, head in dorsal view; C, thorax; D, head in profile; E, right front leg. Scale bar = 1.0 mm.

Material examined

BRAZIL. *Amapá*. Curiau: s., w., 18.x.1989, R. Constantino (MPEG-3176). Mazagão: s., w., 20.x.1989, R. Constantino (MPEG-3179). Oiapoque: s., w., im., 01.v.1979, A.G. Bandeira (MPEG-0653). *Amazonas*. Anavilhanas: s., w., 17.iv.1981, A.E. Mill (MZSP-10467). Humaitá: s., w., 13.ix.1990, R. Constantino (MPEG-3682). Manaus: s., w., 07-08.ix.1978, P. Howse (MPEG-485, 489); s., w., 06.iv.1979, A.G. Bandeira (MPEG-609); s., w., 06.x.1998, R.L. Abreu (UnB-2629). Manaus, Reserva Ducke: s., w., im., 01.ix.1990, F.B. Apolinário (UnB-3630). Manaus, Rodovia ZF-3: s., w., 09.x.1999, T. Miura (UnB-1593). Rio Negro: s., w., no date, H.R. Coles (UnB-1076). Itacoatiara, Fazenda Aruanã: s., w., im., 23-30.iv.1977, A.G. Bandeira (MPEG-091, 163, 260). *Bahia*. Ilháus: w., 16.xi.2000, E.M Cancello (MZSP). Monte Pascoal: s., w., 08.viii.1974, R.L. Araujo (MZSP-5460). *Espírito Santo*. Linhares: s., w., im., 28.i.1993, E.M. Cancello (MZSP-9811). *Mato Grosso*. Ique-Juruena: s., w., 27.ix.1980, A.E. Mill (MZSP-10463). Juruena, Rohden Lignea: s., w., 03.vii.2002, R. Constantino (UnB-3331). *Minas Gerais*. Viçosa: s., w., 19.ii.2002, C. Galbiati (UnB-5552). *Pará*. Cachoeira do Arari: s., w., 09.iii.1989, R. Constantino (MPEG-3025). Paragominas: s., w., 27.vi.1990, R. Constantino (MPEG-3515). Parque Nacional da Amazonia: s., w., 19.viii.1978, A.G. Bandeira (MPEG-394). Oriximiná, Porto Trombetas: s., w., 30.vii.2000, A.N.S. Acioli (UnB-5518). Novo Progresso, Serra do Cachimbo: s., w., im., 18.ix.2003, R. Constantino (UnB-3892). Serra dos Carajás: s., w., 01.viii.1985, C.R.F. Brandão (MZSP-8709). Taperinha: s., w., 03.ii.1968, unknown collector (MZSP-1888). Tucurui: s., w., im., 21.iv.1979, A.G. Bandeira (MPEG-0628). *Paraíba*. Areia: s., w., 28.xii.1998, A. Vasconcellos (DSEC-1216). João Pessoa: s., w., 08.x.1993, J.C.D. Pereira (DSEC-142). Quebrangulo: s., w., im., 26.i.2001, A. Vasconcellos (DSEC). *Pernambuco*. Caruaru: s., w., 20.ix.1997, A. Vasconcellos (DSEC-1048). Recife: s., w., im., 29.i.1980, E.M. Cancello (MZSP-8019). *Rondonia*. Guajará-Mirim: s., w., 18.i.2001, D.L. Bernardo (UnB-2728, 2729). Pimenta Bueno: s., w., 17.vii.2000, O. Kitade (UnB-2600). Vilhena: s., w., 27.vii.2000, R. Constantino (UnB-2567). *Roraima*. Ilha de Maracá: s., w., im., 19.xi.1978, A.G. Bandeira (MPEG-448); s., w., 21.xi.1978, A.G. Bandeira (MPEG-469); s., w., im., 19.xi.1978, A.G. Bandeira (UnB-3536). **FRENCH GUIANA**. Saül: s., w., 27.v.1997, J.S. Ashe (UnB-2848, 2849, 2852). **PERU**. *Huánuco*. Tingo María: s., w., no date, W. Weyrauch (MZSP-1889). **VENEZUELA**. *Amazonas*. Alto Orinoco, Motorema: s., w., im., 10.v.1998, M.G. Paoletti (UnB-508, 509). San Pedro: s., w., 23.viii.1981, J.L. Garcia (MZSP-10425).

Labiotermes laticephalus (Silvestri), new combination

Cornitermes laticephalus Silvestri, 1901: 5; Silvestri 1903: 61, 127 [soldier (Pl. Fig. 107), worker]; Desneux 1904: 37 (*Termes*); Holmgren 1912: 50 (*Cornitermes* subgenus *Labiotermes*); Snyder 1949: 333 (*Paracornitermes*); Emerson 1952: 485 (*Paracornitermes*)[soldier, Fig. 4]; Araujo 1954: 183–185 (*Paracornitermes*) [soldier, Figs. 2–3, 5].

Syntypes: soldiers and workers (DEZA, MCSN), not examined.

Type-locality: Brazil: Mato Grosso, Cuiabá.

Imago. Unknown.

Major soldier (Figs. 5A–F, 11E). Head capsule subrectangular in dorsal view; sides convex, converging towards front. Frontal tube small but conspicuous, conical, with narrow tip, oriented anteriorly. Top of head in profile nearly straight. Antenna with 15–16 articles. Labrum wider than long; sides convex. Mandibles short and robust. Left mandible: cutting edge between apical and 1st marginal S-shaped; cutting edge between marginal teeth concave. Right mandible with two marginal teeth, about the same size and grouped together near base. Front coxa with a lateral conical projection near base. Head capsule and labrum brownish yellow; thorax and legs lighter than head capsule; tergites and sternites yellowish. Head capsule with numerous short and straight bristles of variable size; postmentum with a few short bristles near anterior margin; anterior margin of pronotum with a row of bristles; posterior margin with two bristles; tergites and sternites densely covered with bristles and fine hairs. Measurements in Table 2.

Minor soldier (Figs. 5G–K). Smaller than major soldier; head narrower, with parallel sides; antenna with 15 articles; bristles more numerous on the head. Measurements in Table 2.

Comparisons. See *L. emersoni*.

Worker (Figs. 5L–O, 13E, 14C, 15I–J, 16E). Head capsule and postclypeus with numerous bristles. Pronotum with numerous bristles on anterior lobe and a few bristles on posterior margin. Mesonotum with a line of 8 or more bristles on posterior margin. Front coxa with a conspicuous lateral conical projection near base. Antenna with 15 articles. Fontanelle large and rounded. Enteric valve with 4 finger-like ridges of unequal sizes covered with fine spines. Mixed segment with two mesenteric lobes; large lobe elongate, proximal part narrow; small lobe oval, much smaller, its proximal part very narrow. Measurements in Table 3.

Comparisons. See *L. emersoni*.

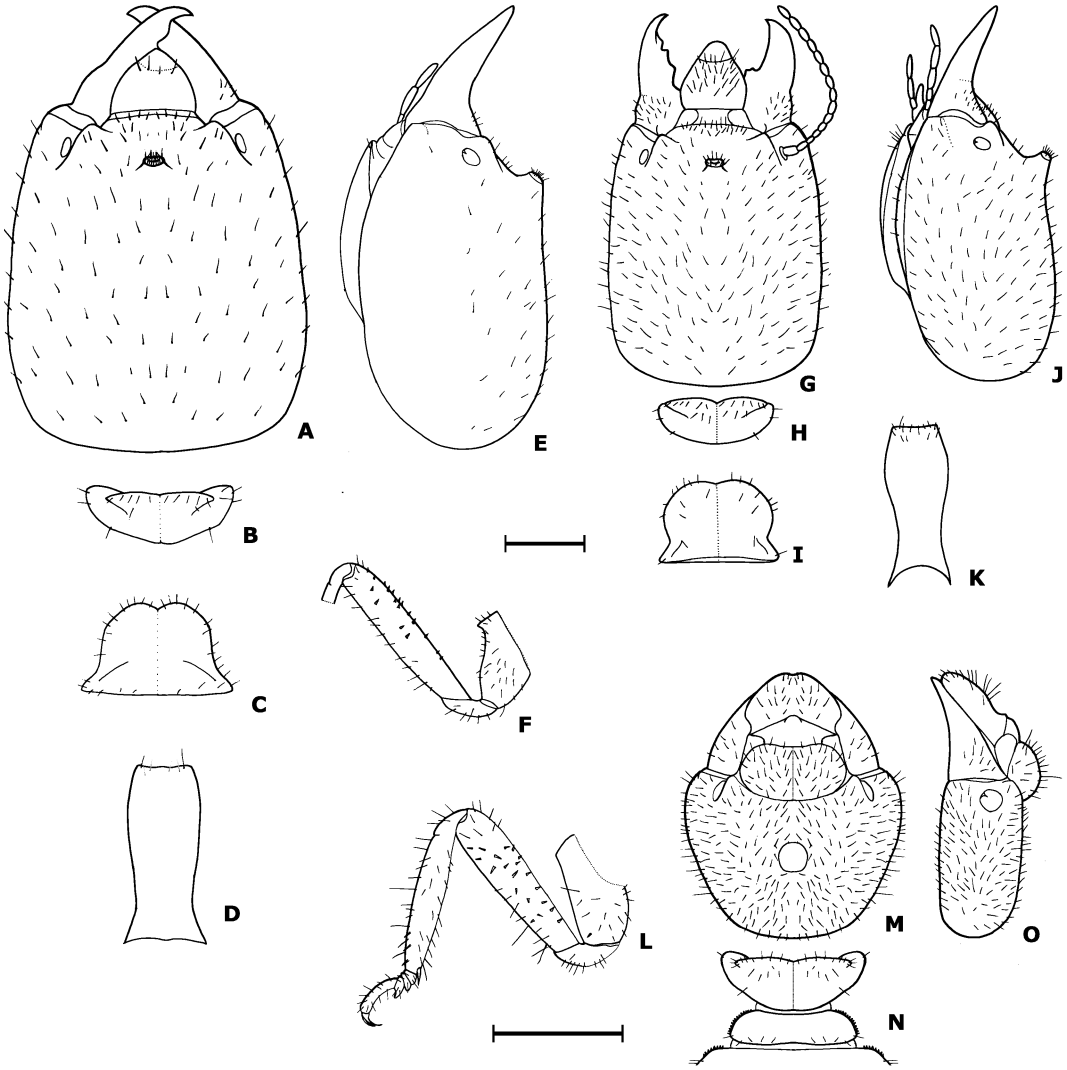
Geographical distribution. *Labiotermes laticephalus* has been recorded from relatively few localities (Fig. 20), most of them in Cerrado biome of Brazil. Torales *et al.* (2005) report its occurrence in northern Argentina.

Remarks. Silvestri (1903: 61) mentions two sizes of soldiers. However, the material available for this study was limited and only one sample had two distinct soldier sizes, while the others had only one size. Based on the measurements, they fall into two non-ovelaping groups.

Material examined

BRAZIL. *Distrito Federal*. Fazenda Água Limpa: s., 01.vii.1992, M. Lima (UnB-1256). *Goiás*. Anápolis: s., w., 10.ii.1958, W.W. Kempf (MZSP-4685). *Mato Grosso*. Chapada dos Guimarães, Rio Manso: s., w., 12–17.v.1999, R. Constantino (UnB-1638, 1663, 1669, 1673). Cuiabá: s., w., 19.ii.1985, M. Zanuto (MPEG-2311). Santo Antônio do

Leverger: s., w., 26.x.1984, J.C. Trager (MZSP-8595). *Mato Grosso do Sul*. Corumbá: s., w., no date, Bordi (MZSP-213). *Minas Gerais*. Paracatu, Fazenda Rossato: s., w., 27.x.2001, R. Constantino (UnB-3084).



FIGURES 5. *Labiotermes laticephalus*. Large soldier: A, head in dorsal view; B, pronotum in dorsal view; C, pronotum in posterior view; D, postmentum; E, head in profile; F, right front leg. Small soldier: G, head in dorsal view; H, pronotum in dorsal view; I, pronotum in posterior view; J, head in profile; K, postmentum. Worker: L, right front leg; M, head in dorsal view; N, thorax; O, head in profile. Scale bars = 1.0 mm.

Labiotermes leptothrix Mathews

Labiotermes leptothrix Mathews, 1977: 208–210 [imago (Fig. 149, 160), soldier (Fig. 148), enteric valve armature (Pl. 49)]

Labiotermes pellisetaceus **nomen nudum**, Mathews 1977: 201, 207, 259, 262 [figure captions only]

Holotype: imago, female (MZSP), examined.

Type-locality: Brazil: Mato Grosso, Xavantina.

Imago. Described and illustrated by Mathews (1977: 208–209).

Soldier (Figs. 6A–B, 11F). Described by Mathews (1977: 209). Additional measurements are presented in Table 2.

Comparisons. The soldier of *L. leptothrix* is easily recognizable by the presence of numerous microscopic hairs on the head capsule. However, these hairs are only visible with magnification of 40X or higher and adequate light. The most similar species are *L. longilabius* and *L. brevilabius*, which lack these microscopic hairs and have different labra.

Worker (Figs. 6C–F, 13F, 14D, 15K–L, 16F). Head capsule and postclypeus with numerous bristles. Pronotum with numerous bristles on anterior lobe and a row of bristles on posterior margin. Mesonotum with a line of bristles on posterior margin. Front coxa with a lateral hump near base. Antenna with 15 articles. Fontanelle large and rounded. Enteric valve with 5 finger-like ridges of unequal sizes, covered with fine spines. Mixed segment with two elongate mesenteric lobes; large lobe with narrow tip; small lobe about one third the length of the large one. Measurements in Table 3.

Comparisons. The worker of *L. leptothrix* can be recognized by the very large apical teeth on both mandibles and the enteric valve armature, which has 5 ridges.

Geographical distribution. *L. leptothrix* occurs in the northern part of the Cerrado biome (Fig. 21). Most records are from cerrado vegetation, but Mathews (1977: 210) also found it in a valley forest.

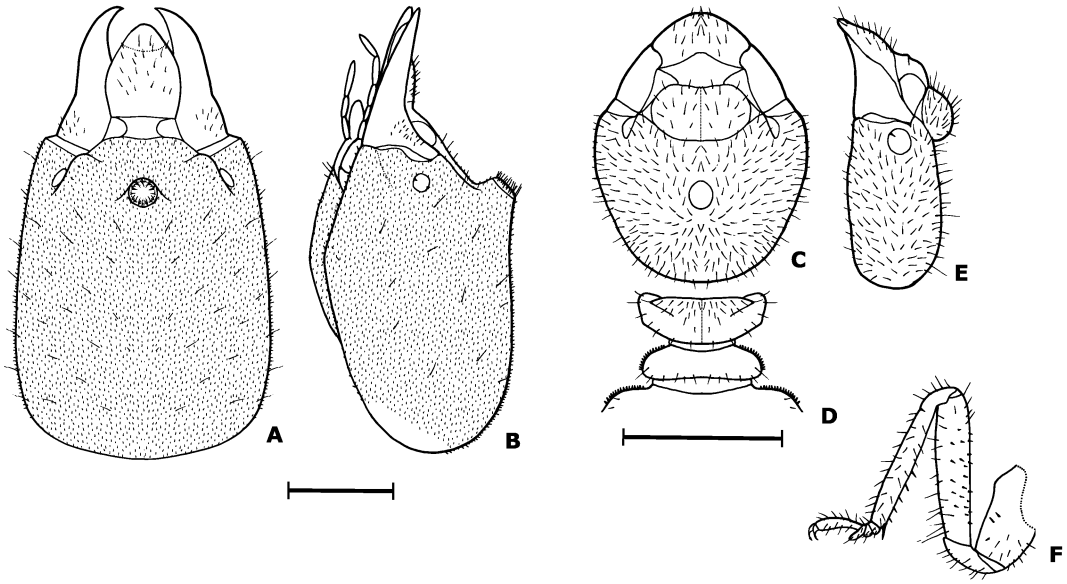
Remark 1. Mathews (1977: 234, plate 49) states that the enteric valve of *L. leptothrix* has 6 finger-like plates (ridges). However, his own illustration shows only 5 ridges. All specimens we examined had 5 ridges, not 6.

Remark 2. *Labiotermes pellisetaceus* is a *nomen nudum* which appears in figure captions in Mathews (1977), obviously as a result of an error. The association of a name with illustrations alone does not satisfy the requirements of article 13 of the International Code of Zoological Nomenclature (ICZN, 1999). The fact that the original description of *L. leptothrix* was published in the same book is irrelevant. The name itself should be accompanied by a description or definition that states in words characters that are purported to diferentiate the taxon. This name is not available and therefore is not to be treatead as a real synonym.

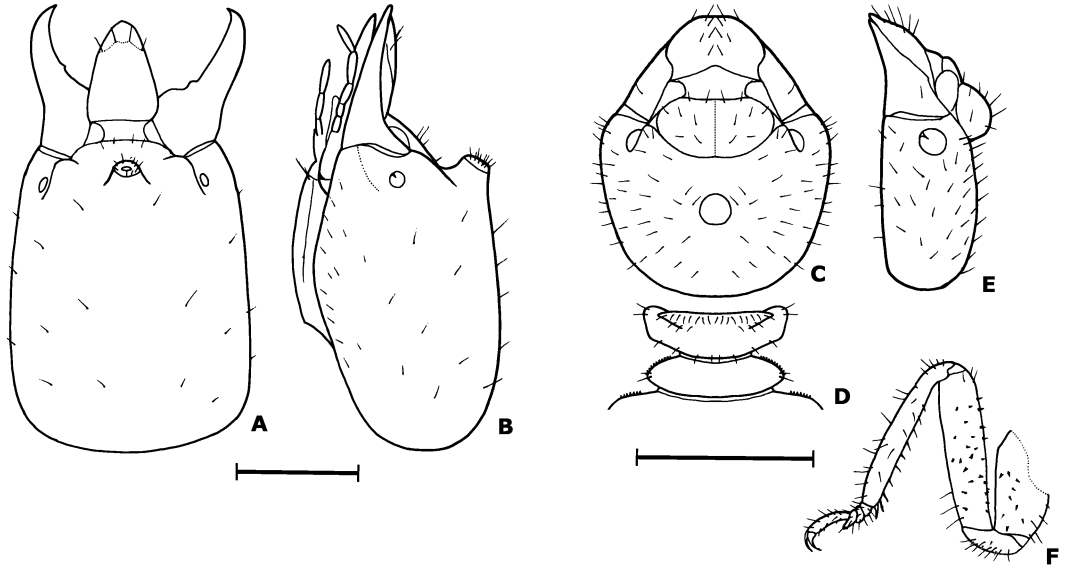
Material examined

BRAZIL. *Amazonas*. Humaitá: s., w., 01.vii.2003, G.C. Costa (UnB-4784). *Goiás*.

Alvorada do Norte, Fazenda Paraná: s., w., 24–25.viii.2003, D.L. Bernardo (UnB-4021, 4067). Mimoso: s., w., 21.ii.1999, R. Chaves (UnB-1946). Minaçu, Serra da Mesa: s., w., 25.ii.1997, R. Constantino (UnB-235, 236). *Mato Grosso*. Chapada dos Guimarães, Rio Manso: s., w., 16–17.i.1999, R. Constantino (UnB-849, 891). Chapada dos Guimarães: s., w., 10.ii.1976, R.L. Araujo (MZSP-6574, 6608). Cuiabá: s., w., 15.ii.1976, R.L. Araujo (MZSP-6536). *Rondonia*. Pimenta Bueno: s., w., 24.vii.2000, R. Constantino (UnB-2524).



FIGURES 6. *Labiotermes leptothrix*. Soldier: A, head in dorsal view; B, head in profile. Worker: C, head in dorsal view; D, thorax; E, head in profile; F, right front leg. Scale bars = 1.0 mm.



FIGURES 7. *Labiotermes longilabius*. Soldier: A, head in dorsal view; B, head in profile. Worker: C, head in dorsal view; D, thorax; E, head in profile; F, right front leg. Scale bars = 1.0 mm.

***Labiotermes longilabius* (Silvestri)**

Cornitermes longilabius Silvestri, 1901: 5; Silvestri 1903: 59–60, 127 [imago (text Fig. 13, Pl. Fig. 103), soldier (Pl. Fig. 105), worker (Pl. Fig. 105)]; Desneux 1904: 37 (*Termes*); Holmgren 1912: 50 (*Cornitermes* subgenus *Labiotermes*); Emerson & Banks 1965: 20–24 (*Labiotermes*) [imago (Fig. 5), soldier (Fig. 6)].

Syntypes: Imagos, soldier, workers (DEZA, AMNH and MCSN), not examined.

Type-locality: Brazil: Mato Grosso, Cuiabá.

Imago. Described and illustrated by Emerson & Banks 1965: 20–22.

Soldier (Figs. 7A–B, 11G). Described and illustrated by Emerson & Banks 1965: 22–23. Additional measurements are presented in Table 2.

Comparisons. See *L. brevilabius* and *L. leptothrix*.

Worker (Figs. 7C–F, 13G, 15M–N, 16G). Head capsule and postclypeus with numerous bristles. Pronotum with numerous bristles on anterior lobe and a row of bristles on posterior margin. Mesonotum with a few bristles near lateral sides. Front coxa with a rounded hump near base. Front and middle trocanters and tibias with numerous short and thick bristles. Antenna with 15 articles. Fontanelle large and rounded. Enteric valve 6 finger-like ridges of unequal sizes, covered with fine spines. Mixed segment with two mesenteric lobes; large lobe oval; small lobe very small and narrow. Measurements in Table 3.

Comparisons. The worker of *L. longilabius* can be recognized by the presence of short and thick bristles on the front and middle trocanters. In all other species, these spine-like bristles are present only on the femur and coxa. The enteric valve is also distinct (Fig. 16-G).

Geographical distribution. *L. longilabius* occurs in Brazil and Paraguay (Fig. 19), and most records are located in the Cerrado biome.

Material examined

BRAZIL. *Goiás*. Alvorada do Norte, Fazenda Paraná: s., w., 25.viii.2003, D.L. Bernardo (UnB-4047, 4049). Santo Antônio de Goiás: s., w., 05.v.2000, D.A. Costa (UnB-4512). *Mato Grosso*. Chapada dos Guimarães, Rio Manso: s., w., 11–12.v.1999, R. Constantino (UnB-1635, 1641). Cuiabá: s., w., 13–18.ii.1976, R.L. Araujo (MZSP-6675, 6679). Jaraguá: s., w., 25.x.1953, R.L. Araujo (MZSP-3930). *Minas Gerais*. Curvelo: s., w., 14.xi.1972, R.L. Araujo (MZSP-5786). Francisco Sá: s., w., 16.vii.1975, R.L. Araujo (MZSP-5930). *São Paulo*. Bálsamo: s., w., 27.viii.1977, Diniz (MZSP-8115). Parque Estadual de Porto Ferreira: s., w., 28.ix.2003, K. Espírito-Santo (UnB-1818). Piracicaba: s., w., 24.iii.2003, R. Amaral (UnB-4481). *Tocantins*. Paraná, Fazenda São João: s., w., 18.ix.2003, D.L. Bernardo (UnB-4981); s., w., 27–28.iii.2004, G.C. Costa (UnB-5386, 5471).

***Labiotermes oreadicus* Constantino, new species**

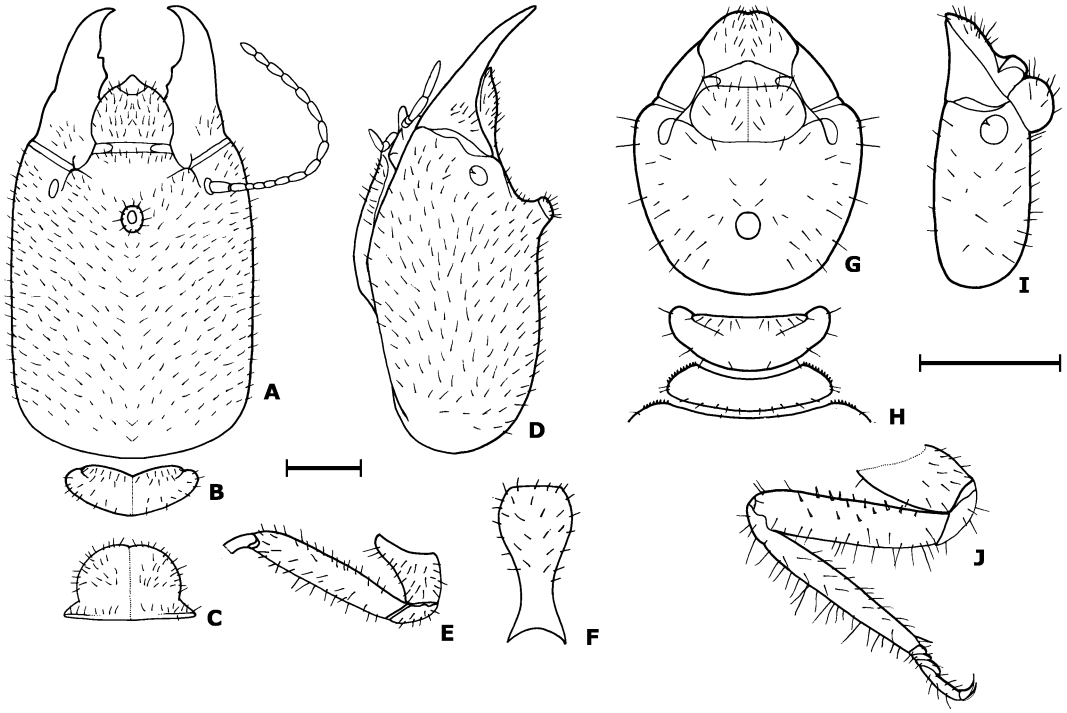
Holotype: soldier, part of lot UnB-241, 27.ii.1997, R. Constantino

Type-locality: Brazil. Goiás State. Serra da Mesa (Fig. 20).

Paratypes: workers, same data as holotype (UnB-241).

Etymology: *Oréades* corresponds to the Cerrado biome in the classification proposed by the German botanist von Martius. The word comes from the Latin *oreadis* and the Greek *oreias*, mountain nymph. In this case, *oreadicus* means inhabitant of the Cerrado.

Imago. Unknown.



FIGURES 8. *Labiotermes oreadicus*, new species. Soldier: A, head in dorsal view; B, pronotum in dorsal view; C, pronotum in posterior view; D, head in profile; E, right front leg; F, postmentum. Worker: G, head in dorsal view; H, thorax; I, head in profile; J, right front leg. Scale bars = 1.0 mm.

Soldier (Figs. 8A–F, 11H). Head capsule subrectangular, with parallel sides in dorsal view. Frontal tube short but conspicuous, with broad tip, upturned. Top of head convex in profile. Antenna with 16 articles. Labrum wider than long; sides convex. Mandibles moderately elongate and robust. Left mandible: cutting edge between apical and 1st marginal slightly S-shaped; cutting edge between marginal teeth slightly concave. Right mandible with two marginal teeth, about the same size. Front coxa without a lateral projection near base. Head capsule and labrum brownish yellow; thorax and legs lighter than head capsule; tergites and sternites yellowish. Head capsule with numerous short and straight bristles of relatively uniform size; postmentum with numerous bristles on anterior

half; pronotum with many bristles on margins and surface; mesonotum with metanotum with tergites and sternites densely covered with bristles and fine hairs. Measurements in Table 2.

Comparisons. The mandibles and postmentum of *L. oreadicus* are distinct (Fig. 11H). It is also much larger than most other species, except *L. guasu*, which has very few bristles on the head.

Worker (Figs. 8G–J, 13H, 14E, 15O–P, 16H). Head capsule and postclypeus with numerous bristles. Pronotum with numerous bristles on anterior lobe and a row of bristles on posterior margin. Mesonotum with a line of bristles on posterior margin. Front coxa without any projection near base. Antenna with 15–16 articles. Fontanelle large and rounded. Enteric valve armature with 3 distinct ridges of unequal sizes covered with dense, fine, and long hairs, and 3 vestigial ridges with long hairs. Mixed segment withtwo mesenteric lobes; large with a very narrow part closer to the mesenteron and an oval distal part; small lobe narrow and elongate. Measurements in Table 3.

Comparisons. The workers of *L. oreadicus* can be recognized by its large size and the absence of a projection on the front coxa. Among all other species, only *L. guasu* and *L. labralis* lack this projection, but their heads have very few bristles. The enteric valve of *L. oreadicus* is distinct (Fig. 16H).

Labiotermes orthocephalus(Silvestri), new combination

Cornitermes orthocephalus Silvestri, 1901: 5; Silvestri 1903: 60–61 [soldier (Pl. Fig. 106), worker]; Desneux 1904: 38 (*Termes*); Holmgren 1912: 50 (*Cornitermes* subgenus *Labiotermes*); Snyder 1949: 333 (*Paracornitermes*); Araujo 1954: 183–185 (*Paracornitermes*) [soldier, Fig. 1, 4].

Syntypes: soldiers and workers (DEZA, MCSN), not examined.

Type-locality: Brazil: Mato Grosso, Cuiabá.

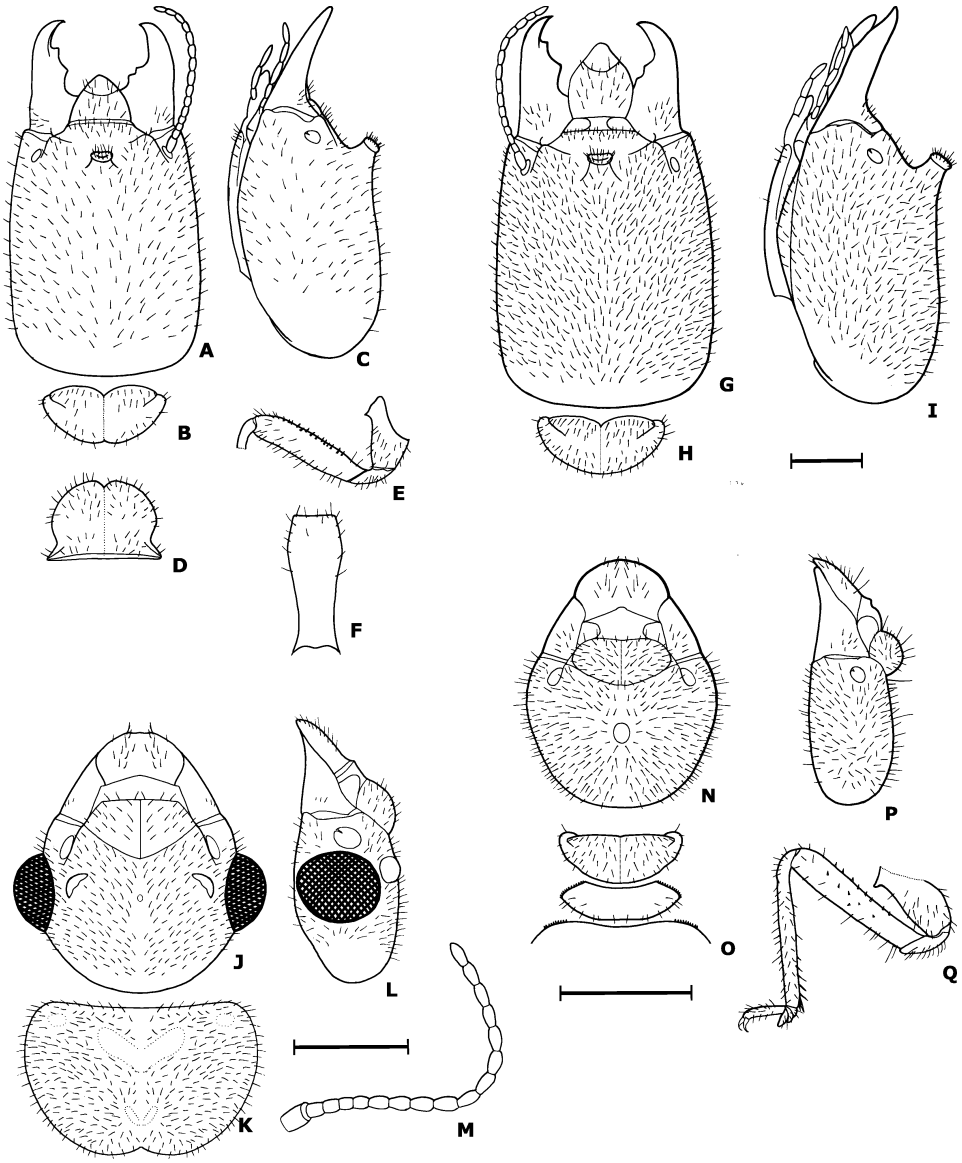
New Synonyms:

Paracornitermes hirsutus Araujo, 1954: 187 [soldier]; Mathews 1977: 205 [soldier]. Holotype: soldier (MZSP), examined; type-locality: Brazil: Minas Gerais, Monte Azul.

Paracornitermes caapora Bandeira & Cancello, 1992: 424 [soldier (Figs. 2–5), worker (Fig. 1)]. Holotype: soldier (INPA), examined; type-locality: Brazil: Roraima, Ilha de Maracá.

Imago (Figs. 9J–M, 12D). Head capsule rounded; fontanelle small and inconspicuous. Eyes nearly rounded, very large, almost touching the lower margin of head capsule; ocelli large, elliptical, larger than antennal socket. Postclypeus moderately arched in profile. Pronotum wider than head without eyes. Mesonotum and metanotum with deeply emarginate hind margins. Left mandible: distance from M3 to M4 shorter than distance from M1 to M3; distance from A to M1 about the same as distance from M1 to M3; M3

conspicuously smaller than M1. Right mandible: distance from A to M1 longer than distance from M1 to M2; M2 small. Antenna with 17–18 articles. Head capsule brown; postclypeus, pronotum and tergites light brown; sternites brownish yellow; wings transparent, brownish. Head, postclypeus and pronotum densely covered with straight bristles; tergites and sternites densely covered with bristles and hairs of variable size; wings densely covered with minute hairs. Measurements in Table 1.



FIGURES 9. *Labiotermes orthocephalus*. Soldier from Mato Grosso: A, head in dorsal view; B, pronotum in dorsal view; C, head in profile; D, pronotum in posterior view; E, right front leg; F, postmentum. Soldier from Minas Gerais: G, head in dorsal view; H, pronotum; I, head in profile. Imago: J, head in dorsal view; K, pronotum; L, head in profile; M, antenna. Worker: N, head in dorsal view; O, thorax; P, head in profile; Q, right front leg. Scale bars = 1.0 mm.

Comparisons. The imago of *L. orthocephalus* can be recognized by its large size, inconspicuous fontanelle and numerous, relatively long, hairs on the head and pronotum. The imagos of all other known species have fewer or shorter hairs, and a more conspicuous fontanelle. The imagos of *L. emersoni* and *L. brevilabius* have antenna with 16 articles.

Soldier (Figs. 9A–I, 11I). Head capsule subrectangular, with nearly parallel sides in dorsal view; sides slightly convex. Frontal tube conspicuous, oriented anteriorly; fontanelle about the same line as antennal sockets. Top of head in profile almost straight. Antenna with 15 articles. Labrum longer than broad; sides convex. Mandibles short, robust and curved. Left mandible: cutting edge between apical and 1st marginal concave; cutting edge between marginal teeth concave. Right mandible with two marginal teeth, about the same size and grouped together near base. Front coxa with a lateral conical projection near base. Head capsule and labrum brownish yellow; thorax and legs lighter than head capsule; tergites and sternites yellowish. Head capsule densely covered with bristles of variable size; postmentum with numerous bristles on anterior half; pronotum with many bristles; tergites and sternites densely covered with bristles and fine hairs. Measurements in Table 2.

Comparisons. The soldier of *L. orthocephalus* can be recognized by its large size, hairy head, coxa with a prominent conical projection, mandibles with large marginal teeth and cutting edge of apical tooth of left mandible evenly curved.

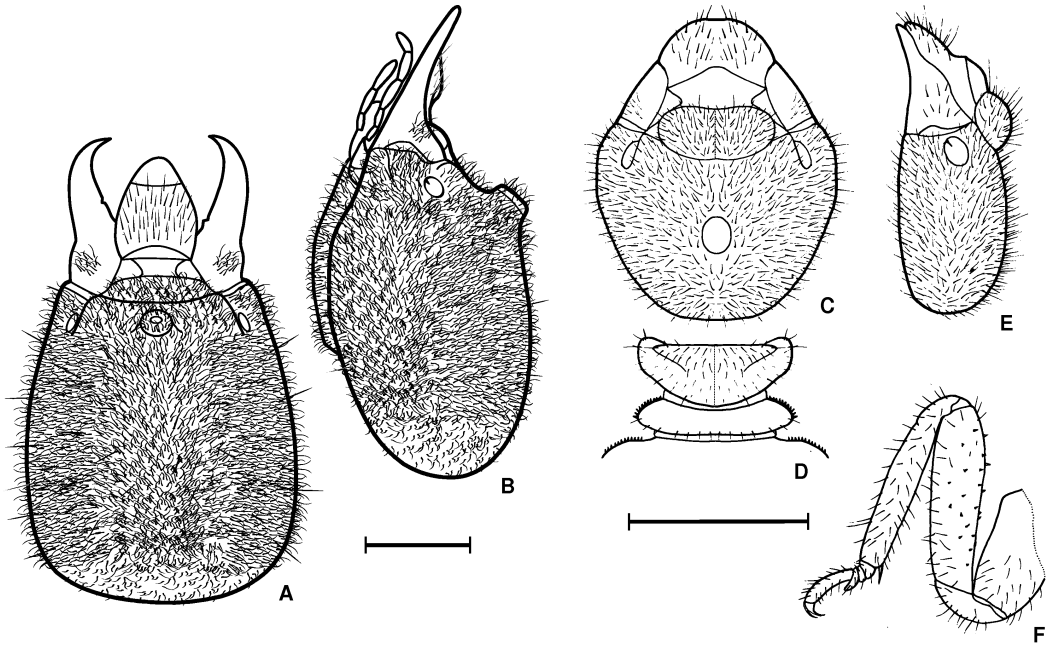
Worker (Figs. 9N–Q, 13I, 14F, 15Q–S, 16I). Head capsule and postclypeus with numerous straight bristles. Pronotum with numerous bristles on anterior and posterior lobes. Mesonotum with numerous bristles near posterior margin. Front coxa with a conspicuous lateral conical projection near base. Antenna with 15 articles. Fontanelle large and rounded. Enteric valve with 6 ridges of unequal size and irregular shape, covered with fine spines. Mixed segment with two mesenteric lobes; large lobe oval, proximal part very narrow; small lobe rounded and inflated. Measurements in Table 3.

Comparisons. The worker of *L. orthocephalus* is the most similar species are *L. laticephalus* and *L. emersoni*, which are in the same size range and have a conical projection on the front coxa. The enteric valve armature of *L. orthocephalus* is distinct (see description above and Fig. 16I).

Geographical distribution. *L. orthocephalus* occurs in the Cerrado, the Brazilian Atlantic Forest, and in Amazonia (Fig. 22).

Remarks. *P. hirsutus* is clearly an eastern geographical form of *L. orthocephalus*. Araujo (1954) based his description of *P. hirsutus* on samples from Minas Gerais, which have larger and more hairy soldiers than typical *L. orthocephalus* from Mato Grosso. Soldiers from Goiás are intermediate and there is a clear East-West gradient of soldier size and number of hairs on soldier head. Soldier mandibles show considerable intraspecific variation. The imagos are identical, as well and all the other diagnostic characters. *P. caapora* was described based on a single sample with a few soldiers and several workers.

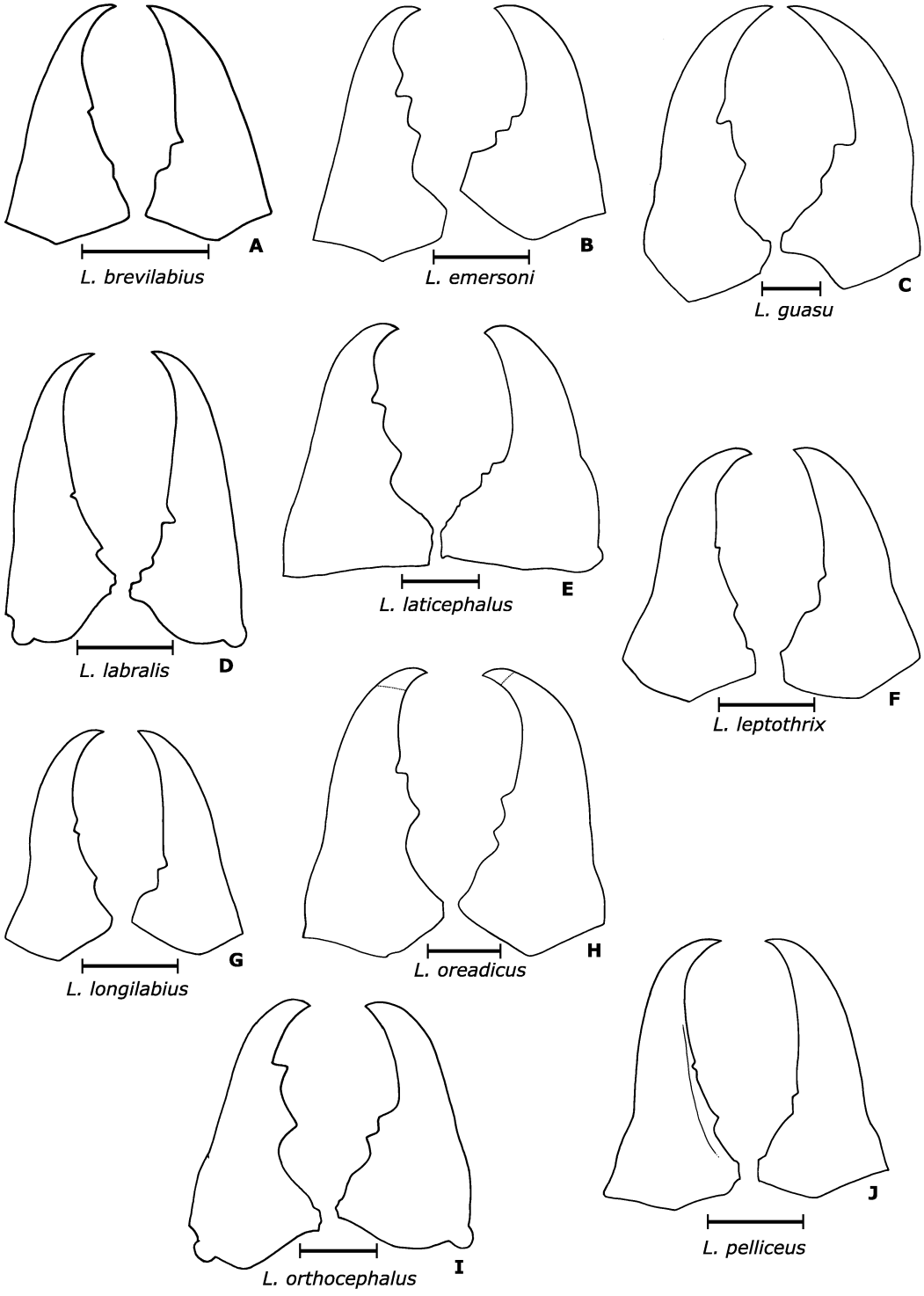
Compared to larger series from several localities, the differences mentioned in its original description are not consistent and soldiers from its type series are nearly identical to some soldiers of *P. orthocephalus* from central Brazil.



FIGURES 10. *Labiotermes pelliceus*. Soldier: A, head in dorsal view; B, head in profile. Worker: C, head in dorsal view; D, thorax; E, head in profile; F, right front leg. Scale bar = 1.0 mm.

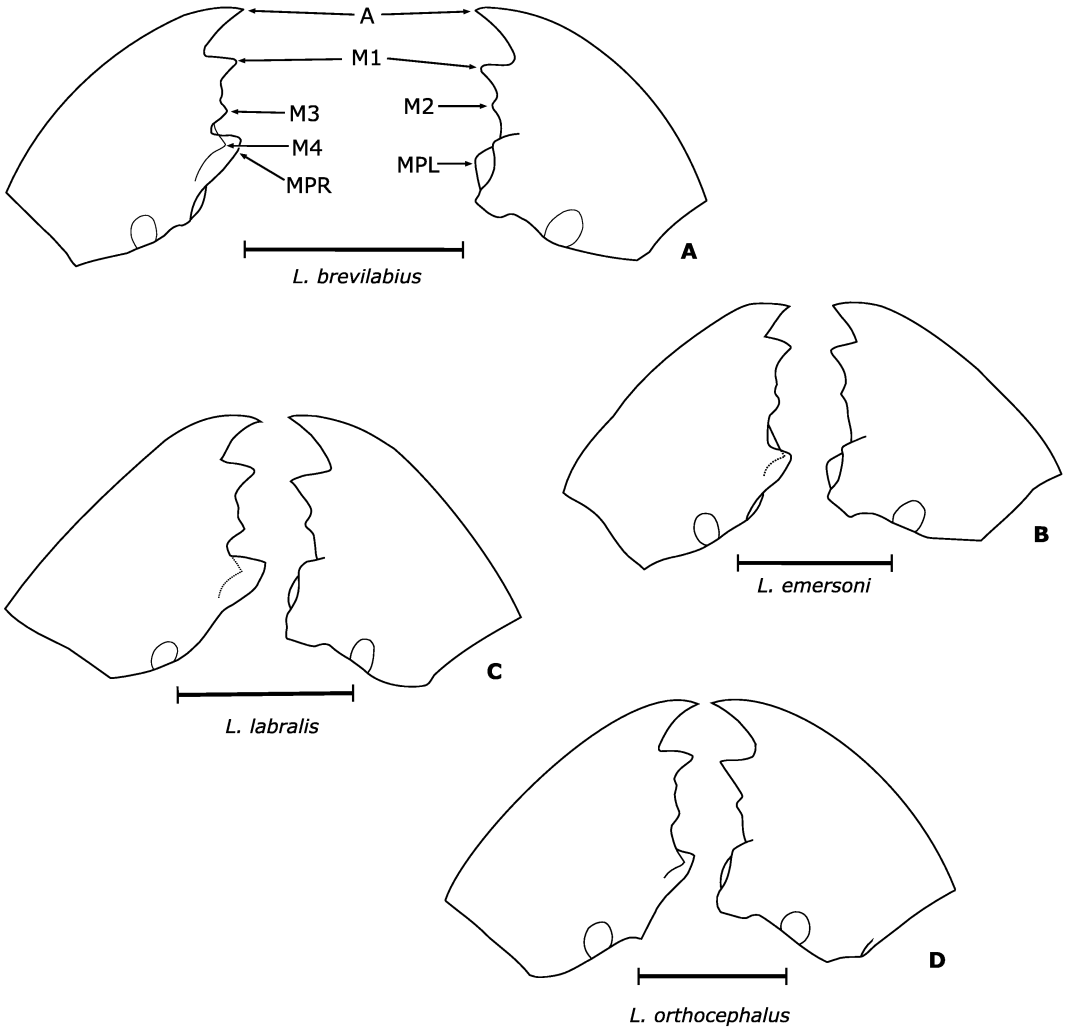
Material examined

BRAZIL. *Amazonas*. Humaitá: s., w., 20.ix.1990, R. Constantino (MPEG-3802). *Bahia*. Eunápolis: s., w., 26.vi.1974, R.L. Araujo (MZSP-5566). *Ceará*. Crato: s., w., 17.x.2004, A. Vasconcellos (DSEC). *Distrito Federal*. Brasília: s., w., 01.xii.1971, K. Kitayama (MZSP-7064). *Espírito Santo*. Linhares: s., w., 28.i.1993, E.M. Cancello (MZSP-9810). Rebio Sooretama: s., w., 31.viii.1966, H. Reichardt (MZSP-2018). Vila Velha: s., w., 31.v.1954, R.L. Araujo (MZSP-4190). *Goiás*. Alvorada do Norte, Fazenda Paraná: s., w., 25.viii.2003, D.L. Bernardo (UnB-4040, 4058). São Domingos, Monte Alto: s., w., 02–05.ix.2003, D.L. Bernardo (UnB-4278, 4300, 4325, 4329, 4361). Parque Nacional das Emas: s., w., 06.iv.1984, IQUSP (MZSP-8424). Minaçu, Serra da Mesa: s., 23–28.ii.1997, R. Constantino (UnB-234, 239, 240). *Mato Grosso*. Chapada dos Guimarães, Rio Manso: s., w., 12.i.1999, R. Constantino (UnB-0782). Chapada dos Guimarães: s., w., 10.ii.1976, R.L. Araujo (MZSP-6636). Cuiabá: s., w., 17.ii.1976, R.L. Araujo (MZSP-2019). Juruena: s., w., 06.vii.2002, R. Constantino (UnB-3429). Utiariti: s., w., 01.viii.1961, K. Lenko (MZSP-8096). *Mato Grosso do Sul*. Campo Grande: s., w., 20.ii.1976, R.L. Araujo (MZSP-6568). Costa Rica: s., w., 01.ii.1986, IQUSP (MZSP-9289). *Rondonia*. Vilhena: s., w., im., 07–09.xi.1998, R. Constantino (UnB-684, 691,

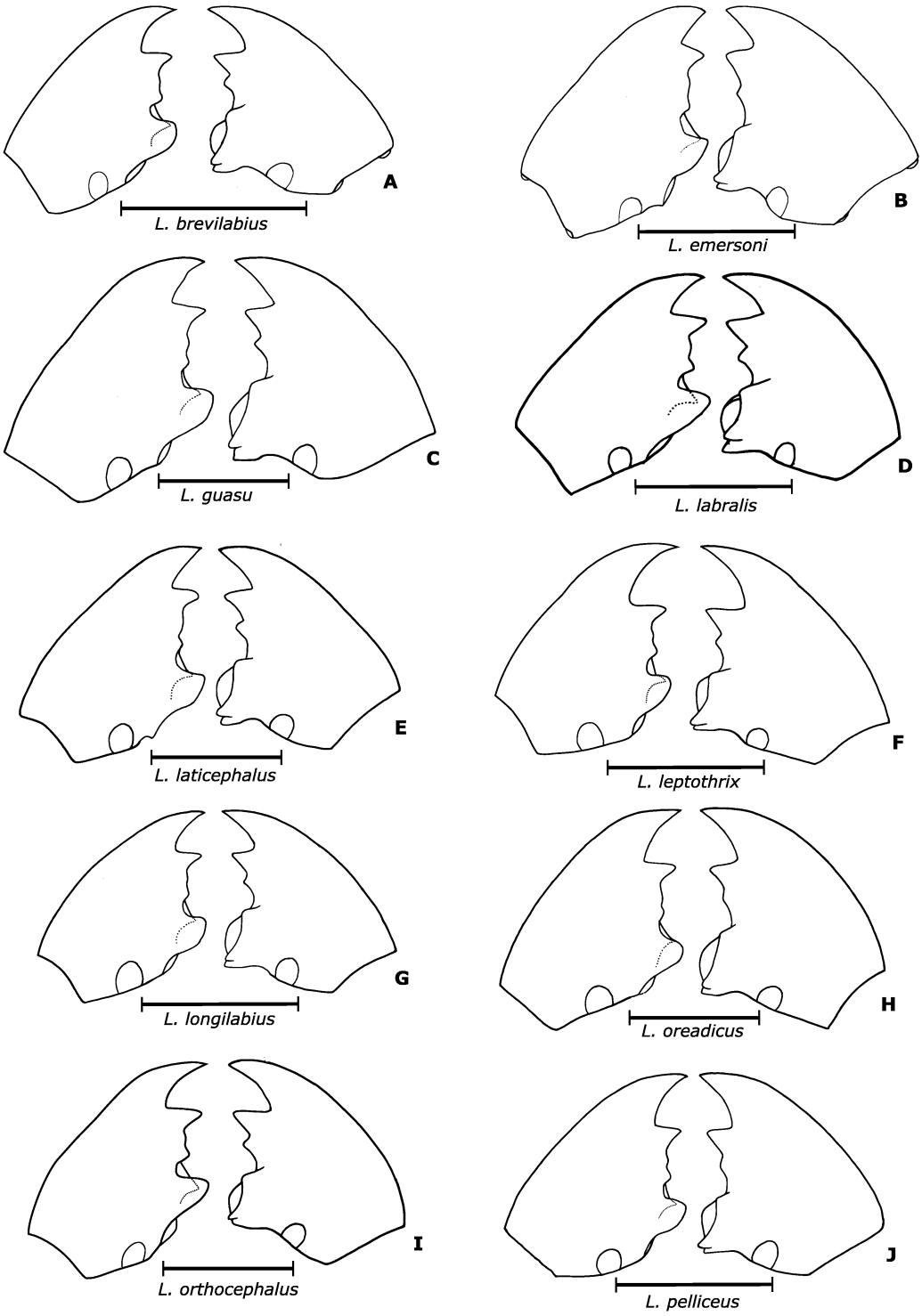


FIGURES 11. Soldier mandibles. A, *Labiotermes brevilabius*; B, *L. emersoni*; C, *L. guasu*, new species; D, *L. labralis*; E, *L. laticephalus*; F, *L. leptothrix*; G, *L. longilabius*; H, *L. oreadicus*, new species; I, *L. orthocephalus*; J, *L. pelliceus*. Scale bars = 0.5 mm.

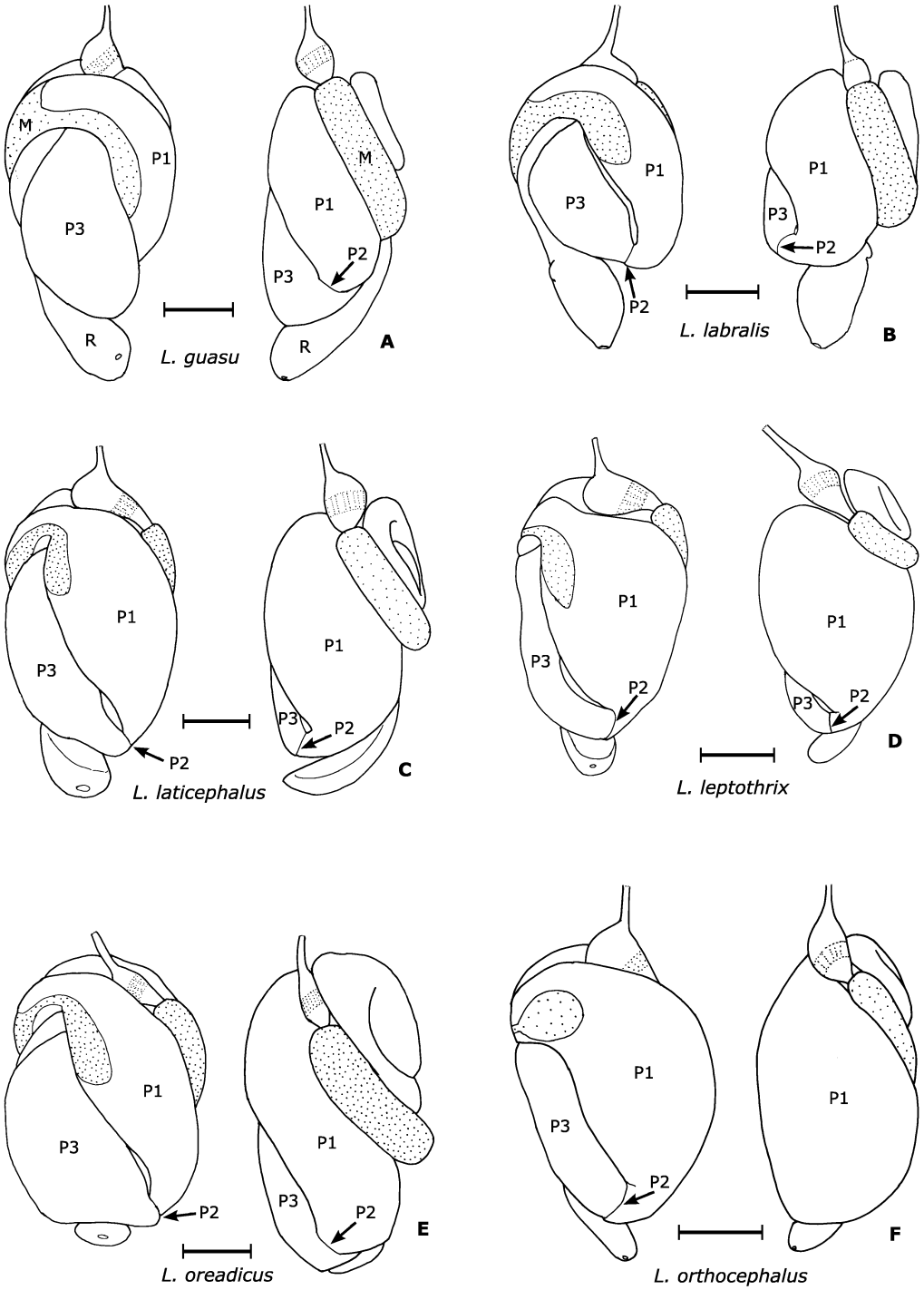
692, 726). *Minas Gerais*. Bocaiúva: s., 26.xi.1998, N.R.A. Castro (UnB-1785). Bom Sucesso: s., w., im., 12.xi.1972, R.L. Araujo (MZSP-5793). Capitão Eneias: s., w., 15.vii.1975, R.L. Araujo (MZSP-6247). Curvelo: s., w., im., 13.xi.1972, R.L. Araujo (MZSP-5781, 6234). Francisco Sá: s., w., 18.vii.1975, R.L. Araujo (MZSP-6143). Montes Claros: s., w., 16.xi.1972, R.L. Araujo (MZSP-5610, 5641). Rio Pomba: s., w., 01.vii.1975, R.L. Araujo (MZSP-6092, 6180). Teófilo Otoni: s., w., 26.xii.1976, R.L. Araujo (MZSP-7262). *Rio de Janeiro*. Rio de Janeiro: s., w., 06.i.1966, R.L. Araujo (MZSP-377, 2019). Seropédica: s., w., im., 11.x.2001, R. Constantino (UnB-2127). *Roraima*. Ilha de Maracá: s., w., paratypes of *P. caapora*, 22.x.1987, A.G. Bandeira (INPA-222). *Tocantins*. Paranã, Fazenda São João: s., w., 12–17.ix.2003, D.L. Bernardo (UnB-4874, 4905, 4922, 4947, 4966).



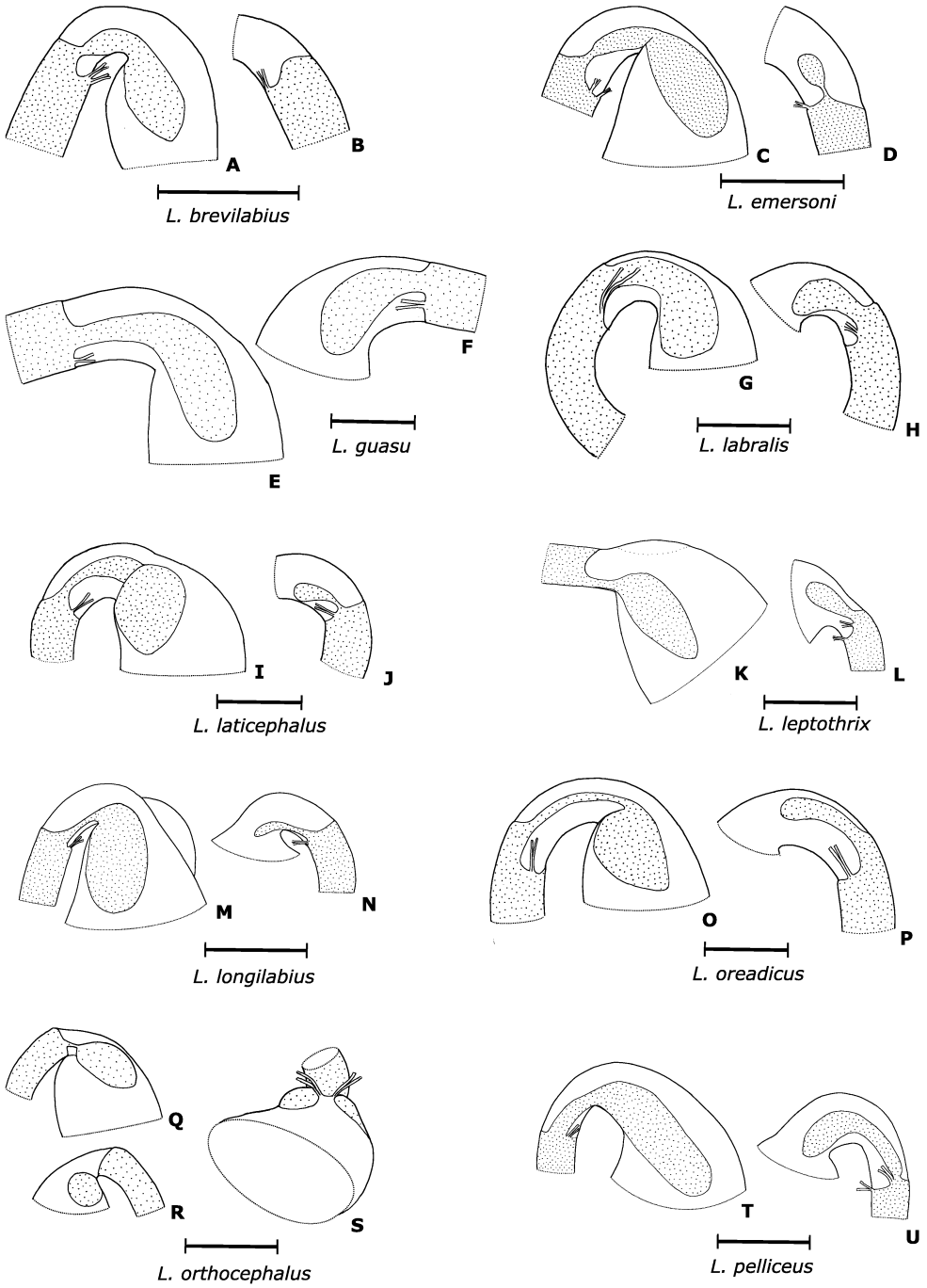
FIGURES 12. Imago mandibles. A, *Labiotermes brevilabius*; B, *L. emersoni*; C, *L. labralis*; D, *L. orthocephalus*. A = apical tooth; M1–3 = first, second and third marginal teeth; M4 = subsidiary marginal tooth (= molar tooth); MPR= molar prominence; MPL= molar plate.Scale bars = 0.5 mm.



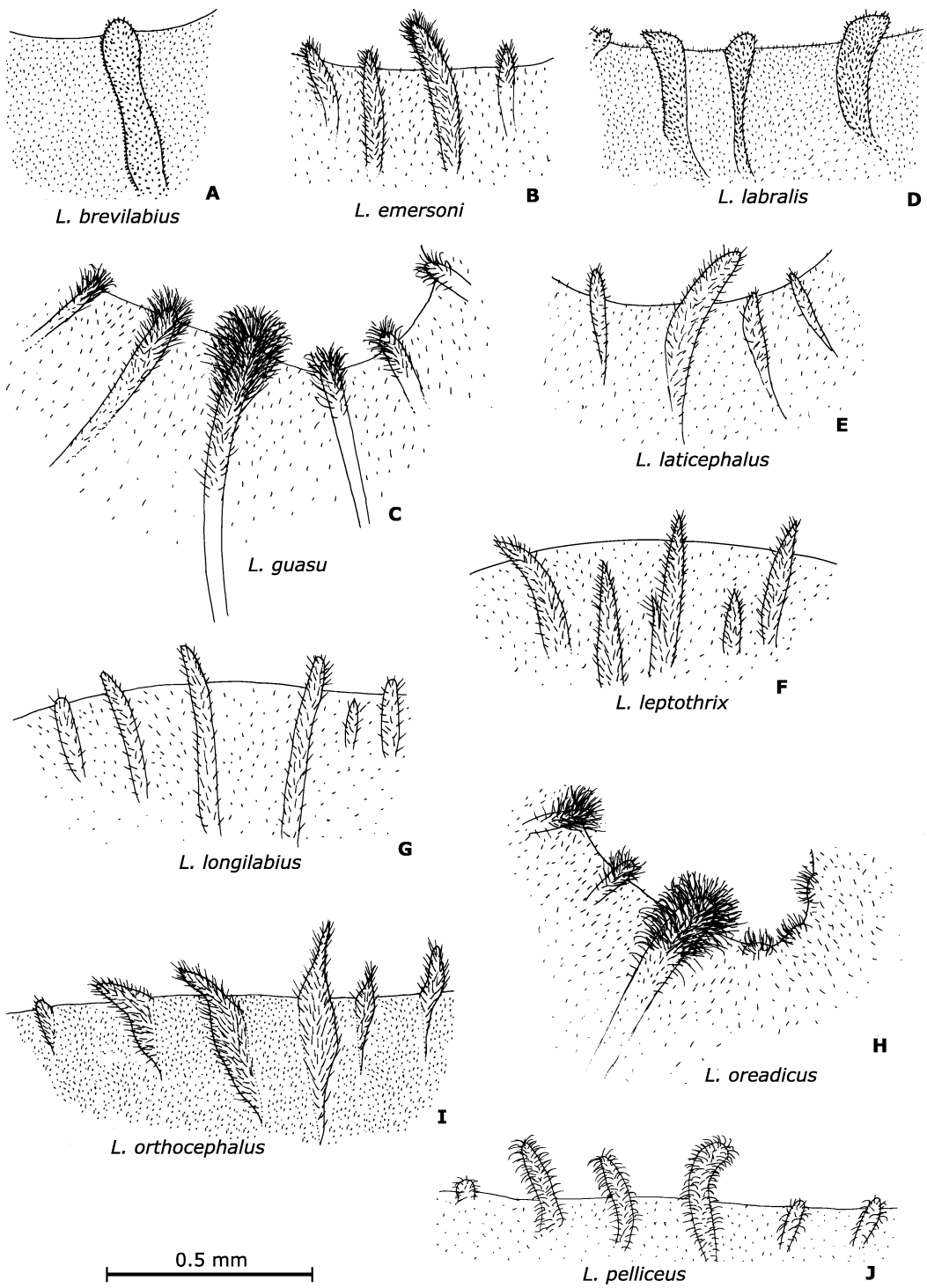
FIGURES 13. Worker mandibles. A, *Labiotermes brevilabius*; B, *L. emersoni*; C, *L. guasu*, new species; D, *L. labralis*; E, *L. laticephalus*; F, *L. leptothrix*; G, *L. longilabius*; H, *L. oreadicus*, new species; I, *L. orthocephalus*; J, *L. pelliceus*. Scale bars = 0.5 mm.



FIGURES 14. Gut morphology of workers *in situ*, ventral and left view, respectively. A, *Labiotermes guasu*, new species; B, *L. labralis*; C, *L. laticephalus*; D, *L. leptothrix*; E, *L. oreadicus*, new species; F, *L. orthocephalus*. Scale bars = 1.0 mm. M= mesenteron; P1=first proctodeal segment; P2= enteric valve; P3= third proctodeal segment (paunch); R= rectum.



FIGURES 15. Mixed segment of workers. A–B, *Labiotermes brevilabius*; C–D, *L. emersoni*; E–F, *L. guasu*, new species; G–H, *L. labralis*; I–J, *L. laticephalus*; K–L, *L. leptothrix*; M–N, *L. longilabius*; O–P, *L. oreadicus*, new species; Q–S, *L. orthocephalus*; T–U, *L. pelliceus*. For each species, the first drawing corresponds to the large mesenteric prolongation (visible from ventral view) and the second corresponds to the small mesenteric prolongation (on opposite side). Scale bars = 1.0 mm.



FIGURES 16. Enteric valve armature of workers. A, *Labiotermes brevilabius*; B, *L. emersoni*; C, *L. guasu*, new species; D, *L. labralis*; E, *L. laticephalus*; F, *L. leptothrix*; G, *L. longilabius*; H, *L. oreadicus*, new species; I, *L. orthocephalus*; J, *L. pelliceus*.

Labiotermes pelliceus Emerson & Banks

Labiotermes pelliceus Emerson & Banks, 1965: 28–30 [soldier, Fig. 9]; Kovoor 1969: 198–207 [gut morphology, Figs. 3–4, Pl. Figs. I-3, II-3].

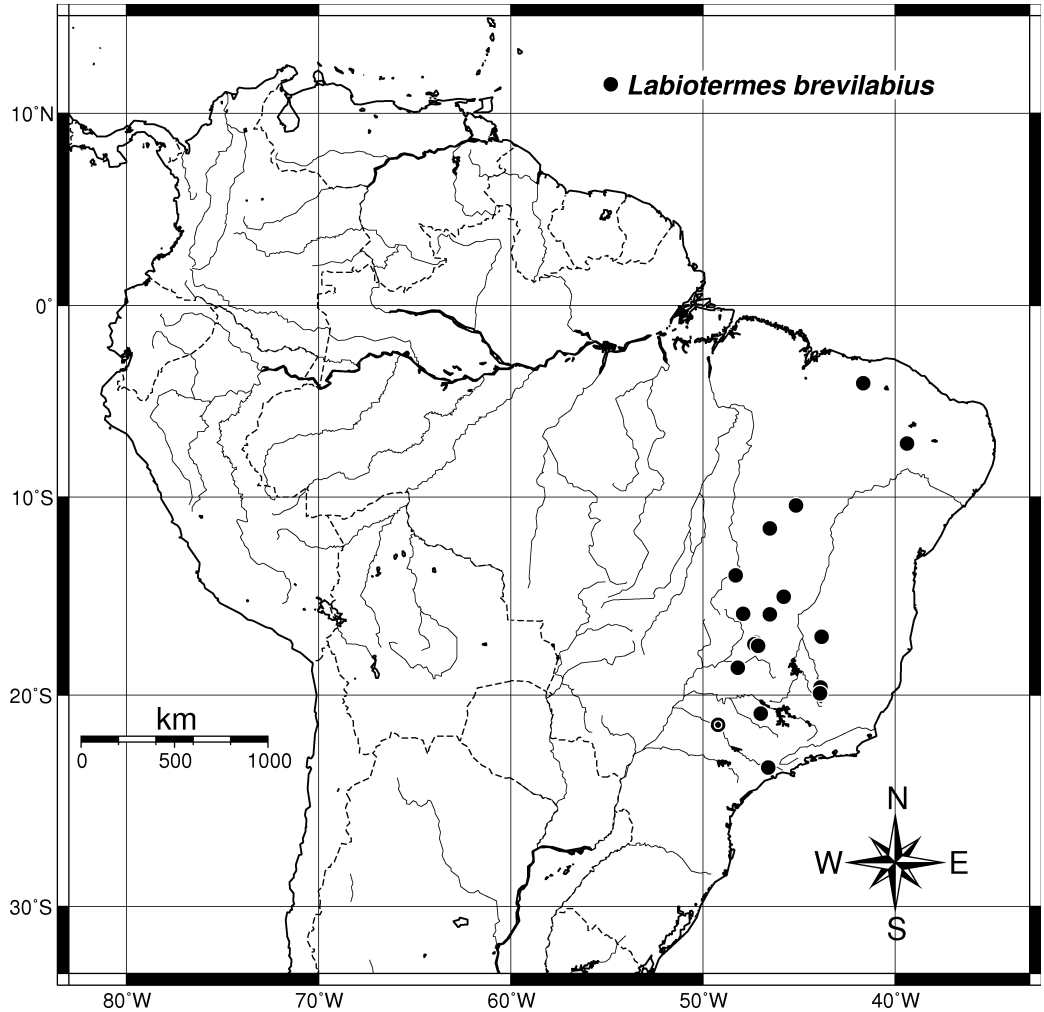
Holotype: soldier (AMNH), not examined.

Type-locality: Guyana: Itabu Creek.

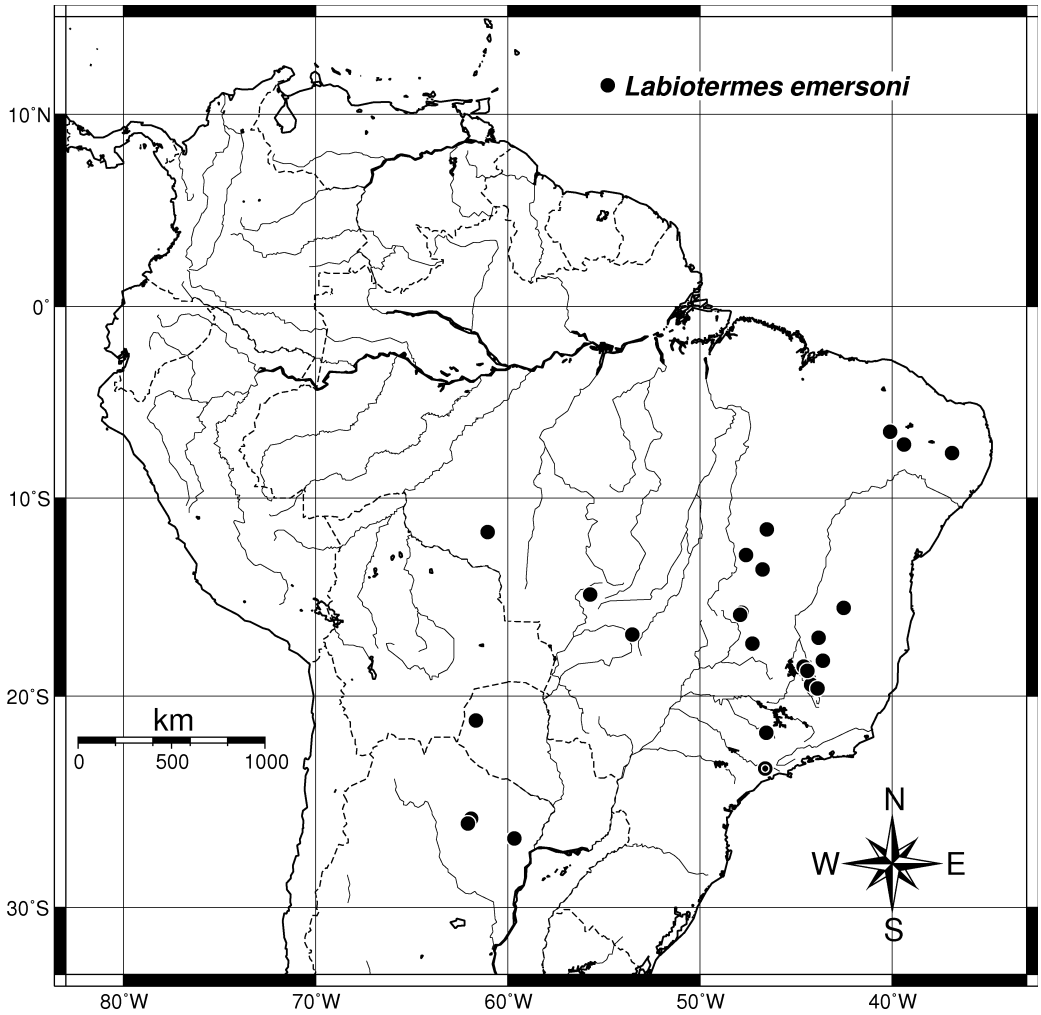
Imago. Unknown.

Soldier (Fig. 10A–B, 11J). Described by Emerson & Banks (1965: 28–30). Additional measurements are presented in Table 2.

Comparisons. The soldier of *L. pelliceus* can be easily recognized by the dense fine hairs on the head capsule.



FIGURES 17. Geographic distribution of *Labiotermes brevilabius*. The double circle indicates the type-locality.



FIGURES 18. Geographic distribution of *Labiotermes emersoni*. The double circle indicates the type-locality.

Worker. (Figs. 10, 13J, 15T–U, 16J) Head, postclypeus and pronotum densely covered with bristles and fine hairs. Mesonotum with a line of numerous bristles on posterior margin. Front coxa with a blunt lateral projection near base. Antenna with 15 articles. Fontanelle large and rounded. Enteric valve with 6 finger-like ridges of unequal size, covered with long and curved spines. Mixed segment with two elongate mesenteric lobes; small lobe more than half the length of the large one. Measurements in Table 3.

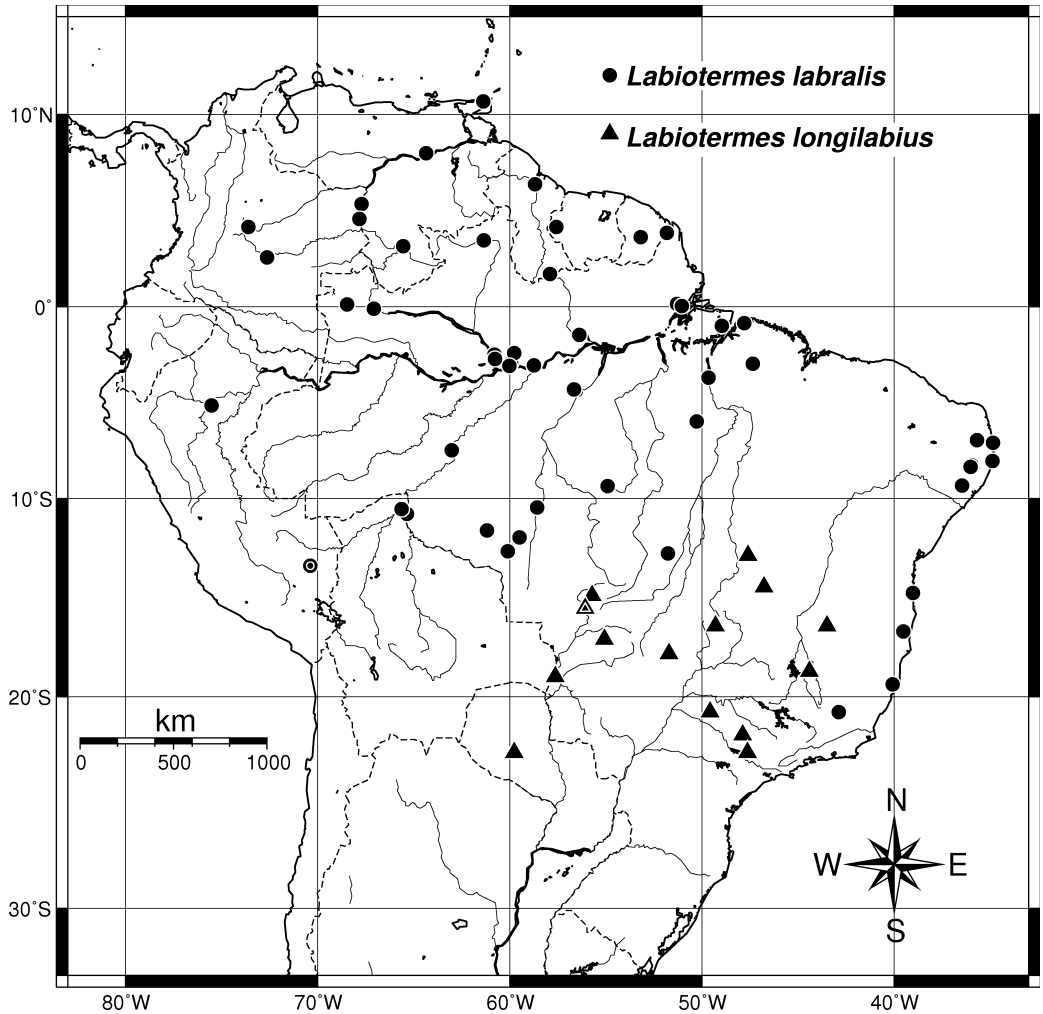
Comparisons. The worker of *L. pelliceus* can be recognized by the dense fine hairs on the head and body. Its enteric valve is distinct from all other species.

Geographical distribution. *Labiotermes pelliceus* has been recorded from relatively few localities (Fig. 21), most of them in Brazilian Amazonia. It seems to occur only in the rainforest.

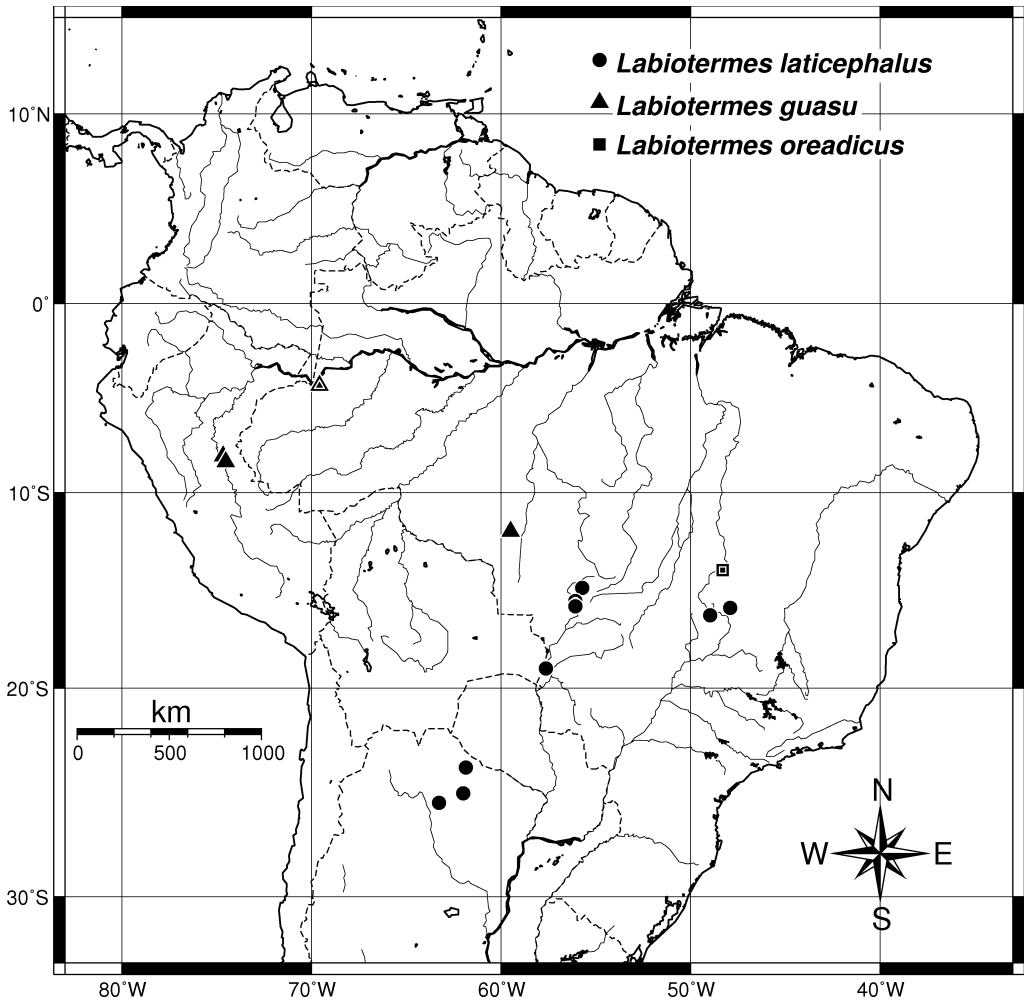
Remarks. In most samples examined, the color of the soldier head capsule is not as dark as described by Emerson & Banks (1965). Most had the head capsule light brown.

Material examined

BRAZIL. *Amazonas*. Manaus, rodovia BR-174, km 54: s., w., 05.vi.2002, I. Ackerman (UnB-4711, 4712, 4713). Manaus, Reserva Ducke: s., w., 27.vii.1983, Ch. Noirot (MZSP-9380); s., w., 01.i.1991, F.B. Apolinário (UnB-3689). Manaus, Rodovia ZF-2: s., w., 16.iii.1988, A.G. Bandeira (INPA-690). *Maranhão*. Aldeia Araçu: s., w., 07.v.1963, B. Malkin (MZSP-1891). *Mato Grosso*. Juruena: s., w., 06.vii.2002, R. Constantino (UnB-3431). *Pará*. Paragominas: s., w., 27.vi.1990, R. Constantino (MPEG 3514). Oriximiná, Porto Trombetas: s., w., 29.vii.2000, A.N.S. Acioli (UnB-5514). **GUYANA**. Acary Mountains, Itabu Creek: paratype soldier, x.1938, E.R. Blake (MZSP).



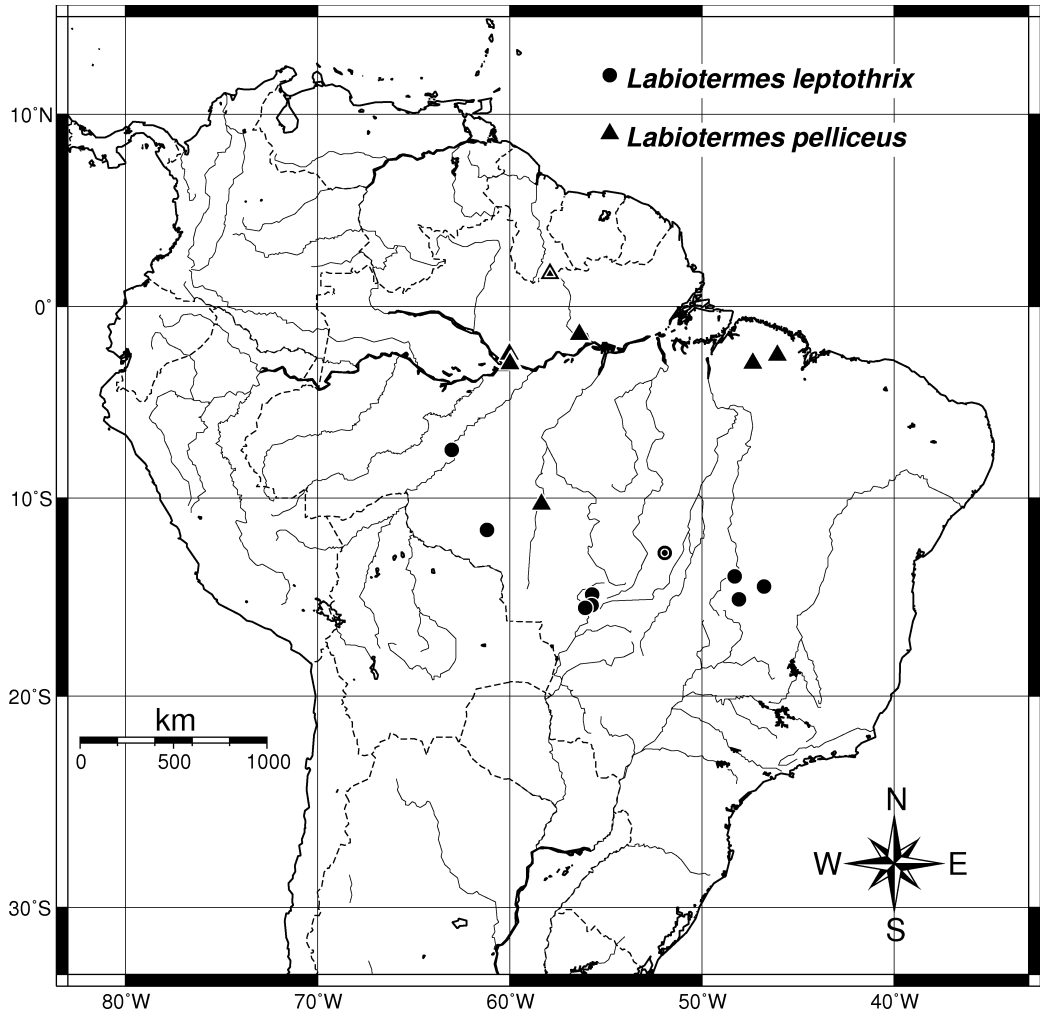
FIGURES 19. Geographic distribution of *Labiotermes labralis* and *L. longilabius*. The double symbol indicates the respective type-locality.



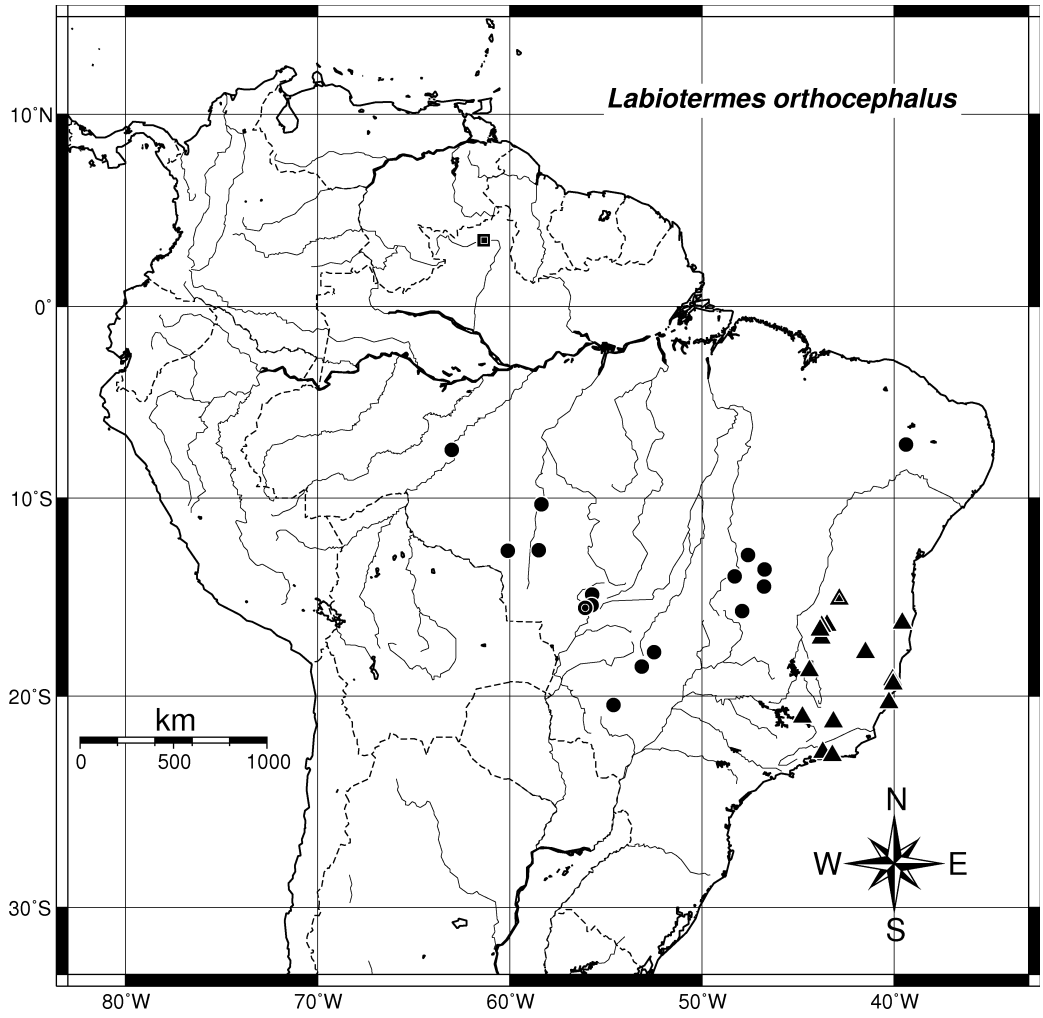
FIGURES 20. Geographic distribution of *Labiotermes laticephalus*, *L. guasu*, new species, and *L. oreadicus*, new species. The double symbol indicates the respective type-locality.

Acknowledgments

This work was supported by a grant from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq no. 307123/2004-9). We thank the following colleagues for sending specimens for study: Eliana M. Cancello (MZSP), Augusto L. Henriques (INPA), AnaY. Harada (MPEG), Og F. DeSouza (UFVB), and Adelmar G. Bandeira (DSEC). We also thank Yves Roisin for providing unpublished records of *L. emersoni* and *L. longilabius*. Collecting trips to some unexplored places in Brazil where supported by grants from the Brazilian Ministry of the Environment (MMA/PROBIO/GEF) and the project Conservation and Sustainable Management of Below-Ground Biodiversity (TSBF/UNEP/GEF).



FIGURES 21. Geographic distribution of *Labiotermes leptothrix* and *L. pelliceus*. The double symbol indicates the respective type-locality.



FIGURES 22. Geographic distribution of *Labiotermes orthocephalus*. Triangles correspond to *Paracornitermes hirsutus* and the square to *P. caapora*, both synonyms of *L. orthocephalus*. The double symbol indicates the respective type-locality.

References

Araujo, R.L. (1954) Notes on the genus *Paracornitermes* Emerson, 1949, with description of two new species (Isoptera, Termitidae, Nasutitermitinae). *Revista Brasileira de Entomologia*, 1, 181–189.

Bandeira, A.G. & Cancello, E.M. (1992) Four new species of termites (Isoptera, Termitidae) from the Island of Maracá, Roraima, Brazil. *Revista Brasileira de Entomologia*, 36(2), 423–435.

Bandeira, A.G., Vasconcellos, A., Silva, M. & Constantino, R. (2003) Effects of habitat disturbance on the termite fauna in a highland humid forest in the Caatinga Domain, Brazil. *Sociobiology*, 42(1), 117–127.

Calderon, R.A. & Constantino, R. A survey of the termite fauna (Isoptera) of an eucalypt plantation

in central Brazil. *Neotropical Entomology*, in press.
Desneux, J. (1904) Isoptera Fam. Termitidae. *In:* P. Wytsman (Ed.), *Genera Insectorum*, Fascicule 25, pp. 1–52, color plates 1–2, V. Verteneuil & L. Desmet, Brussels.
Donovan, S.E., Jones, D.T., Sands, W.A. & Eggleton, P.E. (2000). Morphological phylogenetics of termites. *Biological Journal of the Linnean Society*, 70, 467–513.
Emerson, A.E. (1925) The termites from Kartabo, Bartica District, Guyana. *Zoologica*, 6(4), 291–459.
Emerson, A.E. (1952) The neotropical genera *Procornitermes* and *Cornitermes* (Isoptera, Termitidae). *Bulletin of the American Museum of Natural History*, 99(8), 475–540.
Emerson, A.E. & Banks, F.A. (1965) The neotropical genus *Labiotermes* (Holmgren): its phylogeny, distribution and ecology (Isoptera, Termitidae, Nasutitermitinae). *American Museum Novitates*, 2208, 1–33.
Engel, M. & Krishna, K. (2004) Family-group names for termites. *American Museum Novitates*, 3432, 1–9.
Fontes, L.R. (1998) Novos aditamentos ao Catálogo dos Isoptera do Novo Mundo, e uma filogenia para os gêneros neotropicais de Nasutitermitinae. *In:* L.R. Fontes & E. Berti-Filho (Eds.), *Cupins: O desafio do conhecimento*, pp. 309412, FEALQ, Piracicaba.
Holmgren, N. (1906) Studien über südamerikanische Termiten. *Zoologische Jahrbücher Abt. Systematik*, 23(5), 521–676.
Holmgren, N. (1909) Termitenstudien 1. Anatomische Untersuchungen. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 44(3), 1–215.
Holmgren, N. (1912) Termitenstudien 3. Systematik der Termiten. Die Familie Metatermitidae. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 48(4), 1–166.
International Commission on Zoological Nomenclature (1999) *International Code of Zoological Nomenclature*. International Trust for Zoological Nomenclature, London, 4 edition.
Kovoor, J. (1969) Anatomie comparée du tube digestif des termites II. —Sous-Famille des Nasutitermitinae. *Insectes Sociaux*, 16(3), 195–234.
Krishna, K. (1963) The African genus *Foraminitermes* Holmgren (Isoptera, Termitidae, Termitinae). *American Museum Novitates*, 2161, 1–23.
Martius, C. & Ribeiro, J.D. (1996) Colony populations and biomass in nests of the Amazonian forest termite *Anoplotermes banksi* Emerson (Isoptera: Termitidae). *Studies on Neotropical Fauna and Environment*, 31(2), 82–86.
Mathews, A.G.A. (1977) *Studies on Termites from the Mato Grosso State, Brazil*. Academia Brasileira de Ciências, Rio de Janeiro, 267 pp.
Noirot, C. (2001) The gut of termites (Isoptera). Comparative anatomy, systematics, phylogeny. II. Higher termites (Termitidae). *Annales de la Societé Entomologique de France*, 37(4), 431–471.
Roonwal, M.L. (1970) Measurement of termites (Isoptera) for taxonomic purposes. *Journal of the Zoological Society of India*, 21(1), 9–66.
Sands, W.A. (1998) *The identification of worker castes of termite genera from soils of Africa and the Middle East*. Cab International, Wallingford, 500 pp.
Silvestri, F. (1901) Nota preliminare sui Termitidi sud-americani. *Bollettino dei Musei di Zoologia e Anatomia Comparata della Università di Torino*, XVI(389), 1–8.
Silvestri, F. (1903) Contribuzione alla conoscenza dei Termitidi e Termitofili dell' America Meridionale. *Redia*, 1, 1234.
Sjöstedt, Y. (1926) Revision der Termiten Afrikas. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 3(1), 1–419.
Snyder, T.E. (1926) Termites collected on the Mulford Biological Exploration to the Amazon Basin 1921–1922. *Proceedings of the U. S. National Museum*, 68(14), 1–76.
Snyder, T.E. (1949) Catalog of the termites (Isoptera) of the World. *Smithsonian Miscellaneous Collections*, 112, 1–490.

Torales, G.J., Laffont, E.R., Godoy, M.C., Coronel, J.M. & Arbino, M.O. (2005) Update on taxonomy and distribution of Isoptera from Argentina. *Sociobiology*, 45(3), 853–886.

Wessel, P. & Smith, W.H.F. (1998) New, improved version of Generic Mapping Tools released. *EOS Transactions of the American Geophysical Union*, 79(47), 579.

Appendix. Localities indicated in the lists of material examined and in the distribution maps

ARGENTINA. *Chaco*. Parque Nacional Chaco: 26°50' S 59°40' W. *Santiago del Estero*. Copo, Parque Nacional Copo: 25°55' S 61°55' W. Copo, Ruta Nacional 16: 26°8' S 62°5' W. **BRAZIL**. *Amapá*. Curiau: 0°1'48" N 51°3' W. Mazagão: 0°7'48" N 51°18' W. Oiapoque: 3°50'35" N 51°50'6" W. *Amazonas*. Anavilhanas: 2°45' S 60°46'12" W. Manaus, rodovia BR-174, km 54: 2°30'40" S 60°1'46" W. Itacoatiara, Fazenda Aruanã: 3°4'12" S 58°45' W. Humaitá: 7°30'58" S 63°1'19" W. Manaus: 3°6'47" S 60°1'30" W. Manaus, Reserva Ducke: 2°57' S 59°57' W. Manaus, Rodovia ZF-2: 3°0' S 60°0' W. Manaus, Manaus - Rod. ZF-3: 2°27' S 59°47' W. Benjamin Constant, Nova Aliança: 4°21' S 69°36' W. Rio Negro: 2°31' S 60°48' W. *Bahia*. Eunápolis: 16°22'39" S 39°34'49" W. Ilhéus: 14°49'12" S 39°1'48" W. Monte Pascoal: 16°45' S 39°32' W. *Ceará*. Aiuaba: 6°34'25" S 40°7'25" W. Crato: 7°13'48" S 39°22'48" W. *Distrito Federal*. Brasília: 15°46'47" S 47°55'47" W. Fazenda Água Limpa: 15°58' S 47°54'22" W. Jardim Botânico de Brasília: 15°50'51" S 47°50'13" W. Reserva Ecológica do IBGE: 15°56'42" S 47°53'6" W. *Espírito Santo*. Linhares: 19°23'28" S 40°4'20" W. Rebio Sooretama: 19°11'29" S 40°5'31" W. Vila Velha: 20°19'47" S 40°17'33" W. *Goiás*. Anápolis: 16°19'48" S 48°58'12" W. Alvorada do Norte, Fazenda Paraná: 14°31'31" S 46°47'5" W. Mimoso: 15°10'1" S 48°4'59" W. São Domingos, Monte Alto: 13°39'20" S 46°45'9" W. Parque Nacional das Emas: 17°49'48" S 52°30' W. Santo Antônio de Goiás: 16°29'1" S 49°18'40" W. Minaçu, Serra da Mesa: 14°1' S 48°19' W. *Maranhão*. Aldeia Araçu: 2°34' S 46°6' W. *Mato Grosso*. Alto Garças: 16°56'38" S 53°31'41" W. Chapada dos Guimarães, Rio Manso: 14°56' S 55°44' W. Chapada dos Guimarães: 15°27'38" S 55°44'59" W. Cuiabá: 15°35'46" S 56°5'48" W. Iquê-Juruena: 12°0' S 59°30' W. Jaraguá: 17°9' S 55°5' W. Juruena: 10°19'5" S 58°21'32" W. Juruena, Rohden Lignea: 10°28'9" S 58°34'54" W. Santo Antônio do Leverger: 15°51'56" S 56°4'36" W. Utiariti: 12°40'12" S 58°30' W. *Mato Grosso do Sul*. Campo Grande: 20°27' S 54°37'12" W. Corumbá: 19°1'1" S 57°39' W. Costa Rica: 18°32'38" S 53°7'45" W. *Minas Gerais*. Araguari: 18°38'50" S 48°11'14" W. Bocaiúva: 17°7'12" S 43°49'12" W. Bom Sucesso: 21°1'48" S 44°46'12" W. Capitão Eneias: 16°31'48" S 43°46'12" W. Curvelo: 18°45' S 44°25'12" W. Diamantina: 18°15' S 43°36' W. Paracatu, Faz. Rossato: 17°23'42" S 47°16'34" W. Paracatu, Faz. Susano: 17°29'12" S 47°19'55" W. Guarda-Mor: 17°34'17" S 47°8'37" W. Buritis, Fazenda São Miguel: 15°58'22" S 46°32'6" W. Francisco Sá: 16°28'12" S 43°30' W. Lagoa Santa: 19°37'48" S 43°52'48" W. Montes Claros: 16°43'12" S 43°52'12" W. Morro da Garça: 18°32'49" S 44°36'9" W. P. N. Grande Sertão Veredas: 15°6' S 45°48' W. Poços de Caldas: 21°47'16" S 46°33'41" W. Rio Pardo de Minas: 15°36'35" S 42°32'23" W. Rio Pomba: 21°16'29" S 43°10'45" W. Sete Lagoas: 19°27' S 44°13'48" W. Teófilo Otoni: 17°51' S 41°30' W. Viçosa: 20°45' S 42°52'48" W. *Pará*. Cachoeira do Arari: 1°0'41" S 48°57'48" W. Paragominas: 2°59'45" S 47°21'10" W. Parque Nacional da Amazonia: 4°19'48" S 56°40'12" W. Oriximiná, Porto Trombetas: 1°29' S 56°23' W. Novo Progresso, Serra do Cachimbo: 9°21'32" S 54°54'51" W. Serra dos Carajás: 6°0' S 50°16'12" W. Taperinha: 0°52' S 47°49' W. Tucurui: 3°43'12" S 49°40'48" W. *Paraíba*. Areia: 6°58'12" S 35°42' W. Sumé, Fazenda Almas: 7°40'18" S 36°52'48" W. João Pessoa: 7°7'12" S 34°52'12" W. Quebrângulo: 9°19'8" S 36°28'16" W. *Pernambuco*. Caruaru: 8°17' S 35°58'34" W. Recife: 8°3' S 34°54' W. *Piauí*. Corrente: 10°26'36" S 45°9'44" W. Parque Nacional de Sete Cidades: 4°5' S 41°40' W. *Rio de Janeiro*. Rio de Janeiro: 22°54' S 43°13'48" W. Seropédica: 22°43'59" S 43°43'1" W. *Rondonia*. Guajará-Mirim: 10°48' S 65°22'1" W. Pimenta Bueno: 11°39' S 61°12' W. Pimenta Bueno, Área 05: 11°45'9" S 61°2'50" W. Vilhena: 12°43'12" S 60°6' W. Vilhena, Área 3: 12°39'41" S 60°7'25" W. *Roraima*. Ilha de Maracá: 3°27' N 61°21' W. *São Paulo*. Bálsamo: 20°44'7" S 49°35'1" W. Parque Estadual de Porto Ferreira: 21°51' S 47°54' W. Piracicaba: 22°43' S 47°38' W. São Paulo: 23°31'48" S 46°37'12" W. *Tocantins*. Dianópolis, Fazenda Novo Iguaçu: 11°36'9" S 46°31'3" W. Paranã, Fazenda São

João: 12°54'50" S 47°37'1" W. **FRENCH GUYANA**. Saül: 3°37' N 53°12' W. **GUYANA**. Itabu Creek: 1°42' N 57°55' W. **PARAGUAY.** *Boquerón*. La Patria, Parque Nacional Teniente Enciso: 21°12'25" S 61°39'25" W. *Presidente Hayes*. Cruce de los Pioneros: 22°43'15" S 59°46'50" W. **PERU**. *Huánuco*. Tingo María: 5°10'12" S 75°31'48" W. *Ucayali*. Pucalpa: 8°22'57" S 74°32'17" W. Río Aguaytía: 8°3'59" S 74°40'13" W. **VENEZUELA**. *Amazonas*. Alto Orinoco - Motorema: 3°10' N 65°33' W. San Pedro: 4°34'22" N 67°50'8" W.