freqüência de capturas para ambas espécies no rio Uatumã não permitiu uma precisa estimativa da abundância, muito embora a menor abundância de *carbonaria* em relação à *denticulata* seja óbvia. Auffemberg (1971) afirma que a separação evolutiva de *carbonaria* e *denticulata* está associada ao desenvolvimento dos cerrados periféricos à bacia amazônica. Moskovits (1985) capturou, em Maracá, mais fêmeas de *carbonaria* em áreas abertas que no ecótono floresta/ cerrado durante o período de reprodução. O fato de *carbonaria* ser menos abundante que *denticulata* no Uatumã, região de densas florestas tropicais, parece indicar que diferentes padrões fisiológicos ou comportamentais podem estar associados à manutenção das populações de *carbonaria* que ocorrem em florestas densas. O pequeno número de recapturas pode estar associado a migrações de animais para outras localidades ou ao tamanho da área utilizada por indivíduo. As áreas de censo, neste estudo, possuíam 10 ha e é possível que este tamanho tenha sido insuficiente para conseguir um maior número de recapturas. Moskovits (1985) afirma que o tamanho da área utilizada por vários indivíduos de ambas as espécies variou de 0,63 a 117,5 ha.

Dentre as características taxonômicas definidas por Williams (1960) duas apresentaram nenhuma ou pouca variação: a que define o contato das placas femorais com as inguinais, e a relação de tamanho entre as suturas humerais e femorais. Estas características são, portanto, mais adequadas para identificação de ambas as espécies na região do rio Uatumã.

AGRADECIMENTOS

Eu agradeço a George Rebelo, Sílvia Egler e Márcio Martins, por terem me prestado valioso auxílio na preparação do manuscrito.

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TERMITES (ISOPTERA) FROM THE LOWER JAPURÁ RIVER, AMAZONAS STATE, BRAZIL

R. Constantino[1]

ABSTRACT – Seventy species of termites were collected in primary forests on the lower Japurá River, Amazonas State, Brazil. Seven new species, Orthognathotermes humilis, *sp.n.,* Spinitermes longiceps, *sp.n.,* Armitermes gnomus, *sp.n.,* Araujotermes nanus, *sp.n.,* Embiratermes ignotus, *sp.n.,* Subulitermes constricticeps, *sp.n., and* Syntermes robustus, *sp.n., are described. The imago of* Cavitermes parvicavus *is described for the first time. Drawings of the soldiers' head, alates' head and mandibles, worker's mandibles and enteric valve armature are presented for the new species and for those without adequate illustrations in the literature.*

KEY WORDS – Termites, Isoptera, Amazonia, Taxonomy.

RESUMO – Setenta espécies de cupins foram coletadas em florestas primárias do baixo rio Japurá, Amazonas, Brasil. Sete espécies novas, Orthognathotermes humilis, *sp.n.,* Spinitermes longiceps, *sp.n.,* Armitermes gnomus, *sp.n.,* Araujotermes nanus, *sp.n.,* Embiratermes ignotus, *sp.n.,* Subulitermes constricticeps, *sp.n. e* Syntermes robustus, *sp.n., são descritas. O imago de* Cavitermes parvicavus *é descrito pela primeira vez. São apresentados desenhos da cabeça dos soldados, da cabeça e das mandíbulas do alado e das mandíbulas e válvula entérica das espécies novas e daquelas para as quais não havia ilustração adequada na literatura.*

PALAVRAS-CHAVES – Cupins, Isoptera, Amazônia, Taxonomia.

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INTRODUCTION

The Amazon forest, occupying an area of approximately six million km^2, is the largest extension of tropical forest in the world. The first reliable information on Amazonian termites seems to be the observations of Bates (1854), in part of his notes translated into German and published by Hagen (1858). Holmgren (1906) collected termites in Bolivia and Peru as a member of the Nordenskiöldi Expedition and described 26 new species, with biological notes and information on nest architecture. Emerson (1925) studied the termites of Kartabo, Guyana, and described 51 new species in his classic work. The termites collected by the Mulford Biological Exploration of the Amazon Basin in Bolivia and Brazil in 1921-1922 were studied by Snyder (1926), who listed 77 species, 36 described as new. Mathews (1977) studied the termites of Mato Grosso State, Brazil, as a member of the Xavantina-Cachimbo Expedition, in a transition zone between the Amazon forest and the savannas ("cerrado") of Central Brazil. The above mentioned studies are mainly taxonomic and only Mathews (1977) provides ecological information. Most of the collections were made in peripheral areas of the Amazon Basin.

The following taxonomic work is the result of the study of the material I collected in the lower Japurá River in September and October, 1988. It is essentially a faunal work, but an ecological analysis is to be published in another paper. I hope it will be useful for further termite studies, given the paucity of collections and taxonomic studies in this region. Seventy species of 33 genera were collected, and seven are described as new. Four other new species and one new genus were previously described from the material collected (Constantino 1990a, b; 1991).

METHODS

The study area is located on low Japurá River, 10 Km downstream from the town of Maraã (01°51'S 65°27'S) (Figure 1). Termites were collected by me in and around two plots of 50 m X 50 m, one on primary "terra firme" forest on left margin of the river and one on primary swamp forest ("várzea") on Jaraqui Island. All material collected was deposited in the collection of the Museu Paraense Emílio Goeldi (MPEG) and some duplicates were deposited in the collection of the Museu de Zoologia da Universidade de São Paulo (MZSP).

Camera-lucida drawings were made with a stereomicroscope using magnifications from 10 X to 80 X, according to the size of the species. Mandibles, enteric valve armatures and small-sized species were mounted on slides using glycerin or Hoyer's medium and drawn with a microscope. Measurements were taken with an ocular micrometer, as described by Roonwàl (1969). The terminology for mandibles and digestive tube used in this paper is the same used by Fontes (1987a, b). Terms used for chaetotaxy are comparative. Bristles are long and hard, with well-marked bases. Hairs are shorter and more slender than bristles. Microscopic hairs are visible only under high magnifications, generally more than 60 X. Colors are described using the scheme proposed by Sands (1965).

The material studied is listed by catalog number of the termite lots, each

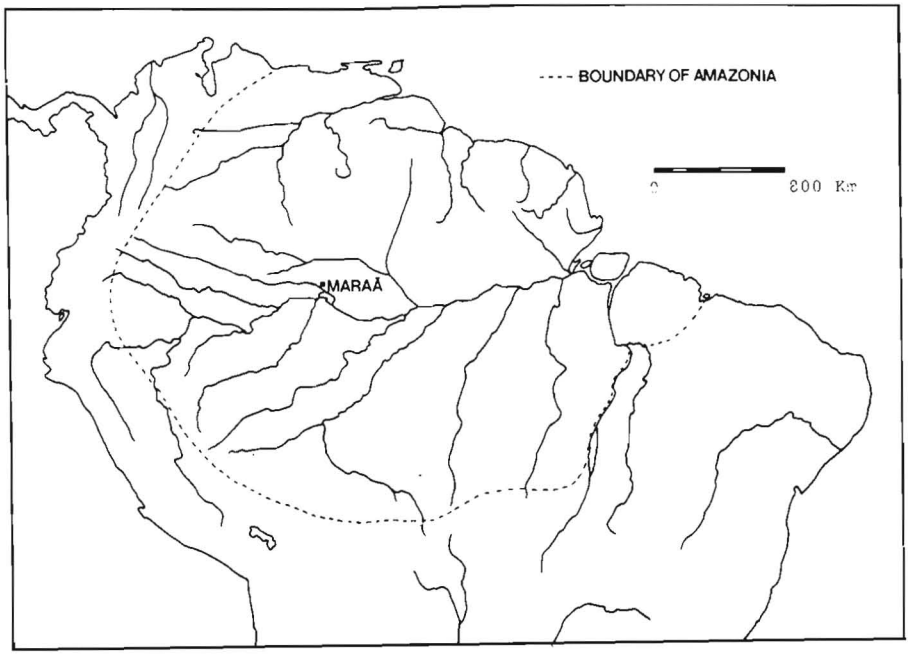


Figure 1 – Location of the study area.

corresponding to one sample, in the collections of MPEG and MZSP. All the lots contains soldiers and workers, except the Apicotermitinae. All Neotropical species of this subfamily lack a soldier caste. The presence of alates, queen or king is indicated in parentheses.

Araujo (1977) and Fontes (1983) provide a complete bibliographic list of taxonomic descriptions.

FAMILY RHINOTERMITIDAE

Coptotermes testaceus (L.) 1785

Material – MPEG 2811, 2818, 2857, 2891, 2906, 2916, 2921, 2985, MZSP 9234.
Biology – Collected in sound wood. This species sometimes builds earthen, clayish structures on tree trunks, but not true nests.

Heterotermes tenuis (Hagen) 1858
(Figures 2 & 3)

Material – MPEG 2814, 2817, 2839, 2851, 2867, 2868, 2869, 2871. 2894, 2917, 2951, 2952, 2994, MZSP 9229.
Biology – This species lives in wood, frequently in rotten wood and in the bark of dead trunks. Sometimes it was found in nests built by other species.

Dolichorhinotermes japuraensis Constantino 1990a

Material – MPEG 2853 (holotype and paratypes).
Biology – Collected in rotten wood on the ground. *Armitermes gnomus*, sp.n., *Atlantitermes raripilus* and *Triangularitermes triangulariceps* were found in the same piece of wood.

Dolichorhinotermes longilabius (Emerson) 1925
(Figures 6, 9 & 10)

Material – MPEG 2831.
Biology – Collected in rotten wood on the ground.

Rhinotermes hispidus Emerson 1925
(Figures 5 & 8)

Material – MPEG 2983.
Biology – Collected in wet wood on the ground.

Rhinotermes marginalis (L.) 1758
(Figures 4 & 7)

Material – MPEG 2785, 2792.
Biology – Collected in sound wood in swamp forest. This species seems to be more abundant in this habitat and rare in the "terra firme" forest.

FAMILY TERMITIDAE
SUBFAMILY APICOTERMITINAE

Anoplotermes banksi Emerson 1925
(Figure 13)

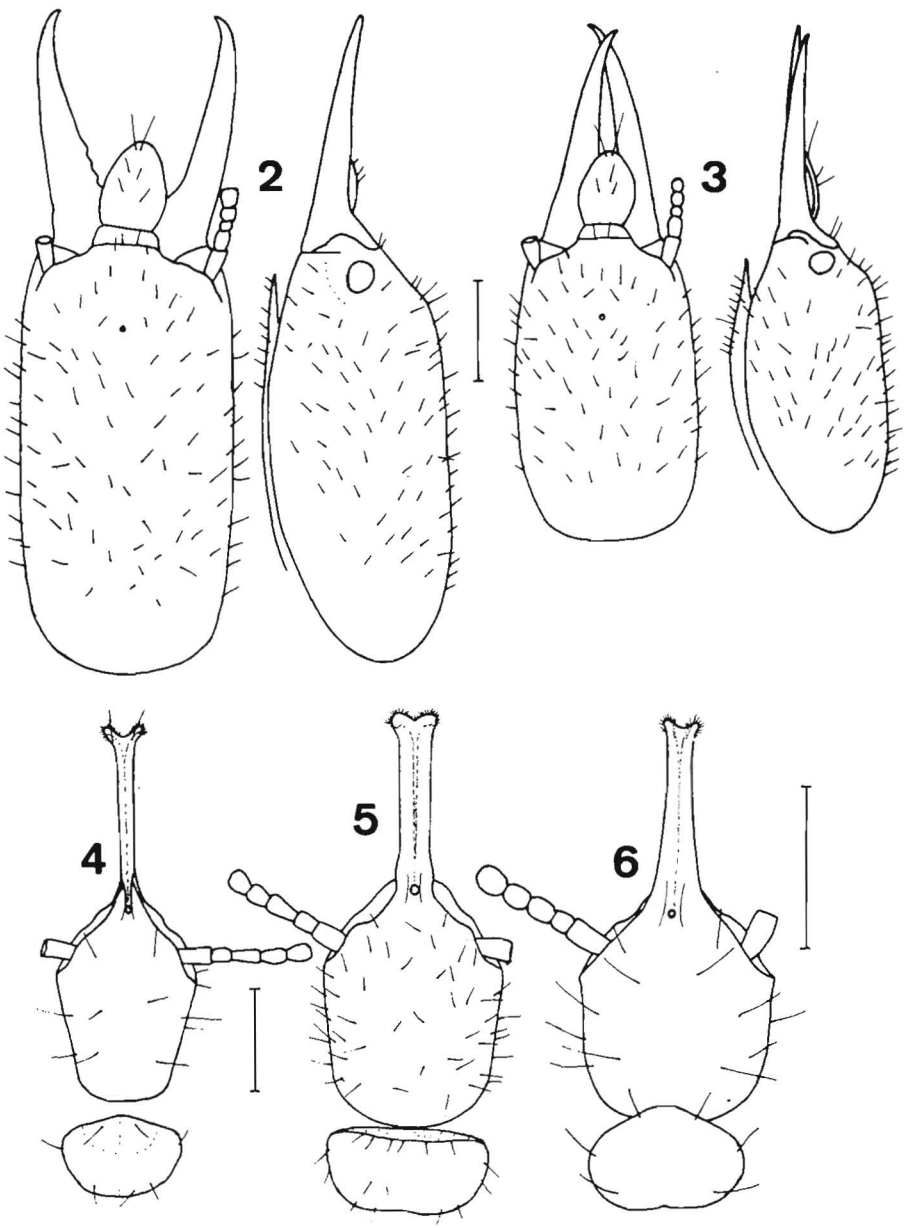
Material – MPEG 2873 (queen), 2874, 2875, 2915, 2970 (queen), 3004 (queen).
Biology – This species builds a small earthen arboreal nest, generally less than one meter above ground.

Anoplotermes spp

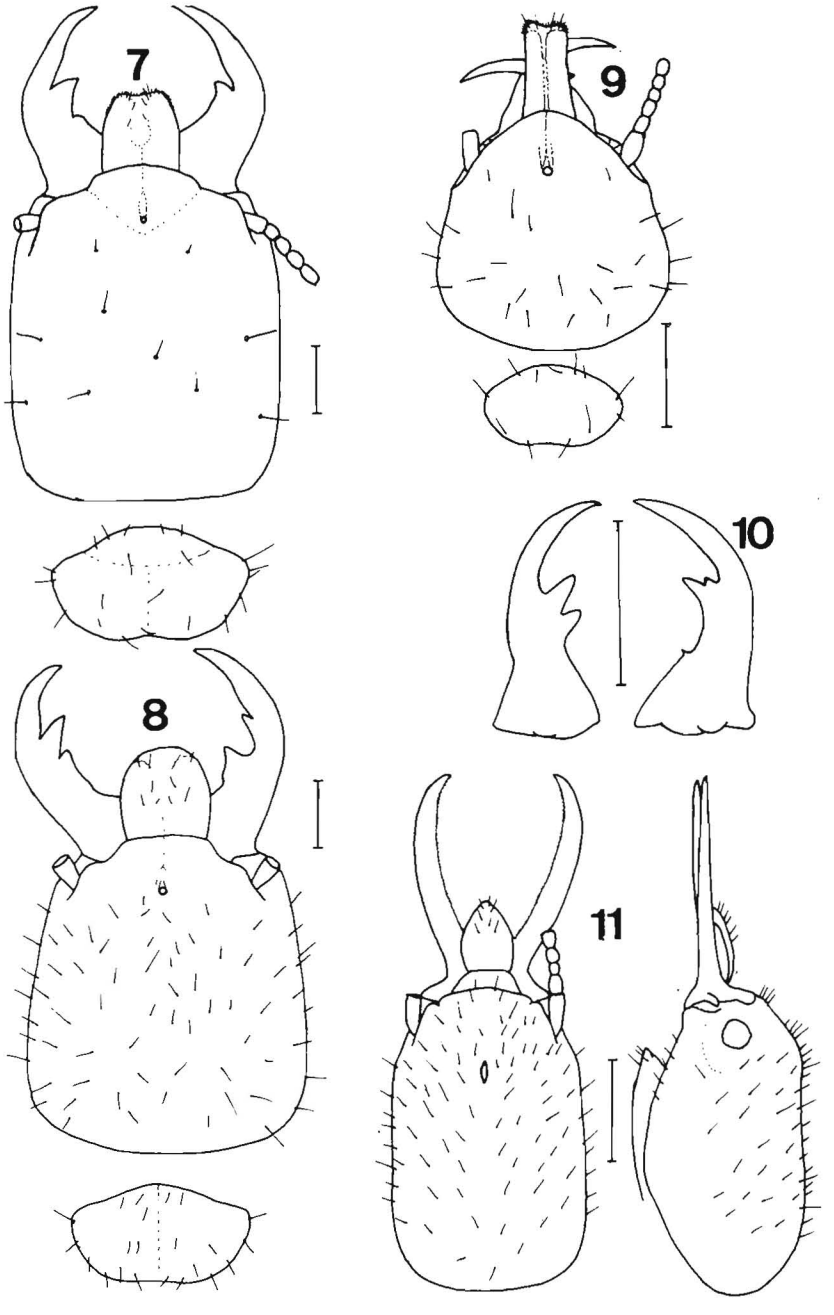
Remarks – Nine other species of *Anoplotermes* sensu lato were collected, most of them without imagoes. This group needs a complete taxonomic revision, and many new genera and species are yet to be described from the Neotropical Region. In the absence of imagoes, identification to species level is very difficult.

Grigiotermes sp.

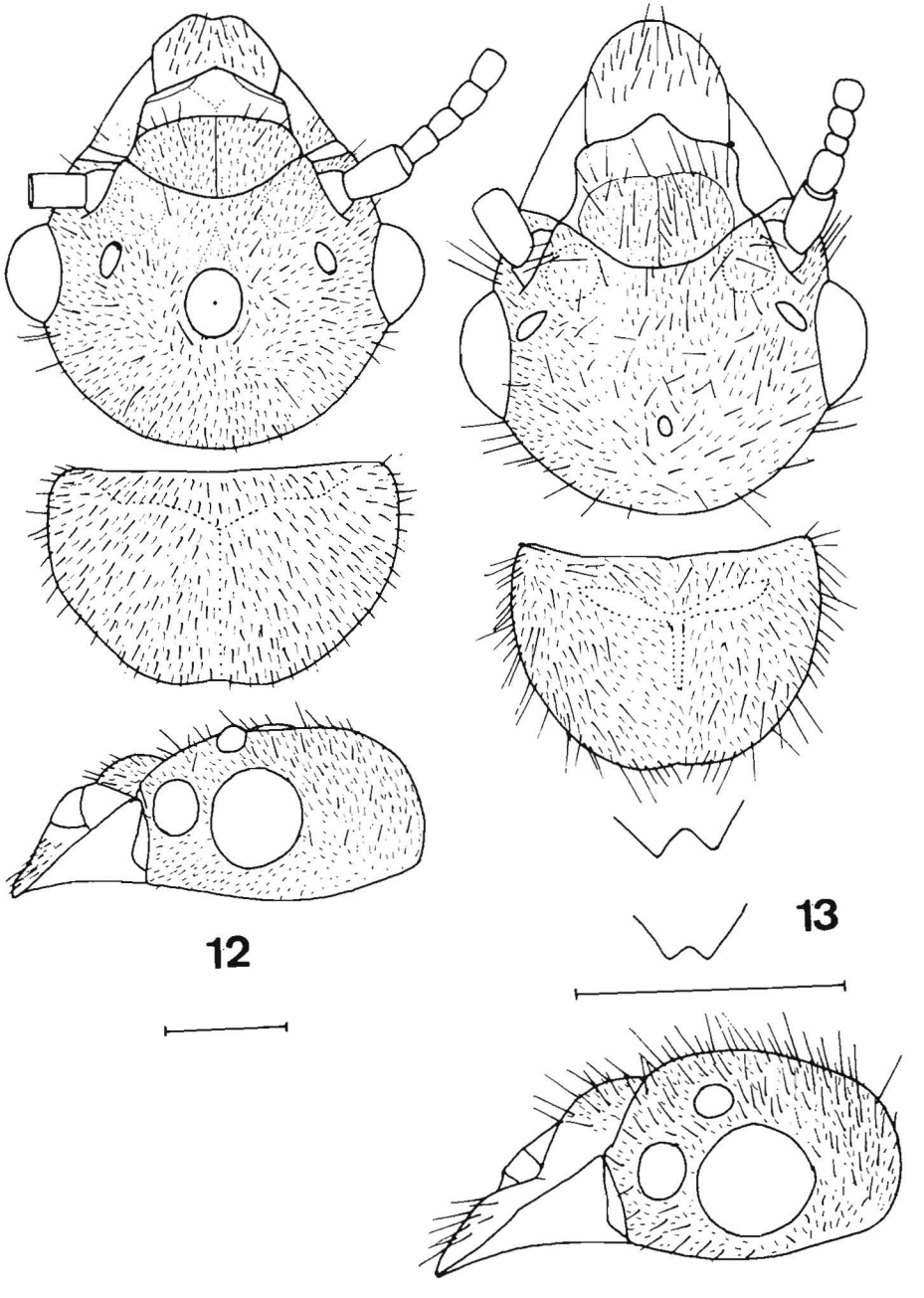
A single colony (MPEG 2975) was found in an abandoned earthen termitarium at the base of a tree. This is probably a new species, but in the



Figures 2-6 – 2. *Heterotermes tenuis*, major soldier; 3. *H. tenuis*, minor soldier; 4. *Rhinotermes marginalis*, minor soldier; 5. *R. hispidus*, minor soldier; 6. *Dolichorhinotermes longilabius*, minor soldier. Scales = 0.5 mm.



Figures 7-11 – 7. *Rhinotermes marginalis,* major soldier; 8. *R. hispidus,* major soldier; 9. *Dolichorhinotermes longilabius,* major soldier; 10. *D. longilabius,* mandibles of the major soldier; 11. *Microcerotermes strunkii,* soldier. Scales = 0.5 mm.



Figures 12-13–12. *Ruptitermes arboreus,* imago; 13. *Anoplotermes banksi,* imago. Scales = 0.5 mm.

absence of imagoes it was not possible to confirm. The enteric valve armature was examined and is identical to that of *G. metoecus,* the type-species of the genus.

Ruptitermes arboreus (Emerson) 1925
(Figure 12)

Material – MPEG 2956 (queen).
Biology – This species builds arboreal carton nests of medium size. The well sclerotized and fast-moving workers of this species resemble ants and actively bite the hand of the collector. It is apparently rare, and only one nest was found in Maraã though it was conspicuous and easily located.

Ruptitermes spp

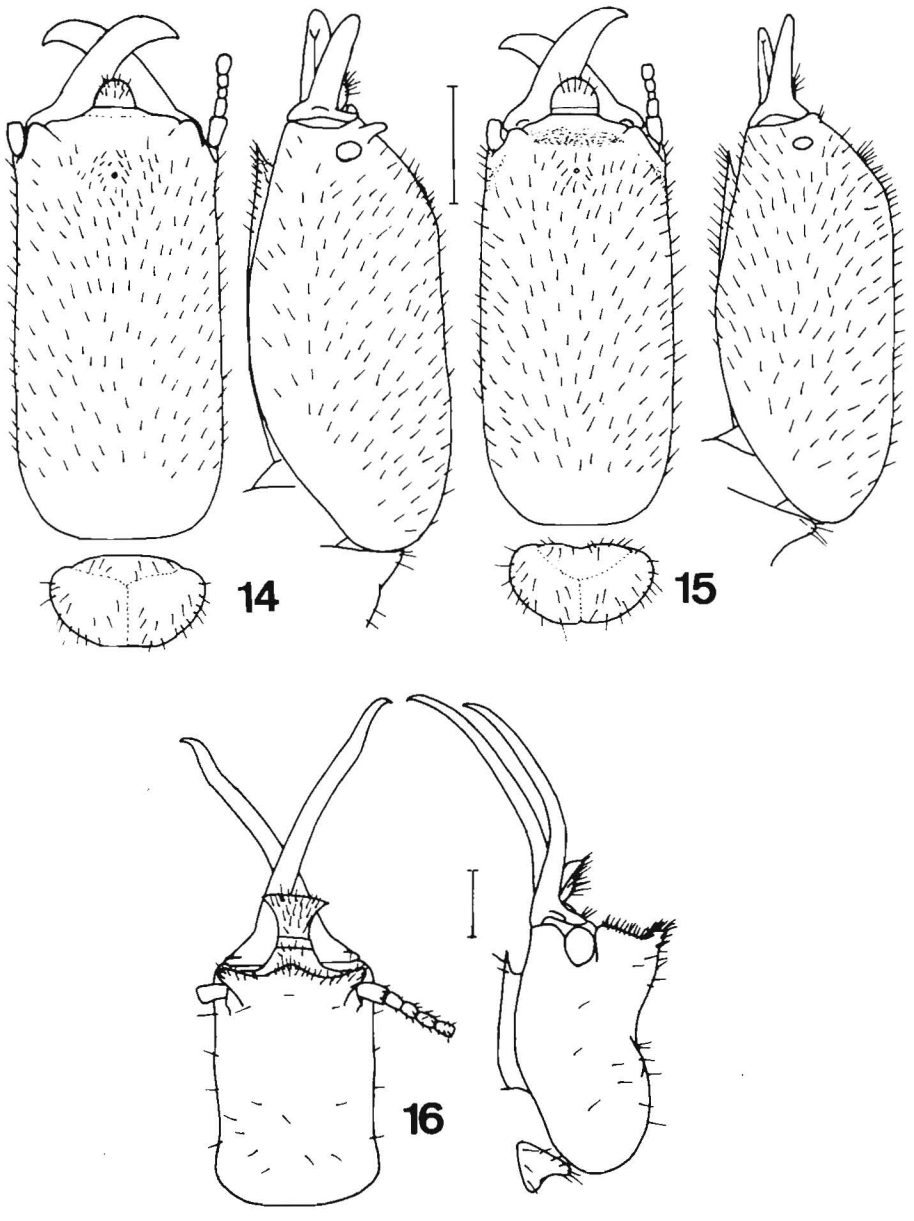
Two other unidentified species of *Ruptitermes* were collected without imagoes (MPEG 2959, 2972, and 3001). See notes under *Anoplotermes* spp.

SUBFAMILY TERMITINAE

Cavitermes parvicavus Mathews 1977
(Figures 17-19)

Material – MPEG 2805 (alates), MZSP 9256 (alates).
Imago – Head rounded with top straight in profile. Eyes medium-sized; distance to lower margin of head approximately equal to the length of ocellus. Distance eye to ocellus approximately equal to the length of ocellus. Fontanelle small, ellipsoid. Clypeus with median line visible. Labrum rounded. Antennae with 15 segments, first longer than fourth, fourth longer than second, second longer than fifth, third the smallest one. Pronotum with sides rounded, approximately the same width of head. Meso and metanotum with a incision in the middle of posterior margin. Head covered with short hairs and with few bristles. Clypeus with two bristles in the middle and two bristles on anterior margin. Labrum with eight bristles. Postmentum with numerous bristles. Pronotum, mesonotum and metanotum with numerous short hairs. Legs with numerous bristles. Tibial spurs 3:3:2. Tergites and sternites densely covered with hairs. Sternites with a row of bristles on posterior margin. Head capsule, pronotum and tergites sepia brown. Fontanelle hyaline. Clypeus and sternites brown. Legs and wings pale brown.

Measurements (in millimeters) of five alates: length of head to lateral base of mandibles 1.11-1.18; maximum width of head with eyes 1.45-1.52; height of head excluding postmentum 0.64; maximum diameter of eye 0.45; maximum length of pronotum 0.86-0.95; maximum width of pronotum 1.41-1.48; length of hind tibia 1.55-1.59.
Comparisons – *C. parmae* is smaller, has much larger ocellus and fontanelle narrower and elongated. *C. tuberosus* is much smaller, has proportionally smaller fontanelle and shorter pronotum.
Biology – Collected in an abandoned arboreal nest. *Nasutitermes banksi* and *Termes medioculatus* were found in the same nest.
Remarks – The imago described by Mathews (1977:119) was arbitrarily placed under this name since it was collected separately from the soldiers. As the



Figures 14-16 – 14. *Cylindrotermes flangiatus,* soldier; 15. *C. parvignathus,* soldier; 16. *Cavitermes tuberosus,* soldier. Scales = 0.5 mm.

holotype of this species is a soldier, the true imago of *C. parvicavus* is described here for the first time.

Cavitermes tuberosus (Emerson) 1925
(Figure 16)

Material – MPEG 2789, 2795, 2957, 2980.
Biology – Collected in abandoned nests, the majority arboreal, built by several species.

Cylindrotermes flangiatus Mathews 1977
(Figure 14)

Material – MPEG 2812 (alates), 2816, 2859, 2876 (alates), 2878, MZSP 9254.
Biology – This species was found in rotten wood and under the bark of dead trees, only in the "terra firme" forest.

Cylindrotermes parvignathus Emerson 1949
(Figure 15)

Material – MPEG 2800, 2837, 2850, 2861, 2893, 2899, 2904, 2940 (alates), MZSP 9255.
Biology – Same as *C. flangiatus.*

Inquilinitermes inquilinus (Emerson) 1925
(Figure 27)

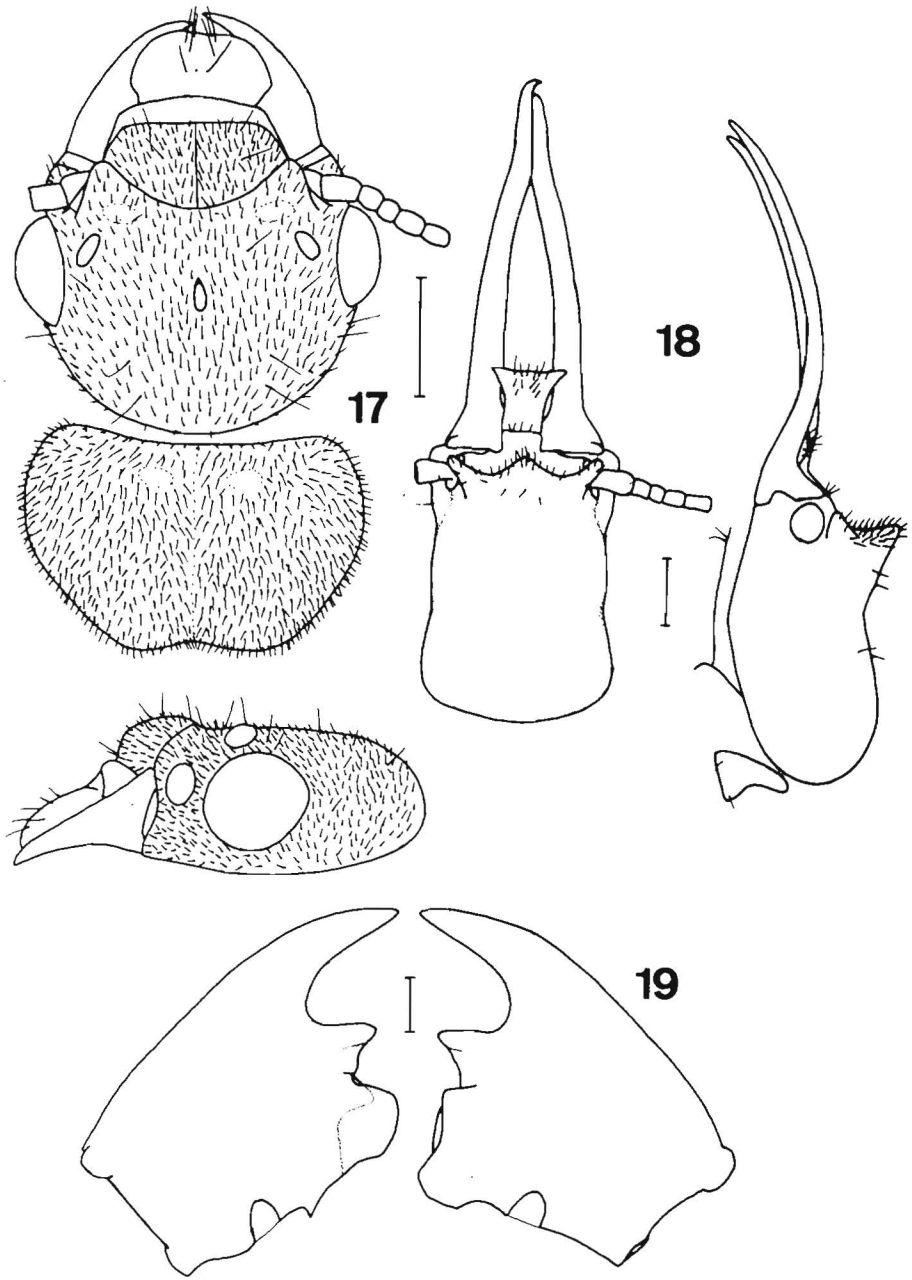
Material – MPEG 2920 (alates), 2949 (alates), MZSP 9252 (alates).
Biology – This species was collected only in the arboreal nests built by *Constrictotermes cavifrons.* It occupies the base of the nest, where the cells are filled with dark organic material.

Microcerotermes strunkii (Sorensen) 1884
(Figure 11)

Material – MPEG 2845 (alates), 2923, 2939, 2978, 2997, MZSP 9246.
Biology – This species build small to medium-sized arboreal carton nests with a rugose surface and feeds on sound wood.
Remarks – This material agrees in detail with the description of Mathews (1977) and with the lot MZSP 3609 from Mato Grosso State determined by Emerson as *M. strunkii.* I have compared it also with lots MZSP 2794 and 3609 determined by Emerson as *M. arboreus* and they are conspicuously different, specially the imagoes. Although the type-locality of *M. strunkii* is in Argentina, this seems to be a common species in Amazonian forests.

Neocapritermes braziliensis (Snyder) 1926

Material – MPEG 2848, 2849, 2852, 2877, 2886 (alates), 2896, 2942, 2944, 2988 (alates), MZSP 9245.



Figures 17-19 – *Cavitermes parvicavus:* 17. imago; 18. soldier; 19. imago mandibles. Scales = 0.5 mm.

Biology – This species builds arboreal or epigeal nests, frequently at the base of trees. The nests are dark, similar to those built by *Termes* spp. This species was found only in the "terra firme" forest.

Orthognathotermes humilis, sp.n.
(Figures 28-30)

Material – MPEG 2825 (holotype soldier, paratypes soldiers and workers), MZSP 9249 (paratypes soldiers workers).
Imago – Unknown.
Soldier – Head elongated with sides straight, converging toward front. Top of head in profile with a prominence between antennal lobes and a depression behind the prominence. Labrum three-lobed. Head with scattered hairs and few short bristles. Labrum with 12 bristles. Pronotum covered with hairs and with bristles on margins. Tergites and sternites with numerous hairs on surface and a few short bristles on posterior margin. Tibiae with spines on the distal inner margin. Tibial spurs 3:2:2. Antennae with 15 segments, first longer than fifth, fourth and fifth of equal lenght, fourth longer than second, third the smallest one. Head capsule orange yellow to orange. Antennae orange. Pronotum and legs yellow. Abdomen yellowish, transparent.

Measurements (in millimeters) of five soldiers: length of head to lateral base of mandible 3.04-3.26; maximum width of head 1.96-2.04; height of head excluding postmentum 1.43-1.48; maximum length of mandible 2.65-2.70; maximum width of postmentum 0.57-0.61; maximum width of pronotum 1.22-1.26; length of hind tibia 1.52-1.57.
Worker – Head rounded, abdomen voluminous. Antennae with 14 segments. Head with scattered long bristles. Labrum with 10 bristles. Chaetotaxy of legs and abdomen similar to that of soldier. Tibial spurs 2:2:2. Head, pronotum and legs yellowish white; abdomen yellowish, transparent. Mandibles as in Fig. 30. Enteric valve armature well sclerotized, 3 swellings of 1st order alternating with 3 swellings of 2nd order. Swellings of 1st order with bulbous, finger-like processes extending toward the lumen of the valve, covered with dense short spines. Swellings of 2nd order with smaller spines, only in their basal part (Fig. 29).
Comparisons – *O. aduncus* is smaller, has the head with sides parallel, and the labrum weakly three-lobed. *O. giberorum* has a deep furrow down the back of the head. *O brevipilosus* has dense short hairs on head *O. macrocephalus* lacks the prominence between antennal lobes. *O. orthognathus* is larger and the sides of the head are parallel. *O. wheeleri* is smaller, and the head is proportionally shorter.
Biology – The single colony was collected in soil on the roots of a fallen tree and is probably subterranean.

Planicapritermes planiceps (Emerson) 1925

Material – MPEG 2838, 2862, 2898.
Biology – This species has specialized habits, living in and under the bark of dead wood. Soldiers and workers of *P. planiceps* are dorso-ventrally flattened as an adaptation to this particular habit.

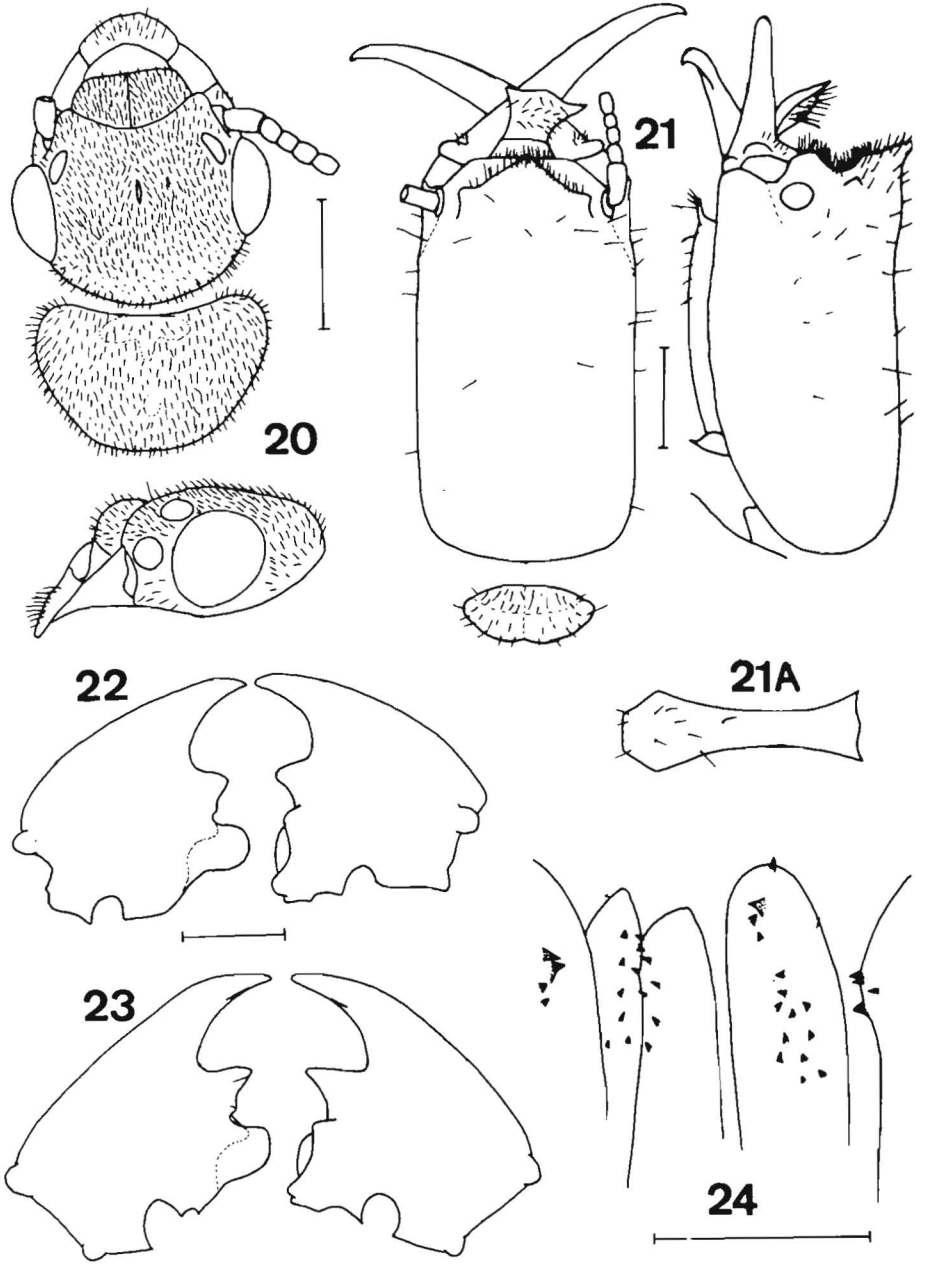
Spinitermes longiceps, sp.n.
(Figures 20-24)

Material – MPEG 2835 (holotype soldier and paratypes soldiers, alates and workers), MZSP 9248 (paratypes soldiers, alates and workers).
Imago – Head capsule rounded. Eyes large, with small distance to lower margin of head. Ocellus close to eyes. Fontanelle small, elongated. Labrum short, rounded. Mandibles as in Fig. 23. Antennae with 15 segments, first longer than fourth, fifth equal fourth, fifth longer than second, third the smallest one. Pronotum trapezium-shaped with sides convex, a little narrower than head. Meso and metanotum with a deep incision on posterior margin. Head densely covered with short hairs and a few bristles. Labrum with numerous bristles. Pronotum, mesonotum and metanotum with numerous hairs. Legs with hairs and bristles. Tibiae with spines on inner margin. Tibial spurs 3:3:2, but third spur only a little larger than spines. Tergites and sternites with many hairs on surface. Sternites with a row of bristles on posterior margin. Head capsule brown. Fontanelle hyaline. Clypeus pale brown. Pronotum a little paler than head, with a T-shaped light mark near anterior margin. Legs yellow-brown. Tergites pale brown. Sternites a little paler than tergites. Wings pale brown.

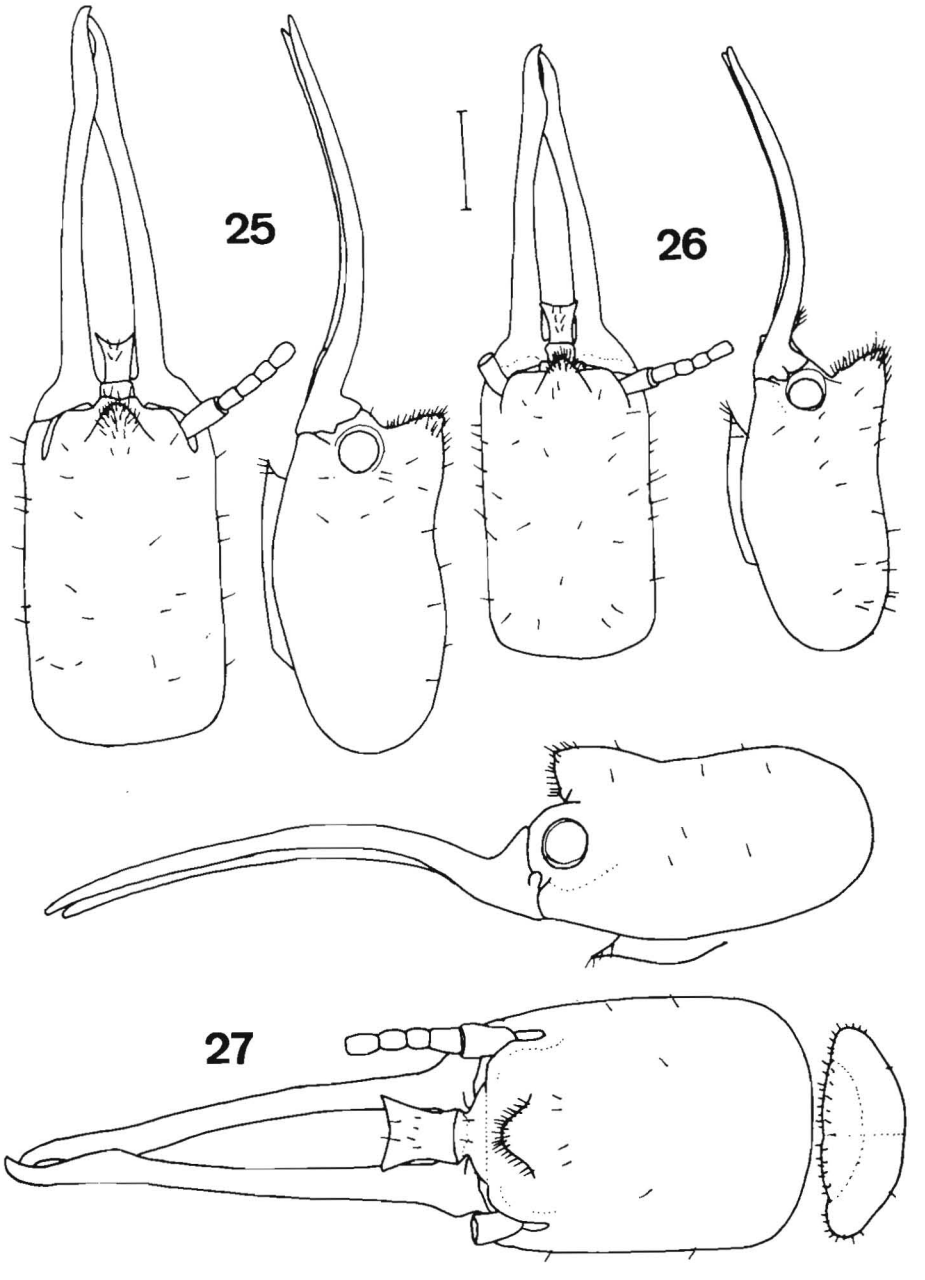
Measurements (in millimeters) of five alates: lenght of head to lateral base of mandibles 0.73-0.77; maximum width of head with eyes 0.95-1.00; height of head excluding postmentum 0.48-0.50; maximum diameter of eye 0.39; maximum length of pronotum 0.55-0.57; maximum width of pronotum 0.86-0.91; length of hind tibia 1.25-1.30.

Soldier – Head capsule elongate; sides straight and almost parallel. Frontal projection (or "cap") small, narrow at tip; lateral points small. Labrum wide with two lateral, hyaline points. Antennae with 14 segments, first longer than second, fifth equal second, fifth longer than third, second the smallest one. Head capsule with few scattered bristles. Frontal projection with many bristles directed forward. Labrum with numerous bristles. Pronotum with bristles on margins and hairs on surface. Meso and metanotum with bristles on posterior margin and hairs on surface. Legs with median and long bristles. Tibiae with spines on inner margin. Tibial spurs 3:3:2. Tergites and sternites with numerous hairs on surface. Sternites with a row of bristles on posterior margin. Head ferruginous orange. Pronotum and legs yellow. Abdomen yellowish, transparent.

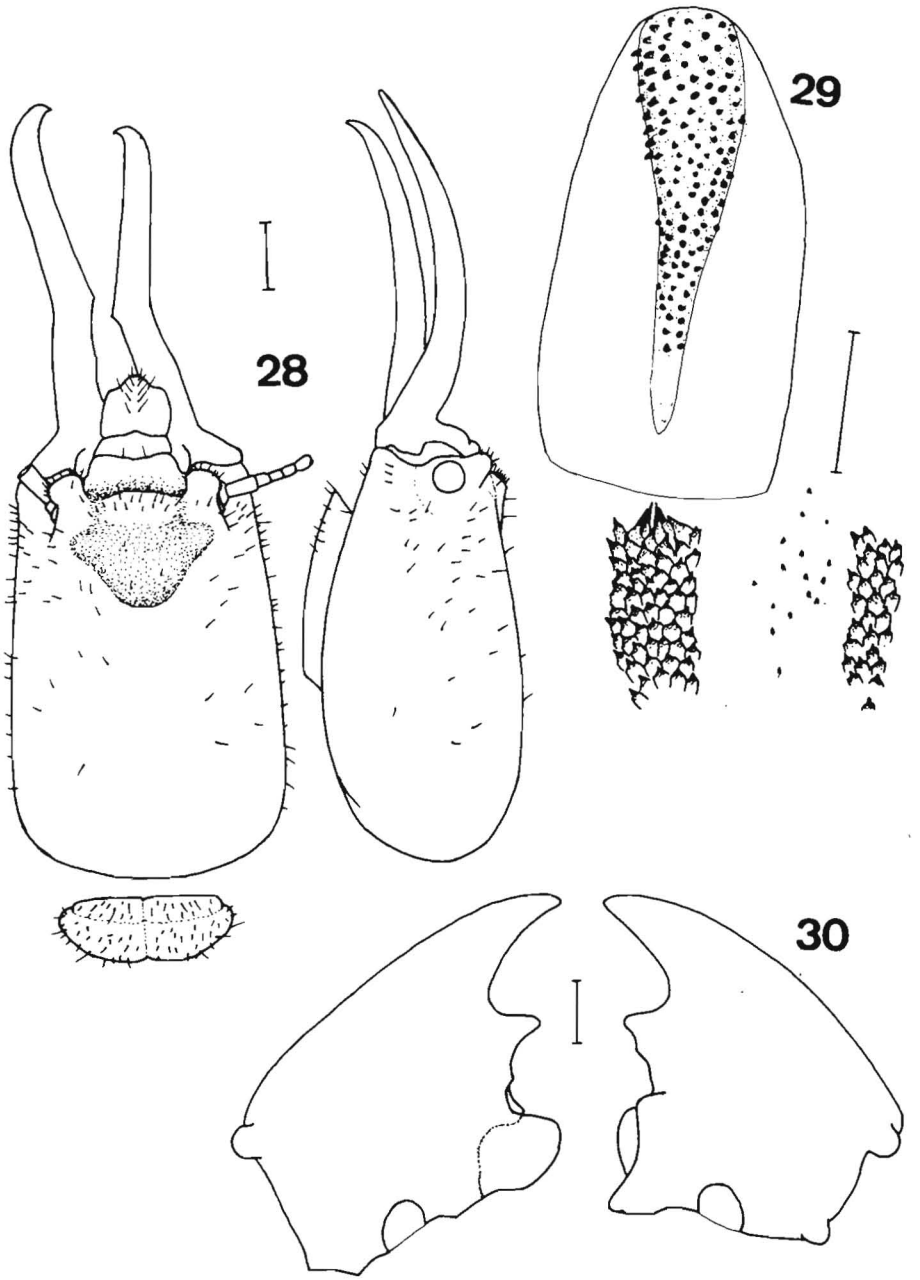
Measurements (in millimeters) of five soldiers: length of head to lateral base of mandible 1.86-2.00; maximum width of head 1.11-1.14; height of head excluding postmentum 0.91-0.98; maximum length of mandible 1.32-1.39; maximum width of postmentum 0.41-0.45; maximum width of pronotum 0.66-0.68; length of hind tibia 0.82-0.89.
Worker – Mandibles as in Figure 22. Enteric valve armature with scattered small spines and a few large ones. (Figure 24).
Comparisons – The soldiers of all other species known of this genus have the head proportionally shorter with a larger projection on top. The alate of *S. trispinosus* is darker, has eyes, ocelli and fontanelle proportionally smaller, and the pronotum proportionally wider. The alate of *S. brevicornutus* has smaller eyes and wider pronotum. Both alates and soldiers of the other species have tibial spurs 2:3:2.



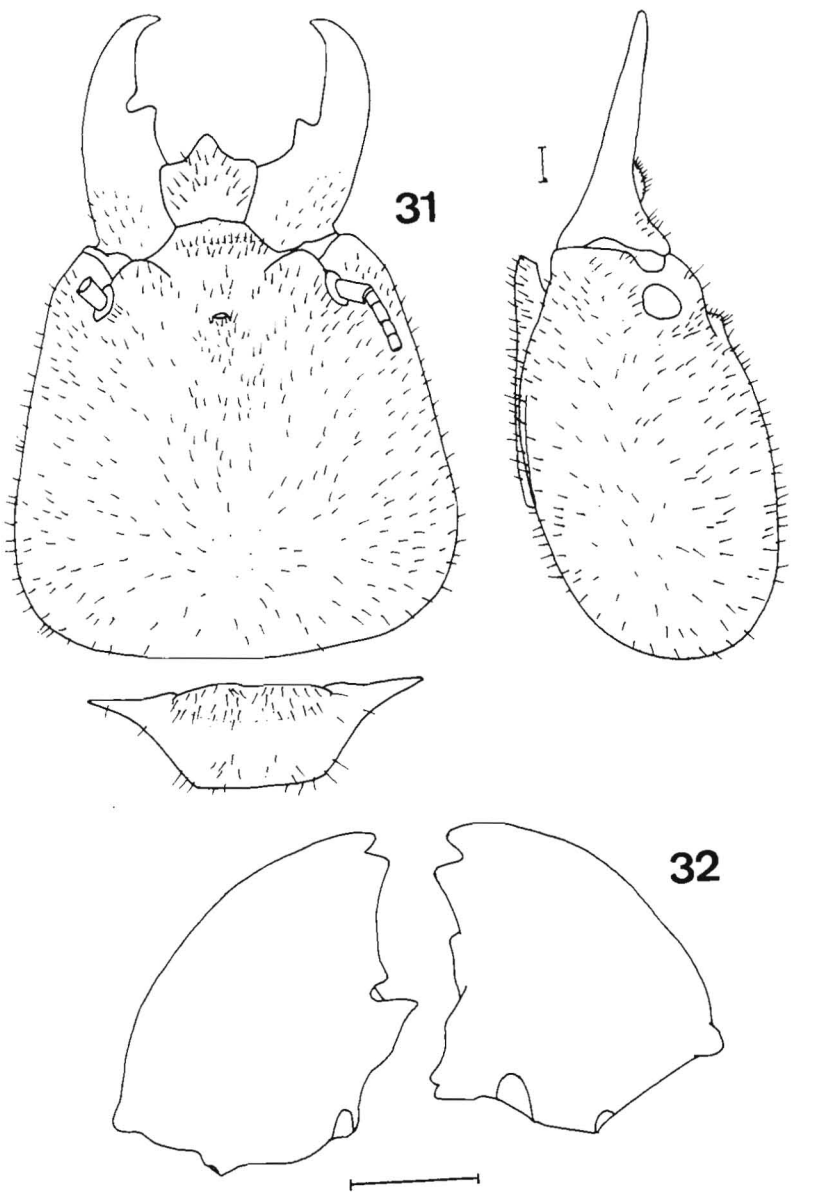
Figures 20-24 – *Spinitermes longiceps,* sp.n.; 20. alate; 21. soldier; 21a. postmentum of soldier; 22. worker mandibles; 23. imago mandibles; 24. enteric valve armature. Scales = 0.5 mm for heads and 0.1 mm for mandibles and enteric valve.



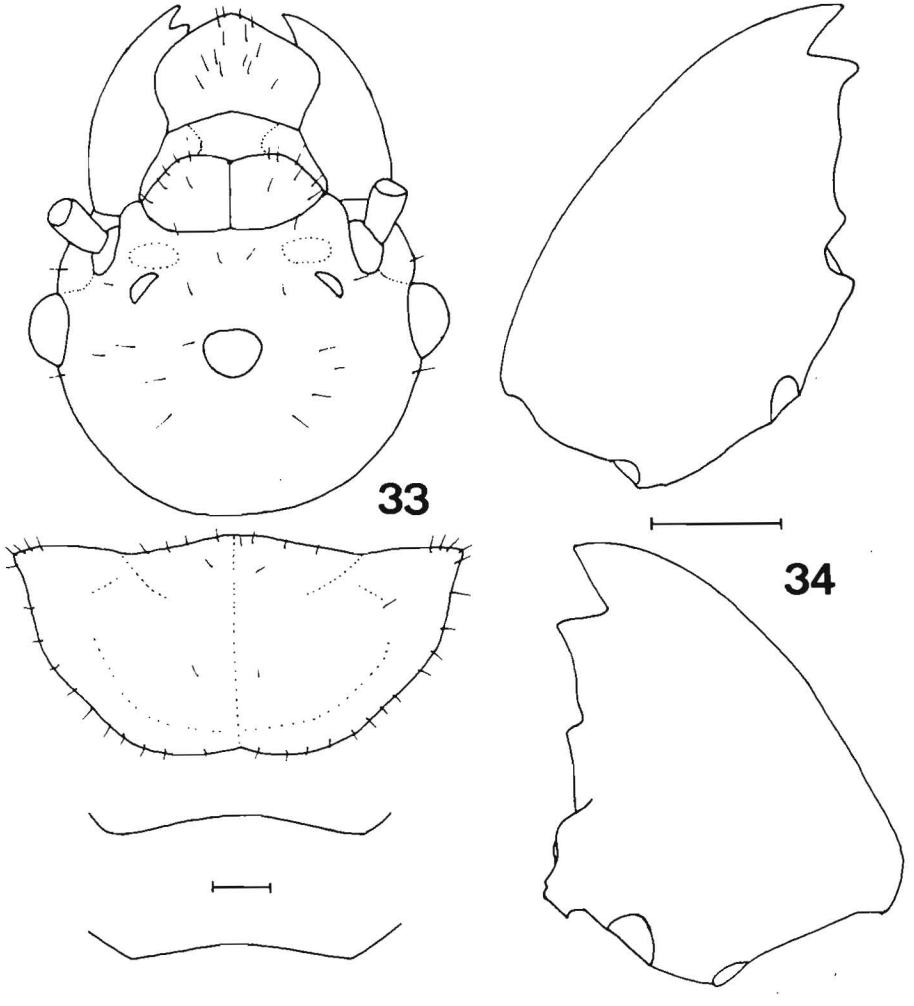
Figures 25-27 – 25. *Termes hispaniolae,* soldier; 26. *T. medioculatus,* soldier; 27. *Inquilinitermes inquilinus,* soldier. Scales = 0.5 mm.



Figures 28-30 – *Orthognathotermes humilis,* sp.n.: 28. soldier; 29. enteric valve armature; 30. worker mandibles. Scales = 0.5 mm for heads and 0.1 mm for mandibles and enteric valve.



Figures 31-32 – *Syntermes robustus,* sp.n.: 31. soldier; 32. worker mandibles. Scales = 0.5 mm for head and 0.1 mm for mandibles.

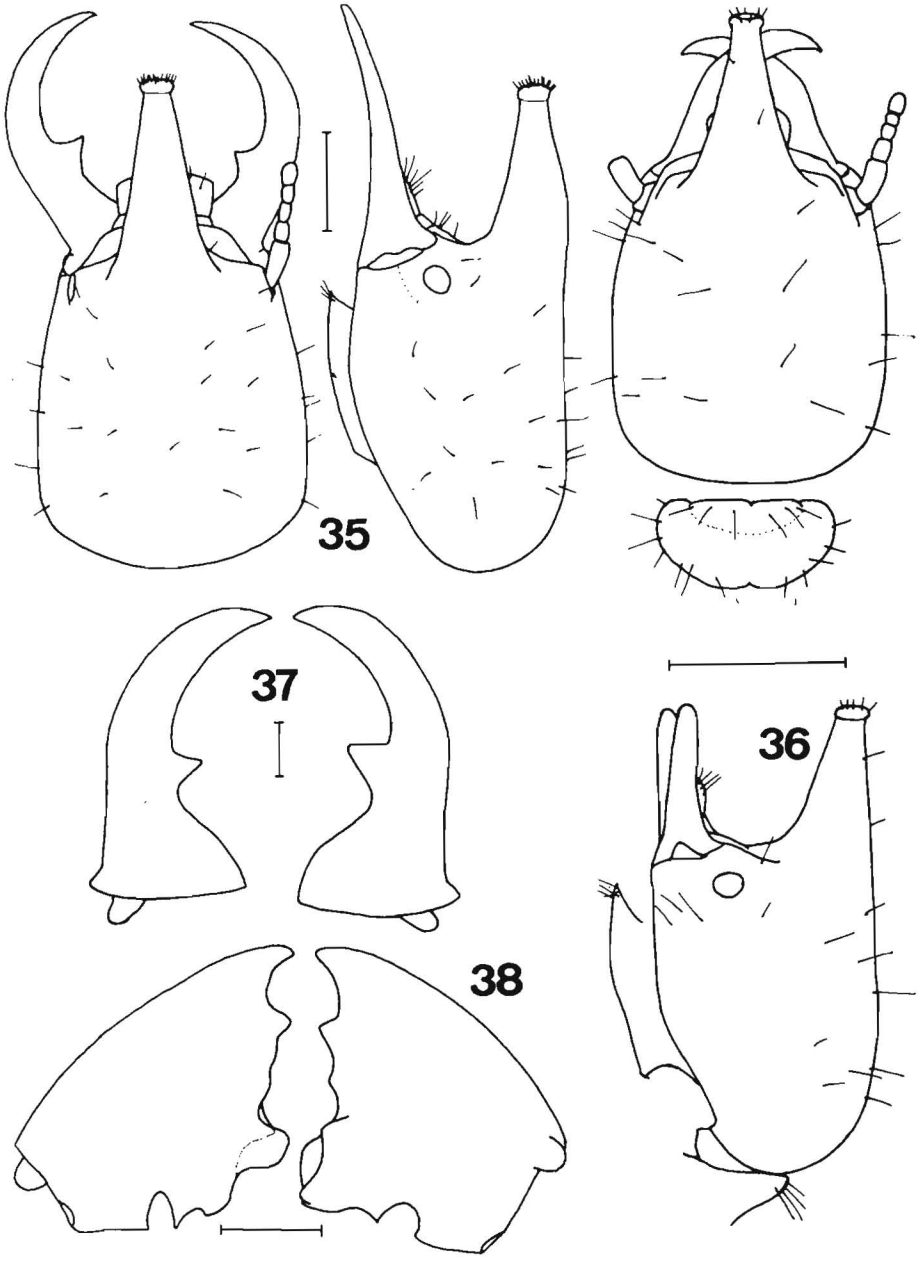


Figures 33-34 – *Syntermes robustus*, sp.n: 33. imago; 34. imago mandibles. Scales = 0.5 mm for head and 0.1 mm for mandibles.

Biology – Collected in an abandoned epigeal nest in "terra firme" forest.

Termes hispaniolae (Banks) 1918
(Figure 25)

Remarks – This identification is tentative since the full range of variation possible for this species is not known, and there are a number of very closely related species in this genus.



Figures 35-38 – 35. *Embiratermes neotenicus*, soldier; 36. *Embiratermes ignotus*, sp. n., soldier; 37. *E. ignotus*, soldier mandibles; 38. *E. ingnotus*, worker mandibles. Scales = 0.5 mm for heads and 0.1 mm for mandibles.

Material – MPEG 2787, 2926, 2935, 2936, MZSP 9214, 9220.
Biology – This species builds a dark colored arboreal nest and was found only in the swamp forest. It feeds on rotten wood.

Termes medioculatus Emerson 1925
(Figure 26)

Material – MPEG 2807, 2847, 2866, 2937, 2955, 2960, 2965, 2976, MZSP 9218.
Biology – This species was collected in abandoned termitaria built by other species and in wood.

Termes sp.

A single sample (MPEG 2836) of another small-sized and apparently new species of *Termes* was collected in "terra firme" forest.

SUBFAMILY NASUTITERMITINAE

Agnathotermes crassinasus Constantino 1990b

Material – MPEG 2810, 2865 (holotype and paratypes).

Araujotermes nanus, sp. n.
(Figures 56-60)

Material – MPEG 2945 (Holotype soldier, paratypes soldiers, alates and workers), MZSP 9224 (paratypes soldiers, alates and workers).
Imago – Head capsule elongated. Eyes very large, touching the bottom line of head. Ocelli close to eyes: Fontanelle narrow and elongate, narrow in the middle. Labrum rounded. Mandibles as in Fig. 59. Antennae with 14 segments, first longer than second, second longer than fifth, fifth longer than fourth, fourth equal third. Pronotum trapezium-shaped, with sides straight. Meso and metanotum with incision on posterior margin, forming an obtuse angle. Head capsule densely covered with hairs and with two bristles on posterior part. Clypeus with dense hairs and two bristles. Labrum with many hairs and two bristles in the middle. Pronotum covered with numerous hairs and a few bristles on margins. Meso and metanotum covered with numerous hairs. Legs with short and long bristles. Tibial spurs 2:2:2. Tergites and sternites with numerous hairs oriented backward. Sternites with a row of bristles on posterior margin oriented perpendicularly. Head capsule brown; clypeus a little paler. Pronotum, legs, sternites and tergites pale brown.

Measurements (in millimeters) of five alates: length of head to lateral base od mandibles 0.47-0.48; maximum width of head with eyes 0.57-0.59; height of head excluding postmentum 0.29-0.31; maximum diameter of eye 0.25; maximum length of pronotum 0.30; maximum width of pronotum 0.40-0.46; length of hind tibia 0.65-0.66.
Soldier – Head capsule oval; top straight in profile. Nasus cylindrical, straight. Mandibles vestigial without points. Antennae with 11 segments, first longer than fifth, fifth longer than second, second longer than fourth, third the smallest one. Head capsule with numerous short to long bristles. Nasus with numerous hairs,

becoming longer toward apex. Labrum with few bristles. Postmentum with few bristles on anterior margin. Pronotum with two bristles on anterior margin and hairs on posterior margin. Meso and metanotum with two bristles on posterior margin. Tibial spurs 2:2:2. Tergites and sternites with numerous hairs on surface and a row of bristles on posterior margin. Head yellow. Nasus orange to ferruginous orange. Pronotum, legs and abdomen yellowish, transparent.

Measurements (in millimeters) of five soldiers: length of head with of head with nasus 0.82-0.89; length of nasus 0.28-0.33; maximum width of head 0.41-0.43; height of head excluding postmentum 0.30-0.33; maximum width of pronotum 0.23-0.27; length of hind tibia 0.40-0.41.
Worker – Mandibles as in Fig. 60. Enteric valve armature weakly sclerotized, 3 swellings of 1st order alternating with 3 swellings of 2nd order. All swellings with scattered small spines (Figure 58).
Comparisons – The soldier of *A. parvellus* is larger, has the head proportionally wider with more numerous longer bristles and antennae with 12 segments. *A caissara* is larger, the nasus is wider at base and has antennae with 12 segments. *A. zeteki* is larger, the nasus is wider at base, the top of head is almost straight in profile and the line between labrum and base of nasus is more concave in profile. The alates of *A. parvellus* and *A. caissara* are larger, with proportionally smaller eyes. The alate of *A. zeteki* is unknown.
Biology – Collected in an abandoned arboreal nest in the "terra firme" forest.

Araujotermes parvellus (Silvestri) 1923
(Figure 54)

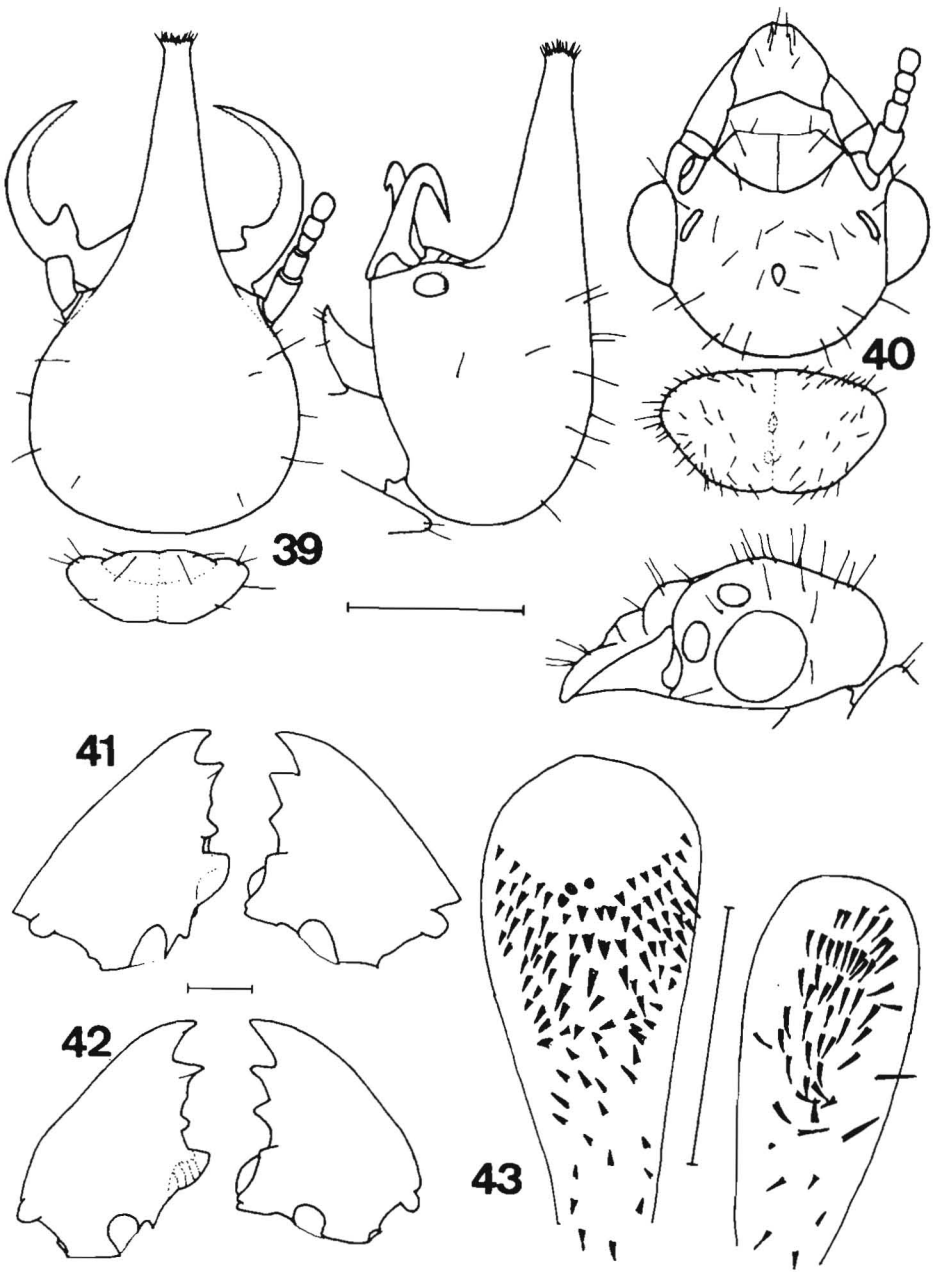
Material – MPEG 2860, 2909, 2914, 2941, 2943, 2998, MZSP 9258.
Biology – Collected in rotten wood.

Armitermes holmgreni Snyder 1926

Material – MPEG 2832 (king and queen), 2834 (queen), 2880 (alates), 2954, 2990.
Biology – This species builds an earthen arborel nest with many tube-like extensions resembling stalagmites on the surface, one or two meters above ground level.

Armitermes gnomus, sp.n.
(Figures 39-43)

Material – MPEG 2903 (holotype soldier, paratypes soldiers, alates and workers); MPEG 2841 (paratypes soldiers and workers), 2854 (paratypes soldiers and workers), 2858 (paratypes soldiers and workers), MZSP 9247 (paratypes soldiers, alates, and workers).
Imago – Head capsule rounded. Eyes large and rounded. Distance eye-ocellus less than width of ocellus. Fontanelle oval, medium-sized. Clypeus with weak median line. Labrum elongate. Mandibles as in Fig. 41. Antennae with 14 segments, first longer than second, second longer than fifth, fifth longer than fourth, third the smallest one. Pronotum trapezoid and short. Mesonotum with deep incision on posterior margin. Metanotum with shallow incision on posterior



Figures 39-43 – *Armitermes gnomus*, sp.n.: 39. soldier; 40. alate; 41. alate mandibles; 42. worker mandibles; 43. enteric valve armature. Scales = 0.5 mm for heads and 0.1 mm for mandibles and enteric valve.

margin. Head with few scattered bristles. Clypeus with two long bristles in the middle and two short ones on anterior margin. Labrum with eight bristles. Pronotum with bristles on margins and scattered short bristles on surface. Meso and metanotum without bristles. Legs with many bristles. Tibial spurs 2:2:2. Tergites and sternites covered with hairs. Sternites with a row of bristles on posterior margin. Head and clypeus sepia brown; fontanelle hyaline. Pronotum brown. Legs yellow. Tergites brown; sternites pale brown. Wings pale brown.

Measurements (in millimeters) of five alates: length of head to lateral base of mandibles 0.61-0.64; maximum width of head with eyes 0.86-0.89; heigth of head excluding postmentum 0.41-0.43; maximum diameter of eye 0.30; maximum length of pronotum 0.36-0.37; maximum width of pronotum 0.64-0.68; length of hind tibia 0.89-0.98.

Soldier – Head capsule rounded; top convex in profile. Nasus conical, long and straight, with wide opening. Labrum short, not visible from dorsal view. Mandibles long and slender, strongly curved, shorter than nasus. Each mandible with one marginal tooth near base. Tooth of left mandible larger than that of right mandible. Inner margins between apex and teeth with minute serrations. Antennae with 13 segments, first longer than second, second equal fourth and fifth, second the smallest one. Forecoxae without projection. Head capsule with few scattered bristles. Nasus with hairs on apex. Postmentum with two or three bristles. Pronotum, mesonotum and metanotum with few bristles on margins. Legs few bristles. Tibial spurs 2:2:2. Tergites and sternites with numerous hairs on surface. Sternites with a row of long bristles on posterior margin. Head ferruginous. Nasus ferruginous orange. Pronotum orange. Legs yellow. Abdomen yellowish, transparent.

Measurements (in millimeters) of five soldiers: length of head with nasus 1.36-1.41; length of nasus 0.61-0.64; maximum width of head 0.75-0.77; heigth of head excluding postmentum 0.59-0.64; cross length of mandible 0.52-0.55; maximum width of pronotum 0.45-0.50; length of hind tibia 0.73-0.75.

Worker – Mandibles as in Fig. 42. Enteric valve armature well sclerotized, 3 swellings of 1st order alternating with 3 swellings of 2nd order. All swellings with numerous large spines (Figure 43).

Comparisons – The soldier of this species is close to *A. minutus* which has a proportionally wider head and shorter nasus. The alate of *A. minutus* is larger and has a proportionally wider head with larger, triangular fontanelle.

Biology – Collected in rotten wood, only in the "terra firme" forest.

Atlantitermes raripilus (Emerson) 1925
(Figure 52)

Material – MPEG 3474.

Biology – Collected in rotten wood on the ground, in the "terra firme" forest.

Remarks – In the original description of this species, there are no hairs on the top of the head. Probably the magnification used by Emerson was not enough to see the very small microscopic hairs on the top and sides of the head. In another sample of this species (MPEG 3022, from Marajó Island) there is an alate which agrees in detail with Emerson's description.

Atlantitermes snyderi (Emerson) 1925
(Figure 53)

Material – 2801, 2840, 2902.
Biology – Collected in rotten wood and in nests built by other species.
Remarks – In the original description (Emerson, 1925:406, Figure 68), the hairs on the top of the head seem to be shorter, but probably the magnification used by Emerson was inadequate to the very small size of this species. The material above was compared to paratypes (MZSP 3770), and agrees in detail.

Atlantitermes sp'

A single sample (MPEG 3005) of another small-sized, apparently new species was collected in "terra firme" forest. The possible range of variation of other species of this genus is unknown and the differences among them are small.

Coatitermes clevelandi (Snyder) 1926

Material – MPEG 2794, 3431.
Biology – Collected in nests built by other species.

Constrictotermes cavifrons (Holmgren) 1910
(Figure 50)

Material – MPEG 2884, 2946, 2948.
Biology – This species builds a typical, column-shaped arboreal nest with interesting rain-shedding devices. The nest of this species frequently contains a colony of *Inquilinitermes inquilinus.*

Convexitermes convexifrons (Holmgren) 1906
(Figure 55)

Material – MPEG 3003, MZSP 9253.
Biology – Collected in rotten wood.

Curvitermes odontognathus (Silvestri) 1901

Material – MPEG 2989.
Biology – Collected in an abandoned epigeal nest build by an unknown species.

Cyrilliotermes cashassa Fontes 1985

Material – MPEG 2809, 2827, 2889, MSZP 9250.
Remarks – Collected in abandoned earthen nests and in diffuse galleries in organic soil.

Embiratermes ignotus, sp.n.
(Figures 36-38)

Material – MPEG 2879 (holotype soldier and paratypes workers).
Imago – Unknown.
Soldier – Head capsule almost rectangular, sides convex. Top of head straight in profile. Nasus shorter than mandibles, elevated in profile, with wide opening. Labrum large, visible from dorsal view. Mandibles robust, curved, with one marginal tooth each near base (Fig. 37). Antennae with 13 segments, first longer than second, second longer than third, third equal fifth, fourth the smallest one. Fore-coxae without projection. Head capsule with scattered bristles. Nasus with few short bristles and with hairs on apex. Labrum with many bristles. Postmentum with two bristles on anterior margin. Pronotum with bristles on margins. Meso and metanotum with bristles on posterior margin. Legs with few bristles. Tibial spurs 2:2:2. Tergites and sternites with numerous hairs on surface and a row of bristles on posterior margin. Head and nasus orange yellow. Base of mandibles ferruginous and the remainder dark chestnut broun. Legs yellow. Abdomen yellowish, transparent.

Measurements (in millimeters) of five soldiers: length of head with nasus 1.30; length of nasus 0.38; maximum width of head 0.78; height of head excluding postmentum 0.63; cross length of mandible 0.55; maximum width of pronotum 0.50.
Comparisons – The closest species is *E. snyderi,* which has proportionally longer nasus, more elevated in profile, wider head with more convex sides and less robust mandibles. All other species are much larger.
Biology – Collected in abandoned earthen epigeal nest in the "terra firme" forest.

Embiratermes neotenicus (Holmgren) 1906
(Figure 35)

Material – MPEG 2820, 2842, 2872, 2881, 2911, 2922, 2947.
Biology – This species builds an epigeal earthen termitarium of variable shape, sometimes at the bases of trees, and is one of the more frequently found termite species in Amazonian "terra firme" forests.

Ereymatermes rotundiceps Constantino 1991

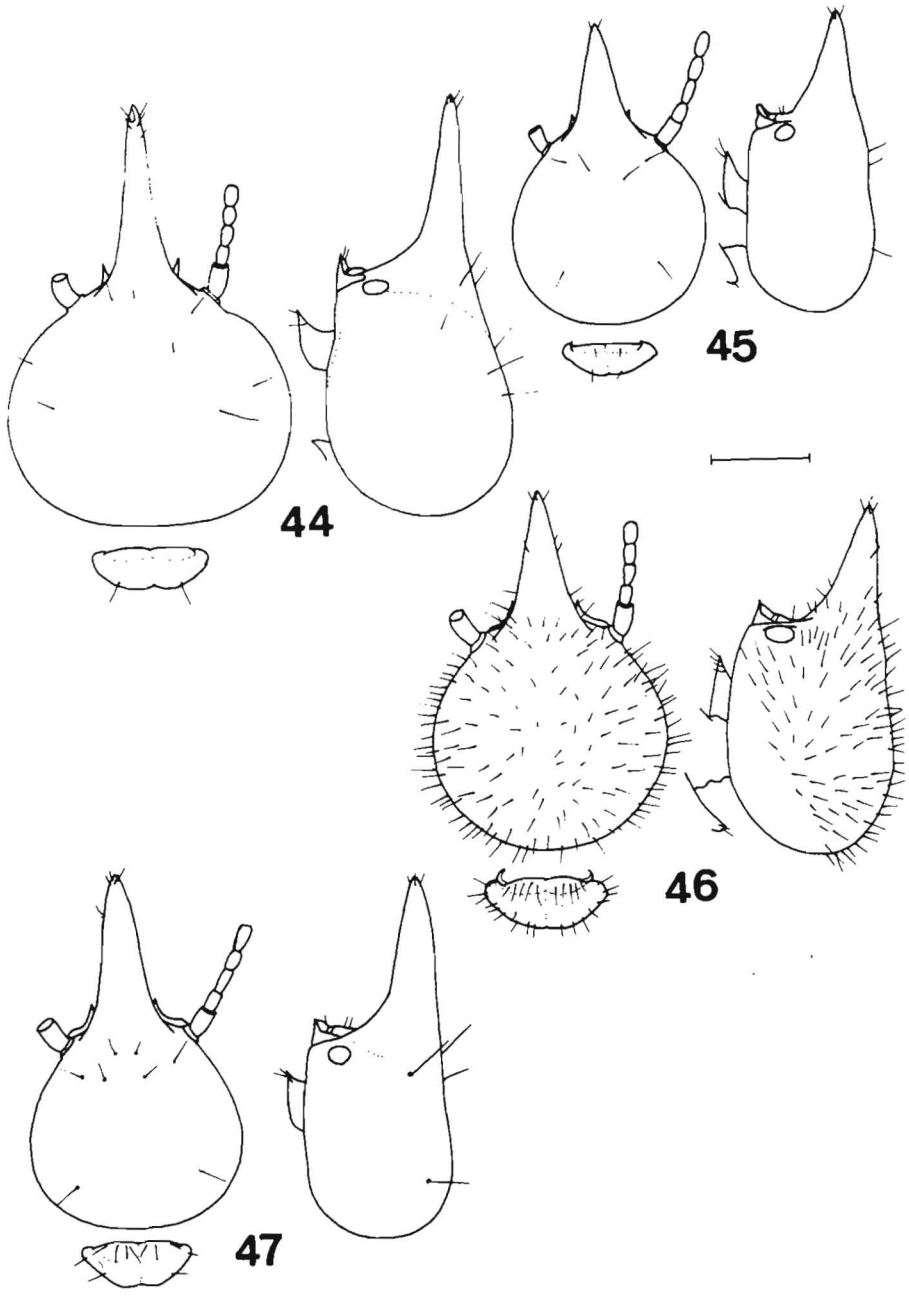
Material – MPEG 2788 (paratypes), 2790 (Holotype and paratypes, with alates).

Ibitermes tellustris Constantino 1990a

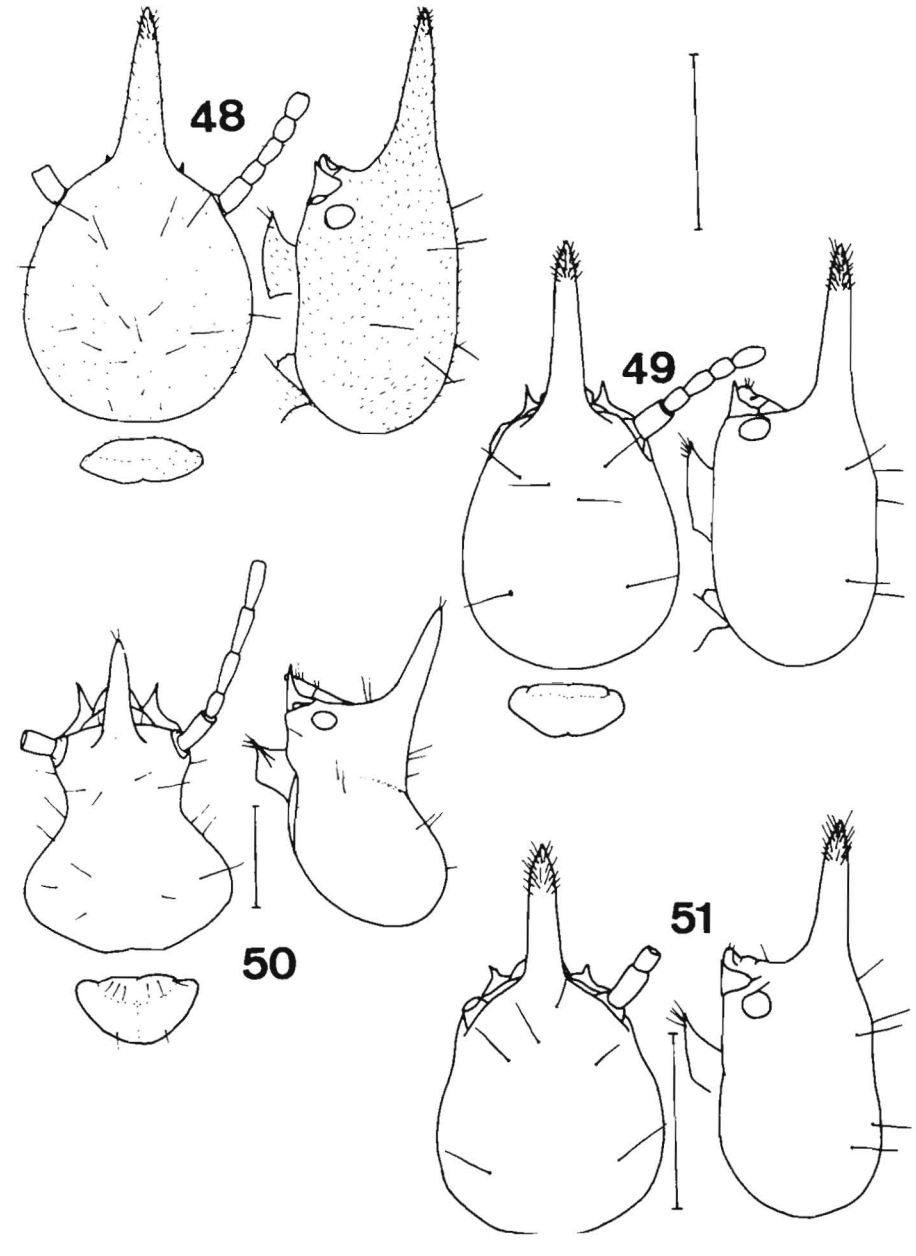
Material – MPEG 2833, 2829, 2888.

Nasutitermes acangussu Bandeira & Fontes 1979

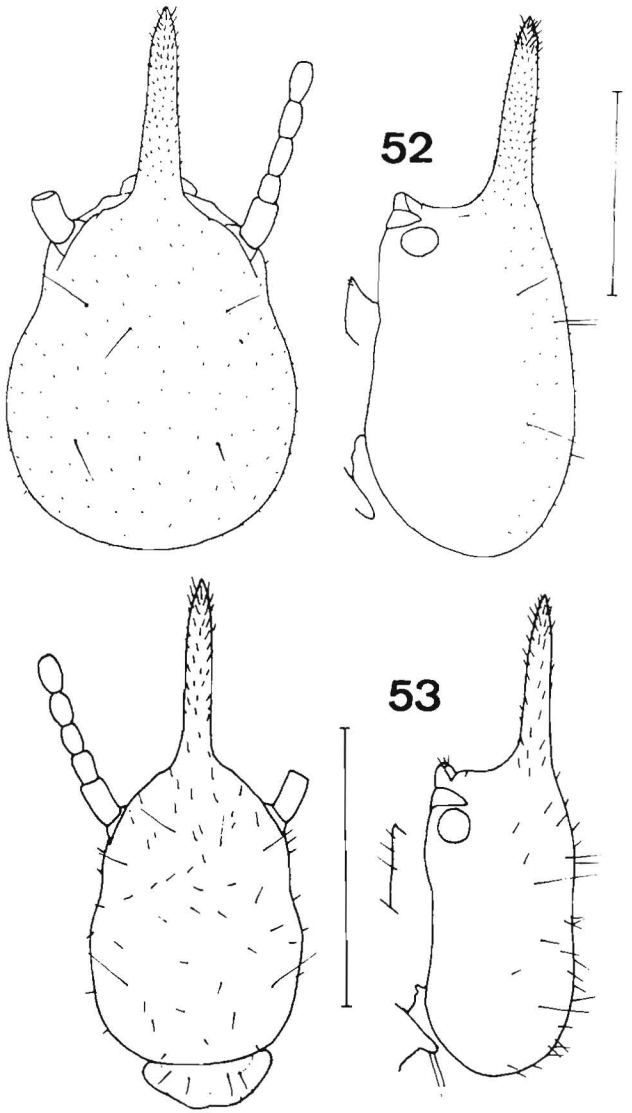
Material – MPEG 2950.
Biology – This species builds large arboreal carton nests.



Figures 44-47 – 44. *Nasutitermes octopilis,* soldier; 45. *N. corniger,* soldier; 46. *N. nigriceps,* soldier; 47. *N. surinamensis,* soldier. Scales = 0.5 mm.



Figures 48-51 – 48. *Nasutitermes banksi,* soldier; 49. *N. gaigei,* soldier; 50. *Constrictotermes cavifrons,* soldier; 51. *Triangularitermes triangulariceps,* soldier. Scales = 0.5 mm.



Figures 52-53 – 52. *Atlantitermes raripilus,* soldier; 53. *A. snyderi,* soldier. Scales = 0.5 mm.

Nasutitermes banksi Emerson 1925
(Figure 48)

Material – MPEG 2803, 2806, 2822.
Biology – Collected in nests built by other species.
Remarks – The soldiers and workers are slow-moving, contrary to the majority of the species of the genus.

Nasutitermes corniger (Motschulsky) 1885
(Figure 45)

Material – MPEG 2786, 2793, 2796, 2925, 2928, 2930, 2934, 2937 (alates), MSZP 9236.
Biology – This species builds a medium-sized arboreal carton nest, from three to 10 meters above ground level. It was frequently found foraging on wood.

Nasutitermes gaigei (Emerson) 1925
(Figure 49)

Material – MPEG 2830.
Biology – Collected in rotten-wood in "terra firme" forest.

Nasutitermes guayanae (Holmgren) 1910

Material – MPEG 2815, 2826, 2843, 2908, 3006, MZSP 9238.
Biology – This species builds a medium sized arboreal carton nest with rugose surface and was frequently found foraging on wood.

Nasutitermes nigriceps (Haldeman) 1853
(Figure 46)

Material – MPEG 2808.
Biology – This species builds a medium-sized arboreal nest.

Nasutitermes octopilis Banks 1918
(Figure 44)

Material – MPEG 2984.
Biology – Collected in rotten wood.

Nasutitermes similis Emerson 1935

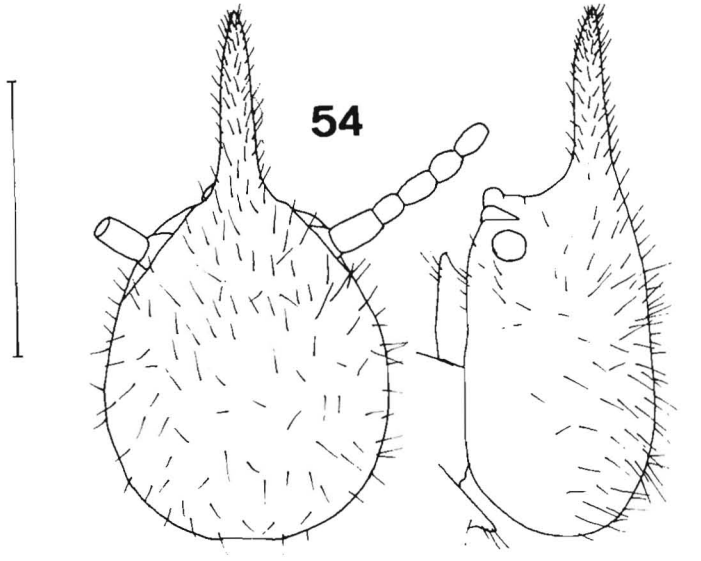
Material – MPEG 2897 (queen), 2962, 2967, 2968, 2995, MZSP 9237.
Biology – This species builds an arboreal carton nest with rugose surface, two to four meters above ground level.

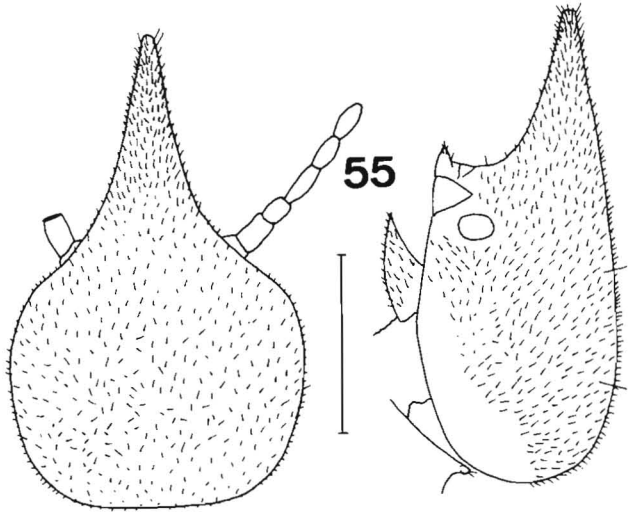
Nasutitermes surinamensis (Holmgren) 1910
(Figure 47)

Material – MPEG 2882, 2953.
Biology – This species builds a large arboreal carton nest with smooth surface, reaching a diameter of one meter, sometimes more than 10 m above ground level.

Nasutitermes spp.

Five other species of *Nasutitermes* collected seem to be new, but erecting new names without a complete taxonomic revision of the genus would add more confusion among the approximately 75 described Neotropical species.

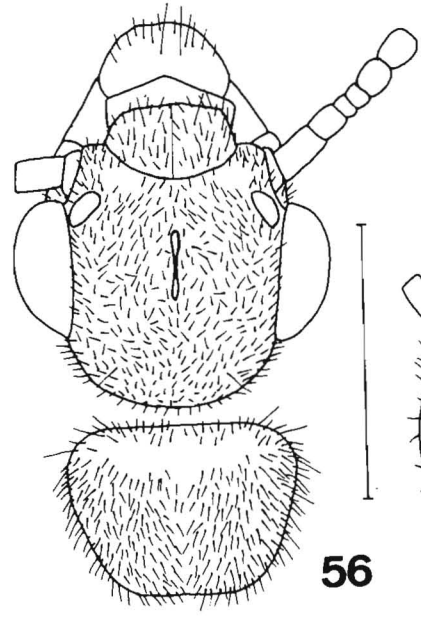


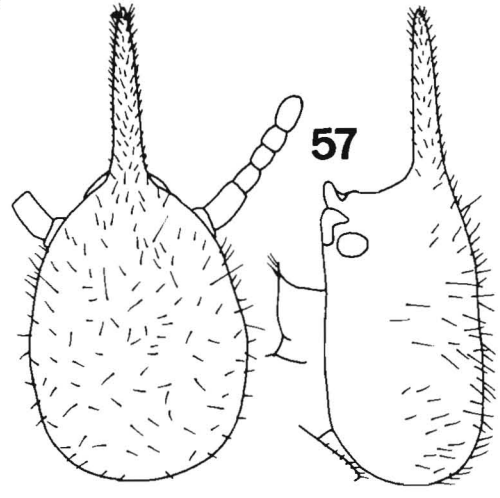


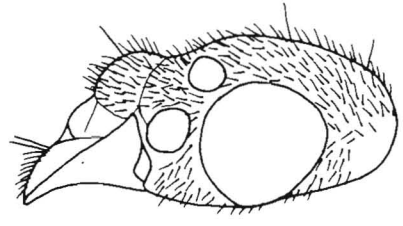
Figures 54-55 – 54. *Araujotermes parvellus,* soldier; 55. *Convexitermes convexifrons,* soldier. Scales = 0.5 mm.

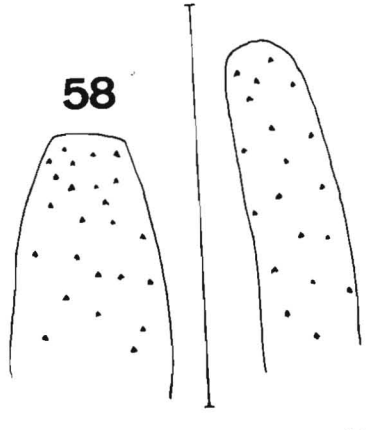
Rotunditermes bragantinus (Roonwal & Rathore) 1976

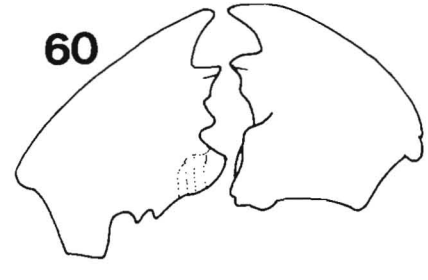
Material – MPEG 2813, 2883, 2892, 2919, 2924, 3000.
Biology – This species builds a dome-shaped epigeal nest made with carton, with many fine roots inside. Sometimes it builds arboreal nests, but close to the ground level.



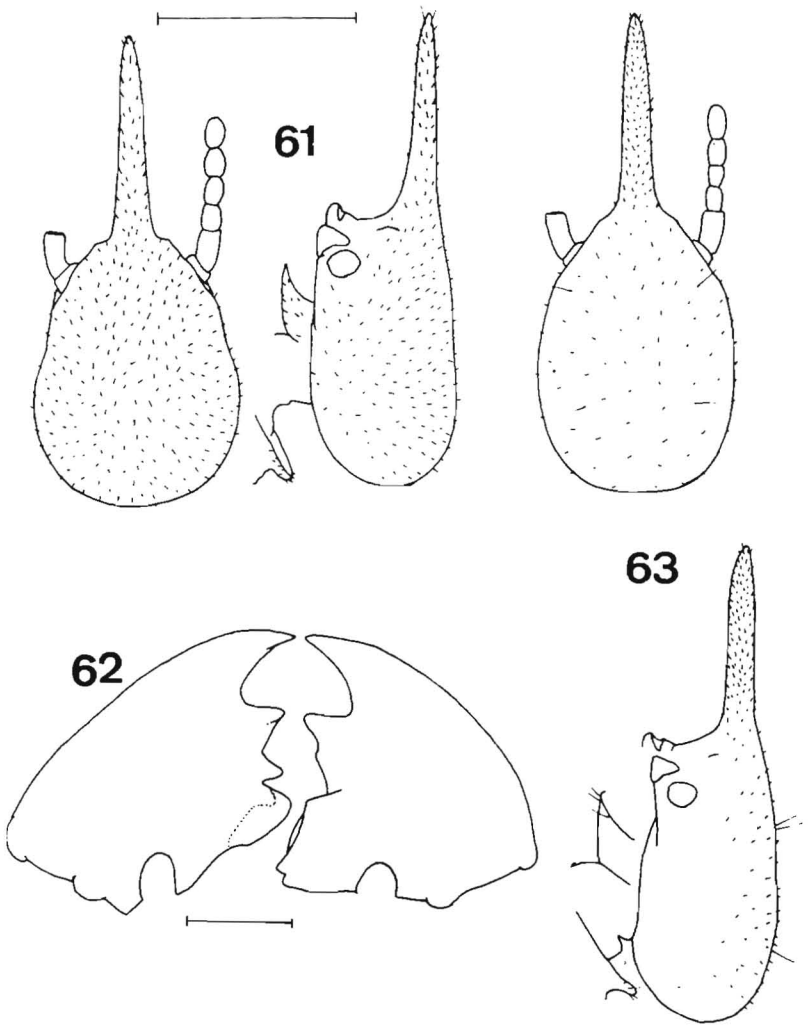








Figures 56-60 – *Araujotermes nanus,* sp.n.: 56. alate; 57. soldier; 58. enteric valve armature; 59 alate mandibles; 60. worker mandibles. Scales = 0.5 mm for heads and 0.1 mm for mandibles and enteric valve.



Figures 61-63 – 61. *Subulitermes constricticeps,* sp.n., soldier; 62. *S. constricticeps,* sp.n., worker mandibles; 63. *Subulitermes baileyi,* soldier. Scales = 0.5 mm for heads and 0.1 mm for mandibles.

Rotunditermes rotundiceps (Holmgren) 1906

Material – MPEG 2824, 2964.
Biology – This species builds a nest similar to that of *R. bragantinus,* but rounded and larger.

Subulitermes baileyi (Emerson) 1925
(Figure 63)

Material – MPEG 2828, 2887 (alates).
Remarks – This species was collected in diffuse galleries in organic soil and in an abandoned epigeal earthen nest.

Subulitermes constricticeps, sp.n.
(Figures 61 & 62)

Material – MPEG 2846 (holotype soldier and paratypes soldiers and workers).
Imago – Unknown.
Soldier – Head capsule elongate, with a slight constriction behind antennae. Nasus cylindrical, long and slender. Vestigial mandibles without points. Antenna with 11 segments, first longer than third, third longer than fifth, fifth longer than fourth, second the smaller one. Head, nasus, post-mentum and pronotum covered with numerous microscopic hairs. Tibiae with a row of spines on inner margin. Tibial spurs 2:2:2. Tergites with scattered short hairs on surface. Sternites with numerous hairs on surface and a row of bristles on posterior margin. Head capsule yellow to orange-yellow. Nasus orange to ferruginous orange. Pronotum, mesonotum, metanotum, legs and sclerites yellowish, transparent.

Measurements of 5 soldiers from type-colony: length of head with nasus 1.11-1.13; length of nasus 0.47-0.49; maximum width of head 0.49-0.59; heigth of head excluding postmentum 0.33-0.35; maximum width of pronotum 0.30-0.32; length of hind tibia 0.49-0.56.
Worker – Postclypeus moderately inflated. Antennae with 12 segments. Head with few bristles and scattered hairs. Pronotum, metanotum and mesonotum with hairs. Tergites with scattered hairs on surface and a row of short bristles on posterior margin. Sternites with numerous hairs on surface and a row of long bristles on posterior margin. Mandibles in Figure 62. Left mandible index 1.26. Enteric valve armature non-sclerotized, with few small spines.
Comparisons – This species is distinguished from the four other of the genus by the constriction of the head. *S. angusticeps* and *S. microssoma* have antennae with 12 segments. All other known species of the genus have four bristles on top of head and less numerous microscopic hairs on head.
Biology – Collected as inquiline in a nest of *Neocapritermes brasiliensis.*

Syntermes robustus, sp.n.
(Figures 31-34)

Material – MPEG 2885 (holotype soldier, paratypes soldiers, alates and workers), MSZP 9228 (paratypes soldiers, alates and workers).
Imago – Head capsule rounded. Eyes rounded, small. Fontanelle triangular with rounded angles, large. Width of clypeus more than two times the length. Mandible as in Fig. 34. Antennae with 20 segments, first longer than third, third longer than second, second longer than fifth, fourth the smallest one. Pronotum wider than head; anterior angles with sharp points; posterior margin rounded, emarginate. Meso and metanotum with posterior margins concave. Head capsule, clypeus and labrum with few scattered bristles. Pronotum with bristles on margins. Meso and metanotum without bristles. Legs with numerous bristles. Tibiae with

numerous spines on inner margin. Tibial spurs 3:2:2. Tergites with hairs on posterior margin. Sternites with numerous hairs on surface. Head chestnut brown. Clypeus ferruginous. Pronotum, mesonotum and metanotum ferruginous orange. Tergites dark chestnut brown. Sternites and wings chestnut brown.

Measurements (in millimeters) of five alates: length of head to lateral base of mandibles 2.5-2.8; maximum width of head with eyes 3.5-3.7; heigth of head excluding postmentum 1.4-1.5; maximum diameter of eye 0.6-0.7; maximum lenght of pronotum 1.8-2.0; maximum width of pronotum 3.7-4.3; length of hind tibia 6.0-6.6.

Soldier – Head capsule with sides straight converging towards front; maximum width approximately equal to length. Frontal tube small; opening directed forwards. Labrum three-lobed. Mandibles strong with a prominent marginal tooth each. Inner margin of apical tooth of left mandible strongly sigmoid. Angle between marginal tooth of right mandible and apical margin approximately 60°. Antennae with 20 segments, first longer than third, third longer than second, second longer than fourth, fourth equal fifth. Pronotum, mesonotum and metanotum with large spines, but narrower than head; anterior margin of pronotum strongly emarginate. Head, labrum and postmentum with numerous short bristles. Pronotum with scattered short bristles, more numerous on anterior margin. Meso and metanotum with short bristles on posterior margin. Legs with numerous bristles. Tibiae with spines on inner margin. Tibial spurs 3:2:2. Tergites and sternites with numerous bristles on surface, more numerous on posterior margin. Head, pronotum, mesonotum and metanotum orange. Mandibles brown at base and remainder very dark brown. Labrum orange; median lobule hyaline. Legs orange yellow. Abdomen yellowish, transparent.

Comparisons – The soldier of this species is close to *S. spinosus* which has more robust mandibles with more curved tips, inner margin of apical tooth of left mandible less sigmoid, and more numerous bristles on head and abdomen. The soldier of *S. dirus* has narrower head with sides less converging towards front, larger frontal tube, smaller notal spines and inner margin of apical tooth of left mandible less sigmoid. The alate of *S. spinosus* is very close but has a proportionally wider pronotum and a larger, rounded fontanelle. The alate of *S. dirus* is almost indistinguishable; has the fontanelle rounded and less numerous bristles on head.

Biology – The single colony was found in a long column with soldiers, workers and alates. They were apparently migrating after the river raised. This species is probably subterranean as the majority of the species of the genus.

Triangularitermes triangulariceps Mathews 1977
(Figure 51)

Material – MPEG 2855, 2905, 3487.
Biology – Collected in rotten wood in "terra firme" forest.
Remarks – The head of the soldiers from Maraã is more rounded and less triangular than described by Mathews. I have also examined material from other localities and a considerable variation in the shape of the head was observed.

DISCUSSION

In reviewing the known geographical distribution of the termite species found in Maraã the pattern that arises is a predominant Amazonian distribution. From the 51 determined species, 42 (82%) are known only from Amazonia (limits in Figure 1) and only 9 (18%) are known from other regions. Among the Amazonian species, 21 are widely distributed in this region and the remainder are known from more restricted areas. Eleven species are known only from Maraã. Many of the species with restricted known distributions certainly have a larger real distribution, given the paucity of collection in this region and their cryptic habits that made difficult their collecting.

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NOTA SOBRE O COMPORTAMENTO DE *VETURIUS PARAENSIS* (COLEOPTERA: PASSALIDAE)

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A família Passalidae constitui um grupo de coleópteros subsociais, distribuídos pantropicalmente, que podem ser encontrados em madeira morta, sem contudo apresentar especificidade de hospedeiro (Luederwaldt, 1931; Fonseca, 1988).

Embora tenham aparente comportamento uniforme, há na literatura citações de colônias atípicas. Luederwaldt (1931) encontrou colônias completas de *Passalus dubitans* (larva, pupa e adulto) explorando nicho sob as raízes de bromeliáceas; também pôde verificar "um exemplar de *Passalus punctiger* debaixo de excremento de vacas", e o segundo autor achou repetidas vezes *Passalus punctatissimus* em abóboras podres (Serra da Cantareira / São Paulo)". Ohaus (1909) encontrou colônias de Passalidae (espécie omitida) que, devido ao adiantado estado de decomposição da madeira colonizada, construíam galerias no próprio solo em baixo do tronco.

Hendrichs & Reyers Castillo (1963) descreveram pela primeira vez a associação entre *Ptichopus angulatus* e as câmaras de lixo dos formigueiros de *Atta mexicana.* Reyes-Castillo (1970) demonstrou que a distribuição de *P. angulatus* está condicionada à distribuição de *Atta mexicana,* sugerindo que possivelmente no sul do México e na América Central a distribuição de *P.*

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