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New Species and a Hitherto Undescribed Imago Caste of the Genus *Calcaritermes* Snyder (Isoptera, Kalotermitidae)¹

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The present study is based on specimens in the collection of the American Museum of Natural History in the custody of Dr. Alfred E. Emerson. Holotypes, morphotypes, paratypes, and paramorphotypes are deposited in the collection of the American Museum of Natural History. Duplicate paratypes and paramorphotypes are deposited in the Smithsonian Institution, United States National Museum, Washington, D. C.

The following generic characters are common to all the species described in this paper and are therefore not repeated in the species descriptions.

IMAGO: Left mandible with posterior margin of first plus second marginal tooth equal to anterior margin of third marginal tooth, posterior margin of first plus second marginal tooth merging with anterior margin of third, forming a concave cutting edge; right mandible with posterior margin of second marginal tooth slightly longer than molar plate. Wing venation as in *Glyptotermes*. Tibial spurs 3:3:3. Arolium present in all species.

¹ Financial assistance for this study was received from the National Science Foundation (Grant No. G-14701). I am indebted to Dr. A. E. Emerson for making preliminary determinations of some of the species, and to Mr. R. L. Wenzel of the Chicago Natural History Museum for the preparation of some of the preliminary drawings.

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SOLDIER: Tibial spurs 3:3:3; front tibia with thick, conspicuous spur near apex of outer side, much larger than other two apical spurs.

***Calcaritermes colei*, new species**

IMAGO: Unknown.

SOLDIER (FIG. 1): Head yellowish brown, blackish anteriorly; pronotum brown; mesonotum and metanotum light brown; antennae brownish yellow; foreleg yellowish brown; middle and hind leg yellowish; tergites dirty white to yellowish brown. Head with a few scattered bristles; pronotum with bristles along margins and on disc. Head with sides

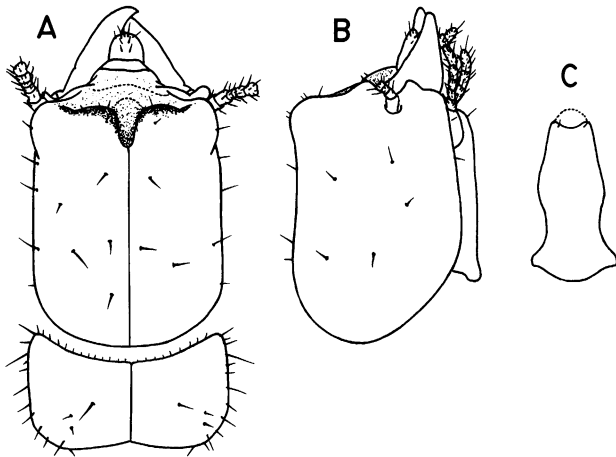


FIG. 1. Holotype soldier of *Calcaritermes colei*, new species. A. Head and pronotum from above. B. Head from side. C. Postmentum from below.

parallel, in some specimens very slightly covering in front; forehead bilobed, with deep, V-shaped depression between lobes; in profile, top portion of front vertical, middle portion sloping at an angle of about 75 degrees, dorsal surface concave; horn-like projection of ventral genae present between mandible base and below antennal socket. Mandibles short, outer margins almost even; left mandible with three marginal teeth, first and second close to each other, concave cutting edge between second and third; right mandible with two marginal teeth; point of first marginal tooth 0.21 mm. from tip of apical tooth. Postmentum shaped as in figure; contraction index 0.73–0.82. Antenna with 11–12 articles; second article longer than fourth; in antenna with 11 articles, third shorter than second

or fourth; in antenna with 12 articles, third equal to fourth. Pronotum slightly broader than head; anterior margin concave; posterior margin emarginate, posterolateral margins rounded or fairly straight.

TABLE 1
MEASUREMENTS (IN MILLIMETERS) OF FOUR SOLDIERS OF
Calcaritermes colei, NEW SPECIES

	Holotype	Range	Mean
Length of head to side base of mandibles	1.58	1.54-1.58	1.57
Width of head	1.16	1.13-1.20	1.17
Height of head	1.13	1.13	1.13
Length of left mandible	0.60	0.60-0.62	0.60
Maximum width of postmentum	0.39	0.39-0.41	0.41
Minimum width of postmentum	0.32	0.30-0.32	0.32
Length of postmentum	0.94	0.94-0.96	0.95
Median length of pronotum	0.47	0.43-0.47	0.46
Maximum length of pronotum	0.69	0.66-0.69	0.68
Width of pronotum	1.20	1.20-1.22	1.20
Length of hind tibia	0.60	0.60-0.62	0.61

COMPARISONS: *Calcaritermes colei* most closely resembles *C. snyderi*, new species. In *Calcaritermes snyderi* the head is broader, the front of the head in profile is greater than vertical, the depression between the anterodorsal lobes on the forehead is U-shaped and deeper, and the mandibles have a slight hump at the outer bases. In *C. emarginicollis* (Snyder) all measurements are much larger, and the depression between the anterodorsal lobes on the forehead is deeper and broader. In *C. nearcticus* Snyder the head is broader, and the depression between the anterodorsal lobes on the forehead is broadly V-shaped and shallower. In *C. parvintus* Light all measurements are much smaller, and the depression between the anterodorsal lobes is shallower.

TYPE LOCALITY: Above El Naranjo, San Luis Potosi (latitude 22° 10' N., longitude 101° 00' W.), Mexico, soldiers (holotype and paratypes), nymphs, collected by R. M. Cole, August 1, 1942 (no. 11A).

This species is named in honor of Mr. R. M. Cole.

***Calcaritermes rioensis*, new species**

IMAGO: Unknown.

SOLDIER (FIG. 2): Head reddish brown, dark reddish brown to blackish anteriorly; mandibles reddish brown, lighter than posterior region of head; pronotum brown; antennae yellowish brown; foreleg brown, with

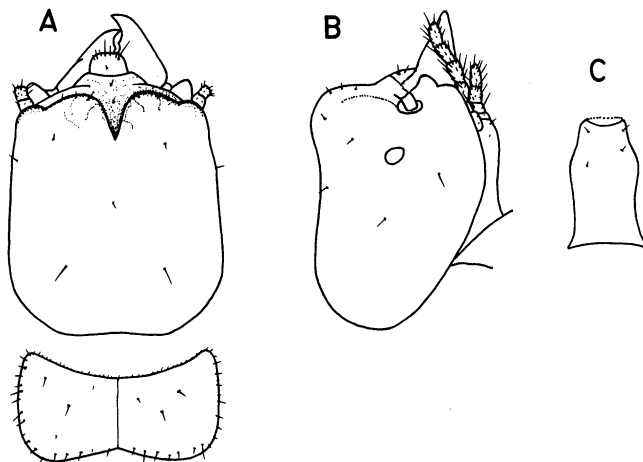


FIG. 2. Holotype soldier of *Calcaritermes rioensis*, new species. A. Head and pronotum from above. B. Head from side. C. Postmentum from below.

yellowish tinge; middle and hind leg pale yellowish; tergites whitish, with yellowish tinge. Head and pronotum with a few short bristles. Head not much longer than broad; sides converging in front; forehead bilobed, surface of lobes roughened, deep, V-shaped depression between lobes; in profile, top portion of front vertical, middle portion sloping at an angle, dorsal surface concave; seen from above, middle portion of frontal slope concave; horn-like projection of ventral genae present between mandible base and below antennal socket; posterior margin slightly emarginate. Mandibles short, outer margin almost even; left mandible with three

TABLE 2
MEASUREMENTS (IN MILLIMETERS) OF HOLOTYPE SOLDIER OF
Calcaritermes rioensis, NEW SPECIES

Length of head to side base of mandibles	1.58
Width of head	1.35
Height of head	1.16
Length of left mandible	0.49
Maximum width of postmentum	0.45
Minimum width of postmentum	0.39
Length of postmentum	0.77
Median length of pronotum	0.41
Maximum length of pronotum	0.71
Width of pronotum	1.28
Length of hind tibia	0.71

marginal teeth, second and third very faint, cutting edge between second and third concave; right mandible with two marginal teeth, point of first marginal tooth 0.19 mm. from tip of apical tooth. Postmentum shaped as in figure; contraction index 0.86. Antenna with 11 articles; third article shorter than second or fourth. Pronotum slightly narrower than head; anterior margin broadly concave; posterior margin deeply emarginate, posterolateral margins rounded.

COMPARISONS: *Calcaritermes rioensis* most closely resembles *C. parvnotus* Light, but differs from it in the following respects: the head and pronotum are larger, the anterodorsal lobes on the forehead are more prominent, and the depression between the lobes is deeper. In *C. nigriceps* (Emerson) the front profile of the head is not so steep, the anterodorsal lobes on the forehead are less prominent, the depression between the lobes is narrower and shallower, and the outer basal margins of the mandibles are sinuate. In *C. nearcticus* the head and pronotum are shorter and narrower, the depression between the anterodorsal lobes on the forehead is broader and shallower, and the posterior margin of the pronotum is not so deeply emarginate.

TYPE LOCALITY: Ilha Grande (approximately latitude 22° 59' S.—23° 7' S., longitude 44° 7' W.—44° 26' W.), state of Rio, Brazil, one soldier (holotype), nymphs, collected by H. Muth and H. Sick, June 11, 1944 (no. 14).

***Calcaritermes snyderi*, new species**

Calcaritermes sp. nov. KIRBY, 1949, pp. 366, 371, 379.

IMAGO (FIG. 3): Head dark smoky brown; labrum yellowish brown; pronotum smoky brown, lighter than head; antennae brown, whitish at tips of articles; femur light brown, with yellowish tinge, tibia lighter than femur; wings light smoky brown, wing scale darker. Head with a few scattered, erect bristles. Pronotum with both long and short bristles along margins and on disc. Head posterior to eyes semicircular, frons with two circular spots; Y suture present but not visible. Eyes small. Ocellus oval, touching eye. Antenna with 13 articles; second article equal to third, fourth shorter than second or third. Pronotum as wide as, or wider than, head; anterior margin broadly concave; sides rounded; posterior margin emarginate, posterolateral corners rounded. Hind wing with median vein branching from radial sector, outside wing scale, at about 0.83–1.28 mm. from suture.

COMPARISONS: The imago of this species differs from that of *Calcaritermes emarginicollis* in the following respects: the forewings are slightly

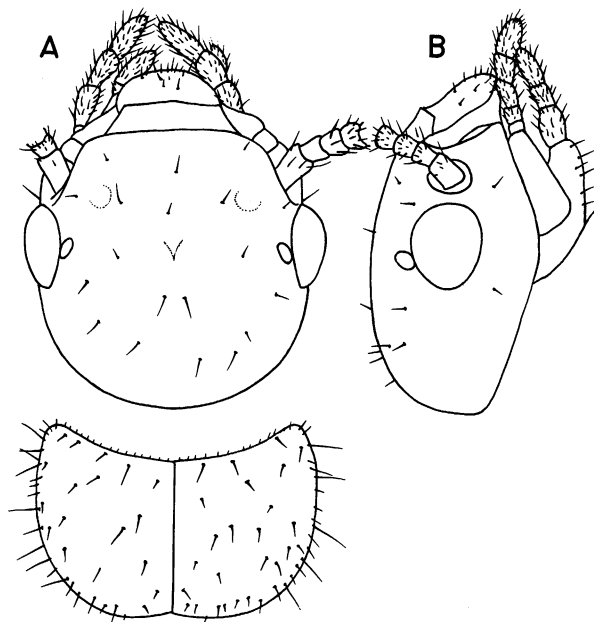


FIG. 3. Imago of *Calcaritermes snyderi*, new species. A. Head and pronotum from above. B. Head from side. Paramorphotype from type colony.

TABLE 3
MEASUREMENTS (IN MILLIMETERS) OF IMAGOS OF
Calcaritermes snyderi, NEW SPECIES

	No.	Type Colony, Range	No.	Paratype Colony, Range
Length of head to tip of labrum	5	1.28	6	1.13-1.24
Length of head to side base of mandibles	5	0.98-1.01	6	0.92-0.98
Width of head	5	1.05-1.09	6	1.01-1.07
Diameter of eye	5	0.29-0.32	6	0.29-0.32
Eye from lower margin	5	0.16-0.18	6	0.16-0.18
Length of ocellus	5	0.08-0.11	6	0.08-0.10
Median length of pronotum	5	0.53-0.60	6	0.53-0.54
Maximum length of pronotum	5	0.68-0.73	6	0.62-0.68
Width of pronotum	5	0.98-1.05	6	0.96-1.01
Length of hind tibia	5	0.99-1.01	5	0.96-0.98
Length of forewing from suture	5	6.65-6.93	5	5.80-6.08
Width of forewing	5	1.69-1.76	5	1.35-1.52

longer, the ocellus is larger and touches the eye, and the sides of the pronotum are rounded. In *C. guatemalae* Snyder the head is larger, the pronotum is longer, and the forewings are slightly broader.

SOLDIER (FIG. 4): Head yellowish brown posteriorly, reddish brown to blackish anteriorly; mandibles shiny, dark reddish brown, blackish at tips; labrum brown; pronotum brown, darker on edges; foreleg light brown, middle and hind leg pale yellowish; tergites dirty yellowish, with tinge of brown. Head with a few scattered, erect bristles; pronotum with bristles along margins and on disc. Head thick, size variable; sides slightly

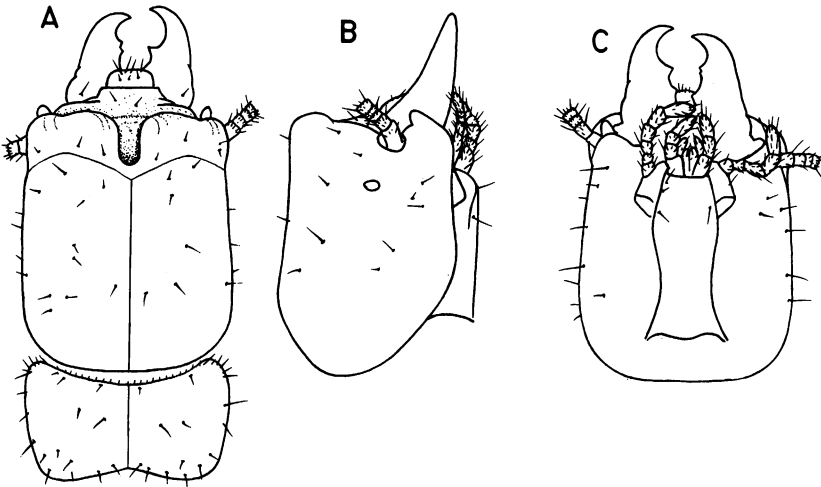


FIG. 4. Soldier of *Calcaritermes snyderi*, new species. A. Head and pronotum from above. B. Head from side. C. Head from below. Paratype from type colony.

converging in front; forehead bilobed, surface of lobes roughened, deep, U-shaped depression between lobes; in profile, top portion of front slightly greater than vertical, middle portion sloping at an angle of about 80 degrees, dorsal surface slightly concave; horn-like projection of ventral genae present between mandible base and below antennal socket. Mandibles short, outer bases slightly humped; left mandible with three marginal teeth, first and second close to each other, cutting edge between second and third concave; right mandible with two marginal teeth, point of first marginal tooth 0.24–0.26 mm. from tip of apical tooth. Postmentum shaped as in figure; contraction index 0.73–0.83. Antenna with 11–13 articles; second article longer than third or fourth, third shorter than, or subequal to, fourth. Pronotum slightly narrower than, as broad as, or

slightly broader than, head; anterior margin evenly and broadly concave; posterior margin emarginate, posterolateral margins rounded.

TABLE 4
MEASUREMENTS (IN MILLIMETERS) OF SOLDIERS OF
Calcaritermes snyderi, NEW SPECIES

	Holotype	No.	Paratype Type Colony, Range	No.	Paratype, Range
Length of head to side base of mandibles	1.65	10	1.61-1.73	5	1.46-1.65
Width of head	1.28	10	1.24-1.31	5	1.20-1.28
Height of head	1.20	10	1.14-1.24	5	1.05-1.13
Length of left mandible	0.68	10	0.68-0.69	5	0.62-0.68
Maximum width of postmentum	0.41	10	0.39-0.43	5	0.38-0.39
Minimum width of postmentum	0.30	10	0.30-0.36	5	0.30
Length of postmentum	0.98	10	0.90-0.99	5	0.73-0.84
Median length of pronotum	0.54	10	0.53-0.56	5	0.45-0.53
Maximum length of pronotum	0.83	10	0.75-0.83	5	0.68-0.75
Width of pronotum	1.24	10	1.20-1.28	5	1.20-1.24
Length of hind tibia	0.73	10	0.73-0.75	5	0.66-0.69

COMPARISONS: *Calcaritermes snyderi* most closely resembles *C. emargini-collis* but differs from it in the following respects: the head and pronotum are smaller in all measurements, the top portion of the front of the head in profile is slightly greater than vertical, the depression between the lobes on the forehead is narrower, and the posterior margin of the pronotum is not so deeply emarginate. In *C. colei*, new species, the head is narrower, the top portion of the front of the head is vertical in profile, the depression between the anterodorsal lobes on the forehead is V-shaped, and the outer margins of the mandibles are even. *Calcaritermes guatemalae* is much larger in all respects.

TYPE LOCALITY AND DISTRIBUTION: Volcan de Santa Ana, Department of Santa Ana (latitude 14° 00' N., longitude 89° 31' W.), El Salvador (type locality), imagoes (morphotype and paramorphotypes), soldiers (holotype and paratypes), nymphs, collected by J. Marshall, April 27, 1942 (nos. T-545, TP-552). Chilata, Department of Sonsonate (latitude 13° 43' N., longitude 89° 44' W.), El Salvador, imagoes (paramorphotypes), soldiers (paratypes), nymphs, collected by J. Marshall, May 5, 1942 (nos. T-548, TP-555).

This species is named in honor of Dr. T. E. Snyder of the Smithsonian Institution, United States National Museum, Washington, D. C., who has contributed enormously to the taxonomy and biology of termites.

Calcaritermes temnocephalus (Silvestri)

Calotermes temnocephalus SILVESTRI, 1901, p. 2 (soldier).

Calotermes temnocephalus; SILVESTRI, 1903, p. 34, pl. 1, figs. 25, 26 (soldier, nymph).

Calotermes (?*Procryptotermes*) *temnocephalus*; HOLMGREN, 1911, p. 55.

Kalotermes (*Glyptotermes*) *temnocephalus*; EMERSON, 1925, p. 331 (remarks).

Calcaritermes sp.; ADAMSON, 1940, pp. 12, 13 (biology).

Calcaritermes sp.; ADAMSON, 1949, pp. 3, 5 (locality).

Calcaritermes temnocephalus; SNYDER, 1949, p. 54 (systematics).

Calcaritermes temnocephalus; SNYDER, 1959, pp. 317, 320.

Silvestri in 1901 described this species from the soldier caste alone. The imago is hitherto undescribed.

IMAGO (FIG. 5): Head yellow brown; pronotum yellowish, with brown patches; antennae yellowish; legs pale yellow; tergites light yellow. Head and pronotum with a few scattered, erect bristles. Eyes small, shaped as in figure. Ocellus oval, touching eye. Antenna with 13 articles; third article longer or subequal to second, fourth shorter than third. Pronotum as broad as, or slightly narrower than, head; anterior margin shallowly concave; sides rounded; posterior margin very slightly indented in middle, posterolateral margins rounded or straight. Hind wing with median vein branching from radial sector, outside wing scale, at about 0.68–0.90 mm. from suture.

TABLE 5
MEASUREMENTS (IN MILLIMETERS) OF IMAGOS OF
Calcaritermes temnocephalus (SILVESTRI)

	No.	Morphotype Colony from Trinidad, Range	No.	Homotype Colonies from Trinidad, St. Vincent, St. Lucia Islands, Range
Length of head to tip of labrum	5	1.11–1.20	9	1.09–1.20
Length of head to side base of mandibles	5	0.90–0.92	9	0.86–0.90
Width of head	5	0.96–0.98	6	0.94–0.98
Diameter of eye	5	0.32	9	0.32–0.36
Eye from lower margin	5	0.14–0.16	9	0.13–0.16
Length of ocellus	5	0.07–0.09	9	0.07–0.11
Median length of pronotum	5	0.51–0.53	9	0.49–0.53
Maximum length of pronotum	5	0.60–0.64	9	0.56–0.60
Width of pronotum	5	0.83–0.88	9	0.79–0.86
Length of hind tibia	5	0.83	9	0.75–0.79
Length of forewing from suture	5	6.29–6.50	9	5.58–6.08
Width of forewing	5	1.78–1.80	9	1.61–1.76

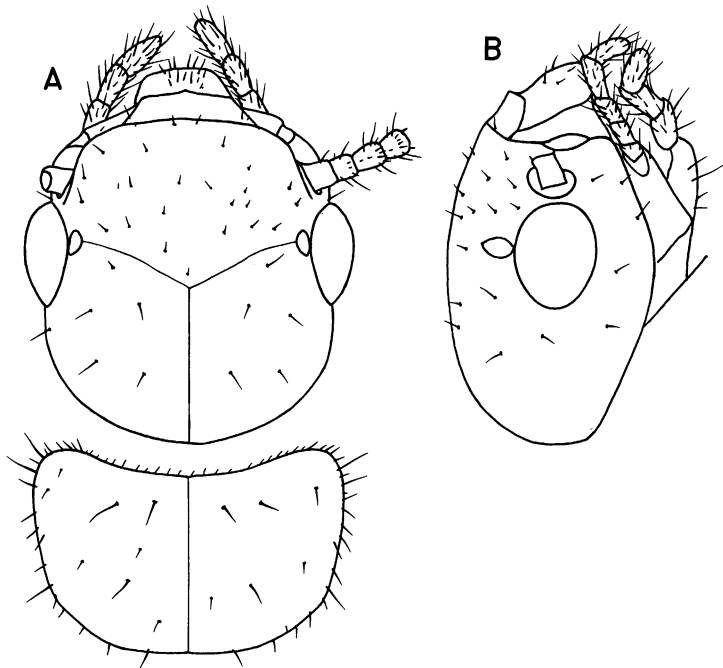


FIG. 5. Imago of *Calcaritermes temnocephalus* (Silvestri). A. Head and pronotum from above. B. Head from side. Morphotype colony from Maracas Valley, Trinidad, the West Indies.

COMPARISONS: The imago of *Calcaritermes fairchildi* Snyder has a narrower head, smaller eyes, and shorter and narrower wings. *Calcaritermes nigriceps* has a wider head and shorter and narrower wings.

Emerson examined two soldiers of this species: one in 1957 in the Copenhagen Museum, labeled "*Calotermes temnocephalus* Silv., Type, 18 sp., Las Trincheras," which he selected as the holotype; and the other, a cotype soldier (now considered a paralectotype), in 1927 in the Silvestri collection, Istituto di Entomologia, Agraria Universita, Portici, Italy, labeled "*Calotermes temnocephalus* Silv., Las Trincheras, Venezuela, F. Meinert, 12, XII. 1891." The following description of the soldier is taken from his notes.

SOLDIER (FIG. 6): Head brownish yellow from vertex to rear, black in front; pronotum in general same color as rear of head; abdomen and legs light yellow. Head comparatively long; front steep, angle of front 120 degrees from longitudinal plane in profile; forehead with two humps on each side of median groove, rounded in outline; shallow grooves between lateral humps and base of antennae; antennae surrounded by

rounded ridges above, at rear, and below, but not at immediate front; lower ridge in front portion projecting slightly, with tip rounded at side base of mandibles but not forming a sharp or prominent projection; top of head in profile very shallowly concave a little in front of middle; vertex slightly convex behind median groove and back of head at first slightly convex on top and strongly convex at rear; lateral wrinkles in head capsule behind thickened ridge at base of maxillae; vertex and front somewhat roughened. Mandibles comparatively short, outer margin strongly convex near tip; (in homotype series left mandible with three

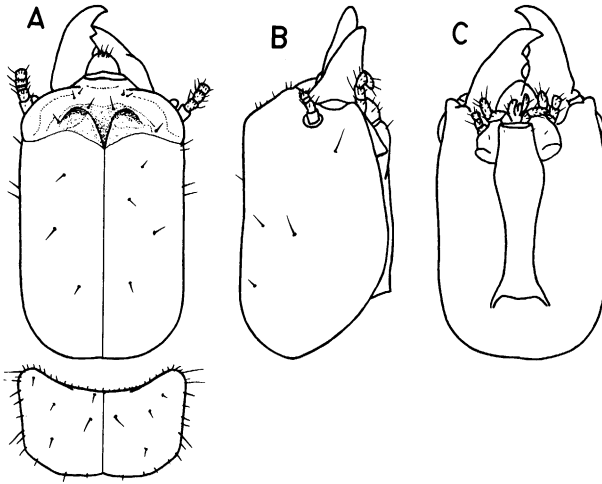


FIG. 6. Soldier of *Calcaritermes temnocephalus* (Silvestri). A. Head and pronotum from above. B. Head from side. C. Head from below. Morphotype colony from Maracas Valley, Trinidad, the West Indies.

marginal teeth, first and second close to each other, concave cutting edge between second and third; right mandible with two marginal teeth, point of first marginal tooth 0.23 mm. from tip of apical tooth). Postmentum fairly long and somewhat constricted in middle (in homotype series contraction index, 0.59–0.72). Antenna with 11 articles; second article equal to third, fourth equal to third (in homotype series, antenna with 11–13 articles; second article longer than third or fourth, third shorter than fourth). Pronotum broader than head; anterior margin fairly evenly concave, with slight indication of an angle in middle; sides straight or very slightly convex and almost parallel; posterior margin with shallow concavity in middle, slightly convex at sides of concavity, and almost

straight between hind lateral angles and slight convexity at sides of middle concavity.

TABLE 6
MEASUREMENTS (IN MILLIMETERS) OF SOLDIERS OF
Calcaritermes temnocephalus (SILVESTRI)

	Holo- lecto- type ^a	Para- lecto- type ^b	No.	Homotype Colonies from Trinidad, St. Lucia, St. Vincent Islands, Range
Length of head to side base of mandibles	1.35	—	9	1.37–1.67
Width of head	0.93	0.97	9	0.98–1.05
Height of head	0.83	—	9	0.88–0.96
Length of left mandible	0.61	0.65	9	0.56–0.60
Maximum width of postmentum	0.31	0.29	9	0.32–0.36
Minimum width of postmentum	0.21	—	9	0.19–0.23
Length of postmentum	—	—	9	0.79–1.11
Median length of pronotum	0.45	0.52	9	0.45–0.53
Maximum length of pronotum	—	0.68	9	0.64–0.68
Width of pronotum	0.97	1.06	9	0.96–1.05
Length of hind tibia	0.57	0.51	9	0.60–0.64

^a A. E. Emerson in 1957 studied and selected the holotype in the Copenhagen Museum.

^b Dr. A. E. Emerson in 1928 measured the cotype specimen in the Silvestri collection, Istituto di Entomologia, Agraria Università, Portici, Italy.

COMPARISONS: *Calcaritermes temnocephalus* most closely resembles *C. fairchildi*, but differs from it as follows: in the left mandible the posterior margin of the second marginal tooth and the anterior margin of the third form a concave cutting edge (as contrasted with an angular cutting edge in *C. fairchildi*), and the posterolateral margins of the pronotum are more angular.

TYPE LOCALITY AND DISTRIBUTION: Las Trincheras (latitude 6° 57' N., longitude 64° 55' W.), Venezuela (type locality), two soldiers (holotype, paralectotype), collected by F. Meinert, December 12, 1891. Maracas Valley, Trinidad, the West Indies, imagoes (morphotypes), soldiers (homotypes), collected by R. Boodhoo, June 8, 1936 (no. 36); imagoes, soldiers (homotypes), collected by R. Boodhoo, July 5, 1937 (no. 322). Sangre Grande (latitude 10° 35' N., longitude 61° 08' W.), Trinidad, the West Indies, one imago, soldiers, nymphs (homotypes), collected by A. M. Adamson, May 14, 1936 (no. 1060). Sandy Bay (latitude 13° 27' N., longitude 61° 08' W.), St. Vincent Island, the

West Indies, imago, one soldier (homotypes), collected by A. M. Adamson, June 24, 1938 (no. 2863). St. Lucia Island, the West Indies, imagoes, one soldier, nymphs, (homotypes), collected by A. E. Emerson, May 20, 1920, in damp decayed stump in ravine.

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