

DESCRIPTIONS OF NEW SPECIES AND HITHERTO UNKNOWN CASTES OF TERMITES FROM AMERICA AND HAWAII.

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The following 12 new species of termites are described in this paper:

KALOTERMITIDAE.

Kalotermes marjoriae, new species, Hawaii, Hilo.

Kalotermes tabogae, new species, Panama, Taboga Island.

Neotermes angustoculus, new species, United States, Florida (Paradise Key).

Glyptotermes pubescens, new species, Porto Rico, Aibonito.

RHINOTERMITIDAE.

Leucotermes convexinotatus, new species, Panama, Colon.

Leucotermes cardini, new species, Bahamas, Andros Island.

Leucotermes longiceps, new species, Brazil, Coxipo, Cuyabã.

TERMITIDAE.

Syntermes magnoculus, new species, Brazil, Chapada.

Syntermes emersoni, new species, Brazil, Iguaripe.

Syntermes colombianus, new species, Colombia.

Nasutitermes (Subutitermes) zeteki, new species, Panama, Summit, C. Z.

Anoplotermes hondurensis, new species, Spanish Honduras, La Ceiba.

Descriptions are also given of the hitherto unknown winged sexual adults of *Amitermes wheeleri* Desneux of Texas, which is also figured, and *Amitermes beaumonti* Banks of Panama, as well as that of *Nasutitermes guayanae*, form *columbicus* Holmgren of Panama, which I designate a distinct species.

The soldier of *Syntermes dirus*, form *hageni* Holmgren, is described more fully and figured; I believe it to be a distinct species and have so designated it; keys to the soldiers of 15 species and to the winged adults of 9 species of *Syntermes* are given.

It has been found that there are two species of *Neotermes* in southern Florida, namely, *angustoculus* Snyder—a small-eyed new species—and *N. castaneus* Burmeister—a large-eyed species; the latter has been redescribed for comparison with my new species; specimens of these distinct species had been confused in the collection

of the United States National Museum until my attention was called to the differences by A. Emerson. Specimens from Venezuela and Brazil in the Hagen collection are also large-eyed; they are referred to by Hagen¹; Hagen writes that Burmeister's type agrees with these specimens from southern Brazil (St. Leopoldo), collected by Winthem. Soldiers have been correlated with the winged adults of both *angustoculus* and *castaneus*. The winged adults of *N. castaneus* collected by Appun at Porto Cabello, in Venezuela, in the Hagen collection form the basis for Hagen's redescription (1858); the long diameter of the eye of these specimens is 0.60 mm.; the specimens collected in Brazil by Winthem have an eye diameter of 0.65. A soldier from Brazil in the Hagen collection is labeled by Hagen *castaneus*?; it is from the Nuremburg Museum and has short mandibles (less than the width of the head), as do specimens from Florida.

Hagen also has winged adults of a variety, a = *cubana* (label on specimens) in his collection under the species *N. castaneus*; he referred to these specimens in 1858 (p. 41) but did not publish the name; this variety is a small (13 mm. in length), small-eyed form (eye 0.45 mm. in diameter), collected by Gundlach in 1864. *N. angustoculus* from southern Florida and Cuba has an eye diameter of 0.35 mm. A dealated adult of *N. castaneus* in the Hagen collection from St. Thomas, collected by Uhler, has an eye diameter of 0.70 mm.

Winged adults of another variety, b = *chilensis* (label on specimens) from Chile referred to by Hagen 1858 (p. 41) but the name not published, is 17 mm. in length and has an eye diameter of 0.45 mm. It is remarkable in that the pulvillus is not visible. This may be Blanchard's species *Termes chilensis*; however, Hagen 1858 (p. 41) refers to both this variety of *N. castaneus* and (p. 103) to *Termes chilensis* (Gay) Blanchard as occurring in Chile, stating that he believes, instead of *chilensis* being in synonymy with *Porotermes quadricollis* Rambur, it is a closely related species to "*Calotermes castaneus*."² Blanchard's figure of *Termes chilensis* shows wing venation differing from that of Hagen's specimens of *N. castaneus*, var. b. *chilensis*, but the figures of both the winged adult and soldier are very poor. Blanchard's type of *T. chilensis* is in the Museum of Paris and, until I can examine this type, I shall consider Hagen's var. *chilensis* Blanchard's species.

The termite *Kalotermes approximatus* Snyder, described from Ortega, Fla., in 1920, is described more fully with detailed measurements and also figured.

In addition, there is a general discussion of the genus *Leucotermes*, its systematic position, and its genotype *L. tenuis* Hagen; keys have

¹ Linnæa Entomologica, vol. 12, pp. 40-41, 1858.

² Desneux (Ann. Soc. Ent. Belg., vol. 49, 1905, pp. 336-8) has redescribed the type and states that he believes it is near *C. castaneus* Burmeister and is not a *Porotermes*.

been made to include all the known American species—five in number. In the past several species have been included under the name *tenuis*. My species *Reticulitermes aureus*, originally described from dealated adults from southern Arizona, I have found to be a *Leucotermes* after the winged adults have been collected; I have redescribed this termite. It is extremely interesting but unfortunate that a species of this genus occurs in the United States; as yet this species *aureus* is apparently confined to unsettled regions at the base of the Santa Catalina Mountains and has not been found damaging the woodwork of buildings or crops.

Species in the genus *Leucotermes* of South, Central, and North America are extremely destructive both to timber and to living crops. The presence of two species of this genus, *convexinotatus* and *cardini*, in the West Indies—in close proximity to the United States—renders it very desirable to make a careful study of these termites. Possibly they might be introduced into the southern portions of the United States, where they would be very injurious. Indeed, species of *Leucotermes* may even now be present on some of the offshore Florida keys, where but little collecting of termites has been done.

A key to seven American species of *Anoplotermes* is given in this paper.

Thanks are gratefully rendered to Dr. S. Henshaw and N. Banks, of the Museum of Comparative Zoology, for courtesies and the unrestricted use and examination of the Hagen collection.

KALOTERMES MARJORIAE, new species.

Winged adult.—Head light castaneous, darker between the eyes, shining, slightly longer than broad, rounded posteriorly, with scattered, fairly long, light yellow hairs.

Antennae light yellow brown, first three segments darker colored than the others; 18 segments, segments become longer and broader toward apex, pubescent; first segment stout, cylindrical; second narrower, shorter, somewhat clavate; third segment shorter than second, clavate; fourth approximately the same size as the third (first half of antennae more ring or bead-like, last half more elongate and clavate); last two segments shorter than sixteenth—possibly there is a segment or two missing.

Palpi segments short but broad, apical segment longer and conical—pointed at tip.

Eye black, large, not round, separated from lateral margin of head by a distance equal to less than half its long diameter. Ocellus large, elongate, very close to eye, set somewhat obliquely but nearly parallel to eye.

Labrum yellowish, somewhat tongue-shaped, broadest in middle, rounded anteriorly, with long hairs.

Post-clypeus light yellow, broad but short, posterior margin nearly straight.

Pronotum slightly lighter colored than the head, not twice as broad as long, broader than head, quadrilateral, anterior corners high, sides rounded; anterior margin slightly concave, with fairly long hairs on margins.

Legs light yellow, fairly long.

Wings white, veins yellowish, iridescent, tissue reticulate or rugose; 5-7 long branches from subcosta (radius sector) to costa, first branch arises nearer to wing scale than to apex (before middle of wing). Median vein halfway between subcosta and cubitus branched to apex of wing and with short branches running up to the subcosta. Cubitus in about the center of the wing, with 17-20 branches or subbranches (pl. 1, fig. 6).

Wing scale slightly longer than the pronotum, with long hairs.

Abdomen slightly lighter colored than the head, shining, lighter colored ventrally, with scattered, fairly long, light yellow hairs.

Measurements.—Length of entire deãlated adult, 6.5 mm.; length of head (from tip of labrum to posterior margin), 1.8 mm.; length of pronotum, 0.9 mm.; length of hind tibia, 1.01 mm.; length of wings, 9.5 mm.; width of head, 1.4 mm.; diameter of eye (long diameter), 0.402 mm.; width of pronotum, 1.5 mm.; width of wings, 2.5-3 mm.

Type locality.—Hilo, Hawaii, Territory of Hawaii.

Described from a single winged adult, now deãlated, collected at the type locality in July, 1900, by H. W. Henshaw.

Named in honor of Marjorie Edgar Benjamin.

Type, winged adult.—Cat. No. 25082, U.S.N.M.

KALOTERMES TABOGAE, new species.

Winged adult.—Head yellow-brown to light castaneous, with a darker castaneous-brown horizontal stripe just back of the ocelli; paler at posterior margin, V-shaped, darker depression at front of head, in center, epicranial suture. Head longer than broad, broadest at the compound eyes, head rounded to posterior. Head with scattered but long hairs. Labrum yellow-brown, broadly rounded in front and with long hairs.

Compound eye black, not round, large and slightly projecting, much larger than in *K. marginipennis* Latreille of Texas; less than its diameter from the lateral (lower) margin of head or front of head, less than two diameters from posterior of head. Ocellus large, larger and closer to eye than in *marginipennis*, elongate, nearly parallel to compound eye, very close to eye.

Antennae paler than head, longer than width of head, 16-18 segments, pubescent; third segment shorter or as long as second, chitin colored more deeply than other segments, but not as long or as dark as in *marginipennis*; fourth short, ring-like; last segment shorter and not so broad, subelliptical.

Pronotum paler than head except at margins, broader than long, nearly as broad as head, slightly emarginate at anterior (less so than in *marginipennis* where deeply and roundedly emarginate-concave) and posterior, lateral margins rounded and narrowed to posterior, pronotum shorter than wing stub (longer in *marginipennis* where not so broad, however), with long hairs on margins.

Body same color as pronotum, ventral surface and legs paler, body with long hairs, tibiae and tarsi darker.

Wing pale, marginal veins yellowish-brown, radial sector usually with over 5 (to 8) branches to costa; median nearer to radial sector than to cubitus, branches or not to tip of wing, cubitus with 19 branches or sub-branches.

Legs with femora white with tinge of yellow, tibiae and tarsi yellow-brown.

Abdomen with long light yellow hairs.

Measurements.—

	<i>K. taboga</i> Snyder.	<i>K. marginipennis</i> Latreille. ³
	Mm.	Mm.
Length of entire winged adult	12.5 -13.0	11.0 -12.0
Length of entire dealated adult	6.0 - 7.5	6.0 - 7.5
Length of head (to tip of labrum)	1.65- 1.75	1.60- 1.75
Length of pronotum	0.90- 0.95	1.0 - 1.05
Length of hind tibia	1.1 - 1.2	1.05- 1.2
Length of anterior wing	9.0 - 9.75	9.0 - 9.5
Diameter of eye (long diameter)	0.41- 0.47	0.30- 0.35
Width of head (at eyes)	1.40- 1.45	1.40- 1.45
Width of pronotum	1.60- 1.65	1.45- 1.50
Width of anterior wing	2.9	2.95- 3.0

Larger than *K. marginipennis*, with larger eyes, shorter but broader pronotum; lighter colored and larger than *K. immigrans* Snyder, body hairs slightly longer.

Soldier unknown.

Type locality.—Taboga Island, Republic of Panama.

Described from several winged adults collected by J. Zetek on March 30, 1922; the species was collected at Taboga Island by August Busck of the National Museum as early as June 9, 1911.

Type, winged adult.—Cat. No. 25691, U.S.N.M.

³ Specimens from Texas.

KALOTERMES APPROXIMATUS Snyder.

Soldier (pl. 1, fig. 1).—Head yellowish-brown (light castaneous), darker anteriorly, one and one-half times as long as broad, sides parallel to slightly concave, with few, scattered, light yellow, long hairs; front of head slopes anteriorly, with V-shaped depression.

Antennae pale yellowish, 13 segments, reach tip of mandibles when mandibles are crossed, pubescent; third segment yellow-brown, subclavate, not quite as long as fourth and fifth segments together

Eye hyaline, white, round to oval; ocellus visible above eye spot.

Labrum yellow-brown, broader than long, hardly round at apex, with long hairs.

Mandibles black, shining, reddish-brown at base, nearly as long as width of head; broad at base, pointed and incurved at tip; right mandible with two short, pointed, subequal marginal teeth near base, left mandible with three broader blunt marginal teeth on lower two-thirds, the median tooth being broadest (molar). (See figure.)

Gula slender, over twice as broad at front as at middle.

Pronotum dirty white with pale yellowish tinge, wider than head, less than twice as broad as long, roundedly and fairly deeply concave anteriorly, anterior margin not dentate as in *K. marginipennis* Latreille; sides slope roundedly to posterior, posterior margin convex.

Legs pale yellow, tarsi yellow, legs short, hind femora swollen, legs with short hairs.

Abdomen dirty white gray, with tinge of yellow, with light yellow long and short hairs.

Measurements.—Length of entire soldier, 7.50–7.75 mm.; length of head with mandibles, 3.3–3.7 mm.; length of head without mandibles (to anterior margin), 2.2–2.4 mm.; length of head without mandibles (to tip of labrum), 2.6 mm.; length of pronotum (at corners), 1.10–1.15 mm.; length of left mandible, 1.35–1.40 mm.; length of hind tibia, 1.1 mm.; width of head, 1.40–1.55 mm.; width of pronotum, 1.6–1.7 mm.

Species close to *marginipennis* but differs in antenna, mandibles, and pronotum. The winged adult is unknown. I described this species in 1920,⁴ but this more complete description and figure is desirable.

Type locality.—Ortega, Fla.

Described from specimens collected by the writer at the type locality on March 5, 1919.

Type, soldier.—Cat. No. 22359, U.S.N.M.

⁴ 1920. Banks, N., and Snyder, T. E. Revision of Nearctic Termites. Bull. 108, U. S. National Museum, p. 22, Apr. 13.

NEOTERMES CASTANEUS Burmeister.

Deälated adult.—Head castaneous-brown, darker anteriorly especially at sides of depression, longer than broad, depression between epicranial suture, lines of suture not visible as in *N. angustoculus* Snyder, with scattered short hairs, trace of round frontal gland depression. Compound eye black, large, projecting, not round, separated from lateral margin of head by a distance less than its diameter,⁵ less than two diameters from posterior margin. Ocellus hyaline, large, obliquely inward from but very close to eye.

Labrum light yellow-brown, widest at middle, nearly truncate on tip, with long hairs.

Post-clypeus yellow, broader than long.

Antennae yellow-brown, 16 (20?) segments, pubescent; third segment slightly modified, clavate, darker colored, longer than second or fourth.

Pronotum paler than head, much broader than head, not twice as broad as long (length measured to corners where high) and shorter than wing scale, not very deeply emarginate anteriorly, sides narrowed slightly posteriorly, slightly emarginate posteriorly, with short hairs.

Abdomen dorsally same color as pronotum with short hairs.

Legs yellow-brown, tibiae darker, slender, pubescent.

Measurements.—Length of entire deälated adult, 8.5–9.5 mm.; length of head (to tip labrum), 2.1 mm.; length of pronotum, 1.35–1.45 mm.; length of hind tibia, 1.6 mm.; length of wing scale, 1.45 mm.; diameter of eye, 0.45–0.50 mm.; width of head, 1.85–1.90 mm.; width of pronotum, 2–2.15 mm.

Soldiers were not collected with these adults, but Mr. Banks states (Banks and Snyder, 1920⁶) that there is variation in the soldiers of *N. castaneus* Burmeister; I believe, however, two species are represented—*N. castaneus* and *N. angustoculus*. It is probable that the soldier of *N. castaneus* is the form with mandibles short and stout, with blunt points, being not nearly as long as the width of the head; head shorter than in *N. angustoculus* Snyder, pronotum not so narrowed behind. However, this may be variation within the species.

Deälated adults distinct from *angustoculus* by the very large eye, long pronotum, trace of round frontal gland depression (absent in *castaneus*) and short hairs. However, close to *connexus* Snyder but has short pubescence.

⁵ This distance is greater in *N. angustoculus* Snyder and this difference was noted by N. Banks in Antillean Isoptera, Bull. Mus. Comp. Zoology, vol. 57, No. 10, p. 477, pl. 1, fig. 10, January, 1919; he believed that there were two forms of *castaneus*.

⁶ 1920. Banks, N., and Snyder, T. E. Revision of the Nearctic Termites, Bull. 108, U. S. National Museum, Washington, Apr. 13.

This description is based on two deãlated adults—a male and female—collected at Coconut Grove, Fla., in a hollow mangrove branch on May 23, 1887, by Dr. E. A. Schwarz, of the Bureau of Entomology; these specimens are deposited in the collection of the United States National Museum.

NEOTERMES ANGUSTOCULUS, new species.

Winged adult.—Head yellow-brown or light castaneous, epicranium slightly darker, epicranial suture Y-shaped, trace of frontal gland present; longer than broad, rounded at base, with scattered light yellow long hairs.

Compound eye black, *small*, nearly round, separated from lateral margin of head by a distance nearly equal to its long diameter, fully two diameters from posterior margin. Ocellus large, oval, close to and at oblique angle to eye.

Labrum light yellow-brown, broadest at middle, constricted at base and apex, apex truncate, with long hairs.

Post-clypeus same color as head, broad but not long, convex posteriorly—that is, front of head concave.

Antennae light yellow-brown, 18 segments, pubescent; third segment darker colored than other basal segments, clavate, as long as or longer than second segment, longer than fourth; last segment shorter and narrower, subelliptical.

Pronotum lighter colored than head, light yellow-brown, much broader than head, nearly twice as broad as long, shorter than wing scale, broadly roundly emarginate anteriorly and rounded posteriorly where also emarginate; with long and short hairs.

Abdomen light castaneous dorsally, with long hairs near hind margin each segment.

Legs pale yellow-brown, tibiae darker.

Wings but little longer than entire insect, hyaline, costal veins yellow-brown; in fore wing 6–7 long branches from subcosta to costa, median vein very close to subcosta reaches apex of wing, cubitus with 17 branches or sub-branches, not reaching apex.

Measurements.—Length of entire winged adult, 15 mm.; length of entire deãlated adult, 10 mm.; length of head (to tip of labrum), 2.10–2.15 mm.; length of pronotum, 1.25 mm.; length of hind tibia, 1.6 mm.; length of anterior wing, 10.5–11 mm.; length of wing scale, 1.55 mm.; width of head (at eyes), 1.70–1.75 mm.; diameter of eye, 0.32–0.35 mm.; width of pronotum (at widest point), 2.15–2.25 mm.; width of anterior wing, 3.50–3.65 mm.

This species is closely related to *N. castaneus* Burmeister, but has a much smaller eye, hence its specific name.

Soldier.—Head light castaneous, somewhat darker in front, twice as long as broad, broadest anteriorly, front of head depressed at epicranial suture, with long hairs.

Eye spot hyaline, elongate, long diameter at right angles to lateral margin of head. Labrum light yellow-brown, broadest in middle, front convex, with long hairs.

Mandibles black, reddish brown at base, slender, elongate, sharp pointed at tip, nearly as long as width of head, left mandible with two sharp-pointed teeth near apical third, smaller tooth at middle and molar near base; right mandible with only two larger pointed teeth near base.

Antenna yellow-brown, pubescent, with third segment slightly modified and darker colored, clavate and longer than second or third segments.

Gula slender, one-third as wide in middle as at front.

Pronotum light yellow-brown, not as broad as head, about twice as broad as long—length measured to corners of pronotum where high, anteriorly broadly concave, sides rather narrowed behind, posteriorly not emarginate, with long hairs.

Legs with tinge of yellow, slender, pubescent.

Abdomen dirty gray, with tinge of yellow, long hairs near base each segment.

Measurements.—Length of entire soldier, 9.5–12.5 mm.; length of head with mandibles, 4.75–5.5 mm.; length of head without mandibles (to tip labrum), 3.8–4.1 mm.; length of head without mandibles (to anterior), 3.3–3.5 mm.; length of left mandible, 2.1–2.2 mm.; length of pronotum (to corners), 1.20–1.35 mm.; length of hind tibia, 1.70–1.75 mm.; width of head (at widest point), 2.3–2.5 mm.; width of pronotum, 2.3–2.4 mm.

Similar to the soldier of *N. castaneus*, except that the mandibles are nearly as long as the width of the head and more sharply pointed, the head is proportionately a little longer and the pronotum rather more narrowed posteriorly.

Type locality.—Paradise Key (Lower Everglades), Dade County, Fla.

Described from a series of winged adults collected with soldiers and nymphs at the type locality by T. E. Snyder, on May 14, 1916, Hopkins U. S. No. 14083n. *N. angustoculus* also occurs at Miami Beach, Fla., and in Cuba.

Type, winged adult.—Cat. No. 25747, U.S.N.M.

Genus GLYPTOTERMES Froggatt.

The genus *Glyptotermes* was established by Froggatt in 1896; its contained species are widely distributed throughout the world. The wing venation of the sexual adult is distinctive; the wings are opaque. *Lobitermes* established by Holmgren in 1910, for Silvestri's species "*Calotermes*" *lobicephalus*, described in 1903 from Argentina, as a subgenus of the genus *Kalotermes* Hagen, is closely related to

Glyptotermes. The winged sexual adult of *Lobitermes* is similar to that of *Glyptotermes*; the soldier of *Lobitermes* has a shorter darker colored (blacker) head and has more segments to the antennae than in *Glyptotermes*.

In habits, species of *Glyptotermes* are similar to species of *Kalotermes*; they live in small colonies in the trunks of dead trees; the galleries (pl. 2, figs. 11, 12) are small and the pellets of excrement are similar to those of other Kalotermitidae (pl. 2, fig. 13).

GLYPTOTERMES PUBESCENS, new species.

Dealcated adult (pl. 2, fig. 10).—Head dark castaneous-brown to piceous, smooth, shining, arched, nearly as broad as long, highest in center, rounded posteriorly, with scattered, long, light yellow hairs.

Antennae light castaneous-brown, broken, segments become broader toward apex, with long hairs; first segment elongate, cylindrical; second shorter than first but longer than third, subclavate; third more wedge shaped, segments become longer after fifth segment.

Palpi last segment elongate, cylindrical, pointed at tip.

Eyes black, somewhat projecting, not round, separated from lateral margin of head by a distance less than their diameter. Ocellus large, round, close to eye.

Labrum yellowish-brown, wider than long, broadly rounded at apex, broadest at center, with long hairs.

Pronotum same color as head, over twice as broad as long, emarginate anteriorly, convex posteriorly, sides rounded, gradually slope toward posterior margin, margins with long hairs.

Meso- and metanotum emarginate posteriorly.

Wing scale longer than pronotum, with long hairs.

Legs light yellow-brown, tibiae darker, fairly elongate, with hairs; tibiae with 3 spines at apex.

Abdomen slightly lighter colored than pronotum, paler ventrally, margins with long, dense, light yellow hairs as well as shorter hairs; styli present.

Measurements.—Length of entire dealcated adult, 4.75–5.75 mm. (the smaller being a dry specimen); length of head, 1.3–1.4 mm.; length of pronotum, 0.6–0.7 mm.; length of hind tibia, 1–1.005+ mm.; width of head (at eyes), 1.1–1.2 mm.; diameter of eye, 0.302 mm.; width of pronotum, 1.1–1.4 mm.

Soldier (pl. 1, figs. 2–5).—Head light yellow-brown, darker anteriorly, where deeply lobed, longer than broad but relatively short, subcylindrical, narrowed slightly at front, highest in center; front rimmed with black, almost vertical, with scattered long, light-yellowish hairs on margins and 4 long hairs in a transverse row on dorsum at about middle of head, the 2 inner hairs being slightly

shorter than the outer, another row of hairs is on the anterior of the head.

Antennae light yellow-brown, 10 or 11 segments, a little longer than mandibles, with long hairs, segments become broader toward apex; first segment elongate, cylindrical; second shorter than first, not clavate; third longer than second, clavate, appears to be divided near narrow base, latter however with no hairs; fourth broader, shorter than third; last segment elongate, subelliptical.

Eyes pale, large, elongate, subelliptical, near antennal socket.

Labrum yellow-brown, longer than broad, somewhat tongue-shaped, rounded at apex, with 2 long hairs (longer than labrum) set in center of apex, also with shorter hairs.

Mandibles blackish, short, not as long as width of head, broad at base, pointed and incurved at tips; 2 pointed, small marginal teeth near tip and a broader tooth near base on left mandible; right mandible with 2 broader marginal teeth nearer base (pl. 1, fig. 3).

Gula elongate, narrowed in center, not twice as broad at front as in center.

Pronotum paler than head, twice as broad as long, anterior and posterior margins nearly parallel, anterior corners high, sides rounded, gradually slope to posterior, with long, light-yellow hairs on margins (pl. 1, fig. 4).

Legs with tibiae and tarsi yellowish, fairly elongate, femora thickened.

Abdomen gray-white, with long, dense, light-yellow hairs.

Measurements.—Total length of soldier, 5.5–6.5 mm.; length of head with mandibles, 2.4–2.5 mm.; length of head without mandibles, 1.8–1.9 mm.; length of left mandible, 0.85 mm.; length of pronotum (at corners), 0.65–0.80 mm.; length of hind tibia, 0.57–0.705 mm.; width of head, 1.2–1.4 mm.; width of pronotum, 1.1–1.4 mm.

Described from 2 soldiers found with the typical dealated adult.

The genus *Glyptotermes* Froggatt has not been previously recorded from the Antilles.

Type locality.—Aibonito, Porto Rico.

Described from several dealated adults collected at the type locality from partly dead coffee tree on December 2, 1921, by F. Sein and George N. Wolcott, Acc. No. 488-'21; 2 soldiers and nymphs were found with these dealated adults.

Type, dealated adult.—Cat. No. 25415, U.S.N.M.

Biological.—The burrows of *G. pubescens* in a partly dead coffee tree at Aibonito, Porto Rico, in dry, hard, sound wood (pl. 2, figs. 11–12) are similar to those of *Cryptotermes*. The impressed pellets of excrement are small, more elongate, irregular in shape and are pointed at the apex, as an apple seed (pl. 2, fig. 13).

Genus *LEUCOTERMES* Silvestri.

This genus was established in 1901 with Hagen's *tenuis* as the type species. Apparently it is closely related to the genus *Reticulitermes* Holmgren—more closely than Mr. Banks realized when he stated (1920) that our common species of *Reticulitermes* are not congeneric with the type species of *Leucotermes*. One divergent character from *Reticulitermes* emphasized by Banks was the absence of ocelli in the type specimen of *tenuis*; however, the species has ocelli variably absent or present. Another factor was that the margins of the wings are ciliate in *Leucotermes*, whereas in *Reticulitermes*, *Prorhinotermes* Silvestri, and also in *Rhinotermes* Hagen they are not ciliate; however, the wing margins are ciliate in *Coptotermes* Wasmann, which, nevertheless, has a subcordate pronotum and is contained in Holmgren's family Mesotermitidae.

Without specimens of the winged adult, it is difficult to distinguish species in these two genera. In 1920⁷ I described a termite from southern Arizona as *Reticulitermes aureus* from deälated adults. This termite had been collected flying at night and I emphasized this biological fact and the unusually light color. Later I received winged adults; the wings are ciliate and it is plainly a *Leucotermes*; species of *Leucotermes* fly at night.

The soldiers of species of *Leucotermes* usually have the mandibles more slender and elongate than in species of *Reticulitermes*, where they are usually more robust and curved at the tip (that is, more S shaped), except in case of the species *R. humilis* Banks and *R. hoferi* Banks.

Species of both *Reticulitermes* and *Leucotermes* construct earth-like carton shelter tubes both attached and in some cases free; that is, constructed into the air and not supported except at the base.

The first form queen of species of *Leucotermes* is larger and less active than in species of *Reticulitermes*; a queen of *tenuis* from Panama measures 22 mm. in length and 4.5 mm. in width.

The genus *Leucotermes* should be placed in the family Rhinotermitidae, which will supplant Holmgren's family Mesotermitidae, which has no contained genus "Mesotermes." The shape of the pronotum is subcordate, as in this family, whereas it is saddle-shaped in the family Termitidae (Holmgren's Metatermitidae). The fact that the post-clypeus is three times as broad as long would place it in the subfamily Rhinotermitinae, according to Banks' key (1920, p. 10) (my term "post-clypeus" being equivalent to Banks' "clypeus"); however, the wing margins are ciliate as in *Coptotermes*, which should also be placed in the family Rhinotermitidae. The guts of species of

⁷ 1920. Snyder, T. E. Two New Termites from Arizona. Proc. Ent. Soc. Wash., vol. 22, No. 2, February, pp. 38-40 (pp. 39-40, A *Reticulitermes* flying at night in Arizona).

Leucotermes, moreover, contain pollyflagellate protozoa—not found in the guts of any of the Termitidae.

Species of *Leucotermes* are of great economic importance, being very destructive not only to the woodwork of buildings—as can be seen from the damage done on the island of St. Helena—but also to living vegetation. It is unfortunate that we have a species in the United States.

The following discussion of *Leucotermes tenuis* Hagen, *L. aureus* Snyder, *L. crinitus* Emerson Ms. and my three new species of *Leucotermes* is the result of an examination of Alfred Emerson's collection, the collection of the United States National Museum and that in the Museum of Comparative Zoology at Cambridge, Mass.

LEUCOTERMES TENUIS Hagen.

Undoubtedly several new species have been included under the specific name *tenuis*; Hagen (1858) records this species from Santo Domingo, Port aux Prince, Colombia, and Brazil (collected in Brazil in 1846). It has also later been reported from the Bahamas, Cuba, Panama, and British Guiana.

It is stated⁸ that this termite was accidentally introduced into the island of St. Helena from the coast of Guiana about 20 years since; that is, about 1843. This is interesting in view of the fact that McLachlan's typical specimens, collected by Melliss at St. Helena,⁹ while somewhat larger, are practically identical with a specimen of *L. tenuis* from Brazil; this latter specimen, although not from the type locality is designated by Alfred Emerson, of the University of Pittsburgh, and the writer as the type of *tenuis*; it has the type No. 212 in the Hagen collection in the Museum of Comparative Zoology, at Cambridge, Mass. McLachlan's specimens are also in the Hagen collection and I have compared them with specimens of *tenuis* from the Beaumont collection from Panama and specimens of *tenuis* collected by Emerson at Kartabo, British Guiana. While there is variation in size, all are the same species; the Panama specimens are slightly smaller than the type specimen.

However, a new, lighter colored species (*convexinotatus* Snyder) also occurs at Panama. Specimens from Cuba ("6/5, 18/5, and 11/6, Cayamas, E. A. Schwarz, Col.") are apparently identical with this new species, whereas another new species (*cardini* Snyder) occurs in the Bahamas, and was also found in Cuba (Ch. Wright, Col.); *L. aureus* Snyder occurs in southern Arizona and is close to *convexinotatus*; *L. longiceps* Snyder from Brazil is known only from the soldier caste.

⁸ Proc. Ent. Soc. London, 1863, p. 185.

⁹ Proc. Ent. Soc. London, 1869, p. 13.

Both of these new species *convexinotatus* and *cardini* (as well as *tenuis* Hagen) have the ocelli variably present or absent in specimens from the same colony and show variations in the size and shape of antennal segments and in wing venation (branching of the veins and area occupied by the cubitus and branches); the wing scale covers the meso-notum in both new species and the meso- and metanota are convex, while they are emarginate in *tenuis*. In *convexinotatus* the median vein runs nearer to the middle (more intermediate between the subcostal vein and cubitus) than in *tenuis* and *cardini*, where the median is nearer to the cubitus. In *convexinotatus* the cubitus and branches take up less area of the wing than in *tenuis* and *cardini*—that is, the distance between the cubitus and lower margin of the wing is less; there are also specific differences in the number of hairs on the surface of the wings (pl. 3). The soldiers of my three new species have the heads less hairy than in *tenuis*, but the soldier of *cardini* has a few more hairs on the head and pronotum than that of *convexinotatus*. The soldier of *L. crinitus* Emerson MS. has an extremely hairy head.

To summarize, it is evident that there is either a single extremely variable species involved, or a species in the process of evolving several nascent species, or a complex series of very closely related species, there being two extremes *tenuis* Hagen and *convexinotatus* Snyder with intergrading connecting species which display characters of either extreme.

In 1902¹⁰ Wasmann mentions the soldier of *Leucotermes flavipes*, subspecies *paraensis* from Para, Brazil; this is probably *L. tenuis* Hagen or a related species of *Leucotermes*; he also describes (p. 140) the species *insularis* from "Oceania," which may be my species *convexinotatus*, since soldiers from the Galapagos Islands are the same as *convexinotatus*. It is probable that the species *insularis* from the Cocos Islands should be the same as that found in the Galapagos and Central America. Wasmann's description is too meager to enable or warrant precise identification. Mr. A. Emerson has kindly loaned me specimens of soldiers collected by the Williams Galapagos Expedition.

A soldier in the Hagen collection¹¹ is labeled *Termes corticola* Bates. The head is very hairy (the hairs being long). The anterior margin of the pronotum is emarginate; the posterior margin is slightly concave. This specimen is from Obispo, Panama, and is probably *Leucotermes tenuis* Hagen. Hagen writes that the same soldier occurs in Bates' termites from Santarem, Brazil.

¹⁰ 1902. Wasmann, E. Termiten, Termitophilen und Myrmekophilen Gesammelt auf Ceylon, von Dr W. Horn, 1899, etc. Zool. Jahrbuch., vol. 17, Heft 1, pp. 99-164 (p. 119).

¹¹ Hagen, Linn. Ent., vol. 12, p. 203.

KEY TO AMERICAN SPECIES OF *LEUCOTERMES* SILVESTRI.*Winged adults.*

1. Wing surface densely hairy.....*crinitus* Emerson.¹²
 Wing surface with *many* hairs, posterior margin of meso- and metanota *emarginate* and *not* covered by wing scale.....*tenuis* Hagen.
 Wing surface with *few* hairs, posterior margin of meso- and metanota *convex* and covered by wing scale..... 2.
2. Cubitus vein and branches spread over more than half of width of wing, median vein near cubitus, hardly any hairs on wing surface.....*cardini*, new species.
 Cubitus and branches spread over less than half of width of wing, median intermediate between subcosta and cubitus..... 3.
3. Compound eye more than its long diameter from lateral margin of head.....
*aureus* Snyder.
 Compound eye less than its long diameter from lateral margin of head.....
*convexinotatus*, new species.

Soldiers.

1. Head densely hairy.....*crinitus* Emerson.¹²
 Head with *many* hairs.....*tenuis* Hagen.
 Head with *few* hairs..... 2.
2. Head very elongate.....*longiceps*, new species.
 Head not very elongate..... 3.
3. Head with *few* hairs.....*cardini*, new species.
 Head with *very few* hairs.....*convexinotatus*, new species.¹³

LEUCOTERMES CONVEXINOTATUS, new species.

Winged adult (pl. 1, fig. 7).—Head yellow-brown, darker between the eyes, paler posteriorly, not so dark as in *L. tenuis* Hagen; sub-elliptical, broadest at eyes, narrower than in *tenuis*, rounded posteriorly; with fairly dense light yellow long bristles and shorter hairs. Fontanelle not so large as in *tenuis*, a pale, slightly raised, round spot on a line just back of the eyes.

Antennae light yellow-brown, with 17 segments, pubescent; segments variable in size and shape; first segment elongate, cylindrical; second shorter and not so wide; third ring-like, about half the length of the second; fourth longer than third; the following segments become wider and more wedge-shaped toward apex; last segment elongate, slender, elliptical.

Compound eye black, not round, not very prominent or raised; separated from lateral margin of head by a distance less than its long diameter. Ocelli variably absent or present; when present elongate, and about the short diameter of an ocellus distant from eye.

Labrum light yellow, longer than broad, broadest near middle, somewhat tongue-shaped, broadly rounded in front, with long hairs on apex.

¹² The characters of this termite *Leucotermes crinitus* Emerson MS. are those used by Alfred Emerson in his description and the species is to be credited to Emerson.

¹³ It is very difficult to separate these two species from the soldier caste alone; *convexinotatus* has fewer hairs on the head than *cardini*.

Post-clypeus light yellow, prominent and bulging as in *tenuis*, over three times as wide as long; posterior margin markedly convex, border of head concave—more so than in *tenuis*; post-clypeus longer than in *tenuis* but not as broad; not strongly bilobed as in *tenuis*.

Pronotum same color as head, subcordate, wider than long, but not as wide as head, not emarginate posteriorly, but anterior margin indented in middle; with long bristles and short hairs on surface and margins; not as long as the wing scale.

Mesonotum not as long as and covered by wing scale, posterior margin convex (emarginate in *tenuis*). Metanotum also convex posteriorly, longer than metathoracic wing scale, which is about half the length of the mesothoracic wing scale.

Legs light yellowish, elongate, slender.

Wings gray-white or smoky, costal veins yellowish, margins ciliate, tissue punctate, fewer hairs on surface of wings than in *tenuis*, but more hairs than in *cardini* Snyder (pl. 3, figs. 14–15); in *tenuis* the hairs are arranged in rows, with fewer and shorter hairs on the hind wing (pl. 3, figs. 16–17); median vein runs nearer to middle (between subcostal vein and cubitus) than in *tenuis*, where the median is nearer to the cubitus; cubitus and branches take up less area of wing than in *tenuis*.

Abdomen with dorsum same color as head, ventrally paler, golden-yellow, densely covered with light yellow, short and longer hairs or bristles.

Measurements.—

	<i>L. convezinotatus.</i> Mm.	<i>L. tenuis.</i> ¹⁴ Mm.
Length of entire winged adult	9.75–10.25	9.0–9.75
Length of entire deãlated adult	5.0	4.7
Length of head (posterior to tip of labrum)..	1.0–1.3	1.2–1.3
Length of pronotum	0.47–0.50	0.47–0.55
Length of hind tibia	0.77–0.80	0.805
Length of anterior wing	7.75	7.50–7.75
Length of wing scale	0.62–0.70	0.50
Width of head	0.80	0.802
Diameter of eye (long diameter)	0.18–0.20	0.17–0.20
Width of pronotum	0.67–.70	0.65
Width of anterior wing	1.85–1.90	2.00

Soldier (pl. 1, fig. 8).—Head light yellow-brown, broadest posteriorly, not twice as long as broad, with but few short hairs and longer bristles on head, lack of pubescence being distinctive specifically.

Antennae white, with tinge of yellow, 15 segments, pubescent; segments variable in size and shape; second segment short; third long, clavate; segments become wider toward apex.

¹⁴ Specimens from the Beaumont collection, Panama, being slightly smaller than the type from Brazil, which is in turn smaller than McLachlan's specimens collected by Melliss at St. Helena.

Labrum yellow, longer than broad, broadest near middle, somewhat tongue-shaped, narrowed toward apex where somewhat pointed, apex with bristles.

Mandibles castaneous-brown with reddish tinge, elongate, slender, curved inward near tip, with 4 rudimentary teeth at base of left mandible.

Gula at narrowest point (near middle) less than one-half the width at the front (near apex).

Pronotum white with a tinge of yellow, subcordate, not as broad as head, with pubescence.

Legs white with a tinge of yellow.

Abdomen white with a tinge of yellow, pubescent.

Measurements.—Length of entire soldier, 4.7 mm.; length of head with mandibles, 2.25–2.30 mm.; length of head without mandibles, 1.4 mm.; length of left mandible, 1 mm.; length of pronotum, 0.4 mm.; length of hind tibia, 0.62 mm.; width of head, 0.85–0.90 mm.; width of pronotum, 0.7 mm.

Described from a series of soldiers found with the typical winged adults.

Close to *L. tenuis* Hagen but paler, with more yellow and less brown color than in *tenuis*; the post-clypeus is not strongly bilobed and the wing has the median vein located differently than in *tenuis*. The most strikingly distinctive character is the convex posterior margin of both the meso- and metanotum—hence the specific name; also the fact that the wing scale covers the mesonotum—not the case in *tenuis*. The soldier is smaller, more slender, and has but few hairs on the head—a distinctive specific character; in *tenuis* the soldier has 17 segments to the antenna and the mandibles have the minute teeth or denticulations at the base of the left mandible larger and more prominent.

Type locality.—Colon, Panama.

Described from a series of winged and deälated adults collected at the type locality by engineers of the Western Electric Co., in woodwork of cable office, "Cable, 4/11/14," Hopk. U. S. No. 12817a; workers, soldiers, and nymphs also found with these adults.

Type, deälated adult.—Cat. No. 25083, U.S.N.M.

LEUCOTERMES CARDINI, new species.

Winged adult.—Head pale yellow-brown, darker between the eyes, paler posteriorly; subelliptical, widest at the eyes, rounded posteriorly; with dense short and longer hairs. Fontanelle a pale, slightly raised, round spot on a line just back of the eyes.

Antennae light yellow, with 17 segments, pubescent; segments become wider toward the apex, vary in size and shape; first segment elongate, cylindrical; second shorter than first, third ringlike, about

half the length of the second segment; fourth ringlike, longer than the third; last segment elongate, slender, elliptical.

Compound eyes black, not round, slightly projecting; eye separated from lateral margin of head by distance less than (or equal to?)¹⁵ its long diameter. Ocelli absent or present, separated from the eye by a distance about equal to the short diameter of an ocellus.

Labrum and post-clypeus as in *L. convexinotatus* Snyder.

Pronotum same color as head, subcordate, indented in middle anteriorly, but slightly emarginate posteriorly, with both long and short hairs.

Meso- and metanotum not emarginate posteriorly; mesonotum covered by the wing scale.

Legs light yellow, elongate, slender.

Wings smoky, costal veins yellow, margins of wings ciliate, tissue punctate, but few hairs on surface of wings; median vein nearer to cubitus than to subcostal vein, cubitus and branches take up a larger area of the wing than in either *tenuis* or *convexinotatus* (pl. 3, figs. 18-19).

Abdomen with the tergites slightly lighter colored than the head, sternites paler, densely covered with hairs.

Measurements.—Length of entire winged adult, 9.5-10 mm.; length of entire dealated adult; 4-5.5 mm.; length of head (to tip of labrum), 1.1-1.2 mm.; length of pronotum, 0.5 mm.; length of hind tibia, 0.800-0.802 mm.; length of anterior wing, 8 mm.; length of wing scale, 0.602-0.606 mm.; width of head (at eyes), 0.78-0.82 mm.; diameter of eye (long diameter) (0.16-0.185),¹⁶ 0.2 mm.; width of pronotum (at widest point), 0.7 mm.; width of anterior wing, 1.9-2 mm.

Soldier.—Head light yellow-brown, lighter posteriorly, not many hairs on head, but a few more than in *convexinotatus*.

Antennae light yellow, 15 segments, become wider toward apex. pubescent; first segment long and cylindrical; second shorter; third longer than second, clavate; fourth shorter than third; last segment elongate, slender and subelliptical.

Labrum and mandibles as in *convexinotatus*, latter somewhat shorter.

Gula over twice as wide at front as at narrowest point near the middle.

Pronotum white with a tinge of light yellow, subcordate, emarginate anteriorly and posteriorly, more hairs on margins than in *convexinotatus*.

Legs and abdomen as in *convexinotatus*.

¹⁵ Specimens appear to be immature (not completely colored); eye may not be as small as it appears to be.

¹⁶ Actual area where facets are colored: specimens do not appear to be completely mature, outline of eye larger—0.2 mm.

Measurements.—Length of entire soldier, 4.2 mm.; length of head with mandibles, 2.25 mm.; length of head without mandibles, 1.4 mm.; length of left mandible, 0.87–0.95 mm.; length of pronotum, 0.42 mm.; length of hind tibia, 0.62 mm.; width of head, 0.78–0.85 mm.; width of pronotum, 0.6 mm.

Close to *L. convexinotatus* Snyder but lighter colored, and with the other differences noted in both the winged adult and soldier, named in honor of the late Prof. Patricio Cardin, of the experiment station, Santiago de las Vegas, Cuba; Professor Cardin studied termites in Cuba.

Type locality.—Andros Island, Bahamas.

Described from a series of winged adults collected at the type locality on May 18; soldiers were found with these adults. Additional material collected on the same date is in the Museum of Comparative Zoology, at Cambridge, Mass.

Type, winged adult.—Cat. No. 25084, U.S.N.M.

LEUCOTERMES AUREUS Snyder.

Winged adult.—Head pale yellowish to light brownish, paler posteriorly, longer than broad, broadest at the eyes, sharply narrowed (rounding) posteriorly, with dense light yellow long and shorter hairs. Fontanelle in a depression on a line with hind border of eyes.

Antennae light yellow-brown, 16–17 segments, segments become broader toward apex, pubescent; first segment elongate, cylindrical; second shorter, not so broad as first; third short, ring-like; from fourth on segments become longer; last segment elongate, sub-elliptical.

Compound eyes black, large as in *L. cardini* Snyder, not round, not prominent or much raised, more than its long diameter from lateral margin of head. Ocellus separated from compound eye by a distance less than its short diameter.

Labrum light yellow, broadest near middle, with long hairs.

Post-clypeus pale yellow, prominent, bulging, plainly bilobed, posterior margin convex, border of head concave, over twice as broad as long.

Pronotum posteriorly darker colored than head, subcordate, sides narrowed posteriorly, anterior margin markedly emarginate, posterior margin slightly emarginate, with long hairs; broader than long, but not as broad as head; not as long as the wing scale; median line prominent.

Mesonotum not as long as and covered by wing scale; posterior margin convex; metanotum also convex posteriorly.

Legs light yellowish, elongate, slender.

Wings gray (smoky-white), costal area yellow-brown, punctate, ciliate. Fore and hind wing with but few hairs on their surfaces; more hairs on hind wing. In fore wing median vein intermediate between subcosta and cubitus, but slightly nearer cubitus; median unbranched or doubly branched to apex of wing; cubitus with 9-11 branches or sub-branches, variably does not or does reach apex of wing. Area of cubitus takes up less than half breadth of wing.

Abdomen dorsally yellow-brown, apex ventrally golden-yellow; with dense, light yellow, long and short hairs.

Measurements.—Length of entire winged adult, 10 mm.; length of entire dealated adult, 4.25-5.25 mm.; length of head (to tip of labrum), 1.35 mm.; length of pronotum, 0.50-0.55 mm.; length of hind tibia, 0.80-0.802 mm.; length of anterior wing, 7.75 mm.; length of anterior wing scale, 0.8 mm.; width of head, 0.86-0.90 mm.; diameter of eye (long diameter), 0.17-0.20 mm.; width of pronotum (at anterior corners), 0.7-0.8 mm.; width of anterior wing, 2-2.05 mm.

Close to *L. convexinotatus* Snyder but of lighter color, eyes further separated from lateral margin of head, ocelli nearer to eyes, and surface of wing not so hairy, etc.

This termite was described from dealated adults as *Reticulitermes aureus* by Snyder (1920).¹⁷ It is now redescribed from a series of winged adults from the type locality; these adults were collected on August 9, 1920, at a light at 7.30 o'clock in the evening, after a thunderstorm.

Type locality.—Sabino Canyon, Santa Catalina Mountains Arizona.

Type, dealated adult.—Cat. No. 22693, U.S.N.M.

LEUCOTERMES LONGICEPS, new species.

Soldier.—Head light yellowish-brown, slender, very elongate, over twice as long as broad, sides slightly concave at center, with but few scattered long hairs.

Antennae white with tinge of yellow, 17 segments, segments become broader toward apex, pubescent; third segment subclavate, shorter than second or fourth segments.

Labrum light yellow, pointed at apex, where long hairs, broadest in middle.

Mandibles dark castaneous brown to black, slender, curved in at tips.

Gula slender, elongate, twice as broad at front as at middle.

Pronotum white with tinge of yellow, subcordate, with long hairs, anterior and posterior margins emarginate; sides roundedly narrowed to posterior.

¹⁷ 1920. Snyder, T. E. Proc. Ent. Soc. Wash., vol. 22, no. 2, pp. 39-40, February.

Legs whitish with tinge of yellow, slender, elongate.

Abdomen whitish, with tinge of yellow, with dense, long hairs. Cerci elongate, prominent.

Measurements.—Length of entire soldier, 6.75 mm.; length of head with mandibles, 3.2 mm.; length of head without mandibles (to anterior), 2.2 mm.; length of head (to tip of labrum), 2.775 mm.; length of pronotum, 0.5 mm.; length of left mandible, 1.1 mm.; length of hind tibia, 0.708 mm.; width of head, 1 mm.; width of pronotum, 0.8 mm.

Whereas this termite is known only from the soldier caste, it appears from the length of the head to be a distinct species.

Type locality.—Coxipo, Cuyabá, Brazil.

Described from a single soldier with workers determined as *Leucotermes tenuis* Hagen by Silvestri and presented by him to the United States National Museum, No. 27. Other soldiers of *longiceps* are from Minas Geraes, Brazil (between Philadelphia and Alahó), Thayer Expedition.

Type, soldier.—Cat. No. 25689, U.S.N.M.

Genus SYNTERMES Holmgren.

An interesting South American genus, usually of large and striking species, which come above ground and harvest dead leaves; they live in the ground in the forest and are very shy, retreating to their deep underground galleries at the first alarm. Several of the 10 known species have been inadequately described and in a future paper on new termites from Bolivia and Brazil some of these species will be redescribed. All the castes of the described species have not as yet been found.

The galleries of some species are of large diameter, according to Dr. W. M. Mann, of the Bureau of Entomology, and these termites may utilize the burrows of rodents; one species in Bolivia (*S. chaquimayensis* Holmgren) has been found to inhabit earth cook ovens.

Winged, sexual adults of only nine species are known.

KEY TO NINE SPECIES OF THE GENUS SYNTERMES HOLMGREN.

Winged adults.

1. Anterior corners of pronotum *very* pointed at tip; post-clypeus fairly large, raised up..... 2.
- Anterior corners of pronotum nearly rectangular, somewhat rounded off; post-clypeus fairly flat..... 3.
- Anterior corners of pronotum strongly rounded..... 5.
2. Ocelli separated from eye by a distance less than the diameter of eye.

dirus Burmeister.

Ocelli separated from eye by distance more than diameter of eye. *snyderi* Emerson.

3. Eyes *very* large (long diameter 1.15 mm.); median vein nearer to cubitus.
magnoculus, new species.
 Eyes not very large (long diameter 0.95 mm.); median vein equally distant from subcosta and cubitus..... *grandis* Rambur.
 Eyes small; median vein nearer to cubitus..... 4.
4. Antennae with 19-20 segments, entire length 32-34 mm.; long diameter of eye 0.58 mm..... *terrītus* Emerson.¹⁸
 Antennae with 19 segments, entire length 29 mm.; long diameter of eye 0.59 mm.
parallelus Silvestri.
5. Antennae with 21 segments..... *obtusus* Holmgren.
 Antennae with 20 segments..... 6.
6. Larger species, entire length 34.5-40 mm..... *peruanus* Holmgren.
 Smaller species entire length 30 mm., long diameter of eye 0.70 mm., ocelli separated from eye by distance equal to over half the eye diameter; median vein nearer to subcosta (Lassance, Peru)..... manuscript species of Emerson.
 Still smaller species entire length 28 mm., long diameter of eye 0.75 mm., ocelli separated from eye by a distance equal to one-half eye diameter, median vein nearer to cubitus..... *molestus* Burmeister.

KEY TO FIFTEEN SPECIES OF THE GENUS *SYNTERMES* HOLMGREN.*Soldiers.*

1. Thoracic nota with long, sharp lateral spines, frontal tube projecting..... 2.
 Thoracic nota without long, sharp lateral spines, three-cornered; sides produced to blunt points, frontal tube nearly flat (not raised up), small species..... 11.
2. Mandibles with prominent marginal teeth..... 3.
 Mandibles with marginal teeth not prominent..... 10.
3. Lateral spines of meso- and metanota usually very robust, more or less conical; large and robust species, total length 14-22 mm..... 4.
 Lateral spines of meso- and metanota relatively short, more or less cylindrical.. 9.
4. Mandibles relatively slender beyond marginal teeth..... 5.
 Mandibles relatively not slender beyond marginal teeth..... 8.
5. Head markedly hairy, many long hairs at base mandibles, meso- and meta-thoracic spines long and droop markedly toward posterior..... 6.
 Head not markedly hairy, thoracic spines relatively short..... 7.
6. 15 mm. in length, left mandible with marginal tooth not projecting much if any beyond inner margin of mandible..... *dirus* Burmeister.
 20 mm. in length, left mandible with marginal tooth projecting. *snyderi* Emerson.
7. Pronotum not wide, mandibles not markedly incurved near apex, left mandible with marginal tooth near apex of labrum, 14-19 mm. in length, tibia. 5+ mm. in length..... *grandis* Rambur.
 Pronotum relatively wider, mandibles markedly incurved near apex, left mandible with marginal tooth beyond apex of labrum, 15.5+ mm. in length.
magnoculus, new species.
8. Head hairy, mandibles robust (not slender), relatively short, marginal tooth on right mandible not near base, base of mandibles with many long hairs, 15-17 mm. in length, tibia 5+ mm. in length..... *chaquimayensis* Holmgren.
 Head with few hairs, marginal tooth on right mandible near base opposite small basal tooth on left mandible, but few long hairs on base mandibles, 17+ mm. in length, tibia 6.75 mm. in length..... *emersoni*, new species.
9. Sides of head nearly parallel-oval, only slightly narrowed anteriorly, length of head with mandibles 8.5-9 mm., entire length 13.5 mm..... *hageni* Holmgren.
 Head broader, shorter and strongly narrowed anteriorly, length of head with mandibles 7-10 mm., entire length 15-17 mm..... *peruanus* Holmgren.

¹⁸ The characters of this termite *S. terrītus* Emerson MS. are those used by Alfred Emerson in his description and the species should be credited to Emerson.

angles to veins. In fore wing median vein nearly in middle between subcosta and cubitus, but slightly nearer to cubitus, branches to apex of wing, cubitus with 17 branches or sub-branches, does not reach apex of wing.

Wing stub shorter than pronotum, median and cubitus originate free within stub, with hairs on margins.

Abdomen with tergites dark brown, with reddish tinge; sternites yellow-brown; with long hairs.

Syntermes dirus Burmeister, type No. 204, Museum of Comparative Zoology, male winged adult from Brazil, Winthem, Col., has the head reddish-brown in color, not hairy. The fontanelle is a yellow depression, not as large as the diameter of an eye. The ocellus is separated from the eye by a distance (0.65 mm.) nearly equal to the diameter of an eye. The post-clypeus is yellow-brown and raised up. In a winged female from Rio de Janeiro, Brazil, identified as *dirus*, in the Hagen collection, the forewing is 35 mm. in length and 7.5 mm. in width; the length of the deilated adult is 19 mm.

Termes decumanus Erichson, type from British Guyana, Schomburgk Col. (Mus. Berol), in the Hagen collection, is labeled *Syntermes grandis* Rambur by Hagen. Hagen states that these specimens have been compared with and are identical with Rambur's type of *grandis*. The head is deep black, not hairy. The ocellus is separated from the eye by a distance (0.65 mm.) nearly equal to the diameter of an eye. The fontanelle is a large, reddish-brown, round spot. The post-clypeus is red-brown and not raised up.

The following comparative measurements show how the winged sexual adult of *S. magnoculus* Snyder differs from that of *dirus* and of *grandis*.

Measurements.

	<i>Syntermes magnoculus</i> Snyder (female).	<i>Syntermes dirus</i> Burmeister (male). ¹	<i>Syntermes grandis</i> Rambur (female). ²	<i>Syntermes molestus</i> Burmeister (male). ³
Length of entire winged adult.....	37.00 mm.	36.00 mm.	36.00 mm.	29.00 mm.
Length of entire deilated adult.....	15.00 mm.	16.00 mm.	15.00 mm.	12.00 mm.
Length of head (tip of mandibles to posterior margin).....	5.20 mm.	4.10 mm.	4.50 mm.	3.40 mm.
Length of pronotum.....	2.25 mm.	2.20 mm.	2.20 mm.	1.50 mm.
Length of hind tibia.....	6.80 mm.	6.00 mm.	4 6.90 (?) mm.	4.20 mm.
Length of anterior wing.....	33.00 mm.	30.00 mm.	32.50 mm.	22.00 mm.
Diameter of eye (long diameter).....	1.15 mm.	0.80 mm.	0.95 mm.	0.75 mm.
Width of head (between eyes).....	4.50 mm.	3.70 mm.	4.40 mm.	3.00 mm.
Width of pronotum.....	4.30 mm.	4.00 mm.	3.90 mm.	2.80 mm.
Width of anterior wing.....	7.00 mm.	7.00 mm.	6.0-7.0 mm.	6.00 mm.

¹ Type (paratype?) No. 204, Museum of Comparative Zoology, Cambridge, Mass., from Brazil, Winthem, Collector.

² Measurements made of a winged female of *Termes decumanus* Erichson, from British Guyana, Schomburgk Col. (Museum Berol), Museum of Comparative Zoology, which Hagen compared with Rambur's type of *grandis* and declared them to be identical (Linn. Ent., vol. 12, pp. 158-9).

³ A winged male labeled *molestus*, from the Amazon River, Brazil, Saunders Col., Hagen Collection, Museum of Comparative Zoology.

⁴ Broken; measurement taken from a specimen from Brazil.

Soldier (pl. 4, fig. 22).—Head light castaneous (yellow-brown) with reddish tinge anteriorly, shining (dull in *grandis*), broad, broadest at base, but slightly narrowed to anterior, with few scattered fairly long hairs.

Fontanelle opening projected into a short tube, near front of head. Post-clypeus not raised. Labrum light castaneous-brown, 3-lobed at apex, central lobe hyaline, with long hairs at apex.

Mandibles piceous, shining, elongate, slender and strongly incurved at tips, with stout reddish-brown base, but few short hairs on base. Left mandible with stout, arrow-head pointed, projecting marginal tooth at basal third of black portion (beyond tip of labrum), small tooth near base; right mandible with projecting sharp-pointed tooth near base, just below tooth on left mandible (near tip of labrum).

Antenna light yellow-brown, 20 segments, pubescent; second segment half length third, longer than fourth; fifth longer than fourth; sixth longer than fifth, not quite as long as third; segments from then on longer, more slender.

Pronotum yellow-brown, margins reddish, saddle-shaped, lateral spines short, slender, as are those on meso- and metanota.

Legs yellow-brown, tibia darker, slender, pubescent.

Abdomen yellow-brown; densely covered with hairs.

Measurements.—Length of entire soldier, 15.5 mm.; length of head with mandibles, 8.5 mm.; length of head without mandibles (to tip labrum), 6.9 mm.; length of head without mandibles (to anterior), 6 mm.; length of labrum (to central hyaline lobe), 1.5 mm.; length of pronotum, 1.6 mm.; length of left mandible, 3.2 mm.; width of head (at widest point), 6.2 mm.; width of labrum, 2 mm.; width of pronotum (to tip of spines), 4.3 mm.

This soldier was not collected with the winged adult but was found at the same locality in July. It is close to *grandis* (pl. 4, fig. 23),¹⁹ but has a larger pronotum, the marginal teeth on the mandibles are differently placed, and the thoracic spines are longer.

S. magnoculus Snyder is darker colored than *dirus*, and has a larger eye than either *dirus* or *grandis*.

Type locality.—"Chapada" (Brazil), "Oct."

Described from a single winged adult collected at the type locality by H. H. Smith, 30 years ago; this is in the Matto Grosso region of southern Brazil.

Type, female winged adult.—Cat. No. 14510, Museum of Comparative Zoology, Cambridge, Mass.; paratype in United States National Museum.

¹⁹ The specimens of *grandis* from which fig. 23 were drawn are from Santarem, Brazil.

SYNTERMES EMERSONI, new species.

Soldier (pl. 4, fig. 20).—Head light castaneous-brown, more reddish at front, shining, broadest at base, narrowed anteriorly, flatly arched, with scattered fairly long hairs, fewer hairs than in *S. dirus* (Klug) Burmeister²⁰ or *chaquimayensis* Holmgren.

Fontanelle opening projected into a short tube, near front of head. Post-clypeus short, not raised up as in *dirus*. Labrum piceous, short and broad, 3-lobed at apex; center lobe dark, usually hyaline (possibly due to age of pinned specimen).

Mandibles shining, piceous, with stout reddish-brown base, broad at base where there are a few long hairs, incurved and pointed at apex, with marginal teeth as in figure. The first marginal tooth on the left mandible is nearer to the tip than in *dirus*;²¹ close to *chaquimayensis* but longer and more slender, in the latter species the marginal teeth are nearly opposite.

Antennae reddish-brown, broken (9 segments remaining), with pubescence; third segment very long, longer than second or fourth (dividing?); fourth shorter than second, subclavate; fifth shorter than third, but longer than fourth; segments become longer after the fifth.

Pronotum yellow-brown, saddle-shaped (smaller in *dirus*, as is the pronotum in *grandis*), very slightly emarginate anteriorly, if emarginate, the lateral spines are shorter than in *dirus*, as they are in *grandis*. Meso- and metanota also with lateral spines.

Legs yellow-brown, elongate; tibiae darker, apical spines red-brown.

Abdomen light castaneous-brown, densely covered with long hairs.

The soldier of *S. emersoni* was compared with a paratype? (type) of *dirus*, collected by Winthem in Brazil, No. 204, Museum of Comparative Zoology, Cambridge, Mass.; with specimens of *dirus* collected by Emerson at Kartabo, British Guiana, which are larger than the type; and also with specimens of *chaquimayensis* collected by Bradley at Perene, Peru, and others collected by Mann at Huachi, Bolivia. Comparison was also made with a soldier of *grandis* Rambur, "coll. Rbr. Patria?," and larger specimens of *grandis* collected by the Thayer Expedition at Santarem and Tapajos Rivers in the collection of the Museum of Comparative Zoology.

In the paratype of *dirus* the head is hairy and the marginal tooth in the middle of the left mandible does not project much if any beyond the inner margin of the mandible; the marginal tooth said (in Hagen's redescription) to be at the base of the right mandible is not visible in the type; that is, the mandibles are similar to those of *silvestri* Holmgren.

²⁰ The species should be credited to Burmeister; Klug was curator of the Berlin Museum and his was merely a manuscript name without a description.

²¹ The shape and position of the marginal teeth on the mandibles in the genus *Syntermes* are good specific characters.

In other specimens (identified as *dirus* in the Hagen collection) from Rio de Janeiro, Brazil (Mus. Berol) the marginal tooth on the left mandible is near the line of division of the mandible at the base; the tooth on the right mandible is larger and projecting. Holmgren²² writes that specimens identified by Hagen as *dirus* have large, strong marginal teeth on the mandibles. From an examination of the paratype it is apparent that Holmgren is wrong and that the hairy headed, long spined specimens of *dirus* collected by A. Emerson in British Guiana are a new species. Mr. Emerson has described these as *S. snyderi*, since this paper went to the printer.

In the soldier of *grandis* from Rambur's collection²³ (not in very good condition), the head is not hairy, is yellow-brown, dull, with a tinge of red at the apex; the mandibles are saber-shaped, broad at the base but curved in and slender at the apex; the left mandible is slender and curved beyond the marginal tooth, which is blunt and is near the apex of the labrum (when the mandibles are crossed or together); the right mandible has the marginal tooth at about the middle; both marginal teeth are projecting.

Measurements.

	<i>Syntermes emersoni</i> Snyder.	<i>Syntermes dirus</i> Burmeister.		<i>Syntermes grandis</i> Rambur. ³
		Brazil. ¹	British Guiana. ²	
Total length of soldier.....	17+ mm....	15+ mm.....	19-22 mm....	14+ mm.
Length of head with mandibles.....	10 mm.....	8.8 mm.....	9.5-9.7 mm....	9 mm.
Length of head without mandibles (to tip of labrum).....	8.15 mm....	6.85 mm.....	7.5-7.9 mm....	7 mm.
Length of head without mandibles (to anterior of head).....	7.5 mm....	6 mm.....	6-6.5 mm....	6 mm.
Length of labrum (to base central hyaline lobe).....	0.95 mm....	1.7 mm. (entire labrum).	1.3-1.5 mm. (entire labrum).	1 mm. (entire labrum).
Length of pronotum.....	1.9 mm....	1.5 mm.....	1.7-1.8 mm....	1.2 mm.
Length of hind tibia.....	6.75 mm....	6.2 mm.....	6-6.2 mm....	5.5? mm.
Length of left mandible.....	3.5 mm....	3.1 mm.....	3.2-3.5 mm....	3.2 mm.
Width of head (at broadest part).....	7.5 mm....	6.2 mm.....	6.5-6.9 mm....	6.2 mm.
Width of labrum.....	1.65 mm....	1.4 mm.....	1.7 mm.....	1.4 mm.
Width of pronotum (to tips spines).....	5.4 mm....	4.5 mm.....	5.5-5.9 mm....	3.6 mm.
Length of spines on pronotum.....	1.1 mm....	0.7 mm.....	0.8-1 mm....	(Short) 0.35 mm.

¹ Collected by Winthem in Brazil, No. 204, Museum of Comparative Zoology, Cambridge, Mass.

² Collected by A. Emerson at Kartabo, British Guiana.

³ "Coll. Rbr. Patria?" in the Hagen collection at the Museum of Comparative Zoology.

I take great pleasure in naming this termite after Alfred Emerson, of the department of zoology, University of Pittsburgh, who has done valuable taxonomic and biological work on termites.

Type locality.—Iguaripe (?), Brazil.

Described from a single soldier in the collection of the United States National Museum.

Type, soldier.—Cat. No. 25748, U.S.N.M.

²² Zool. Anzeig., vol. 37, pp. 545-6, 1911.

²³ Rambur did not describe the soldier of this species, so this is not a type, though from this collection. In Hagen's copy of Rambur's book he has crossed the locality "Senegal" and written "d'apres les types etiquettes de la main de M. Rambur de Cayenne."

SYNTERMES HAGENI Holmgren.

Soldier (pl. 4, fig. 21).—Head light castaneous-brown, somewhat darker (reddish-brown) toward front, shining, flatly arched, broadest near base, narrowed anteriorly but little, sides nearly parallel, oval, with few scattered long hairs, fewer than in *S. chaquimayensis* Holmgren or *dirus* Burmeister.

Fontanelle near front of head, opening projected into a short tube. Antennae yellow-brown, broken. Labrum reddish-brown, front with central lobe hyaline. Post-clypeus reddish-brown, somewhat raised up.

Mandibles shining black, elongate, pointed at tips where slender, stout, base reddish-brown, more slender than in *S. chaquimayensis*; with few long hairs; marginal teeth as in figure.

Pronotum yellowish-brown, saddle-shaped, anterior margin slightly emarginate, lateral spines shorter and stouter than in *dirus* or *chaquimayensis*.

Legs yellow-brown, elongate.

Abdomen light castaneous-brown.

Measurements.—Total length of soldier, 13.5 mm.; length of head with mandibles, 8.5 mm.; length of head without mandibles (to tip of labrum), 6.6 mm.; length of head without mandibles (to anterior of head), 6.1 mm.; length of labrum (to base central hyaline lobe), 0.8 mm.; length of pronotum (to tips spines), 1.2 mm.; length of left mandible, 3 mm.; width of head (at broadest part), 6 mm.; width of labrum, 1.3 mm.; width of pronotum, 4.2 mm.

Undoubtedly *hageni*, considered by Holmgren to²⁴ be a form of *S. dirus* Burmeister, is a distinct species. The specimens of *S. chaquimayensis* with which this soldier were compared were from Huachi, Bolivia, and those of *dirus* from Kartabo, British Guiana. Unfortunately Holmgren's description is meager, the only characters given being those used in a key.

Hageni is a smaller species than *dirus*, with the head not as yellowish as *dirus*, being more castaneous. It is only known from the soldier caste.

The single pinned soldier upon which this description is based was kindly loaned the writer by Alfred Emerson, of the department of zoology of the University of Pittsburgh; it is deposited in the Carnegie Museum, Pittsburgh, Pa., Acc. No. 3564. This soldier was collected at Entre Rios, Rio de Janeiro, Brazil, June 4, 1908, by J. D. Haseman.

²⁴ Holmgren, Nils. 1. Bemerkungen über einige Termiten-Arten. Zoolog. Anzeiger, vol. 37, No. 26, pp. 543-548, 13 June, 1911.

SYNTERMES COLOMBIANUS, new species.

Soldier (pl. 4, fig. 24).—Head pale, yellow-brown, slightly darker anteriorly, shining, flatly arched, broadest near base, narrowed slightly toward front, with few scattered, fairly long, light yellow hairs.

Fontanelle near front of head, opening projected into a short tube.

Antennae light castaneous-brown, elongate, slender, 19 segments, with long hairs; third segment subclavate shorter than second but longer than fourth, which is short and subclavate.

Labrum light yellow, 3-lobed, central hyaline lobe white, fleshy, tip of labrum with long hairs.

Post-clypeus yellow-brown, somewhat raised up.

Mandibles dark reddish-brown to piceous, base yellow to reddish-brown, few hairs on base, shining, slender and nearly straight, incurved at tips; left mandible with two blunt small teeth near base, do not project beyond margin of mandible; right mandible with no marginal teeth (trace of tooth at base located between the two teeth on the left mandible). (See figure.)

Gula more than half the width of the front at the middle.

Pronotum yellow-brown, saddle-shaped, anterior margin emarginate, with short blunt spines; meso- and metanota also with short spines, more pointed than those on pronotum, shorter than in *silvestri*.

Legs light yellow-brown, elongate, slender, pubescent.

Abdomen dirty gray with tinge of yellow-brown.

S. colombianus is a small species found in the Hagen collection at Cambridge, Mass., with *S. dirus* (Klug) Burmeister. N. Banks has kindly loaned me the specimen for study; *colombianus* is about the same size as *braziliensis* Holmgren, but, unlike that species, has spines on the thorax. It may be close to *bolivianus* Holmgren.

Measurements.—Total length of soldier, 10.5 mm.; length of head with mandibles, 6.5 mm.; length of head without mandibles (to tip labrum), 4.8 mm.; length of head without mandibles (to anterior), 4.2 mm.; length of pronotum, 0.9 mm.; length of left mandible, 2.5 mm.; length of labrum, 0.65 mm.; length of hind tibia, 3.5 mm.; width of head (at widest point), 3.4 mm.; width of pronotum (to tips spines), 2.25 mm.; width of labrum, 0.95 mm.

Type locality.—"Colombia, S. Amer."

Described from a single soldier in the Hagen collection labeled "*S. dirus*, Winthem, collector, Colombia, S. Amer."

Type, soldier.—Cat. No. 14511, Museum of Comparative Zoology, Cambridge, Mass.

Genus *NASUTITERMES* Banks.

In 1920 Nathan Banks adopted the generic name *Nasutitermes* for a species of the genus *Eutermes* Fritz Müller. In 1912 Nils Holmgren subdivided the genus "*Eutermes*" into 20 subgenera, based not only on differences in the winged adults but also to differentiate the various forms of nasuti or soldiers. Species in these subgenera not only differ taxonomically but also in biology, and they have been adopted by the writer.

Species of the genus *Nasutitermes* are widely distributed throughout the world's tropical and subtropical regions; there are a great number of species and some species are apparently quite variable and seem to intergrade.

Most species are wood borers and are destructive to timber and the woodwork of buildings.

Many species of *Nasutitermes* construct carton tree nests which sometimes contain several first-form queens. In some species second-form queens have been found, and in case of large distended queens from the Solomon Islands there is a series of intermediate queens (pigmented) ranging from second-form queens with short wing pads to queens with long wing pads, like first-form nymphs.

NASUTITERMES COLUMBICUS Holmgren.

Winged adult.—Head dark brownish-black, shining; longer than broad, rounded posteriorly, with long hairs. Fontanelle small, narrow, slit-like with a forked tip, between the eyes.

Antenna yellow-brown, 16 segments, pubescent; first segment elongate, cylindrical; second shorter and narrower than first; third approximately one-half the length of the second, narrower, ring-like, with more color; fourth longer than third, more ring-like; fifth longer than fourth; segments become longer toward apex; last segment elongate and suboval.

Eye purplish, small but prominent (bulging), close to lateral margin of head (separated by a distance less than half an eye diameter). Ocellus small, elongate, separated from eye by a distance equal to approximately twice its short diameter, fairly deeply inset.

Labrum yellow-brown, broader than long, broadly rounded anteriorly but truncate and slightly emarginate at tip, with long hairs.

Post-clypeus yellow-brown, over three times as broad as long, bilobed, not bulging, posterior margin not markedly concave.

Pronotum same color as head, not twice as broad as long, slightly emarginate anteriorly (but margin nearly straight), anterior corners elevated, sides rounded, slope fairly sharply to posterior margin where more emarginate than anteriorly, pronotum subtriangular, with long hairs.

Meso- and metanota lighter colored than pronotum, slightly angularly emarginate posteriorly.

Legs yellow-brown.

Wing brown-black, costal veins darker, tissue punctuate and with hairs, margin ciliate, median vein close to cubitus, branched 4 times before reaching apex, but reaches apex, cubitus with 7–10 branches or sub-branches.

Wing scale about the same length as pronotum, with long hairs.

Tergites of abdomen darker colored than meso- and metanota, but slightly lighter colored than pronotum; sternites lighter colored than tergites—lighter at middle of segments; abdomen with numerous short hairs.

Measurements.—Length of entire winged adult, 15 mm.; length of entire deãlated adult, 10 mm.; length of head, 1.75 mm.; length of pronotum, 0.74–0.80 mm.; length of hind tibia, 1.7 mm.; length of anterior wing, 11.5 mm.; width of head (at eyes), 1.55 mm.; diameter of eye (long diameter), 0.307 mm.; width of pronotum, 1.28–1.30 mm.; width of anterior wing, 3.78 mm.

N. guayanae described by Holmgren in 1910 from South America (upper Surinam) is a longer and lighter colored adult than the form *columbicus* from Colombia, which I consider to be a good species, although close to *guayanae*; the distance of the ocelli from the eyes is different. It was described²⁵ from the nasutus caste and the winged adult has remained unknown until found at Panama with nasuti and workers.

This species, *columbicus* Holmgren, does not construct a regular spherical carton "niggerhead" nest in trees, but will cover over infested posts with material of the same consistency of the usual carton nest, forming an irregular shaped mass or nest.

Described from several winged adults ready for the flight, collected with nasuti and workers by J. Zetek and I. Molino, on April 28, 1921, at Frijoles, Canal Zone, Panama (Z. 1404), in a rotten log at avocado plantation. These specimens are deposited in the United States National Museum.

Subgenus SUBULITERMES Holmgren.

As yet this subgenus of the genus *Nasutitermes* Banks, established by Holmgren in 1912, contains but few known species, which, however, occur in South America and Asia; two species which occur in Africa are doubtfully placed in *Subulitermes* by Holmgren.

The soldiers of the American species have pear-shaped, light colored heads but slightly constricted with the dorsal profile of the head

²⁵ 1910 (1909). Holmgren, N. Versuch einer Monographie des amerikanischen *Eutermes*-Arten. Mitteil. Naturh. Mus. Hamburg, vol. 27, 2 Beiheft, pp. 254–256 [*Nasutitermes*] *Eutermes guayanae* described; p. 256, new form *columbicus* described from "Columbien."

nearly in a straight line; the nasus is cylindrical, but slender. The mandibles of the soldier caste, as a rule, are absent. The postclypeus is large.

NASUTITERMES (SUBULITERMES) ZETEKI, new species.

Soldiers (pl. 4, figs. 25-26).—Head pale yellowish, nasutiform, pear-shaped, elongate, but narrow, tapers anteriorly, where slightly thicker (higher), with dense long and short hairs; nasus castaneous-brown, elongate, narrow, straight, with dense short hairs even to apex and on both dorsal and ventral surfaces. Mandibles absent.

Antennae white with tinge of yellow, 11 segments, pubescent, segments become broader and longer toward apex; first segment elongate, broad, cylindrical; second shorter than first; third subclavate, slender, slightly longer than second or fourth, also slightly narrower; fourth subclavate, slightly longer than second; last segment elongate, slender and subelliptical.

Pronotum white with tinge of yellow at anterior margin, saddle-shaped, not nearly as broad as head, with long hairs.

Legs white with tinge of yellow, fairly elongate, slender, pubescent.

Abdomen grayish-white with tinge of yellow, with dense short light yellow hairs on both dorsal and ventral surfaces and long hairs at each side at the base of each segment.

Measurements.—Length of entire soldier, 2.2-3.1 mm.; length of head with nasus, 0.95-1.1 mm.; length of head without nasus, 0.6-0.7 mm.; length of nasus, 0.35-0.38 mm.; length of pronotum, 0.11 mm.; length of hind tibia; 0.45-0.50 mm.; width of head, 0.42-0.46 mm.; width of pronotum, 0.27 mm.

This small, hairy, species of *Subulitermes* is the first to be found in Central America; it differs from the two known South American species as well as from undescribed species from South America in the collection of the United States National Museum. *S. zeteki* is smaller and has more longer hairs on the head than either *S. microsoma* Silvestri or *incola* Holmgren. It also differs from 6 undescribed species from South America, which will be described by A. Emerson and F. Silvestri; only one other of these 2 described and 6 undescribed species of *Subulitermes* from America consistently has 11 segments to the antennae.

Winged adult unknown.

Type locality.—Summit, Canal Zone, Panama.

Described from a series of soldiers found with workers at the type locality by J. Zetek and I. Molino (Z. 1731), on July 29, 1922, abundant, in the trunk and petiole of an oil palm (*Eleas melanococca*)

Named in honor of J. Zetek, of the Bureau of Entomology.

Type, soldier.—Cat. No. 25766, U.S.N.M.

AMITERMES WHEELERI Desneux.

Winged adult (pl. 1, fig. 9.)—Head dark brown to blackish, slightly longer than broad, rounded posteriorly, with dense, fairly long, light yellow hairs. Fontanelle white, prominent but not as large as an ocellus, elongate, wider at base (trowel-shaped), base on a line connecting eyes posteriorly.

Antennae yellow-brown, 14 segments, longer than head, segments become longer, broader, and more clavate toward apex, pubescent; first segment elongate, cylindrical; second shorter and narrower than first; third shorter than second, ring-like to slightly clavate; fourth longer than third, clavate; last segment elongate and sub-elliptical.

Eye black, nearly round, projecting, separated from the lateral margin of the head by a distance equal to less than half a diameter. Ocellus prominent, elongate, deeply inset, with projecting rim, separated from eye by a distance less than its short diameter.

Labrum yellowish, longer than broad, broadest at middle, broadly rounded at apex, with long hairs.

Post-clypeus pale yellow-brown, bulging, bilobed, posterior margin concave, over twice as wide as long.

Pronotum approximately the same color as the head, broadest anteriorly, not twice as broad as long, anterior margin nearly straight, to slightly convex, anterior corners rounded and slightly raised (elevated), sides gradually taper toward posterior, posterior margin slightly emarginate; pronotum with long hairs.

Meso- and metanota lighter colored than pronotum, emarginate at acute angles posteriorly.

Legs yellow-brown, tarsi lighter.

Wings white, costal veins yellow-brown, membrane punctate, margins ciliate; median vein near cubitus branched in fore wing before reaching apex, cubitus with about 8 branches in fore wing, 10 in hind wing (pl. 4, figs. 27-28).

Wing scale is slightly shorter in length than the pronotum; with hairs.

Abdomen with dorsum lighter colored than pronotum, ventrally paler, with dense, fairly long, light yellow hairs.

Measurements.—Length of entire winged adult, 8.5 mm.; length of entire de-alated adult, 6.25 mm.; length of head (to tip of labrum), 0.905 mm.; length of pronotum, 0.4 mm.; length of hind tibia, 0.6 mm.; length of anterior wing, 6 mm.; length of wing scale, 0.307 mm.; width of head (at eyes), 0.805 mm.; diameter of eye, 0.101-0.106 mm.; width of pronotum, 0.701 mm.

This termite is more slender than is *Amitermes tubiformans* Buckley, the fontanelle is narrower, and the wings are not as long in proportion to the length as in *tubiformans*.

The winged adult of *Amitermes wheeleri* Desneux has hitherto been unknown, the specific description being based upon the soldier caste;²⁶ the above-described winged adults were found with soldiers by C. H. Gable, at San Antonio, Tex., on July 12, 1921, Hopk. U. S. No. 16552. They were flying at 8.15 in the morning, so this species (as is also *A. tubiformans*) is not a nocturnal flying termite.

Described from several winged adults. These specimens are deposited in the United States National Museum.

AMITERMES BEAUMONTI Banks.

Winged adult.—Brown-black, shining, slightly longer than broad, rounded posteriorly, with dense, long, light yellow hairs. Fontanelle indistinct, a linear slit in a depression between the eyes.

Antennae dark yellow-brown, 15 segments, segments become broader toward apex, pubescent; first segment elongate, cylindrical; second shorter (approximately half length of first) and narrower than first, ring-like; third shorter than second, clavate; fourth broader and longer than third; last segment narrower, elongate and subelliptical, pointed at apex. Antennae approximately the same length as the head.

Eye black, large, nearly round, prominent and projecting; very close to lateral margin of head. Ocellus elongate, fairly deeply set in head (with prominent overhanging rim), separated from the compound eye by a distance equal to its short diameter.

Labrum yellow, longer than broad, somewhat tongue-shaped, tapers toward apex, where rounded, with fairly long hairs.

Post-clypeus light yellow-brown, bulging, bilobed, not quite twice as broad as long, posterior margin strongly concave.

Pronotum about the same color as the head, nearly twice as broad as long, broadest anteriorly, emarginate anteriorly, posterior margin nearly straight, anterior corners high; rounded sides gradually slope to posterior, general shape semicircular, with long hairs.

Meso- and metanota lighter colored than pronotum, mesonotum not covered by wing scale, both meso- and metanota are angularly emarginate posteriorly.

Legs light yellow-brown; hind tibiae broken.

Wings dusky gray iridescent, costal veins darker brown, tissue punctate, margins ciliate; median vein runs straight to apex, close to cubitus, which is nearly in the center of the wing, cubitus parallel to the median vein, with 10 to 11 branches or sub-branches, cubitus reaches apex of wing.

Wing scale not as long as the pronotum, with long hairs.

²⁶ 1905. Desneux, J. Variétés Termitologiques II, Termites du Texas. Ann. Soc. Ent. Belg., vol. 49 Bruxelles (p. 340, *Amitermes wheeleri* described from the soldier caste, type locality Belton, Tex.).

Abdomen about same color as mesonotum, lighter ventrally, not half as long as the wings (in dry pinned specimens), with dense, long, light yellow hairs.

Measurements.—Length of entire winged adult, 8.5 mm.; length of entire deälated adult, 4.5 mm.; length of head, 1 mm.; length of pronotum, 0.407 mm.; length of anterior wing, 6.5 mm.; width of head (at eyes), 0.901 mm.; diameter of eye (long diameter), 0.207 mm.; width of pronotum, 0.802 mm.; width of anterior wing, 1.85 mm.

This winged adult has been hitherto unknown; the specific description of *Amitermes beaumonti* Banks was based upon the soldier caste alone. Banks believes that this may be the winged adult of *beaumonti*.²⁷ However, the specimens were not found with soldiers.

The three specimens upon which this description is based were found flying at Trinidad River, Panama, on May 6, 1911, collector August Busck. They are deposited in the United States National Museum.

Genus ANOPLOTERMES Fritz Müller.

Twenty-eight species of *Anoplotermes* are known; 11 are from Africa and 17 are Neotropical.

The winged adults of Nearctic, Antillean, and Central American species have the fontanelle either indistinct or absent; species from South America and other parts of the world have the fontanelle large and prominent. The meso and metanota are elongate and the posterior margin is emarginate.

The mandibles of the winged adults in some species are very elongate, which is interesting in view of the fact that the soldier caste is absent in all species. Species of *Anoplotermes* construct large mound nests in South America.

In some species of the subgenus *Speculitermes* Wasmann the workers are darkly colored and the fontanelle is large, round, and prominent; the third segment of the antennae of the winged adult usually is large (approximately equal to the fourth)—not small as in *Anoplotermes* s. s. These species of *Speculitermes* live in earth nests in the crotches of trees near the ground, whereas some Central American species of *Anoplotermes* do not construct earth nests or mounds.

Twelve species of *Anoplotermes* have been described from America, but only one species of *Speculitermes* is known. I have recently examined the types of *A. ater* Hagen and *A. fumosus* Hagen at the Museum of Comparative Zoology, Cambridge, Mass.

A. ater, female (type No. 208, M. C. Z.), of Brazil, is a small, dark-black species, with short mandibles; the eyes are prominent

²⁷ 1918. Banks, N. The Termites of Panama and British Guiana. Bull. Amer. Mus. Nat. Hist., vol. 23, art. 17, New York, November (p. 664, *Amitermes beaumonti* described from soldier caste from specimens in Beaumont collection from Panama).

and projecting; the post-clypeus is light-brown, slightly bulging, is bilobed, and the posterior margin is convex, it is over twice as broad as long. The fontanelle is a small indistinct spot in a depression, at the back of the eyes, it is nearer the posterior than in *A. fumosus*; the epicranial suture is less distinct than in *fumosus*. The mandibles are reddish to black at the tip but yellow-brown at the base, they project slightly beyond the labrum. The ocelli are large and prominent and are separated from the eyes by a distance equal to about their long diameter.

A. fumosus, female (type No. 218, M. C. Z.), of Vera Cruz, Mexico, is a larger species than *ater*, is dark-brown, and also has longer mandibles; the eyes are prominent and projecting; the post-clypeus is lighter colored than the head, is prominent and projecting, being twice as broad as long, and is bilobed—more so than in *ater*. The mandibles project slightly beyond the labrum. The ocelli are separated from the eyes by a distance equal to about their diameter. The fontanelle is an indistinct spot at the base of the epicranial suture, just back of the ocelli, at the middle of the eyes.

A. tenebrosus Kollar, female (type No. 422, from Ypanema, Province of St. Paulo, Brazil, is larger than any of the preceding American species of *Anoplotermes*. The head is dull brown-black in color, and hairy; the eyes are large and prominent; the mandibles are long. The ocelli are separated from the compound eyes by a distance nearly equal to their long diameter. The fontanelle is a small yellow raised point. The post-clypeus is dark-brown, raised up and one-third as long as wide. The pronotum is lighter colored than the head. The hind tibiae are yellow-brown and elongate.

The following measurements of *A. tenebrosus* are given for comparison with *A. hondurensis* Snyder, *fumosus* and *ater*.

Measurements.—Length of entire winged adult, 14.5+ mm., female; length of entire deälated adult, 5.5+ mm., female; length of head, 1.35 mm.; length of pronotum, 0.65 mm.; length of left mandible, 0.65–0.70 mm.; length of hind tibia, 1.4 mm.; length of fore wing, 13 mm.; diameter of eye, 0.35 mm.; width of head, 1.3 mm.; width of pronotum, 1.15 mm.; width of fore wing, 3.2 mm.

A key to seven American species of *Anoplotermes* is herewith appended.

KEY TO SEVEN AMERICAN SPECIES OF *ANOPLOTERMES* FRITZ MÜLLER.

1. Large, females²⁸ 13–16 mm. in length, mandibles elongate (0.6–0.7 mm.), eyes and post-clypeus bulging..... 2.
- Small, females 7.50–12 mm. in length, mandibles short, eyes not so projecting, post-clypeus over twice as broad as long..... 6.

²⁸ There is a marked difference in length of winged males and females in the genus *Anoplotermes*.

2. Head and pronotum broad..... 3.
Head and pronotum not broad..... 5.
3. Ocelli separated from eyes by a distance greater than their diameter, post-clypeus less than twice as broad as long..... *schwarzi* Banks.
Ocelli separated from eyes by a distance equal to or slightly less than their diameter..... 4.
4. Post-clypeus one third as long as broad..... *tenebrosus* Hagen.
Post-clypeus one half as long as broad..... *hondurensis*, new species.
5. Ocelli separated from eyes by a distance slightly less than their diameter, post-clypeus twice as broad as long..... *fumosus* Hagen.
6. Length 12 mm., head blackish, mandibles short (0.55 mm.), post-clypeus slightly bulging, nearly three times as broad as long..... *ater* Hagen.
Length 7.50 mm., head gray-black, mandibles very short (0.37 mm.), post clypeus not bulging, nearly three times as broad as long..... *parvus* Snyder.
Length 11 mm., head dark-brown, mandibles very short (0.45 mm.), post-clypeus projecting, over twice as broad as long..... *gracilis* Snyder.

ANOPLOTERMES HONDURENSIS, new species.

Winged adult.—Head dull dark brown to blackish, broader than long (to base of post-clypeus), with dense short and long, light yellow hairs. Fontanelle indistinct spot in broad depression between the eyes.

Antennae light brown, 15 segments, segments become broader and longer toward apex, with dense, long, light yellow hairs; first segment long, cylindrical; second shorter, somewhat clavate; third shorter than second, narrow, clavate; fourth longer and broader than third; last segment elongate, subelliptical.

Eye, black, nearly round, projecting, separated from lower margin of head by a distance equal to less than its diameter. Ocellus deeply inset, with projecting upper rim, large, nearly round, separated from eye by a distance equal to its long diameter (distant slightly less than its diameter in *A. fumosus* Hagen and *ater* Hagen).

Labrum light yellow, elongate, broadest at middle, narrows to apex where rounded, with long, light yellow hairs, not as long as mandibles.

Post-clypeus light brown, bilobed, projecting, twice as broad as long, posterior margin concave.

Mandibles yellow, castaneous brown to black at tips, very long (0.7 mm.), extend beyond labrum, longer and with longer marginal teeth than in *fumosus* where the left mandible is 0.6–0.7 mm. in length, also longer than in *gracilis* Snyder, where mandible is 0.45 mm. in length.

Pronotum dark brown, not twice as broad as long, narrower than head, medianally and anteriorly deeply, angularly indented, anterior margin concave, posterior margin convex, sides roundedly narrowed toward posterior margin, with dense short and long, light yellow hairs. Meso- and metanota emarginate posteriorly, whereas the

meso- and metanota are only a little emarginate posteriorly in *fumosus*; narrowly emarginate in *ater*.

Legs yellow with tinge of brown.

Wings gray, veins yellow-brown, costal veins darker, wing margins ciliate, tissue of wing punctate; median vein slightly nearer to cubitus than to subcosta, reaches apex of wing (doubly or singly branched or not branched); cubitus does not reach apex of wing; with 10-12 branches or sub-branches to lower margin, not parallel to but converges to lower margin of wing posteriorly (pl. 5, figs. 31-32).

Wing scale shorter than pronotum.

Abdomen with dorsum slightly lighter colored than pronotum, with dense short and long light yellow hairs.

Measurements.

	<i>A. hondurensis</i> , new species.	<i>A. fumosus</i> , Hagen type.	<i>A. fumosus</i> , Hagen. ¹	<i>A. ater</i> , Hagen type.	<i>A. ater</i> , Hagen. ²
Length of entire winged adult....	11-12 mm., males; 13.5 mm., female. ³	14 mm., female.	12.5 mm., female.	12 mm., female.	12 mm., female.
Length of entire deilated adult....	6-6.5 mm., males; 7 mm., female.	6 mm., female.	6 mm., female.	5 mm., female.	6.5 mm., female.
Length of head (tip of mandibles to posterior margin).	1.55 mm.....	1.35 mm. (to tip of labrum).	1.23-1.30 mm.	1.35 mm. (to tip of labrum).	1.27 mm.
Length of pronotum.....	0.6 mm.....	0.6 mm.....	0.57 mm.....	0.55 mm.....	0.57 mm
Length of hind tibia.....	1.25 mm.....	1.2 mm.....	1.23 mm.....	1.15 mm.....	1.03 m.
Length of anterior wings.....	10.75 mm.....	11 mm.....	11.37 mm.....	10.5 mm.....	10.05 mm.
Length of left mandible.....	0.7 mm.....	0.7 mm.....	0.6 mm.....	0.55 mm.....	0.55 mm.
Width of head (between eyes).....	1.25 mm.....	1.1 mm.....	1.1 mm.....	1.2 mm.....	1.07 mm.
Diameter of eye.....	0.27-0.3 mm.	0.35 mm.....	0.25-0.27 mm.	0.3 mm.....	0.25 mm.
Width of pronotum.....	1.1 mm.....	0.9+ mm. (turned down).	0.93+ mm. (turned down).	1 mm.....	1 m.
Width of anterior wing.....	2.55 mm.....	3 mm.....	2.8 mm.....	2.9 mm.....	2.50 mm.

¹ Specimens from Harlingen, Tex.

² Specimens from Coxipo, Cuyabá. No. 63, determined by F. Silvestri, which were kindly presented by him to the United States National Museum. The head is brown colored—lighter than in the type; the post-clypeus is more bulging than in the type.

³ There is considerable difference in the size of the sexes, the female often being much larger.

Mandibles longer than in *ater* Hagen and *fumosus*, post-clypeus more bulging and broader in proportion to its length than in *ater*; a larger and darker species than is *gracilis* Snyder, eyes more projecting, ocelli separated from eyes by a greater distance; darker and broader than *fumosus*; there are also differences in wing venation (pl. 5, figs. 29-32).

Type locality.—La Ceiba, Honduras.

Described from a series of winged adults collected at the type locality by F. J. Dyer, the American consul, May 19, 1916, Nos. 6655 and 6664.

Type, winged female adult.—Cat. No. 25692, U.S.N.M.

DESCRIPTION OF PLATES.²⁹

PLATE 1.

Soldier of *Kaloterms approximatus*, a new Hawaiian *Kaloterms*, new Antillean *Glyptoterms*, a new *Leucoterms*, and deälated adult of *Amiterms wheeleri*.

- FIG. 1. *Kaloterms approximatus* Snyder. Soldier, head and pronotum.
 2. *Glyptoterms pubescens* Snyder. Soldier, three-quarters view head and pronotum.
 3. *Glyptoterms pubescens* Snyder. Soldier, dorsal view mandibles.
 4. *Glyptoterms pubescens* Snyder. Soldier, dorsal view pronotum.
 5. *Glyptoterms pubescens* Snyder. Soldier, dorsal (outline) view head.
 6. *Kaloterms marjoriae* Snyder. Venation of hind wing.
 7. *Leucoterms convexinotatus* Snyder. Deälated adult, head and thorax.
 8. *Leucoterms convexinotatus* Snyder. Soldier, head and pronotum.
 9. *Amiterms wheeleri* Desneux. Deälated adult, head and thorax.

PLATE 2.

Deälated adult and work of a new Antillean *Glyptoterms*.

- FIG. 10. *Glyptoterms pubescens* Snyder. Deälated adult, dorsal view entire insect.
 11. *Glyptoterms pubescens* Snyder. Burrows in try, sound, hard coffee tree wood; longitudinal view. Natural size.
 12. *Glyptoterms pubescens* Snyder. Burrows in dry, sound, hard coffee tree wood; end view. Natural size.
 13. *Glyptoterms pubescens* Snyder. Pellets of impressed, excreted wood. Greatly enlarged.

PLATE 3.

Wing venation of species of *Leucoterms*.

- FIG. 14. *Leucoterms convexinotatus* Snyder. Venation of fore wing.
 15. *Leucoterms convexinotatus* Snyder. Venation of hind wing.
 16. *Leucoterms tenuis* Hagen. Venation of fore wing.
 17. *Leucoterms tenuis* Hagen. Venation of hind wing.
 18. *Leucoterms cardini* Snyder. Venation of fore wing.
 19. *Leucoterms cardini* Snyder. Venation of hind wing. The median vein usually does not turn up to the subcostal vein.

PLATE 4.

Soldiers of new and known species of *Synterms*, a new *Subuliterms* and wings of *Amiterms wheeleri*.

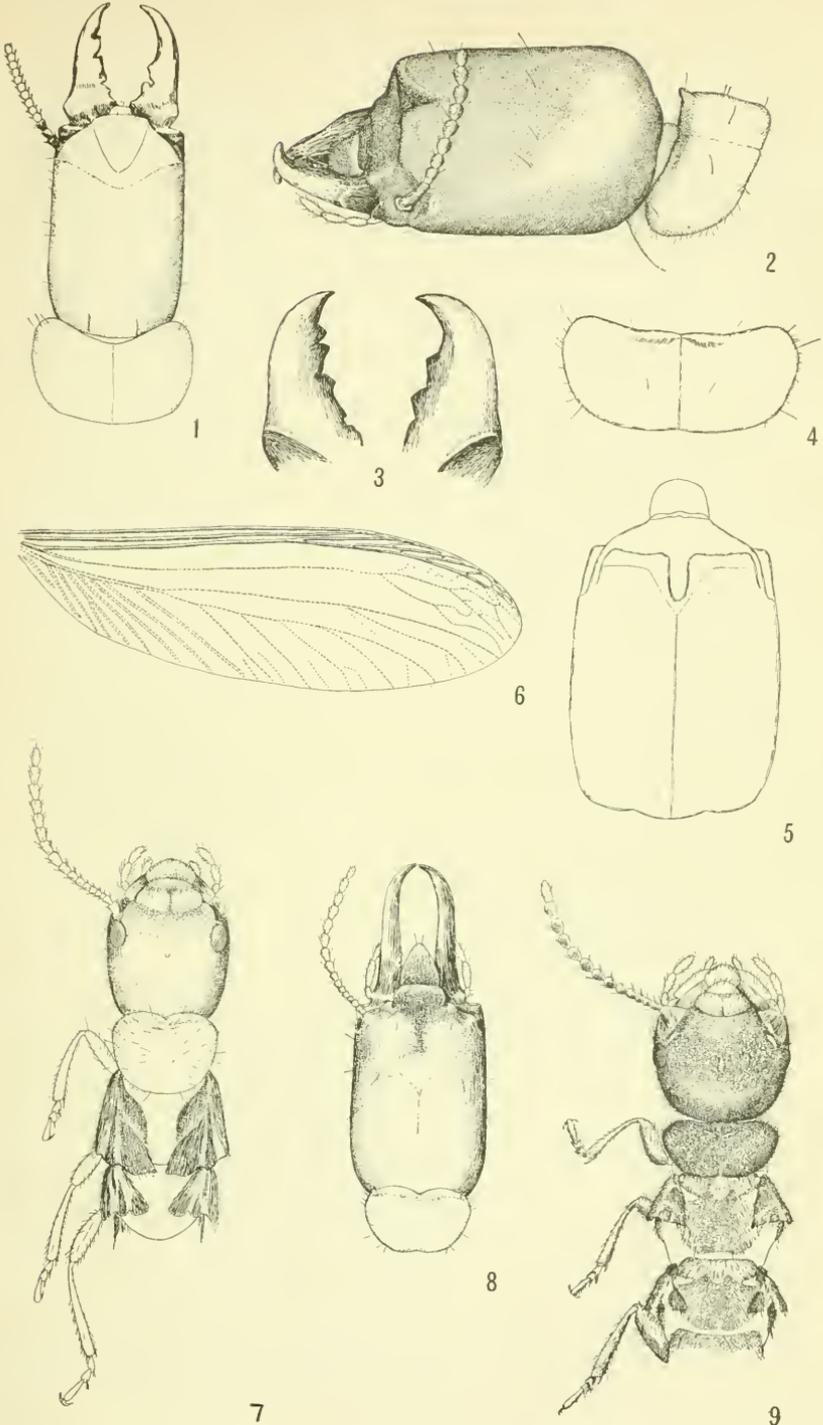
- FIG. 20. *Synterms emersoni* Snyder. Soldier, dorsal view of head and thorax.
 21. *Synterms hageni* Holmgren. Soldier, dorsal view of head and thorax.
 22. *Synterms magnoculus* Snyder. Soldier, dorsal view of head and thorax.
 23. *Synterms grandis* Rambur. Soldier, dorsal view of head and thorax, right mandible inset.
 24. *Synterms colombianus* Snyder. Soldier, dorsal view of head and thorax.
 25. *Subuliterms zeteki* Snyder. Nasutus, lateral view of head and pronotum.
 26. *Subuliterms zeteki* Snyder. Nasutus, dorsal view (outline) of head and pronotum.
 27. *Amiterms wheeleri* Desneux. Fore wing.
 28. *Amiterms wheeleri* Desneux. Hind wing.

²⁹ Drawings by Miss Eleanor T. Armstrong, of the Bureau of Entomology.

PLATE 5.

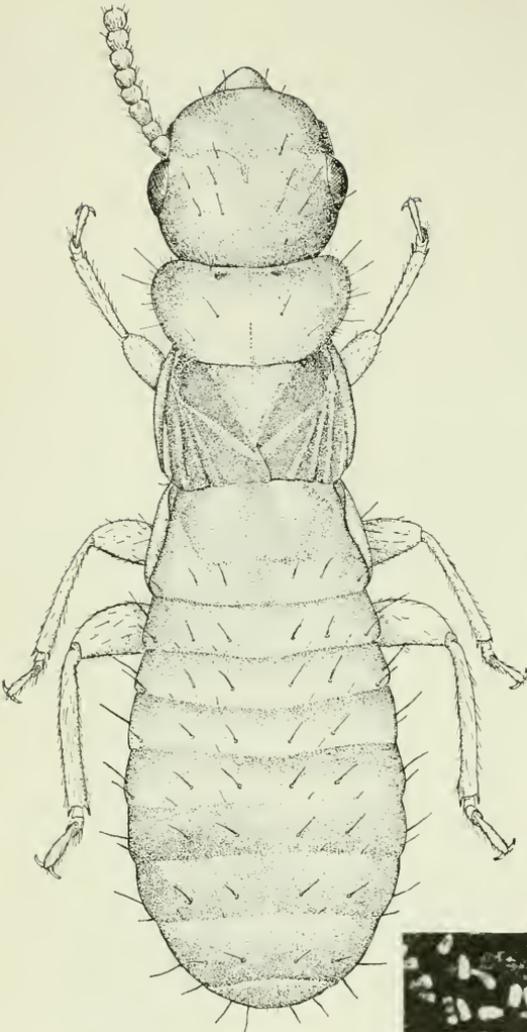
Wings of a new Honduran *Anoplotermes* and *A. fumosus*.

- FIG. 29. *Anoplotermes fumosus* Hagen. Venation of fore wing.
30. *Anoplotermes fumosus* Hagen. Venation of hind wing.
31. *Anoplotermes hondurensis* Snyder. Venation of fore wing.
32. *Anoplotermes hondurensis* Snyder. Venation of hind wing.

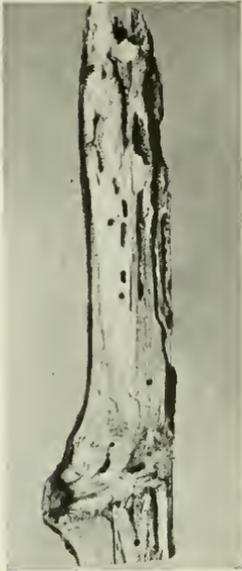


SOLDIER OF *KALOTERMES APPROXIMATUS*, A NEW HAWAIIAN *KALOTERMES*,
 NEW ANTILLEAN *GLYPTOTERMES*, A NEW *LEUCOTERMES*, AND DEALATED
 ADULT OF *AMITERMES WHEELERI*.

FOR EXPLANATION OF PLATE SEE PAGE 39.



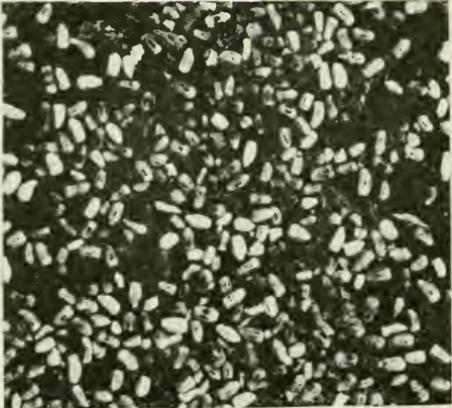
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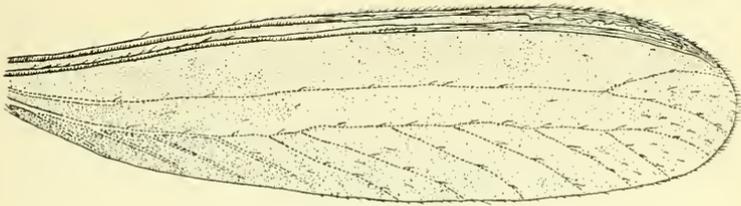
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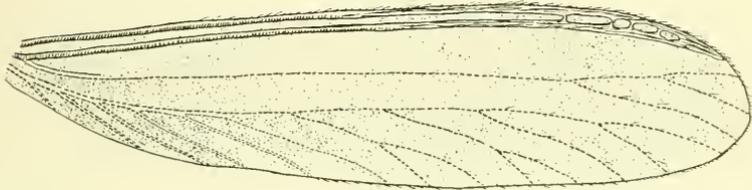
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DE-LATED ADULT AND WORK OF A NEW ANTILLEAN GLYPTOTERMES.

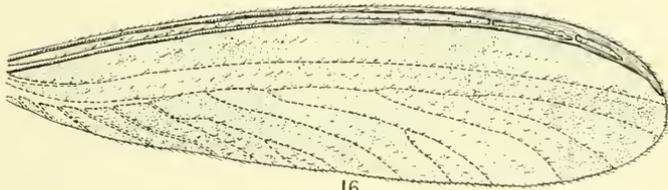
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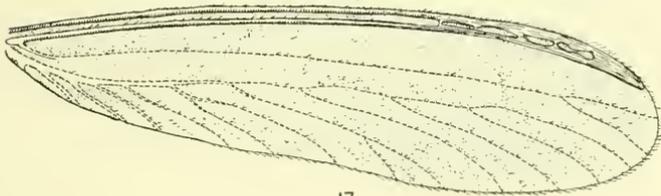
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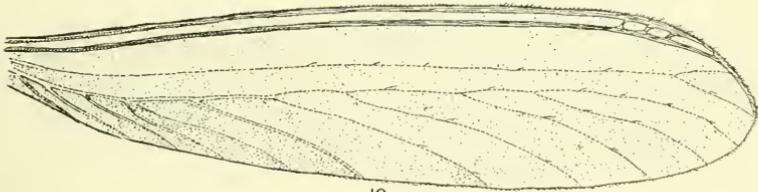
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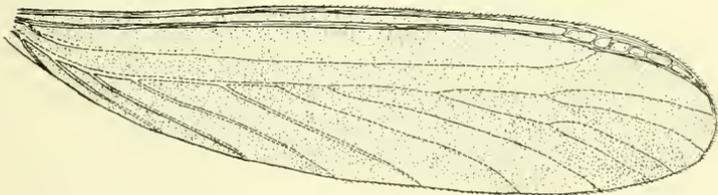
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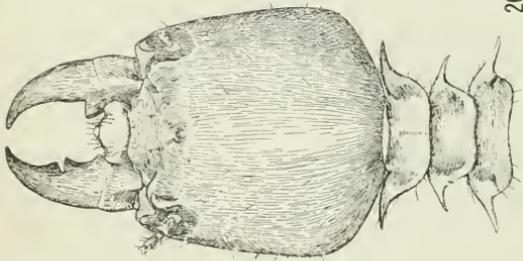
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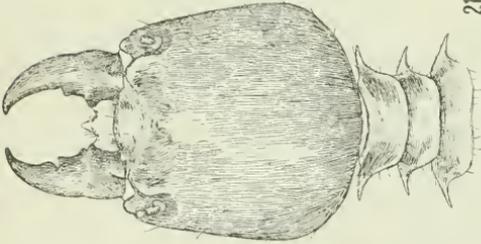
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WING VENATION OF SPECIES OF LEUCOTERMES.

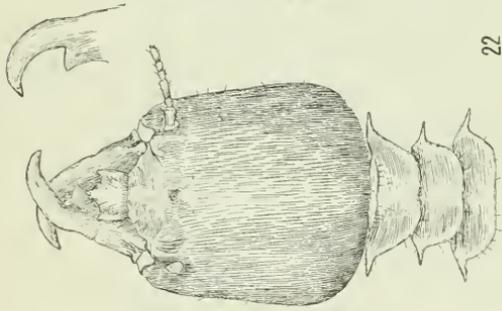
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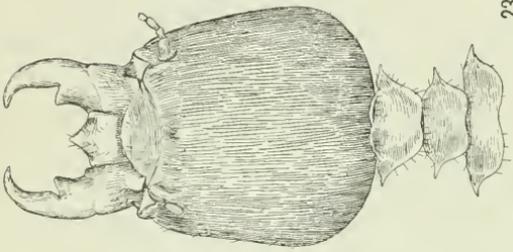
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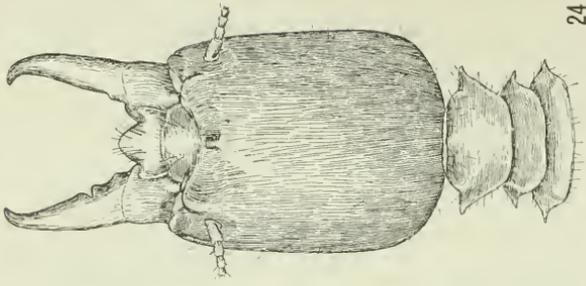
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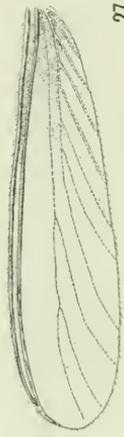
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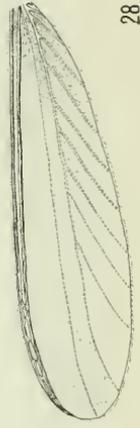
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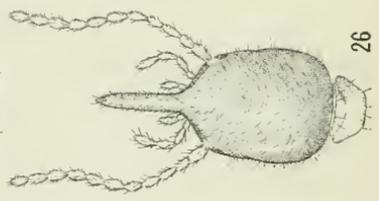
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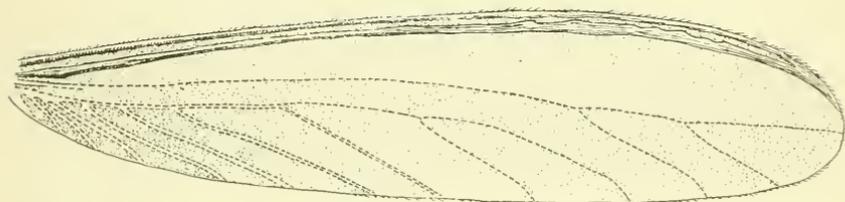
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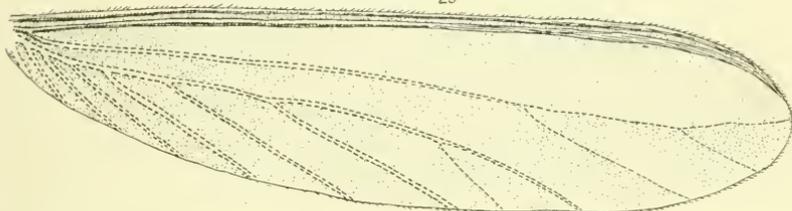
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SOLDIERS OF NEW AND KNOWN SPECIES OF SYNTERMES, A NEW SUBULITERMES, AND WINGS OF AMITERMES WHEELERI.

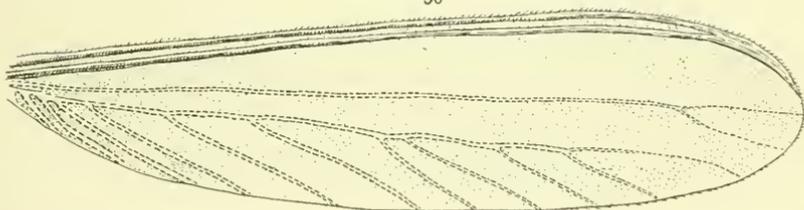
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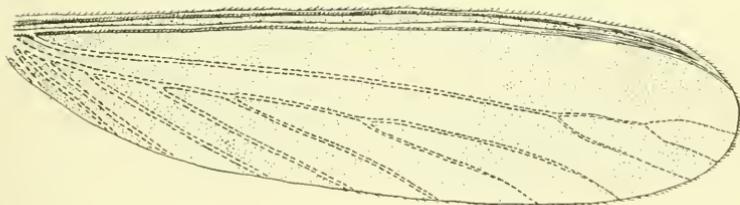
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WINGS OF A NEW HONDURAN ANOPLOTERMES AND *A. FUMOSUS*.

FOR EXPLANATION OF PLATE SEE PAGE 40.

