

A REVISION OF THE EAST AFRICAN
NASUTITERMITINAE (ISOPTERA)

BY

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A REVISION OF THE EAST AFRICAN NASUTITERMITINAE (ISOPTERA)

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THIS paper is one of a series of taxonomic studies on East African termites, based on the work of the Colonial Termite Research Unit. It concerns the subfamily Nasutitermitinae, the soldiers of which are characterized by having the frons and vertex of the head produced into a *nasus* or nose from which a defensive fluid is secreted, instead of having the well developed mandibles common to termite soldiers in general.

For the purposes of this work East Africa is taken to include Kenya, Uganda, Tanganyika, Zanzibar, Nyasaland, Ruanda Urundi, and the north eastern portion of Northern Rhodesia. The collections of Nasutitermitinae from this area are considered sufficiently detailed to permit a degree of revision of the group as it occurs there. Two species are reduced to synonyms, and several have been found to be more variable than was anticipated in the original description. A number of castes previously unknown are described here, and keys to the species known to occur in East Africa have been prepared, differing in arrangement and contents from the keys provided by Sjöstedt (1926), in an attempt to utilize the additional information now available.

The Nasutitermitinae of this area fall into two distinct faunistic groups which do not overlap to any large extent. The greater part of the area is occupied by the true East African fauna, substantially similar to that covering the rest of Africa south of the Equator, excluding the Congo forest. In Uganda north of the Equator, the second group of species is found. This region is the extreme eastward extension of the Guinean Zone, and as such has close affinities with West Africa, Central Africa north of the Tropical Rain Forest, and the Southern Sudan.

The following eighteen species are dealt with here :

- Nasutitermes chapini* Emerson.
- Nasutitermes incurvus* (Sjöstedt).
- Nasutitermes infuscatus* (Sjöstedt).
- Nasutitermes kempae* Harris.
- Nasutitermes torquatus* (Sjöstedt).
- Coarctotermes brunneus* Noirot.
- Coarctotermes coarctatus* (Sjöstedt).
- Grallatotermes africanus* Harris.

Trinervitermes auriterrae Sjöstedt.
Trinervitermes bettonianus (Sjöstedt).
Trinervitermes carbonarius Sjöstedt.
Trinervitermes crassinasus (Sjöstedt).
Trinervitermes dispar (Sjöstedt).
Trinervitermes ebenerianus Sjöstedt.
Trinervitermes gratiosus (Sjöstedt).
Trinervitermes lutzi Emerson.
Trinervitermes oeconomus (Trägårdh).
Trinervitermes rapulum (Sjöstedt)

Two species are regarded as synonyms :

Nasutitermes usambarensis (Sjöstedt), now included in *N. infuscatus*.
Trinervitermes segelli (Sjöstedt), now included in *T. bettonianus*.

Tanganyika records of *Trinervitermes gemellus* (Sjöstedt) are included in *T. dispar*.

A note on variation

A great deal of variation has been found in this group, particularly in the soldier caste, as a result of which many of the commonly used taxonomic characters are of doubtful value in distinguishing species. In some cases it is impossible to allocate individual soldiers to a species with any certainty. However, where the number of specimens of this caste is sufficient to establish the range of variation, it is usually possible to separate even the more closely related forms.

Variation in the soldier caste follows a basically similar pattern within each genus. The nose may vary in thickness, length, shape, and in the angle at which it projects from the main part of the head. A variation of 25 degrees has been found to occur in *T. dispar* (Sjöstedt), but most species fall short of this. The rest of the head capsule may vary considerably in size, and sometimes also in outline in plan view. The antennae frequently vary with the size of the specimen, larger individuals having extra segments the relative proportions of which are also different. The pronotum often varies in the extent of emargination of its anterior border.

These remarks refer to the major soldier where two forms are present. The minor soldiers of *Trinervitermes* are variable to such an extent that it has been found impossible to separate the individual species except in the most widely divergent forms.

In the alate caste there is less variation than in the soldier, and it is more often variation in the size of the entire insect than in the proportion of different parts of the body. The size and relative proportions of the eyes and ocelli vary slightly in some species, as may do the width and length of the fontanelle. Variation in the number and proportions of the antennal segments occurs, but is less than in the soldier.

The alate caste is in most cases the more satisfactory means of identification, and a key is given to those species of which it is known.

Key to the Alates

Alates of the subfamily Nasutitermitinae, in East Africa, are distinguished by the following characters : labrum broader than long, apical third hyaline ; mandibles with apical tooth as long as or slightly longer than first marginal ; left mandible with straight or slightly sinuate cutting edge between first and third marginal teeth true second marginal tooth absent (few exceptions) ; eyes generally large, greatest diameter slightly longer up to twice as long as postclypeus ; fontanelle slit-like, usually bifurcate at anterior end (V, Y, T, or I-shaped), rarely approaching round or oval shape, seldom so small as to appear absent.

1. Head width across eyes not more than 1.40 mm., rarely over 1.36 ; if approaching 1.40, then eyes larger, exceeding 0.50 mm. 2
- Head width across eyes not less than 1.40 mm. ; if as low as 1.40, then eyes smaller, under 0.50 mm. 6
2. Eyes 0.50 mm. diameter or greater *Nasutitermes kempae* Harris
- Eyes 0.45 mm. diameter or smaller 3
3. Postclypeus less than half as long as broad 4
- Postclypeus at least half as long as broad 5
4. Hind tibia less than 1.65 mm. ; fore wing less than 12.0 mm. (Distribution ; Kenya to Nyasaland) *Nasutitermes infuscatus* (Sjöstedt)
- Hind tibia over 1.65 mm. ; fore wing over 12.5 mm. (Distribution : Uganda, Congo) *Nasutitermes torquatus* (Sjöstedt)
5. Left mandible with deep notch in cutting edge between first and " second " marginal teeth, just distal to the latter *Coarctotermes tenebricus* (Silvestri)
- Left mandible with cutting edge between first and " second " marginal teeth entire, straight or slightly sinuate, but never notched *Coarctotermes coarctatus* (Sjöstedt)
6. Pronotum broad, rounded, rather flat, anterior lobe not distinctly raised, separated from the rest of the pronotum by a very weak groove. Head and pronotum very finely pubescent *Grallatotermes africanus* Harris
- Anterior lobe raised, separated from rest of pronotum by marked change of contour and deep grooves. Head and pronotum coarsely pubescent 7
7. Head capsule as wide behind eyes as in front 8
- Head capsule distinctly narrower behind eyes than in front 9
8. Postclypeus 4 times broader than long ; hind tibia 2.00 mm. or more ; head width 1.55–1.70 mm. *Nasutitermes incurvus* (Sjöstedt)
- Postclypeus $2\frac{1}{2}$ –3 times broader than long ; hind tibia 1.70–1.80 mm. ; head width 1.35–1.50 mm. *Nasutitermes torquatus* (Sjöstedt)
9. Head width across eyes less than 1.50 mm. 10
- Head width across eyes greater than 1.50 mm. 11
10. Fontanelle narrow Y-shaped in both sexes. Hind tibia less than 1.90 mm. *Trinervitermes dispar* (Sjöstedt)
- Fontanelle short broad Y-shaped in female, slender U-shaped in male, margins often indistinct. Hind tibia usually over 1.90 mm. *Trinervitermes rapulum* (Sjöstedt)
(Small specimens uncommon.)
11. Greatest diameter of eye less than 0.60 mm. (only a few over 0.56) 12
- Diameter of eye over 0.61 mm. (most over 0.65 mm.) 14
12. Fontanelle with 3–4 stout bristles or spines surrounding and overlapping anterior end (Text-fig. 3, Q, R) ; posterior margin of postclypeus arched, slightly angular, not evenly rounded (Text-fig. 2E) *Trinervitermes lutzi* (Emerson)

- . Fontanelle without bristles or spines ; any setae present not larger than other head setae ; posterior margin of postclypeus evenly rounded 13
13. Fontanelle of female **V** or inverted **A**-shaped, arms slender, dilated terminally to form "serifs" ; males narrower, sometimes approach **Y**-shape. Head dark brown with 3 diverging pale streaks on vertex. Abdominal sternites with darker brown shaded areas around stigmata *Trinervitermes bettonianus* (Sjöstedt).
- . Fontanelle of female **Y**-shaped, arms not slender, uniform in width ; males **U**-shaped ; without "serifs" in both sexes. Head yellow-brown without diverging pale streaks on vertex. Abdominal sternites without darker areas round stigmata *Trinervitermes rapulum* (Sjöstedt)
14. Antennae 15–16 segmented. Eye and ocellus 0.04–0.08 mm. apart, average 0.06 mm. Fore wing 21–24 mm. long. (Distribution : Kenya, Tanganyika, and Uganda south of the Equator) *Trinervitermes graciosus* (Sjöstedt)
- . Antennae 17 segmented. Eye and ocellus 0.02–0.04 mm. apart, average 0.03. Fore wing 17–20 mm. long. (Distribution : Uganda north of Equator, Guinean savannah zone) *Trinervitermes oeconomus* (Trägårdh)
- Based on Sjöstedt's Morphotype queen, and other specimens from West Africa.

Key to the Soldiers

In the case of *Trinervitermes*, where there are two or more soldier forms present, this key refers only to the major soldier.

1. Head constricted behind antennae 2
- . Head not constricted behind antennae 5
2. Large species, head length 1.80 mm. or more *Grallatotermes africanus* Harris
- . Smaller species, up to 1.70 mm. long 3
3. Back of head distinctly to deeply sulcate in the middle line ; hind tibia under 1.00 mm. long *Coarctotermes brunneus* Noirot
- . Back of head evenly rounded, or at least entirely convex ; hind tibia over 1.00 mm. long 4
4. Antennae 13 segmented ; width of head usually greater than 0.65 mm. *Coarctotermes tenebricus* (Silvestri)
- . Antenna 12 segmented ; width of head usually less than 0.65 mm. *Coarctotermes coarctatus* (Sjöstedt)
5. One soldier form only present, mandibles usually with points 6
- . Two or more soldier forms present, mandibles without points 10
6. Nose, measured to hind margin of antennal pit, distinctly shorter than the rest of head capsule *Nasutitermes infuscatus* (Sjöstedt) and *Nasutitermes torquatus* (Sjöstedt)
- . Nose approximately as long or slightly longer than the rest of the head capsule 7
7. Head distinctly swollen above line of nose, with definite change of contour at base of nose *Nasutitermes chapini* Emerson
- . Head profile straight or evenly concave, without marked change of contour at base of nose 8
8. Head width 87–114% of hind tibia length (mean 98%) ; head profile straight or very slightly and evenly concave. (Distribution : Kenya to Nyasaland) *Nasutitermes kempae* Harris
- . Head width 73–93% of hind tibia length (mean 81%) ; head profile slightly to strongly and evenly concave or slightly sinuate. (Distribution : Uganda, Congo). 9
9. Nose broad at base, strongly and evenly tapered (angle 18–23 degrees) *Nasutitermes torquatus* (Sjöstedt)

- . Nose only weakly tapered or almost cylindrical (angle 10–15 degrees)
Nasutitermes incurvus (Sjöstedt)
10. Antennae with 12 segments 11
- . Antennae with more than 12 segments 12
11. Nose broad at base, strongly and evenly tapered (angle 15–22 degrees)
Trinervitermes bettonianus (Sjöstedt)
- . Nose only weakly tapered or almost cylindrical (angle 5–13 degrees)
Trinervitermes dispar (Sjöstedt), *T. rapulum* (Sjöstedt), and *T. lutzi* (Emerson) all uncommon with 12 segmented antennae, and difficult to distinguish in small specimens
12. Antennae with 13 segments 13
- . Antennae with 14 segments 19
13. Nose distinctly conical, strongly and evenly tapered to rather pointed tip . . . 14
- . Nose weakly tapered, approximating to cylindrical, more rounded at tip . . . 15
14. Head capsule from above evenly rounded, broad oval, almost circular, not noticeably tapered anteriorly, pronotum not emarginate. Distribution: Zambezi and lower Shire valleys . . . *Trinervitermes crassinasus* (Sjöstedt)
- . Head capsule from above rarely evenly rounded, usually slightly angular, slightly tapered to front (or rear in some specimens). Pronotum often but not always somewhat emarginate. Distribution: Nyasaland apart from Lower Shire valley, Tanganyika, Kenya, and north-eastern Uganda. *Trinervitermes bettonianus* (Sjöstedt)
15. Fontanelle large, over 0.07 mm. in diameter, almost twice as large as any other species . . . *Trinervitermes auriterrae* (Sjöstedt)
- . Fontanelle small, under 0.05 mm. in diameter 16
16. Hind tibia 1.50 mm. or less 17
- . Hind tibia over 1.50 mm. 18
17. Head usually distinctly wider than length of hind tibia (exceptions to this fairly common . . . *Trinervitermes rapulum* (Sjöstedt)
- . Head capsule usually not wider than length of hind tibia (exceptions fairly common).
 (a) slightly larger: L., 1.98–2.44; W., 1.14–1.39; T₃, 1.16–1.44 mm.
Trinervitermes lutzi (Emerson)
 (b) slightly smaller: L., 1.71–2.23; W., 0.93–1.36; T₃, 1.04–1.39 mm.
Trinervitermes dispar (Sjöstedt)
18. Head capsule and nose, measured to hind margin of antennal pit, about equal in length, or nose slightly the longer. Distribution: West Afr., Uganda North of the Equator . . . *Trinervitermes carbonarius* Sjöstedt
- . Head capsule about one eighth longer than nose. Distribution: Tanganyika, Kenya, and Uganda South of Equator . . . *Trinervitermes graciosus* (Sjöstedt)
19. Hind tibia over 1.50 mm. in length 20
- . Hind tibia less than 1.50 mm. in length . . . *Trinervitermes rapulum* (Sjöstedt)
 (*T. dispar* (Sjöstedt) occasionally has 14 segmented antennae, and then comes out at this point in the key.)
20. Nose measured to hind margin of antennal pit as long as or longer than rest of head capsule . . . *Trinervitermes carbonarius* (Sjöstedt)
- . Nose more or less shorter than head capsule 21
21. Head darker, ferruginous to dark chestnut brown, nose darker than head, to almost black. Distribution: Uganda, and Congo South of Equator, Tanganyika, Southern Kenya . . . *Trinervitermes graciosus* (Sjöstedt)
- . Head paler, yellow to yellow-brown, nose orange to chestnut brown. Distribution: Uganda North of Equator, and Guinean Savannah Zone 22
22. Head yellow, nose orange to ferruginous . . . *Trinervitermes oeconomus* (Trägårdh)
- . Head yellow-brown, with darker shading, nose brown
Trinervitermes ebenerianus Sjöstedt

NASUTITERMES Dudley***Nasutitermes chapini*** Emerson

(Text-fig. 4, A, B)

Nasutitermes (*Nasutitermes*) *chapini* Emerson, 1928, *Bull Amer. Mus. nat. Hist.*, **57** : 480-491, Belgian Congo ; Ngayu.

SOLDIER. Fourteen segmented antennae occur in larger specimens. Variation in size somewhat greater than was recorded by Emerson.

	mm.
Length of head	1.67-1.75
Width of head	1.07-1.11
Length of pronotum	0.22
Width of pronotum	0.50-0.54
Length of hind tibia	1.22-1.36

UGANDA : Ankole province, 1939 (*H. C. Johnstone*).

Nasutitermes incurvus (Sjöstedt)

(Text-figs. 1, A ; 3, A ; 4, C, D)

Eutermes (*Eutermes*) *incurvus* Sjöstedt, 1924, *Rev. zool. afr.* **12** : 41 ; Belgian Congo : Kunungu and Lukula.

Nasutitermes (*Nasutitermes*) *incurvus* (Sjöstedt) ; Emerson, 1928, *Bull. Amer. Mus. nat. Hist.*, **57** : 478.

IMAGO. Measurements of the ocellus, and its distance from the eye, are added to those given by Emerson.

	mm.
Width of head across eyes	1.55-1.70
Eye, greatest diameter	0.50-0.53
Ocellus	0.15 × 0.21
Ocellus to eye	0.09
Width of pronotum	1.33-1.43
Length of pronotum	0.72-0.83
Length of hind tibiae	2.00-2.07
Length of fore wing	11.5-12.5

SOLDIER. These fall well within the range of variation in size given by Emerson. The head profile from nose to vertex varies in its degree of concavity, with the result that some specimens are indistinguishable from *N. kempae* Harris. Confusion of the two is unlikely, since *N. kempae* occurs on the Kenya and Tanganyika coast, and in Nyasaland, and *N. incurvus* is a Uganda and Congo forest species. The alates are easily separated in these two species, *N. incurvus* having more prominent eyes and a much narrower postclypeus, and being generally larger than *N. kempae*.

The specimens listed below were identified from material compared with the type by Emerson (1928, Bequaert collection No. 166) and have not been compared with type directly.

UGANDA: Kyagwe, 1949 (*W. V. Harris*); Budongo Forest, 1939 (*C. C. Gowdey*); Namanwe, 1939 (*G. E. E. Hopkins*).

This species has been recorded from Uganda, across the Belgian Congo to the Cameroons.

Nasutitermes infuscatus (Sjöstedt)

(Text-figs. 1, B; 3, B; 4, E, F)

Eutermes infuscatus Sjöstedt, 1902, *Ent. Tidskr.*, **23**: 40; Nyasaland: Zomba.

Eutermes usambarensis Sjöstedt, 1904, *K. svenska Vetensk. Akad. Handl.*, **38**: 103; Tanganyika: Usambara.

Nasutitermes usambarensis (Sjöstedt); Kemp, 1955, *Bull. ent. Res.*, **46**: 33.

IMAGO. The range of variation in size is greater than was recorded in the description of the species.

	mm.
Width of head across eyes . . .	1.29–1.32
Eye, greatest diameter . . .	0.37–0.41
Ocellus . . .	0.11 × 0.15–0.17
Ocellus to eye . . .	0.09–0.10
Width of pronotum . . .	1.07–1.11
Length of pronotum . . .	0.68–0.72
Length of hind tibia . . .	1.54–1.61
Length of fore wing . . .	11.6–11.9

The Imago from the Usambara mountains is slightly darker than Sjöstedt's type material.

SOLDIER. The known range of variation in size is increased.

	mm.
Length of head capsule . . .	1.33–1.69
Width of head capsule . . .	0.63–1.00
Width of pronotum . . .	0.42–0.64
Length of pronotum . . .	0.17–0.29
Length of hind tibia . . .	0.91–1.20

Specimens from Kenya, Tanganyika, and Nyasaland have been compared with the types of *N. infuscatus* and *N. usambarensis* and it has not been possible to distinguish them as two species. *N. usambarensis* therefore becomes a synonym of *N. infuscatus* (Sjöstedt). The specimens recorded as *N. maculiventris* (Sjöstedt) from Zanzibar (*W. M. Aders*, 1925) are actually *N. infuscatus* (Sjöstedt), and the former species must therefore be removed from the East African list.

A representative selection of localities is given, since the complete list is too long to be given in full. KENYA: Gedi, Shimba hills, 1950 (*W. V. Harris*). TANGANYIKA: Mwakijembe, Amani, 1951 (*P. B. Kemp*) Tunduru, Songea, 1938 (*W. V. Harris*). ZANZIBAR: Tunguu, 1951 (*W. V. Harris*). NYASALAND: Cholo-Mlanje, Kota-Kota, Nkata Bay, Songwe River, 1953 (*W. A. Sands and W. Wilkinson*).

This is essentially a forest or moist woodland species, found in the coastal belt of Tanganyika, and in the islands of Zanzibar, and Mafia. It follows the moister

woodland of tall *Brachystegia* spp. inland in Southern Tanganyika, up to Songea, and is also found close to the shores of Lake Nyassa, and in Southern Nyasaland.

Nasutitermes kempae Harris

(Text-figs. 1, C ; 3, C ; 4, G, H.)

Nasutitermes kempae Harris, 1954, *Proc. R. Ent. Soc. Lond.*, **23** : 134-5, Tanganyika : Handeni.
Nasutitermes latifrons (Sjöstedt) ; Harris, 1936, *Bull. ent. Res.*, **27** : 368.

IMAGO. Previously undescribed.

Female, head capsule brown, paler very close to eyes and round antennal pit. Postclypeus and proximal two-thirds of labrum, antennae, legs, and ventral thoracic sclerites, yellow, Pro- meso- and metanota, mainly yellow-brown. Abdominal tergites sepia-brown, sternites yellow, shaded with brown round stigmata. Wings opaque, pale brown, subcosta and radius sector sepia at base, yellowish distally. Cubitus sepia at base, less distinct distally. Median narrow but distinct.

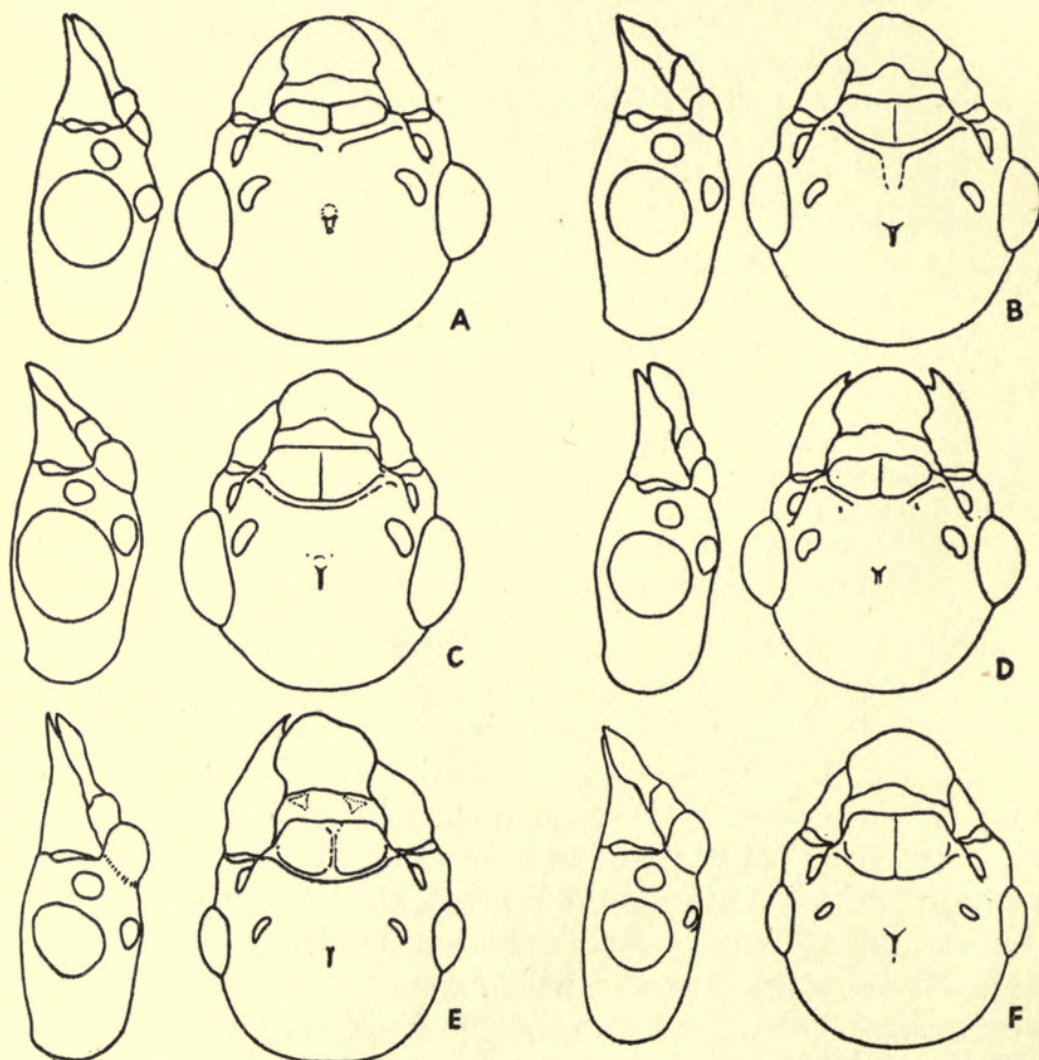


FIG 1.—Side and plan views of heads of Imagos. A, *Nasutitermes incurvus* (Sjöstedt) ; B, *Nasutitermes infuscatus* (Sjöstedt) ; C, *Nasutitermes kempae* Harris ; D, *Nasutitermes torquatus* (Sjöstedt) ; E, *Coarctotermes coarctatus* (Sjöstedt) ; F, *Coarctotermes tenebricus* (Silvestri).

Head wider across eyes than length to front of postclypeus ; frontal area slightly depressed with slit-like fontanelle, which is weakly bifurcate at its ventral end ; eyes very large, prominent, but not in proportion to diameter ; ocelli very large, almost touching eyes in some specimens, broad oval ; postclypeus short and broad, inflated, anterior margin straight, posterior margin convex ; anteclypeus

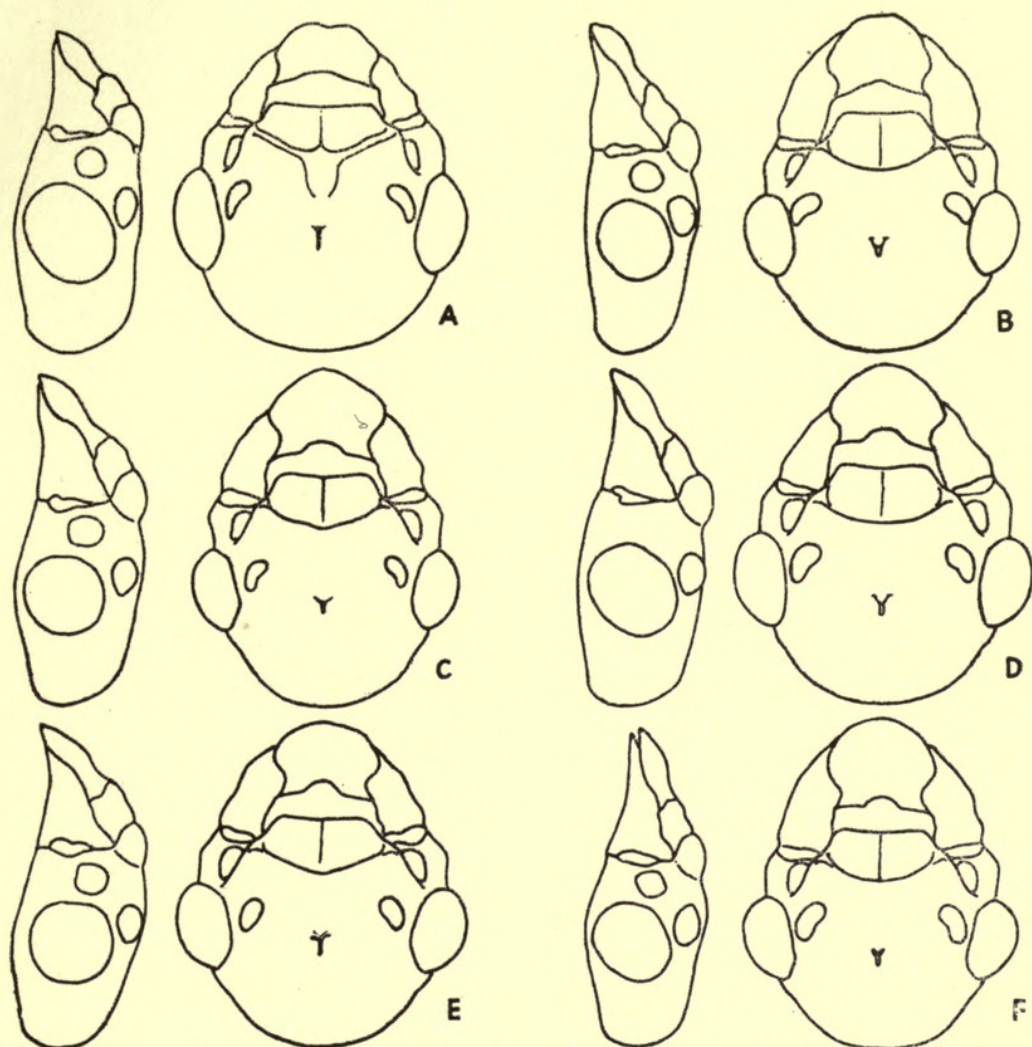


FIG. 2.—Side and plan views of heads of Imagos. A. *Grallatotermes africanus* Harris ; B. *Trinervitermes bettonianus* (Sjöstedt) ; C. *Trinervitermes dispar* (Sjöstedt) ; D. *Trinervitermes graciosus* (Sjöstedt) ; E. *Trinervitermes lutzi* (Emerson) ; F. *Trinervitermes rapulum* (Sjöstedt).

membranous with two small sclerotizations ; labrum dilated about the middle ; antennae, 15 segmented, II and IV subequal, slightly longer than III and V, which are also subequal, though more variation may occur.

Pronotum about one-sixth narrower than head across eyes, anterior margin slightly concave, sides rounded and converging to emarginate posterior.

Entire insect with short pale pubescence, apart from slightly darker hairs on intersegmental membrane of abdomen.

Wings densely covered with minute stellate papillae and short hairs,

Male, slightly smaller than female, otherwise identical.

	mm.
Head width across eyes . . .	1.27-1.36
Eye greatest diameter . . .	0.51-0.55
Ocellus	0.13-0.15 × 0.18-0.20
Ocellus to eye	0.01 or less-0.03
Width of pronotum	1.07-1.18
Length of pronotum	0.63-0.72
Length of hind tibia	1.50-1.64
Length of fore wing	10.9-11.7

Described from four females and two males.

MORPHOTYPE LOCALITY. TANGANYIKA TERRITORY, Pangani Falls, riverine forest, 13.xii.51 (*P. B. Kemp*).

Morphotypes in British Museum (Natural History)

SOLDIER. The discovery of further material has extended the known range of variation in size :

	mm.
Length of head capsule	1.61-2.05
Width of head capsule	0.88-1.29
Depth of head capsule	0.61-0.82
Width of pronotum	0.47-0.64
Length of pronotum	0.20-0.25
Length of hind tibia	0.91-1.28

This species is readily distinguished from *N. infuscatus* (Sjöst.) in the soldier caste by the longer nose, approximately equal in length to the rest of the head capsule, which is in addition more evenly rounded. The imago is more distinct, with very much larger eyes and ocelli, and a more inflated postclypeus than *N. infuscatus*. It is not likely to be confused with *N. chapini* Emerson since this species is found from Uganda westwards, whilst *N. kempae* occurs in eastern and southern Kenya and Tanganyika and in Nyasaland.

OTHER RECORDS. KENYA: Kwale, 1952 (*P. B. Kemp*), (*W. A. Sands*). TANGANYIKA: Ngomeni, 1950, Handeni, 1951-2, Luengera Valley, 1951, Daluni 1952 (*P. B. Kemp*). Morogoro, 1934, Songea, 1935, Turiani, 1936, Kisiru 1937 (*W. V. Harris*). ZANZIBAR: Josani Forest, Gendele Plantation, 1951 (*W. V. Harris*) Pemba Is., 1942 (*Packenham*). NYASALAND: Namwera Road 1953 (*W. A. Sands and W. Wilkinson*).

Though the distribution of *N. kempae* appears on a map to approximate closely to that of *N. infuscatus*, it seems to be capable of existing in rather drier conditions than the latter species.

Nasutitermes torquatus (Sjöstedt)

(Text-figs. 1, D; 3, D, E; 4, K, L)

Eutermes (*Eutermes*) *torquatus* Sjöstedt, 1924, *Rev. zool. afr.*, **12**: 494; Belgian Congo: Stanleyville.

Nasutitermes (*Nasutitermes*) *torquatus* (Sjöstedt); Emerson, 1928, *Bull. Amer. Mus. nat. Hist.*, **57**: 481.

IMAGO. Fontanelle more variable than was stated by Emerson ; in the male, from a short whitish streak, slightly bifurcate at anterior end, to almost obsolete, very slightly paler than the rest of the head ; in the female, from an elongated white slit to an indistinct pale patch.

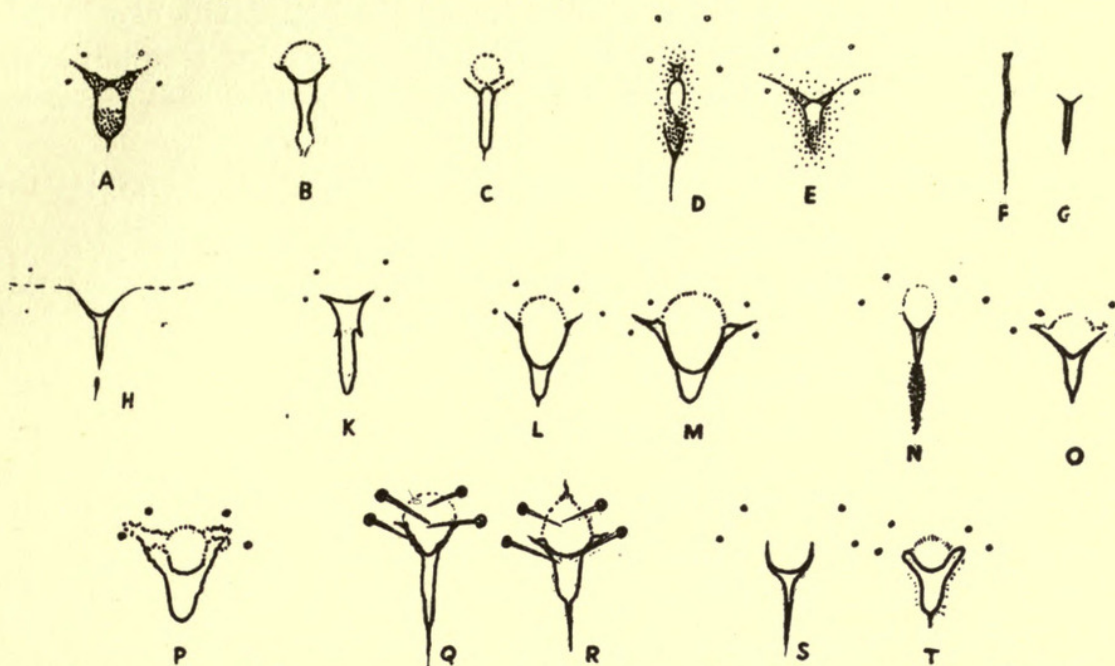


FIG. 3.—Fontanelles of Imagos. A. *Nasutitermes incurvus* (Sjöstedt) ; female ; B. *Nasutitermes infuscatus* (Sjöstedt), male ; C. *Nasutitermes kempae* Harris, male (female similar) ; D, E. *Nasutitermes torquatus* (Sjöstedt), male and female respectively ; F, G. *Coarctotermes coarctatus* (Sjöstedt), male and female ; H. *Coarctotermes tenebricus* (Silvestris), male ; K. *Grallatotermes africanus* Harris, male ; L, M. *Trinervitermes bettonianus* (Sjöstedt), male and female ; N, O. *Trinervitermes dispar* (Sjöstedt), male and female ; P. *Trinervitermes graciosus* (Sjöstedt), female ; Q, R. *Trinervitermes lutzii* Emerson, male and female ; S, T. *Trinervitermes rapulum* (Sjöstedt), male and female.

Range of variation in size considerably greater than was recorded by Emerson.

	mm.
Width of head across eyes	1.36–1.50
Eye, greatest diameter	0.44–0.48
Ocellus	0.13 × 0.16–0.20
Ocellus to eye	0.07–0.10
Width of pronotum	1.04–1.18
Length of pronotum	0.72–0.78
Length of hind tibia	1.72–1.80
Length of fore wing	12.5–14.7

SOLDIER. Range of variation in size much greater than previously known.

	mm.
Head length to tip of nose	1.39–1.89
Head width	0.78–1.11
Depth of head capsule	0.55–0.74
Width of pronotum	0.47–0.54
Length of pronotum	0.18–0.25
Length of hind tibia , , , ,	1.04–1.39

These specimens agree closely with some from the type locality (H. Kohl collection, No 77TZ.) determined by Emerson (1928) as *N. torquatus* (Sjöstedt), and with the descriptions of this species. They have not, however, been compared with Sjöstedt's type material. The imago of this species is readily distinguishable from other East African forms, but the soldier cannot be separated from that of *N. infuscatus* (Sjöstedt). The two species are unlikely to be confused, since *N. torquatus* inhabits the Uganda and Congo Forests, and *N. infuscatus*, Nyasaland and coastal East Africa.

UGANDA: Kigezi, 1947, Bwamba, 1949 (W. V. Harris); Kampala, 1955 (W. Wilkinson).

COARCTOTERMES Holmgren

Coarctotermes brunneus Noirot.

(Text-fig. 4, O, P)

Coarctotermes brunneus Noirot, 1955, *Publ. cult. Cia Diamant. Angola, Separata*, 27: 139-150.

SOLDIER. The following additions to the description of this species must be made: Head in profile only moderately swollen, behind shallow constriction; in plan view, back of head capsule frequently with a distinct median longitudinal groove. Mandibles with small to vestigial points only.

Pronotum slightly or not emarginate anteriorly.

	mm.
Head length to tip of nose	1.14-1.50
Head width	0.54-0.79
Depth of head capsule	0.40-0.52
Width of pronotum	0.32-0.42
Length of pronotum	0.15-0.18
Length of hind tibia	0.68-0.94

WORKER. Mandibles of the *C. tenebricus* form, that is, with the cutting edge between the first and "second" (morphologically third) marginal teeth deeply notched just distal to the "second" marginal.

This species, with its grooved soldier head, is apparently distinct in this respect from all other *Coarctotermes* species.

NORTHERN RHODESIA: Abercorn, 1947 (P. E. Glover).

Coarctotermes coarctatus (Sjöstedt)

(Text-figs. 1, E; 3, F, G; 4, M, N)

Eutermes coarctatus Sjöstedt, 1902, *Ent. Tidskr.*, 23: 304. Nyasaland: Zomba.

Coarctotermes coarctatus (Sjöstedt); Fuller, 1922, *S. Afr. J. nat. Hist.*, 3: 118-9.

IMAGO. Fontanelle present in all specimens examined, though very narrow in some, never absent as stated by Fuller; in males slit-like, in females shorter and broader, often distinctly bifurcate anteriorly.

The range of size variation may be extended.

	mm.
Width of head across eyes	1.18-1.27
Eye greatest diameter	0.33-0.37
Ocellus	0.09-0.10 × 0.12-0.14
Ocellus to eye	0.12-0.15
Width of pronotum	1.06-1.18
Length of pronotum	0.72-0.75
Length of hind tibia	1.43-1.63
Length of fore wing	10.0-11.2

The smaller size, dark colour, twelve segmented antennae (rarely 13), and deeply constricted head distinguish this from the other two East African species in the

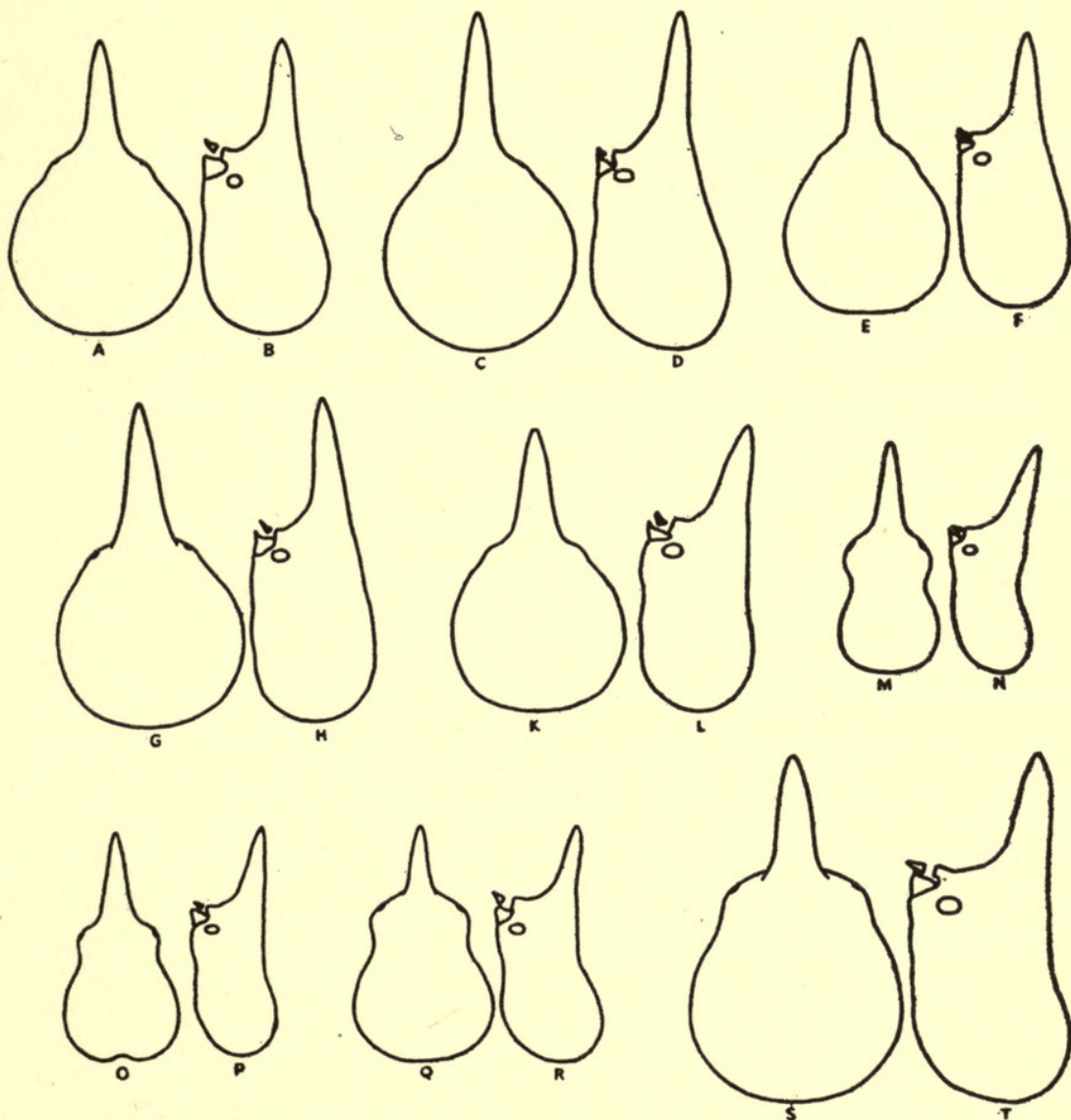


FIG. 4.—Plan and side views of heads of soldier caste. A, B. *Nasutitermes chapini* Emerson; C, D. *Nasutitermes incurvus* (Sjöstedt); E, F. *Nasutitermes infuscatus* (Sjöstedt); G, H. *Nasutitermes kempae* Harris; K, L. *Nasutitermes torquatus* (Sjöstedt); M, N. *Coarctotermes coarctatus* (Sjöstedt); O, P. *Coarctotermes brunneus* Noirot; Q, R. *Coarctotermes tenebricus* (Silvestri); S, T. *Grallatotermes africanus* Harris.

soldier caste. The Imago is generally darker than that of *C. tenebricus*, has larger ocelli and slightly longer wings (10–11 mm. as against 8–8.5 mm. in *C. tenebricus*).

TANGANYIKA: Mwakijembe, 1951, Mgera, Kijungu, 1952 (*P. B. Kemp*); Morogoro, 1934, Handeni, 1936, Iringa, 1937 (*W. V. Harris*); Kongwa, 1952 (*H. C. Periera*). NYASALAND: Zomba, 1954 (*Topotypes*) (*E. L. Drake*); Ekwendeni 1953 (*W. A. Sands and W. Wilkinson*).

***Coarctotermes tenebricus* (Silvestri)**

(Text-figs. 1, F; 3, H; 4, Q, R)

Eutermes tenebricus Silvestri, 1914, *Boll. Lab. zool. Portici*, 9: 44; French Guinea: Kakoulima.

Recorded from Delami, Anglo-Egyptian Sudan, but not yet from Uganda, this appears to be an inhabitant of the Guinean zone. and as such probably occurs in Northern Uganda. It is included in the key to enable its identification if collected in East Africa.

GRALLATOTERMES Holmgren

***Grallatotermes africanus* Harris**

(Text-figs. 2 A; 3 K; 4, S, T)

Grallatotermes africanus Harris, 1954, *Proc. R. ent. Soc. Lond.*, 23: 135–7, Tanganyika: Ngomeni, Tanga.

This species is found only in dense woodland near the coast of Kenya and Tanganyika.

TRINERVITERMES Holmgren

***Trinervitermes auriterrae* Sjöstedt**

(Text-fig. 6, A, B)

Trinervitermes auriterrae Sjöstedt, 1926, *Ark. Zool.*, 18: 3; Gold Coast: Keta.

SOLDIER. Fontanelle very large, 0.07–0.09 mm. in diameter. Range of measurements of major soldier greater than was indicated by Sjöstedt.

	mm.
Head length to tip of nose . . .	2.18–2.50
Width of head capsule . . .	1.29–1.54
Depth of head capsule . . .	0.97–1.07
Width of pronotum . . .	0.61–0.68
Length of pronotum . . .	0.25–0.29
Length of hind tibia . . .	1.32–1.54

This species is easily recognized by the fontanelle which is almost twice as large as that of any other species in East Africa.

UGANDA: Mbale, 1937, and Serere, 1948 (*W. V. Harris*).

This is another inhabitant of the Guinean Zone, and is found from Uganda across to the west coast of Africa,

Trinervitermes bettonianus (Sjöstedt)

(Text-figs. 2, B ; 3, L, M ; 5, A-E)

Eutermes bettonianus Sjöstedt, 1905, *Ark. Zool.*, **2** : 19 ; Kenya : Athi River.*Eutermes bettonianus* Sjöstedt ; Sjöstedt, 1907, *Ent. Tidskr.*, **28** : 246.*Eutermes segelli* Sjöstedt, 1910, *Wiss. Ergeb. Schwed. Zool. Expdn. Kilimandjaro, Meru*, 1905-1906, **3** : 26 ; Tanganyika : Boma ngombe, Kilimandjaro.*Trinervitermes segelli* (Sjöstedt) ; Sjöstedt, 1926, *K. svenska Vetensk. Akad. : Handl.*, **3** : 326.*Trinervitermes bettonianus* (Sjöstedt) ; Sjöstedt, 1926, *ibid.*, **3** : 332.*Trinervitermes segelli* (Sjöstedt) ; Harris, 1936, *Bull. ent. Res.*, **27** : 368.*Trinervitermes segelli* (Sjöstedt) ; Kemp, 1955, *ibid.*, **46** : 133.

This termite is redescribed from the larger amount of material now available.

IMAGO. Male, head dark, reddish to sepia brown. Area surrounding eye, ocellus, and base of antenna, three indistinct streaks diverging forwards on vertex, and postclypeus, paler, yellow-brown. Antennae and basal part of labrum, yellow-brown, apical third of labrum, hyaline. Thoracic sclerites and legs yellow-brown. Abdominal tergites darker brown, sternites yellow-brown, clouded with darker brown round the stigmata. Wings opaque, pale brown.

Head rather wider across eyes than length to front of postclypeus ; frontal area slightly depressed with V or inverted A-shaped fontanelle ; eyes large, prominent, broad oval ; ocelli large, oval to broad oval, very close to but not touching eyes ; postclypeus short and broad, inflated, anterior margin straight, posterior margin convex ; anteclypeus largely membranous, with two small reniform or semi-circular sclerotizations ; labrum dilated about middle ; antenna with 15 segments, proportions of basal segments variable, both III and IV may be partially divided into two in largest specimens.

Head, antennae, postclypeus, and labrum with numerous scattered pale hairs.

Pronotum from one eighth narrower to slightly wider than head across eyes, anterior margin slightly concave, sides broadly rounded and tapering to the distinctly emarginate posterior.

Thorax and abdomen with scattered pale hairs, intersegmental membrane of abdomen with more uniform reddish pubescence, wings densely covered with minute stellate papillae and numerous short hairs. Veins dusky at base, paler, sometimes indistinct distally.

Female generally as the male, but sometimes slightly larger, with slightly longer wings and slightly short hind tibia.

	mm.
Head width across eyes	1.55-1.82
Greatest diameter of eye	0.47-0.59
Ocellus	0.20-0.24 × 0.22-0.31
Ocellus to eye	0.03-0.06
Width of pronotum	1.39-1.85
Length of pronotum	0.88-1.22
Length of hind tibia	1.98-2.43
Length of fore wing	14.2-22.3

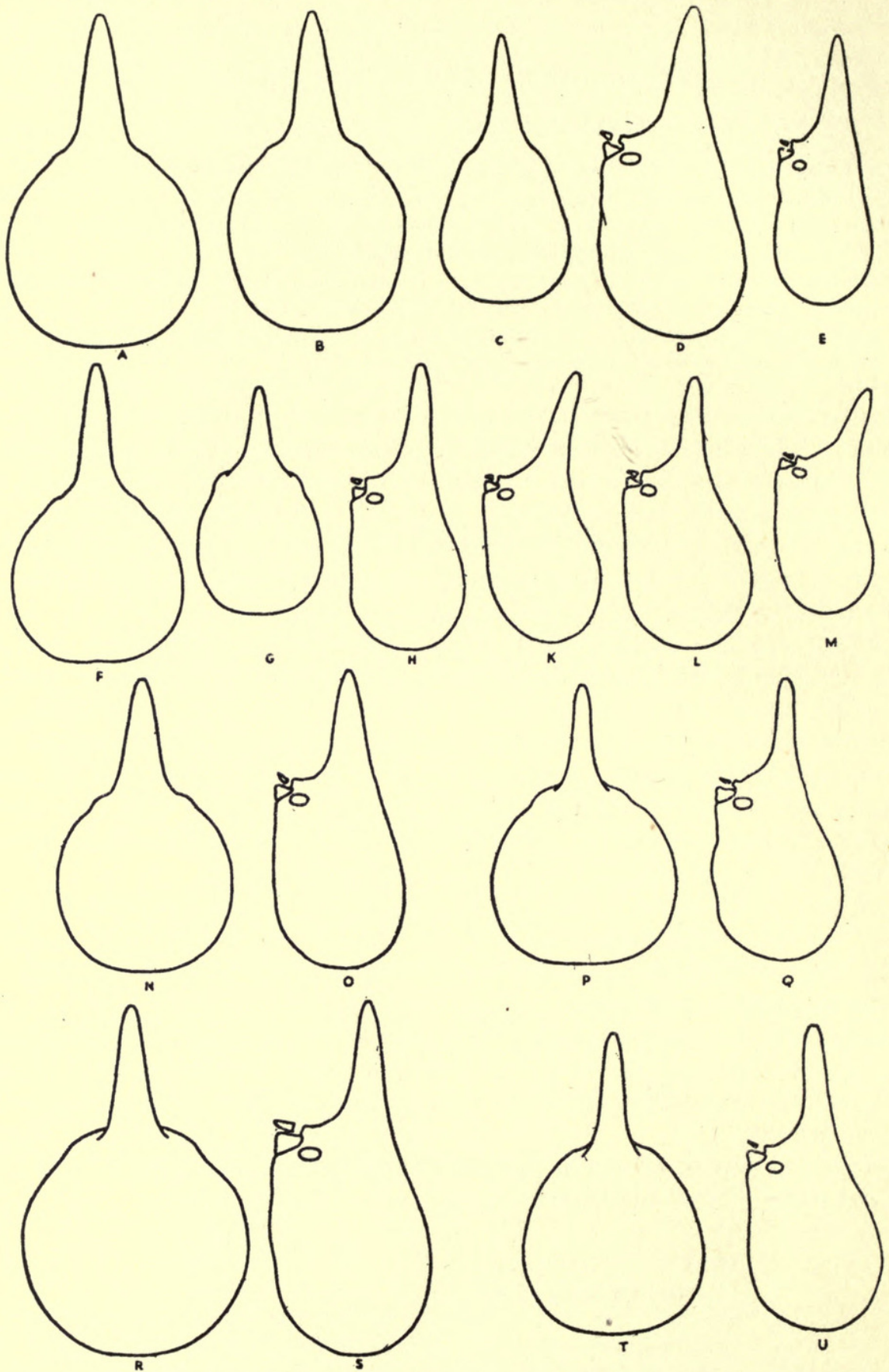


FIG. 5.—Pland and side views of heads of soldier caste. A-E. *Trinervitermes bettonianus* (Sjöstedt); F-M. *Trinervitermes dispar* (Sjöstedt); N, O. *Trinervitermes crassinasus* (Sjöstedt); P, Q. *Trinervitermes rapulum* (Sjöstedt); R, S. *Trinervitermes gratiosus* (Sjöstedt); T, U. *Trinervitermes lutzi* (Emerson).

Described from topotypes and from numerous specimens from other parts of East Africa.

SOLDIER. Major soldier, head colour varies from orange yellow to chestnut brown, commonly ferruginous; nose usually slightly darker than the head capsule; antennae, pronotum, and legs, pale yellow, sometimes slightly darker; abdominal sclerites sepia brown.

Head in plan view variable, in some specimens oval, tapered anteriorly, in others more regular oval; some more angular, tapering either towards the front or the rear, some almost circular; nose tapering uniformly from base to apex. Head profile flat to distinctly concave, angle between nose and rest of head varying by 20 degrees. Length of nose (measured to hind margin of antennal pit) from more than a fifth less up to equal to rest of head.

Antennae, 12-13 segmented, relative proportions of basal segments variable. Pronotum saddle-shaped, anterior margin entire or more or less emarginate.

Minor soldier, coloration much as major soldier, often with more contrast between head and nose colour.

Antennae, 12 segmented; pronotum saddle-shaped, anterior margin entire, evenly rounded.

	Major soldier mm.	Minor soldier mm.
Head length to tip of nose	1.93-2.49	1.33-1.82
Width of head	0.97-1.43	0.57-0.93
Depth of head	0.72-1.07	0.43-0.70
Width of pronotum	0.54-0.72	0.40-0.54
Length of pronotum	0.22-0.32	0.18-0.25
Length of hind tibia	1.11-1.57	0.95-1.40

Topotype alates of *T. bettonianus* from Ruiru on the Athi River, Kenya, and numerous other specimens from all parts of East Africa were compared with the type specimen in the British Museum (Natural History), and found to be of this species. They were in all cases associated with soldiers agreeing closely with *T. segelli* (Sjöstedt), which is therefore reduced to a synonym of *T. bettonianus*. There thus arises some doubt concerning the identity of Sjöstedt's "Cotype" specimens from Mukimbungu, and hence any specimens identified from them (e.g. *Trinervitermes bettonianus* (Sjöstedt), Emerson, 1928, *Bull. Amer. Mus. Nat. Hist.*, 57: 492). These appear from the description to be nearer to *T. gratiosus* (Sjöstedt), though slightly smaller than is usual in this species.

The species most likely to be confused with *T. bettonianus* when both soldiers and alates are present is *T. gratiosus*, but the soldiers of this species, though otherwise somewhat similar, have a much less conical nose, and in the majority of cases, 14 segmented antennae,

The largest imagos of *T. bettonianus* approach the size of *T. gratiosus* but have the forehead more depressed, the head capsule more hairy, than the latter species. Other differences are given in the keys attached to this account.

A representative selection of records is given, since the collections of this species are too large to give the complete list.

KENYA: Ruiru, 1950 (*W. V. Harris*); Kwale, 1952 (*P. B. Kemp*); West Suk, 1952; Meru, Marsabit, 1953 (*W. A. Sands*). UGANDA: Moroto, 1952 (*W. A. Sands*). TANGANYIKA: Bomangombe (topotypes of *T. segelli*) 1950, Morogoro, 1934, Kigoma, 1934, Dodoma, 1940 (*W. V. Harris*); Tanga, 1951, Handeni, 1952, Kakoma, Shinyanga, 1948 (*P. B. Kemp*); nr. Ngare Nairobi, 1954 (*R. M. C. Williams*). ZANZIBAR: Kizumbani, 1951 (*P. B. Kemp*); Bawi Is., 1951 (*W. V. Harris*). NYASALAND: Mlanje, Monkey Bay, Nkata Bay, Nchenanchena, Chisenga, 1953 (*W. A. Sands and W. Wilkinson*). NORTHERN RHODESIA: Lusaka, 1947 (*W. V. Harris*). BELGIAN CONGO: Lukinda (*H. Bredo*).

Though widely distributed in East Africa, this species is absent from the *Brachystegia-Isoberlinia* woodland which stretches over large areas of Tanganyika, Nyasaland, and Northern Rhodesia. It appears to be more tolerant of altitude than many species, being found up to 6,000 ft. near Nairobi, Kenya, and is the only true "East African" species as yet recorded from North-Eastern Uganda. On Mt. Marsabit in the semi-desert of northern Kenya, it is found in the grassland just below the forest zone, but it has not been recorded from the surrounding dry country. In Nyasaland it is almost entirely confined to the Rift Valley, along the shore of Lake Nyassa and down the Shire Valley.

The mound building habits of *T. bettonianus* are of particular interest, being in marked contrast to those of the almost equally widely distributed *T. dispar* (Sjöstedt). Of 49 records, 36 colonies had independent small mounds, 3 had no visible structures above ground level, and 10 were associated more or less intimately with the much larger mounds of Macrotermitinae, either *Macrotermes* or *Pseudacanthotermes*.

Trinervitermes carbonarius Sjöstedt

(Text-fig. 6, C, D)

Trinervitermes carbonarius Sjöstedt, 1926, *Rev. zool. africaine*, **12**: 158; Belgian Congo: Haut Uélé.

Nasutitermes (*Trinervitermes*) *carbonarius* (Sjöstedt); Emerson, 1928, *Bull. Amer. Mus. nat. Hist.* **57**: 448-9.

SOLDIER. Major soldier, specimens agree well with Types, except that antennae often have 13 segments instead of 14, and measurements are somewhat more variable.

Minor soldier, range of measurements has also increased.

	Major soldier mm.	Minor Soldier mm.
Head length to tip of nose	2.43-2.64	1.79-1.96
Width of head	1.36-1.66	0.78-0.93
Depth of head	1.00-1.14	0.61-0.64
Width of pronotum	0.64-0.75	0.47-0.54
Length of pronotum	0.29-0.32	0.22-0.29
Length of hind tibia	1.60-1.80	1.39-1.68

UGANDA: Soroti, 1952 (*W. A. Sands*); Serere, 1948, and Ngotokwe, Lango, 1942 (*W. V. Harris*); Kampala, 1955 (*R. M. C. Williams*).

All these records are from lake shore or riverine situations, at least one nest being within a few yards of the water's edge. The nest itself is a fairly large hard mound, up to 4 feet high having been recorded.

This species is another of those which extend across to the west coast of Africa, but it appears to be associated with moister conditions than the Northern Guinean Savannah Zone.

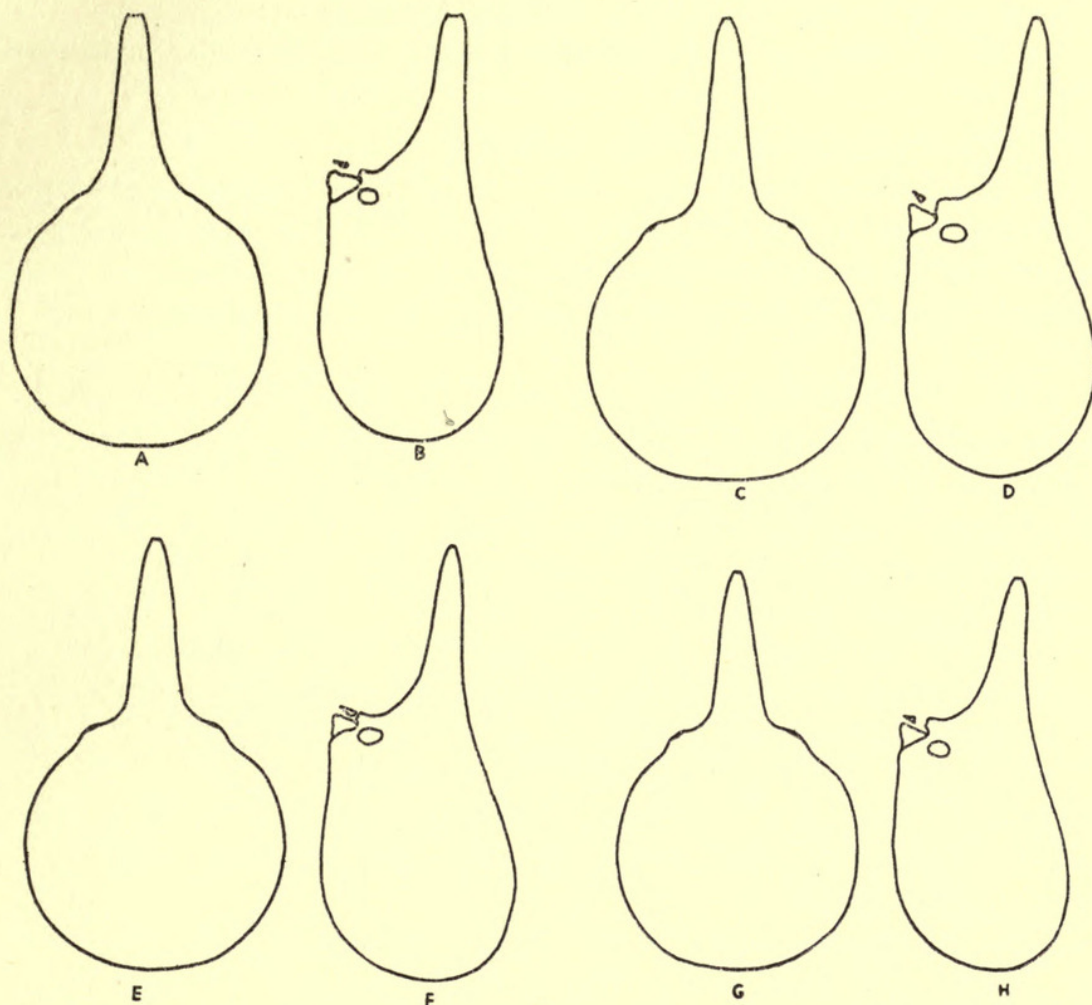


FIG. 6.—Plan and side views of heads of soldier caste. A, B. *Trinervitermes auriterrae* Sjöstedt; C, D. *Trinervitermes carbonarius* Sjöstedt; E, F. *Trinervitermes ebenerianus* Sjöstedt; G, H. *Trinervitermes oecconomus* (Trägårdh).

Trinervitermes crassinasus (Sjöstedt)

(Text-fig. 5, N, O)

Eutermes crassinasus Sjöstedt, 1914, *Ark. Zool.*, 8: 6–7, Zambezi: Villa Fontes.

SOLDIER. Closely resembles *T. bettonianus* in appearance, but head more rounded in plan view, and antennae more consistently with 13 segments.

NYASALAND: Lower Shire Valley, near Ngabu on the Chiromo Road, 1953 (W. A. Sands and W. Wilkinson).

This locality is quite close to that given by Sjöstedt, and since the species is not known elsewhere, it may be confined to the region of the Zambezi valley and its tributaries.

Trinervitermes dispar (Sjöstedt)

(Text-figs. 2, C ; 3, N, O ; 5, F-M)

Eutermes dispar Sjöstedt, 1902, *Ent. Tidskr.* **23** : 303, Nyasaland : Zomba.

Eutermes gemellus Sjöstedt, 1910, *Wiss. Ergeb. Schwed. Zool. Expdn. Kilimandjaro, Meru*, 1905-1906, **3** : 26.

IMAGO. Described here, previously unknown.

FEMALE: head colour varies from pale red-brown to sepia. Area surrounding eye, ocellus, and base of antenna, sometimes part of vertex, and postclypeus, paler, yellow-brown. Labrum, antennae, pronotum, and legs, yellow-brown; abdominal sclerites mainly yellow-brown, darker towards lateral margins; wings opaque, pale brown.

Head rather wider across eyes than length to front of post-clypeus; frontal area slightly depressed, with slit-like Y-shaped fontanelle; eyes large, prominent, almost circular; ocelli large, broad oval, close to but not touching eyes; post-clypeus short and broad, inflated, anterior margin slightly concave, posterior margin convex; anteclypeus yellowish-white; labrum dilated, distal third white; antenna with 15 segments, proportions of II, III, IV, and V variable. Pronotum rather narrower than the head across the eyes, anterior margin slightly concave, sides broadly rounded and converging to the distinctly emarginate posterior; entire insect with numerous scattered pale hairs, apart from intersegmental membrane of abdomen, which bears more uniform reddish pubescence.

Wings densely covered with minute stellate papillae and numerous short hairs. Subcosta and radius-sector dark brown at base, becoming paler distally; median and cubitus dusky brown.

Male: Ocelli sometimes slightly smaller than the female, wings slightly shorter, fontanelle slightly narrower, often with a dusky patch at the dorsal tip.

	mm.
Width of head across eyes . . .	1.40-1.49
Eye, greatest diameter . . .	0.44-0.49
Ocellus	0.16-0.19 × 0.19-0.23
Ocellus to eye	0.03-0.04
Width of pronotum	1.28-1.42
Length of pronotum	0.84-0.92
Length of hind tibia	1.65-1.89
Length of fore wing	14.3-17.8

Described from eleven females and seven males from low mounds from Zomba, and numerous other specimens from various localities in Tanganyika.

MORPHOTYPE LOCALITY. NYASALAND, Zomba, the Golf course, 14.xii.54 (E. L. Drake). Morphotypes in British Museum (Natural History).

SOLDIER. The soldier of this species is much more variable than was recorded by Sjöstedt.

Major soldier, head yellow to yellow-brown, nose from same colour as head to almost black, with paler tip. Nose may be tapering, parallel sided, even slightly dilated at the tip, and from slightly longer to one fifth or more shorter than rest of head capsule, measured to hind margin of antennal pit. Nose in profile slopes away from head forming angle varying from 140 to 165 degrees. Antennae, with 12-14 segments, commonly 13, proportion of basal segments varying with size of specimen. Minor soldier, coloration as major soldier, but nose nearly always darker. Antennae with 12 segments, proportion of basal segments variable.

	Major soldier mm.	Minor soldier mm.
Head length to tip of nose	1.71-2.23	1.18-1.61
Width of head	0.93-1.36	0.43-0.64
Depth of head	0.68-0.99	0.36-0.50
Width of pronotum	0.54-0.68	0.38-0.47
Length of pronotum	0.18-0.25	0.13-0.20
Length of hind tibia	1.04-1.39	0.82-1.18

After examination and comparison of many specimens from all parts of East Africa including Nyasaland, the specimens from Ngare Nanyuki, Tanganyika, collected and determined by Sjöstedt (1907) as *Trinervitermes gemellus* (Sjöstedt) are included in *T. dispar* (Sjöstedt). Soldiers and Alates from that area of Tanganyika are indistinguishable from the types and morphotypes from Zomba, Nyasaland, as are others from other parts of Tanganyika.

The type specimens (soldiers only) of *T. gemellus* (Sjöst.) from South Africa have also been examined, and these are similarly indistinguishable from *T. dispar* (Sjöst.) but in the absence of alates in the *T. gemellus* (Sjöst.) type collection, the two species cannot be amalgamated at present. It seems likely that if *T. gemellus* (Sjöst.) exists as a separate species, it is confined to southern Africa.

Snyder (1949, *Smithson. misc. Coll.* 112: 1-490) refers the description of the imago of *T. dispar* (Sjöst.) to Fuller (1922), but this is incorrect. Fuller states that the imago is unknown, since the description of it by Holmgren (1914) should be referred to *T. zuluensis* (Holmgren).

The range of variation in the soldier caste of *T. dispar* (Sjöst.) is such that it overlaps with *T. rapulum* (Sjöst.) in some cases, and with *T. lutzi* Emerson in others. The alates are more readily separated, *T. lutzi* Emerson being distinguished from the other two species by its larger size, ampler wings, somewhat angular postclypeus, and fontanelle with four spines. *T. dispar* (Sjöst.) differs from *T. rapulum* (Sjöst.) in the nearly circular eyes, the narrower fontanelle, and the consistently 15-segmented antennae.

OTHER RECORDS. A representative selection of localities is given, since the complete list is too long to be included.

KENYA: Kinango (near Mombasa) 1952 (P. B. Kemp): Mtito Andei, 1954 (R. M. C. Williams).

TANGANYIKA: Tanga, 1950, Kihurio, Mkomasi Valley, 1952, Niamansi River, Kakoma, Shinyanga, 1948 (P. B. Kemp); Kigoma, 1934, Lindi, 1938 (W. V

Harris) ; Sanya Plain (nr. Arusha) 1954 (R. M. C. Williams) NYASALAND : Limbe, Benga, Ekwendeni, Chisenga, 1953 (W. A. Sands and W. Wilkinson). PORTUGUESE EAST AFRICA : Vila Coutina, 1953 (W. A. Sands and W. Wilkinson). NORTHERN RHODESIA : Tunduma, 1953 (W. A. Sands and W. Wilkinson).

Though found over a wide area, this species appears to be largely confined to *Brachystegia-Isobertinia* woodland. At the northern end of its range however, *T. dispar* is found up to 150 miles beyond the present limit of this vegetation type. Its nesting habits are widely different from those of *T. bettonianus* (Sjöstedt). Of 30 records, four had small ill-defined independent mounds, eight had no structure above ground level, and 18 colonies occupied parts of the mounds of *Cubitermes* spp. Thus it appears that this species rarely builds a mound itself. If no *Cubitermes* mound is available, the nest usually remains entirely subterranean.

Trinervitermes ebenerianus Sjöstedt

(Text-fig. 6, E, F)

Trinervitermes ebenerianus Sjöstedt, 1926, *Denkschr. Akad. Wiss. Wein*, **100** : 73, 76 ; Sudan : Tanguru.

UGANDA : Karamoja District, 40 miles from Moroto on Soroti road, 1952 (W. A. Sands) ; West Nile District, 3 miles from Moyo on Arua road, 1955 (W. Wilkinson).

This appears to be another inhabitant of the Guinean zone. though more records are required to confirm its distribution.

Trinervitermes gratiosus (Sjöstedt)

(Text-figs. 2, D ; 3, P ; 5, R, S)

Eutermes (*Trinervitermes*) *gratiosus* Sjöstedt, 1924, *Rev. zool. afr.* **12** : 42, Belgian Congo : Luluabourg.

Trinervitermes gratiosus (Sjöstedt) ; Harris, 1936, *Bull. ent. Res.* **27** : 368.

Trinervitermes bettonianus (Sjöstedt) ; Harris, 1936, *ibid.*, **27** : 368.

Trinervitermes bettonianus (Sjöstedt) ; Kemp, 1955, *ibid.*, **46** : 134.

IMAGO. Specimens agree with types.

SOLDIER. Both Major and Minor soldiers are more variable in size and colour than was recorded by Sjöstedt. Darker specimens are deep chestnut brown, the nose almost black.

	Major soldier mm.	Minor soldier mm.
Head length to tip of nose	2.11-2.93	1.61-1.94
Head capsule width	1.18-1.81	0.75-1.06
Depth of head capsule	0.86-1.25	0.57-0.82
Width of pronotum	0.61-0.84	0.47-0.61
Length of pronotum	0.29-0.43	0.22-0.25
Length of hind tibia , , , ,	1.54-1.96	1.22-1.68

The measurements given disregard any possible distinction between "A" and "B" forms, since it was found that all the intermediates between these apparent groupings are usually present in sufficiently large collections, and to separate them is not practicable in this species.

KENYA: Mtito Andei, 1950 (*W. V. Harris*). TANGANYIKA: Uvinza, 1934, Ukerewe, 1938, Mbeya, 1939 (*W. V. Harris*). Babati, 1950, Handeni, Morogoro, Mwakijembe, 1951, Mwanza, 1948 (*P. B. Kemp*). UGANDA: Lake George, 1937, Mbarara, Edward-George Flats, 1949 (*W. V. Harris*). RUANDA URUNDI: Ruindi, 1948, Gabiro, 1952 (*W. V. Harris*).

T. graciosus appears to be able to tolerate drier conditions than the majority of species, and constructs a fairly large domed mound, up to 2 feet in height. There is one record of this species occupying part of a mound of *Pseudacanthotermes*.

Trinervitermes lutzi (Emerson)

(Text-figs. 2, E; 3, Q, R; 5, T, U)

Nasutitermes (*Trinervitermes*) *lutzi* Emerson, 1928, *Bull. Amer. Mus. nat. Hist.* 57: 494; Belgian Congo: Niangara.

IMAGO. Hitherto undescribed.

Male, head yellow-brown, clouded with slightly darker brown on frons; area surrounding eye, antennal base, and ventral half of ocellus, yellow. Antennae, legs, and rest of body sclerites yellow apart from abdominal tergites, which are yellow-brown, slightly darker round stigmata. Wings opaque, pale brown, venation more strongly pigmented, yellow-brown, near base.

Head wider across eyes than length to front of postclypeus; frontal area slightly depressed, with long, slender Y-shaped fontanelle, ventral arms of which partly enclosed by 3 or 4 large inwardly directed spines or bristles, shorter but stouter than other head setae; eyes large, very prominent, very broad oval; ocelli large, very broad oval, close to but not touching eyes; postclypeus short and broad, anterior margin slightly concave, posterior margin convex, arched, slightly angular, not semicircular; anteclypeus largely membranous; labrum dilated about middle; antennae 15 segmented; head and antennae with scattered pale hairs.

Pronotum about one-eighth narrower than head across eyes, rounded sides converging to very slightly emarginate posterior. Thorax and abdomen with inconspicuous pale pubescence. Wings covered with minute stellate papillae.

Female: closely resembles male. Fontanelle slightly shorter and broader, wings shorter, hind tibia slightly shorter.

	mm.
Width of head across eyes . . .	1.65-1.69
Eye, greatest diameter . . .	0.53-0.56
Ocellus	0.18-0.20 × 0.21-0.23
Ocellus to eye	0.03-0.05
Width of pronotum	1.42-1.48
Length of pronotum	0.91-0.97
Length of hind tibia	1.93-2.18
Length of fore wing	18.0-20.0

Described from six males and three females (one of these a queen) from stony hillsides in dry *Brachystegia* woodland.

MORPHOTYPE LOCALITY: NORTHERN RHODESIA, Nzizye, Abercorn, xii.48, (*P. Glover*). Morphotypes in British Museum (Natural History).

SOLDIER. Major soldiers slightly smaller than types, increasing the range of measurements.

	mm.
Head length to tip of nose . . .	1.98-2.28
Width of head	1.14-1.38
Depth of head	0.82-1.00
Width of pronotum	0.56-0.67
Length of pronotum	0.25-0.19
Length of hind tibia	1.16-1.36

Though in some cases the soldiers of *T. lutzi* may be confused with those of *T. dispar* or *T. rapulum*, the imago is distinct from any other species of *Trinervitermes* in East Africa, in having robust spine-like bristles guarding the fontanelle. Some species have small setae in a similar position but these are no larger than the other head setae.

OTHER RECORDS. NORTHERN RHODESIA: Gankonde, Mkoma, Abercorn, 1949 (*P. Glover*). UGANDA: Luentobo, Ankole, 1947 (*W. V. Harris*).

Emerson's type locality is Niangara, on the Uélé River, in the Northern Congo. *T. lutzi* may therefore be distributed round the fringe of the Congo Forest, crossing the ecological barrier which apparently exists for some species near the Equator in Uganda.

Trinervitermes oeconomus (Trägårdh)

(Text-fig. 6, G, H)

Eutermes oeconomus Trägårdh, 1904, *Results Swed. Zool. Exp. Egypt and White Nile*, 1900-1, 12: 23; Sundan: Kaka.

Trinervitermes oeconomus (Trägårdh); Sjöstedt, 1926, *K. svenska Vetensk. Akad. Handl.*, 3: 349.

UGANDA: Mbale, 1937, Butiaba, 1946 and 1950 (*W. V. Harris*); Toror Hills, Karamoja district, Soroti, 1952 (*W. A. Sands*).

This species is the last of those known to occur in the Guinean zone, and extending across the continent to West Africa. It constructs low domed mounds.

Trinervitermes rapulum (Sjöstedt)

(Text-figs. 2, F; 3, S, T; 5, P, Q)

Eutermes rapulum Sjöstedt, 1904, *Nachtr. K. svenska Vetensk. Akad. Handl.*, 38: 99, Tanganyika: Usambara, Tanga.

IMAGO. Described here, previously unknown. Female, head mainly yellow-brown, area surrounding eye, ocellus, and base of antenna, and an area of vertex, pale yellow. Colour varies little in the specimens examined, the darkest being

ferruginous brown. Antennae, basal part of labrum, thoracic sclerites, and legs, pale yellow. Anteclypeus and apical part of labrum, white. Abdominal sternites pale yellow, sometimes slightly darker round stigmata, tergites clouded with yellow-brown round stigmata. Wings opaque, almost colourless, subcosta, radius and cubitus yellow-brown at base, paler distally.

Head wider across the eyes than length to front of postclypeus; frontal area slightly depressed, with short, rather broadly Y-shaped fontanelle (longer, narrower, U-shaped in male); eyes large, prominent, broad oval or very slightly reniform; ocelli large, oval, close to but not touching eyes; postclypeus short and broad, inflated, anterior margin very slightly concave, posterior margin convex; anteclypeus largely membranous; labrum dilated about middle; antennae 15-16 segmented, intermediate stages represented, proportions of segments variable; head, antennae, postclypeus and labrum with scattered pale hairs.

Pronotum generally about one-eighth narrower than head across eyes, anterior margin slightly concave, sides tapering to emarginate posterior, somewhat straighter than most species, or even slightly sinuate. Scattered pale hairs.

Abdomen with numerous scattered yellowish hairs, longer and straighter on sclerites, shorter and more curved on intersegmental membrane.

Wings densely covered with stellate papillae and short hairs.

Male, as female except for slight difference in fontanelle, slightly smaller eyes and ocellae, longer hind tibia.

	mm.
Width of head across eyes . . .	1.47-1.67
Eye, greatest diameter . . .	0.47-0.56
Ocellus	0.15-0.22 × 0.20-0.26
Ocellus to eye	0.03-0.04
Width of pronotum	1.33-1.57
Length of pronotum	0.89-1.00
Length of hind tibia	1.85-2.20
Length of fore wing	14.3-16.9

Described from seven females and eight males collected whilst flying.

MORPHOTYPE LOCALITY: TANGANYIKA, Morogoro, iii.35. (W. V. Harris).
Morphotypes in British Museum (Natural History).

SOLDIERS. Agree well with original description, except for an increase in known range of variation. Nose forms an angle with rest of head capsule varying by about 15 degrees. Antennae of major soldier, about equally divided between 13 and 14 segmented, rarely 12. Minor soldier, antennae 12-13 segmented.

	Major soldier mm.	Minor soldier mm.
Head length to tip of nose . . .	1.85-2.28	1.43-1.62
Width of head	1.07-1.50	0.57-0.64
Depth of head	0.75-1.07	0.45-0.54
Width of pronotum	0.54-0.64	0.40-0.43
Length of pronotum	0.22-0.29	0.18-0.22
Length of hind tibia	1.07-1.39	1.04-1.22

This species appears to be less variable than most of those studied. The main differences between this species and the two others most resembling it, *T. dispar* and *T. lutzii*, have already been given in the section on the former.

OTHER RECORDS. TANGANYIKA: Amani, 1950, Morogoro, Mwakijembe, Handeni, 1951, Daluni, 1952 (*P. B. Kemp*); Morogoro, 1937 and 1941 (*W. V. Harris*). ISLANDS: Mafia Is., 1937, Zanzibar, 1951 (*W. V. Harris*). NYASALAND: Zomba, Domasi (Namwera road) 1953 (*W. A. Sands and W. Wilkinson*).

The records from Nyasaland suggest that this species may be more widely distributed in the South, and that N. E. Tanganyika is near the limit of its range. If this is the case, the record of *T. rapulum* from Ethiopia (Rothschild, Katchinoa) probably refers to a similar but separate species.

The independent mounds of this species are small domed structures, but of nine records of nests, five were in dead stumps or logs, a habit unusual in the East African *Trinervitermes*.

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SUMMARY

Examination of material collected by the members of the Colonial Termite Research Unit has led to the conclusion that the subfamily Nasutitermitinae is represented by a comparatively small number of species in East Africa. The revised list comprises a total of 18 species, of which 9 are new to East Africa. In four species the imago is described for the first time. One species is completely re-described, three are removed from the East African list, and two are reduced to synonyms, the reasons for this adjustment being stated.

The wide range of variation encountered in many species is described and discussed. Keys are provided to the soldiers, and to those alates known.

The distribution of the group is of interest, since the true "East African" fauna is separated from the inhabitants of the Guinean Zone, which includes most of Uganda North of the Equator.





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