

A REVISION OF THE TERMITE SUBFAMILY
NASUTITERMITINAE (ISOPTERA, TERMITIDAE)
FROM THE ETHIOPIAN REGION



BY

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SYNOPSIS

The subfamily Nasutitermitinae is revised for the Ethiopian Zoogeographical Region. 47 species are recognized, of which 7 are new, in 14 genera, of which 4 are new. 77 names are found to be synonymous, of which 62 are newly established synonyms. 4 species are removed from the subfamily. The phylogeny of the subfamily is discussed, and keys are given to genera and species. The distribution of species and genera is related to the vegetation types. Notes are provided on the biology of the species.

INTRODUCTION

THIS paper provides a revision of the termite subfamily Nasutitermitinae Hare (1937) (Isoptera, Termitidae) as it occurs in the Ethiopian Zoogeographical Region. The subfamily is characterized by the adaptation of the head capsule of the soldier caste to a chemical defence mechanism: the frons and vertex are produced into a tubular or conical nose terminating in the opening of the frontal gland, which secretes a sticky fluid. In all of the genera included in this paper the soldier mandibles are reduced to vestiges. The more primitive genera with mandibulate soldiers do not occur in Africa, being confined to the Neotropical Region.

The Ethiopian Zoogeographical Region is taken to consist of the continent of Africa, south of the Sahara Desert, and those adjacent parts of the Arabian peninsula in which the climate permits the survival of African species. There are no unquestionable records of the subfamily from Palaearctic Africa; the Malagasy fauna is separate and distinct and is therefore excluded from this revision.

More material is available for study from the African continent than from any other, enabling a more detailed assessment of variation to be made than is possible for any other part of the world. All the species included are endemic to the Ethiopian Region, as are all but 3 of the genera. Of the latter, *Grallatotermes* has only one African species; *Trinervitermes* is primarily African with only 6 little-known species in the Indo-malayan Region; *Nasutitermes* is the only tropicopolitan genus. Monographic treatment of *Nasutitermes* must needs be unbalanced owing to disparities between collections from different regions: for example, a recent revision by Prashad and Sen-Sarma (1959) of 18 species of *Nasutitermes* in the Indian Region refers to only 39 nest series. For these reasons, this revision of a faunal section of the subfamily has been undertaken rather than separate monographs of component genera.

The first African nasute species to be described was *Termes arborum* Smeathman (1781), followed by *T. trinervius* Rambur (1842). Sjöstedt (1900–1904) provided the first revisions and keys and recognized 18 species of African nasutes, all placed in the genus *Eutermes*. By the time Sjöstedt (1926) produced his second revision of the African termites, the numbers had increased to 88 species and 2 subspecies in 5 genera. Emerson (1928) listed 90 species in 7 genera, and Snyder (1949) catalogued 92 species and 4 subspecies in 6 genera. Subsequent modifications and additions have brought this up to 102 species in 11 genera.

In addition to these, species previously synonymized by other authors have been re-determined, with the result that a total of 120 previously described species and subspecies are involved in this revision. In all but 5 of these, the holotype, lectotype, syntypes, paratypes or paralectotypes from the type colony have been examined. Where the type series consists of alate imagoes collected at light, as much as possible of the original material has been studied to eliminate the risk of confusion resulting from a mixture of species. Of the 5 species in which types have not been seen, one, *Nasutitermes arborum* (Smeathman) lacks a type specimen and a neotype has been selected. The remaining 4 belong to other subfamilies. These are as

follows: *Trinervitermes bouvieri* Sjöstedt and *T. somaliensis* (Sjöstedt) which belong to *Microtermes* (Macrotermitinae), *T. sudanicus* (Sjöstedt) which is unidentified, and *Nasutitermes profestus* (Sjöstedt) which belongs to *Noditermes* (Termitinae). These determinations are extracted from unpublished notes made by Dr. A. E. Emerson, and the species are therefore omitted from further consideration. From the examination of the remaining 115 type specimens and series, combined with a study of variation in the other material, 77 names have been found to be synonymous, of which 62 are newly established synonyms.

In the subfamily Nasutitermitinae from the Ethiopian Region, I recognize as valid 47 species, of which 7 are new to science and described in this paper. These belong to 14 genera, of which 4 are new, one being completely new to science and the others newly formed genera containing existing species.

MATERIAL

A total of 2401 nest series from all parts of Africa (Map 1), have been examined, each containing from one to several hundred specimens. Much of this material has been collected by the members of the Termite Research Unit (Ministry of Overseas Development) and is deposited at the British Museum (Natural History). A further large collection, made by Dr. A. E. Emerson, is now housed at the American Museum of Natural History. Types and other specimens have been studied on personal visits or as a result of loans of material, through the courtesy of specialists and others mentioned in the acknowledgments, from the following museum collections:

Museum National d'Histoire Naturelle, Paris (Mus. Paris); Musée Royal de l'Afrique Centrale, Tervuren (Mus. Tervuren); Institut Royale des Sciences Naturelles Beligiques, Brussels, Selys Longchamps Collection (Selys Longchamps coll., Inst. R. Sci. Nat., Brussels); Institut des Parcs Nationaux du Congo et du Rwanda, Brussels (Inst. des Parcs Nat. du Congo, Brussels); Institut Français d'Afrique Noire, Dakar (Inst. Franç. d'Afr. Noire, Dakar); Museo Civico di Storia Naturale, Genoa (Mus. Civ. di Stor. Nat., Genoa); Naturhistorisch Museum te Maastricht (Mus. Maastricht); Naturhistoriska Riksmuseum, Stockholm (Naturhist. Riksmus., Stockholm); Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg (Mus. Hamburg); Silvestri Collection, Laboratorio di Zoologia della R. Scuola d'Agricoltura in Portici, Naples (Silvestri coll., Lab. Zool. Sc. Agr., Portici); American Museum of Natural History, New York (A.M.N.H.); National Collection of Isoptera, Plant Protection Research Institute, Pretoria (N.C.I., Pretoria).

The abbreviations given in brackets are those used throughout the text in listing the material examined. The British Museum (Natural History), where abbreviated, is given as B.M.(N.H.). Where the museum of deposit is given in brackets in the text, the specimens concerned have not been examined by the author. Where lectotypes are designated, that of the senior synonym in each case is given separately, whilst those of junior synonyms are included in the lists of type material examined.

The material examined constitutes virtually all of that known to exist in museum collections. In listing material in the text, co-ordinates of latitude and longitude are given for localities not included in the *Times Atlas*, vol. IV.



MAP I. Collecting localities of *Nasutitermitinae*. (The Republic of South Africa has been collected over so extensively that on this scale there would be little space between individually marked localities.)

METHODS

Nearly two-thirds of the specific names in existence have been found to be synonyms. Most of the descriptions of species published hitherto are based on characters now found to be of little taxonomic usefulness, and omit many which I have found of most value. In relatively few cases are they adequately illustrated. It has therefore been considered desirable to redescribe the majority of the species, and to provide a full set of figures to aid identification. All species originally described in languages other than English are redescribed, together with others in publications that are rare and likely to be inaccessible. Only in the case of fully and recently described species is redescription omitted from this revision, and in some of these, additional or modified characters are given for use in conjunction with the original descriptions.

It should be noted that the degree of detail given in the descriptions which follow varies from genus to genus. This is intentional, because the characters used vary in number and importance; to standardize descriptions on the most detailed pattern throughout would be wasteful of space. The layout is however standardized for easier comparison.

Characters used for the first time or found of greater importance than hitherto recognized are as follows:—

- Imago*: pilosity of head capsule
proportions of female cerci
form of molar area of mandibles
size of ventral scent gland on 5th abdominal sternite of ♀
- Soldier*: distribution of head and other setae

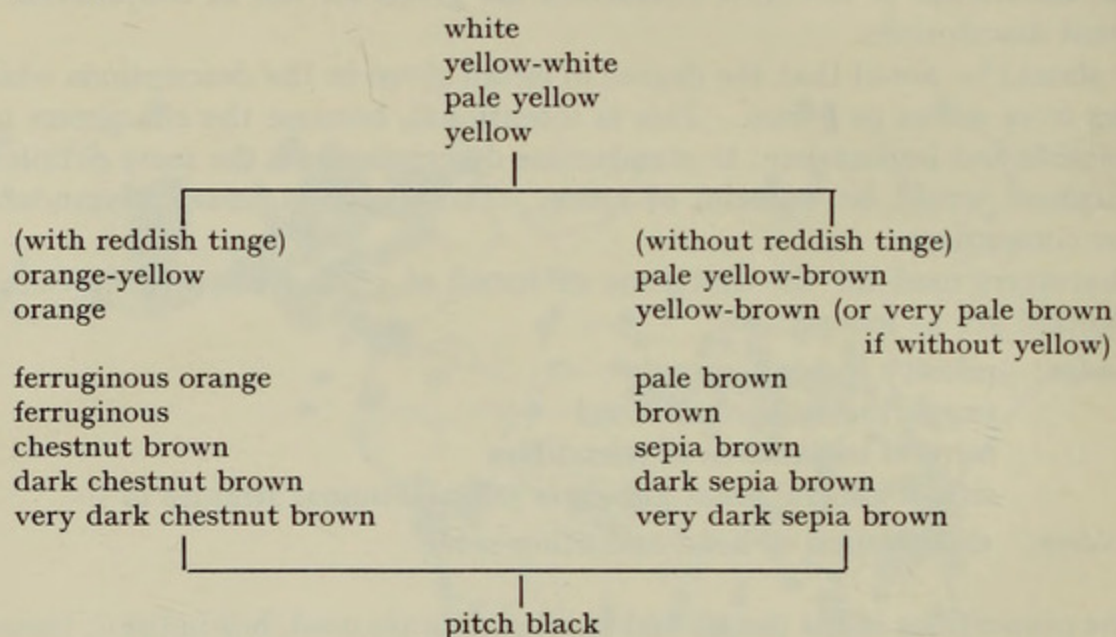
The proportions of the ♀ cerci and scent glands are used, but in the ♂, these features are less diagnostic since all male cerci are slightly longer and all ♂ scent glands distinctly smaller than the ♀. Marginal indentations of thoracic nota have not in general been found of value, nor has imago wing venation. In several genera a very wide range of variation has been encountered in all characters, both of measurement and shape. In others, the degree of variation has been found to be limited in spite of the availability of ample material. Each case of generic or specific status or synonymy has therefore had to be judged on its own merits, and not by the standards of even closely related taxa. These apparent inconsistencies of treatment are further discussed in the section of phylogeny, and under generic and specific headings in the text.

All figures have been drawn with the aid of a camera lucida, from ethanol preserved specimens immersed in ethanol. Only three scales are used, each of the two larger being twice the next smaller. All the illustrations of the entire head capsule of species on the "*Procornitermes* branch" are on the smallest scale, and all other figures are on the middle scale apart from the imago mandibles of species on the "*Paracornitermes* branch" and all the imago fontanelles, which are on the largest scale. Measurements are largely self-explanatory, but it should be noted that in the imago, head width is measured from the extremes of curvature of the eyes as seen in

frontal view of the face, and the length of fore wing includes the stump; in the soldier, head width is the greatest width of the head capsule, and depth of head capsule is taken in profile, excluding the postmentum and measuring vertically from the lower margin to the highest point of curvature of the head capsule, wherever it occurs. The measurements are given in abbreviated form in the keys, as follows:

Head width (across eyes in imago), W; Head length to tip of nose, L; Depth of head, D; Length of hind tibia, T_3 ; Greatest diameter of eye, E; Ocellus, O.

In describing colouration, a limited number of terms are applied as consistently as possible according to an arbitrarily decided scale of intensity from white (unsclerotized) to pitch black, as follows:



VEGETATION MAP

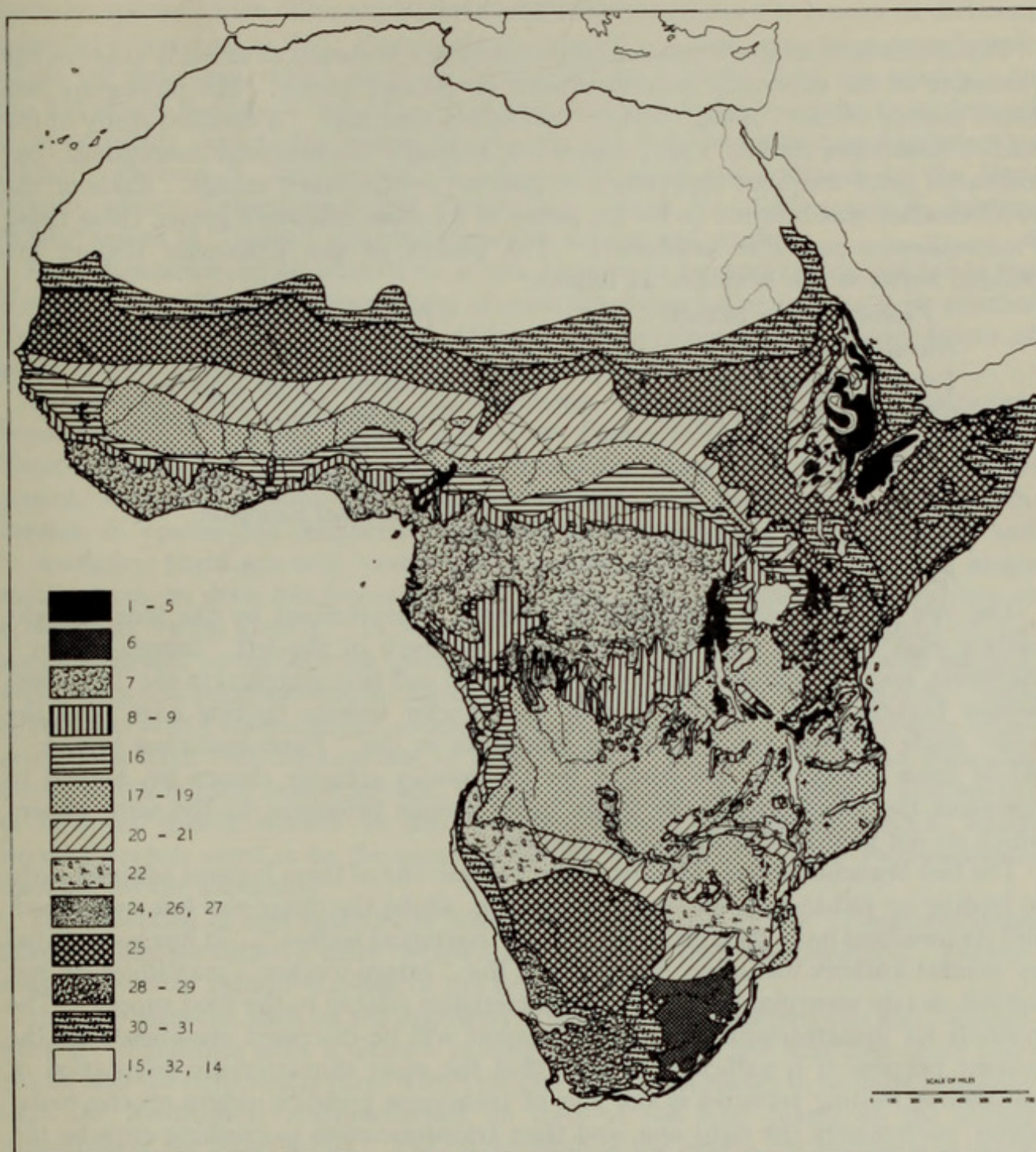
A map is provided of the vegetation zones mentioned in the text. It is based on the vegetation map of Africa south of the Tropic of Cancer prepared for UNESCO by Keay *et al.* (1959), differing in that only the boundaries that are known to have significance in termite distribution are indicated (Map 2).

Subfamily NASUTITERMITINAE Hare

Nasutitermitinae Hare, 1937 : 462. Type-genus, *Nasutitermes* Dudley, 1890.

Imago. Labrum broader than long, without transverse sclerotized band, tip partly hyaline; mandibles with apical tooth slightly shorter to distinctly longer than first marginal, left third marginal with anterior edge at most only slightly longer than posterior (up to $1\frac{1}{2}$ times); fontanelle commonly slit-like, often bifurcate, sometimes nearly obsolete. Tibial spurs 2 : 2 : 2 (*Syntermes* with 3 : 2 : 2, is not African). Styli absent.

Soldier. Head capsule modified to form a proboscis terminating in opening of frontal gland; mandibles reduced to vestiges, with or without "points". Tibial spurs, 2 : 2 : 2. Styli absent.



MAP 2. Vegetation of Africa showing divisions significant in termite distribution. (1-5), montane types ; (6), temperate and subtropical grassland ; (7), moist forest at low and medium altitudes ; (8-9), forest-savannah mosaic ; (16), moist woodlands ; (17-19), *Isoberlinia* and *Brachystegia-Julbernardia* woodlands and savannahs ; (20-21), relatively dry savannah-woodlands ; (22), woodland with abundant *Colophospermum mopane* ; (24, 26, and 27), grass steppes ; (25), wooded steppe with abundant *Acacia* and *Commiphora* ; (28-29), Karoo succulent and subdesert steppe ; (30-31), subdesert steppe, tropical and transitional ; (15, 32), desert and Cape Macchia, and (14), in Ethiopia only, evergreen thickets.

PHYLOGENY

The subdivision of the Nasutitermitinae into two branches at an early stage in the evolution of the subfamily was postulated by Ahmad (1950). His phylogeny was based mainly on the "imago-worker" mandible dentition. A detailed study of the soldier mandibles (Sands, 1957) supported Ahmad's fundamental conclusions, but indicated more frequent occurrence of parallel evolutionary trends. Each of the two branches was referred to by the name of its most primitive genus, these being *Procornitermes* and *Paracornitermes*. The genera of the Ethiopian Region are divided between the branches as follows:

"Procornitermes branch"

Nasutitermes Dudley
Leptomoxotermes gen. n.
Grallatotermes Holmgren
Fulleritermes Coaton
Rhadinotermes gen. n.
Mycterotermes gen. n.
Trinervitermes Holmgren
Baucaliotermes gen. n.

"Paracornitermes branch"

Eutermellus Silvestri
Afrosubulitermes Emerson
Postsubulitermes Emerson
Verrucositermes Emerson
Mimeutermes Silvestri
Tarditermes Emerson

The two branches are, according to Ahmad, characterized by the long straight cutting edge between first and third marginal teeth of the left "imago-worker" mandible, and the narrower angle between apical and first marginal in the "*Procornitermes* branch", as contrasted with the shorter sinuate cutting edge, and the wider angle between apical and first marginals in the "*Paracornitermes* branch". While these distinctions are correct for the species actually chosen by Ahmad to represent the genera, there are many other species belonging to the same genera which do not fit this classification so exactly.

The two branches appear to have arisen because one of them became adapted early to feeding on soil-humus, and has remained so, whilst the other was less specialised, and its members have diverged to fit many "ecological niches". It has been stated by several authors including Ahmad that the "imago-worker" mandibles do not exhibit clearly identifiable adaptive characteristics related to the food supply. The grounds for disagreement with this statement will be discussed elsewhere; for the present purpose it is sufficient to note that the most characteristic adaptation of soil-humus feeding termites is the loss of transverse grinding ridges on the molar plates, particularly the right one, and their transformation to crushing cups by the development of rounded flanges on both sides. This occurs convergently in the subfamilies Termitinae, Amitermitinae, and Nasutitermitinae, and in the latter is the distinguishing feature of the "*Paracornitermes*" branch. In some genera the ridges are not entirely lost, remaining as differences in sclerotisation of an otherwise smooth surface (Text-figs. 431-450).

The "*Procornitermes* branch" possesses variously modified mandibles, but these always have prominently ridged molar plates (Text-figs. 157-196).

The detailed aspects of phylogeny can only be discussed tentatively in a study based on species from only one zoogeographical region. The genus *Nasutitermes*

includes species which differ markedly, and show resemblances to genera on different subsidiary divisions of the "*Procornitermes* branch". This suggests a polyphyletic origin for the genus, which needs to be clarified by a study of all the species. In the Ethiopian Region, *N. latifrons*, *N. schoutedeni* and *N. lujae* appear to be derived from ancestors close to the genera *Hirtitermes* and *Havilanditermes* as suggested by Ahmad, whereas *N. kempae* and *N. elegantulus* show resemblances to the Neotropical genera *Diversitermes* and *Parvitermes*. Both *N. latifrons* and *N. kempae* exhibit traces of "instar" polymorphism in soldier and worker.

Leptomyxotermes doriae from West Africa appears to be most closely related to the *Hospitalitermes*-*Lacessitermes* group of constricted-headed genera, as is its relative *Grallatotermes africanus* from East Africa. *Leptomyxotermes* also shows traces of soldier polymorphism which have been lost in *Grallatotermes*.

The genera *Fulleritermes* and *Rhadinotermes*, although they have constricted-headed soldiers, are not closely related to *Leptomyxotermes* and *Grallatotermes*. Their affinities are instead to another subsidiary branch of mainly Neotropical genera, including *Velocitermes*, *Tenuirostritermes*, and *Diversitermes*. In *Fulleritermes*, *F. coatoni* has distinctly dimorphic soldiers whereas in *F. contractus* and *F. tenebricus* there are only vestiges of polymorphism, and *F. mallyi* has a single soldier form, as does *Rhadinotermes*. The importance of soldier polymorphism as a character varies greatly. In some genera it appears to be on the point of disappearance and varies between species, whereas in others its presence is well marked, and closely related monomorphic forms must be given separate generic status. Such is the case with *Trinervitermes*, which is always polymorphic though showing intergradations from true dimorphism to near "instar" polymorphism, and *Baucalio-termes* which is truly monomorphic. These genera, and *Mycterotermes*, also appear to be most closely related to the *Tenuirostritermes*-*Diversitermes* branch, which would therefore seem to be the most important subdivision of the "*Procornitermes* branch" of the subfamily.

The collection of new material of humus-feeding species on the "*Paracornitermes* branch" has permitted a more detailed assessment of their relationships. *Eutermellus* is the most primitive genus of the Ethiopian Region.

In some respects, such as the distinctly trilobed soldier labrum, and the "imago-worker" mandibles with a sinuate cutting edge between left first and third marginals, and the right molar plate with vestigial ridges, it appears to be more primitive than the Neotropical *Angularitermes*, in spite of the long points on the soldier mandibles of the latter genus. The relationship of the genera are discussed in detail under their own generic headings.

DISTRIBUTION

Representatives of the subfamily are to be found in every vegetation zone from the depths of the tropical rain forests and mangrove swamps to the fringes of the deserts both North and South of the Equator.

In the humid rain forest areas of West Africa and the Congo, *Nasutitermes* is the dominant genus with ten species feeding mainly on dead wood of all kinds.

Leptomyxotermes is found in rotting wood, and the humus-feeding genera of the "Paracornitermes branch" are *Afrosubulitermes*, *Postsubulitermes*, *Verrucositermes*, *Tarditermes*, and some species of *Eutermellus* and *Mimeutermes*. In the less moist coastal forests and woodlands of East Africa, the fauna is much reduced, with only two species of *Nasutitermes* and one of *Grallatotermes*. The feeding habits of the latter are not known, but it probably also feeds on wood.

In the tall grass savannah zones adjacent both north and south to the Congo rain forest, the grass feeding "Harvester" genus *Trinervitermes* becomes dominant, with *Fulleritermes* in a subsidiary wood-feeding role. Humus-feeders are restricted to one or two species of *Mimeutermes* and *Eutermellus*, though it is understood that a few related species or genera await description from the southern areas. In East Africa, *Trinervitermes* is present, but *Rhadinotermes* appears to replace *Fulleritermes*, although their feeding habits are probably rather different. No humus-feeding members of the "Paracornitermes branch" are known from East Africa.

As conditions become drier, both northwards and southwards towards the deserts, the faunae become more restricted. Fewer species of *Trinervitermes* are found, and *Fulleritermes* persists, but the humus-feeding genera are not known beyond the limits of the *Isoberlinia* and *Brachystegia-Julbernardia* savannah woodlands, types 17, 18, 19 of Keay *et al.* (1959).

The driest areas of all on the fringes of the deserts have relatively very few species; one or two *Trinervitermes* occur, and the small related genera *Mycterotermes* and *Baicaliotermes* are found in these types in Arabia and South-West Africa respectively.

More detailed accounts of individual distribution are given under generic and specific headings.

In the distribution maps of individual species, the shaded portions show the full extent of the vegetation types from which each species has been recorded. These are not always floristically identical North and South of the Congo forest, but are considered ecologically equivalent. The shaded parts therefore indicate the probable potential distribution in addition to the actual distribution to which the species is confined by biotic or other ecological barriers. Records of specimens that I have examined are shown by black triangles; those of other authors unsubstantiated by redetermination but thought reliable are shown by hollow triangles.

KEYS TO GENERA

In the keys which follow, certain characters will be more readily appreciated if reference is made to the appropriate figures. The separation of constricted-headed from other soldier castes is such a case, as also are certain features of the imago mandibles. Although it has become customary to refer to "imago-worker" mandibles, and to use those of the worker to avoid damaging scarce imago material, they are in fact different. The "left mandible index" is the distance between left apical and first marginal teeth divided by the distance from first to third marginals and expressed in decimals. This index usually differs considerably between imago and worker castes, probably indicating the greater degree of food adaptation in the latter. In the humus-feeding species the worker index is greater than the imago, and in the others it is approximately equal to or smaller than the imago. In this revision, the imago mandibles have been used wherever possible, and where worker mandibles have to be used this is noted in the text. The key to imagos has however been arranged so that it can also to a large extent be used to identify workers in spite of their differences. Measurements are given in millimetres.

IMAGOS

- 1 Left mandible with apical and first marginal teeth subequal, or apical shorter, left mandible index 0.2–0.6 ; molar plate of right mandible with prominent ridges (Text-figs. 157–196) 2
- Left mandible with apical tooth longer than first marginal, left mandible index 0.9–3.2 ; molar plate of right mandible without ridges, or ridges vestigial in shining smooth surface (Text-figs. 431–450) 8
- 2 Left mandible with cutting edge between first and third marginals entire, straight or at most slightly sinuate 3
- Left mandible with cutting edge between first and third marginals indented in front of third marginal. 6
- 3 Right mandible with posterior cutting edge of first marginal equal to or shorter than posterior cutting edge of second marginal ; molar plate with 9–11 regular ridges
NASUTITERMES (p. 15)
- Right mandible with posterior cutting edge of first marginal longer than posterior cutting edge of second marginal ; molar plate with 5–9 irregular ridges 4
- 4 Smaller, W, under 1.28 ; E, under 0.38 ; T₃, under 1.63. Right molar plate with indented margin at basal end. Colour very dark brown to pitch black
RHADINOTERMES (p. 71)
- Larger, W, over 1.35 ; E, over 0.42 ; T₃, over 1.63. Right molar plate without pronounced irregularity of outline in surface view. Colour paler, to sepia brown or dark chestnut brown 5
- 5 Pilosity of head capsule evenly fine, setae arising from small sockets of regular size with a few larger sockets scattered among them **TRINERVITERMES** (p. 76)
- Pilosity of head capsule uneven, sockets of setae varying from small to large, the latter numerous and conspicuous **BAUCALIOTERMES** (p. 138)
- 6 Right mandible with molar plate bearing 13–14 ridges and without pronounced irregularity of outline in surface view. Postclypeus weakly inflated, width 3.0 times length **GRALLATOTERMES** (p. 55)
- Right molar plate with 7–10 ridges, and with indented margin at basal end. Postclypeus strongly inflated, width 1.7–2.1 times length 7
- 7 Eyes large compared with head width, W/E index 2.4. Fontanelle slit-like, not distinctly bifurcate anteriorly. Left mandible with subsidiary tooth between third marginal and molar prominence not visible in the gap between them in surface view. Colour pale brown **LEPTOMYXOTERMES** (p. 51)
- Eyes smaller compared with head width, W/E index 3.2–4.5. Fontanelle slightly to distinctly bifurcate anteriorly. Left mandible with subsidiary tooth visible in gap between third marginal and molar prominence in surface view. Colour dark brown to pitch black **FULLERITERMES** (p. 55)
- 8 Left mandible with cutting edge between first and third marginals indented in front of third, and sinuate ; left mandible index under 1.4 9
- Left mandible with third marginal absorbed in short cutting edge behind first ; left mandible index over 2.0 11
- 9 Very small, W, 0.56 or less ; T₃, 0.71 or less. Head shining, pilosity reduced to paired prominent setae on vertex, frons and postclypeus. Pronotum, length at least three-quarters width **AFROSUBULITERMES** (p. 153)
- Larger, W, 0.82–0.99 ; T₃, over 1.00. Head with scattered fine and longer paired setae. Pronotum, length less than three-quarters width 10
- 10 Smaller, W, 0.82 ; E, 0.27 ; T₃, 1.00. Pilosity finer, more sparse, surface of head shining. Fontanelle a pale streak. **VERRUCOSITERMES** (p. 156)
- Larger, W, 0.85–0.99 ; E, 0.29–0.38 ; T₃, 1.00–1.20. Pilosity dense, surface of head almost obscured. Fontanelle triangular, dumb-bell-shaped, or nearly obsolete **EUTERMELLUS** (p. 141)

- 11 Posterior margin of head capsule narrowly rounded, width behind eyes distinctly less than length to front of postclypeus ; eyes not set out from sides of head. Smaller, W, 0.80 ; pronotum, width, 0.70, length, 0.42 **POSTSUBULITERMES** (p. 155)
- Posterior margin of head capsule broadly rounded, width behind eyes approximately equal to length to front of postclypeus ; eyes slightly to distinctly set out from sides of head. Larger, W, 0.89 or over ; pronotum, width 0.78 or over, length 0.61 or over 12
- 12 Larger, W, 1.28–1.35 ; E, 0.41–0.42 ; pronotum, width 1.20–1.23, length 0.68–0.75 ; T₃, 1.45–1.56. Pilosity sparse, surface of head shining. Colour, head and pronotum yellow **TARDITERMES** (p. 166)
- Smaller, W, 0.89–1.12 ; E, 0.29–0.35 ; pronotum, width, 0.78–1.35 ; length, 0.61–1.15 ; T₃, 0.82–1.06. Pilosity dense, surface of head almost obscured. Colour uniformly dark sepia brown **MIMEUTERMES** (p. 158)

SOLDIERS

- 1 Head capsule more or less constricted or contracted behind antennae (Text-figs. 119–156, 388–395, 414–430, 464–469) 2
- Head capsule not constricted or contracted behind antennae (Text-figs. 24–99, 256–296, 338–378, 396–398, 470–478, 497–500) 11
- 2 Antennae 14 segmented 3
- Antennae 11–13 segmented 5
- 3 Vestigial mandibles without points . . . **TRINERVITERMES** minor soldiers (p. 76)
- Vestigial mandibles with distinct points 4
- 4 Nose slender, cylindrical. Smaller, T₃, 1.23–1.73. Colour, yellow to orange **LEPTOMYXOTERMES** (p. 51)
- Nose thick, conical, sharply tapered and slightly turned down at tip. Larger, T₃, 1.96–2.05. Colour dark brown **GRALLATOTERMES** (p. 55)
- 5 Head in side view raised behind constriction, above line of nose profile including basal hump if present 6
- Head in side view with undulating or convex profile, not raised behind constriction above line of nose 7
- 6 Vestigial mandibles without points. Vertex of head without prominent setae (sometimes a pair of minute setae present). Constriction of head weak **TRINERVITERMES** minor soldiers (p. 76)
- Vestigial mandibles with small to distinct points. Vertex with single pair of bilaterally placed setae. Constriction of head strong (Text-figs. 130–156) **FULLERITERMES** and **RHADINOTERMES** (p. 55)
- 7 Nose shorter than rest of head capsule, measuring from hind margin of antennal socket. Soldiers dimorphic **MYCTEROTERMES** (p. 75)
- Nose longer than rest of head capsule, measuring from hind margin of antennal socket. Soldier monomorphic 8
- 8 Nose and anterior lobe of strongly constricted head capsule with numerous tubercle-like outgrowths of cuticle, also present on basal antennal segments **VERRUCOSITERMES** (p. 156)
- Nose and head without such outgrowths 9
- 9 Labrum with anterior corners extended as short lobes, middle of anterior margin bowed outwards producing trilobed appearance. Legs with long prominent setae, 1 on each coxa, 3–6 on each femur and tibia, among shorter more typical setae. Nose somewhat rugose **EUTERMELLUS** (p. 141)
- Labrum with anterior margin rounded or at most sinuate. Legs without such setae, or, if one or two present then soldier of minute size, L, 0.98–1.07 ; T₃, 0.47–0.53. Nose smooth 10

- 10 Smaller, L, 0.98-1.07 ; W, 0.37-0.41 ; T₃, 0.47-0.53. Nose shorter in proportion to rest of head capsule (53 : 47) **AFROSUBULITERMES** (p. 153)
 - Larger, L, 1.39-1.53 ; W, 0.55-0.60 ; T₃, 0.71-0.79. Nose longer in proportion to rest of head capsule (59 : 41) **POSTSUBULITERMES** (p. 155)
- 11 Head capsule in plan view tapering continuously from near back to nose tip, top-shaped or tear-drop-shaped. Nose tip without prominent setae
 **MIMEUTERMES** (p. 158)
 - Head capsule in plan view not so, nose distinct from rest of head. Nose tip with 4 or more prominent setae 12
- 12 Vestigial mandibles with points **NASUTITERMES** (p. 15)
 - Vestigial mandibles without points 13
- 13 Labrum with sinuate anterior margin. Head capsule in plan view a rounded rectangle wider than long **TARDITERMES** (p. 166)
 - Labrum with rounded anterior margin. Head capsule in plan view, various, if wider than long, then not a rounded rectangle 14
- 14 Head capsule without prominent setae except on nose and occasionally one pair of small setae on vertex. Where minute setae are present, sockets not visible at normal stereomicroscopic magnifications. Soldiers dimorphic or polymorphic
 **TRINERVITERMES** (p. 76)
 - Head capsule with one pair of setae on vertex, one or two pairs near base of nose, and four at nose tip with smaller setae behind them. Entire head capsule and nose with scattered minute setae with distinct pale sockets. Soldiers monomorphic
 **BAUCALIOTERMES** (p. 138)

NASUTITERMES Dudley, 1890

Nasutitermes Dudley, 1890 : 158. Type-species, by subsequent designation (Emerson, 1925 : 379), *Nasutitermes sanchezi* (Holmgren, 1910) = *Nasutitermes costalis* (Holmgren, 1910).

In a recent paper on this genus as it is represented in the Indian region, Prashad and Sen-Sarma (1959) attribute the authorship of the generic name to Banks (1920). They give as their reasons for this change the opinions that (i) the description "soldiers with beak" as given by Dudley (1890) "does not constitute an indication, a definition, or a description", on the grounds that the description is applicable to most genera in the subfamily, and (ii) "the indirect evidence from the termitophiles is untenable". . . . Because the definition "soldiers with beak", though meagre, satisfies the requirement of Article 12 of the International Code, and because all the other nasute genera at present recognized came into being after the establishment of the genus *Nasutitermes* by Dudley, many of them having been included in it as subgenera or species when first described, these arguments are not acceptable. Not only is the definition of the genus valid as it stands, but it is supported by its author's reference to his own earlier paper of 1889, in which a detailed description of nest structure and habits was given, together with illustrations of all castes (pp. 107, fig. 7, and 108, fig. 8). These fully satisfy the requirements of Article 16 (a), sections (i) and (viii). The evidence of the termitophiles is irrelevant to the discussion of the authorship of the genus.

Dudley neither designated a type-species, nor included any nominal species in the genus. Whilst there is little doubt from the evidence of the termitophile *Termitogaster insolens* Casey, mentioned by Dudley, and now known to be host specific,

that the species concerned was *N. corniger* (Motschulsky, 1855), this does not constitute a valid citation of the species under Article 69 (a). Prashad and Sen-Sarma are therefore correct in rejecting the designation of *N. corniger* as the type-species in Snyder (1949).

The first use after Dudley of the generic name *Nasutitermes* was made by Banks (1919) when eight species were cited by name; from among these Banks (1920) proceeded to designate as type-species *Nasutitermes morio* (Latreille, 1805). Emerson (1925) stated that the species name *Termes morio* Latreille was a junior primary homonym of *Termes morio* Fabricius (1793) (now placed in synonymy with *Coptotermes testaceus* (L.)), and had to be replaced by the next available name *Nasutitermes costalis* (Holmgren). This he considered to be synonymous with *N. morio* (Latreille), and therefore was to be the type-species of the genus. The description in Latreille (1805), referred to by both Banks and Emerson is given under the heading "TERMES MORIO; *Termes morio*. Fab.". Clearly Latreille identified his specimens as Fabricius' species, and in so doing did not create a new species. Though the identification has since proved erroneous, the description cannot be held to have designated a new species since no alternative name was proposed. "*Termes morio* Latreille" has therefore never existed as a valid nominal species, and the specific name *morio* cannot be retained for the species which was before Latreille (Article 49). Banks' designation of this as the type-species of *Nasutitermes* was thus in error and must be rejected in favour of the first subsequent designation. *Nasutitermes costalis* (Holmgren) was not among those cited by name by Banks (1919) and was therefore not directly available for designation, Article 69 (a) clauses (i) and (ii).

Article 69 (a) clause (iv) states: "(iv) If an author designates (or accepts another's designation) as type-species a nominal species that was not originally included, and if, but only if, at the same time he synonymizes that species with one of the originally included species, his act constitutes designation of the latter as type-species of the genus".

Emerson (1925) synonymized a number of species described by Holmgren (1910) and chose from among them the name *N. costalis* for the species. One of those synonymized was *N. sanchezi*, which was among those originally included in the genus by Banks (1919). Thus the type-species of *Nasutitermes* in accordance with Article 69 of the International Code must be taken to have been designated by Emerson (1925) as *Eutermes sanchezi* Holmgren, 1910 (= *Eutermes costalis* Holmgren, 1910). *Nasutitermes costalis* (Holmgren) is therefore only type-species by virtue of its containing *N. sanchezi* (Holmgren) as a synonym. The Holotype of *N. sanchezi* was reported by Weidner (1955) to be a soldier caste, in the Zoologischen Staatsinstituts und Zoologischen Museums, Hamburg.

The generic name *Nasutitermes* was first applied to species from the Ethiopian Region by Emerson (1928), who dealt with some species formally, and some informally, without references to their author's names, in comparisons with the formally treated species. I have thought it best in making out specific synonymies to refer the first use of "*Nasutitermes*" to Emerson (1928) only in those species

dealt with formally in that paper, although he clearly regarded all such related species as belonging to the same genus.

Imago. Left mandible with apical tooth as long as or slightly shorter than first marginal, distance from apical to first marginals less to slightly more than half distance between first and third marginals (left mandible index $\cdot 37$ – $\cdot 54$), second marginal obsolete or only represented by slight undulation of cutting edge between first and third marginals; right mandible with apical and first marginals subequal as left, posterior cutting edges of first and second marginals approximately equal in length, molar plate with 9–11 regular transverse ridges, and no marked irregularity of outline in surface view (Text-figs. 157–162). Postclypeus, length slightly less than half width, to a quarter or less of width. Fontanelle, usually pale coloured, slit-like, and forked anteriorly, but in a number of species virtually obsolete, and scarcely different in colour from rest of head capsule, sometimes visible only as an indistinct round or oval mark.

Soldier. Monomorphic, though sometimes size differences appear to correspond to instars at which metamorphosis from worker caste took place. Nose a weak to strong cone, not cylindrical in species of Ethiopian Region. Vestigial mandibles usually with points. Head capsule without any pronounced constriction behind antennae.

The characters given in the diagnosis are those which distinguish the genus from others in the Ethiopian Region, and are not intended to be diagnostic on a world scale, neither are the more generalized subfamily characteristics included. Only *Grallatotermes* among the Ethiopian genera has a right molar plate which resembles that of *Nasutitermes*, though certain Neotropical and Oriental genera are similar. *Grallatotermes africanus* Harris differs from *Nasutitermes* in having a long cutting edge to the right second marginal, compared to the space between right apical and first marginal, and a deep indentation of the cutting edge on the left mandible between first and third marginals. The soldier also has a constricted head capsule.

The genus is confined in the Ethiopian Region to rain forest, riverain gallery forest, and forest outliers arising from locally moister conditions, or to moist woodland approaching forest conditions and usually situated near forest. This has resulted in a comparatively sharp division into two faunistic groups of species, one of which, the larger, consisting of ten species, is confined to the forests of the Congo and Guinean zones, including northern Uganda. The second consists of two species, mainly found in the coastal forest and woodlands of East Africa, but extending into Zululand in the South, and one of the two up the Rift Valley through Nyasaland and the western border of Tanganyika to the borders of the Congo and Uganda at Rwindi. The distribution of the species is shown on the maps (Maps 3–12).

KEYS TO SPECIES

The increased understanding of the variability of all castes has led to difficulties in constructing suitable keys to species. In the case of the imagos, it has been found necessary to resort to the use of numerical indices to express differences in proportions where actual measurements overlap. Some of the species are represented by very small numbers of specimens, and it is anticipated that discovery of new material may necessitate the reassessment of the validity of key characters in these cases.

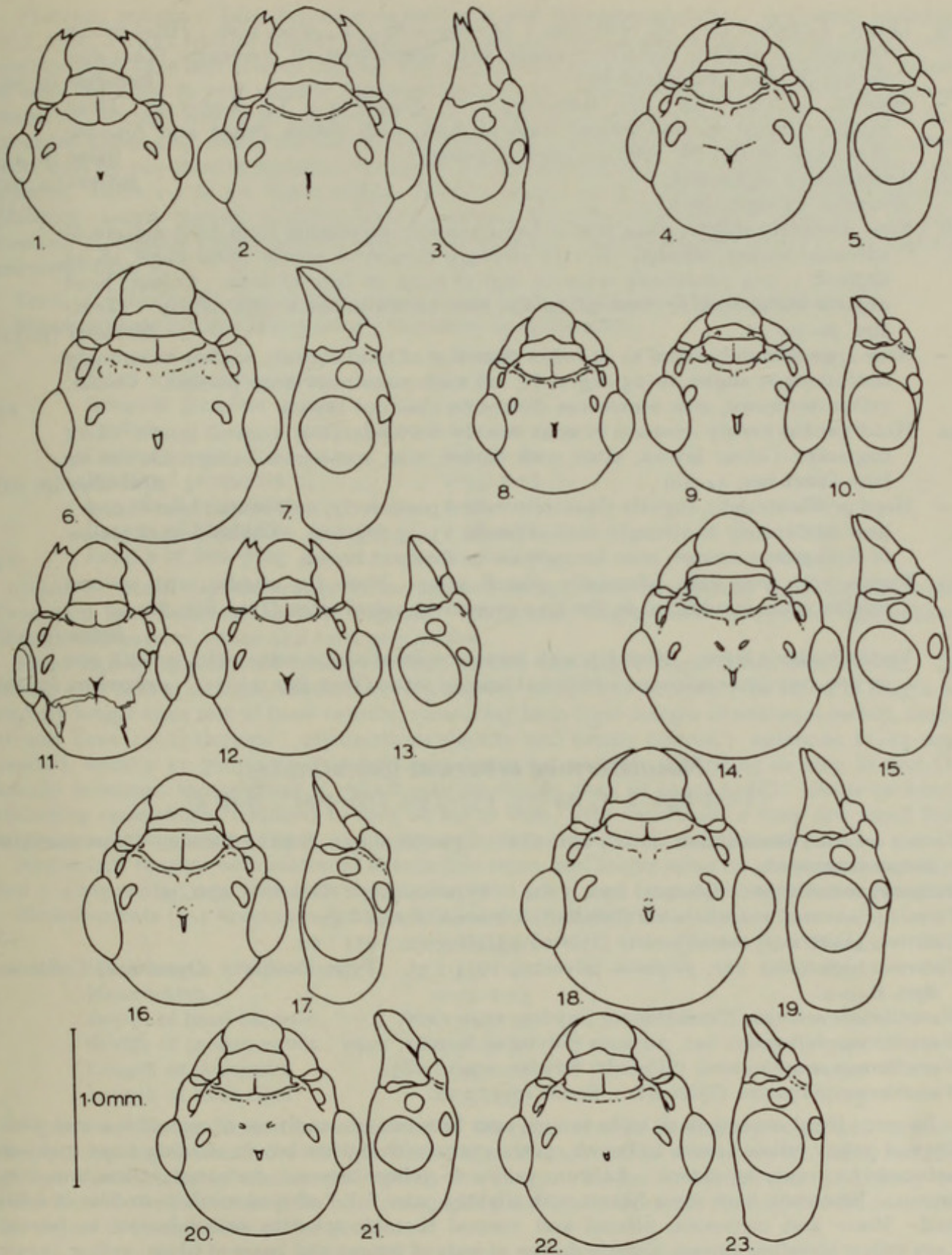
IMAGOS

- | | | |
|---|---|---|
| 1 | Postclypeus width 2–3 times length (Text-figs. 1–5, 8–17) | 2 |
| – | Postclypeus width more than 3 times length (Text-figs. 6, 18–23) | 7 |
| 2 | Eyes relatively larger in proportion to head-width, W/E index under 2.6, ocelli closer to eyes, O–E distance 0.01–0.04mm. | 3 |

- Eyes relatively smaller in proportion to head-width, W/E index over 2.8, ocelli further from eyes, O-E distance 0.04-0.13mm. 4
- 3 Smaller, W, 1.04-1.18 ; E, 0.41-0.51 ; O, 0.09-0.11 \times 0.11-0.14 ; T₃ 1.25-1.38 (W. Afr., Congo, Uganda) *elegantulus* (p. 30)
- Larger, W, 1.20-1.36 ; E, 0.48-0.53 ; O, 0.13-0.16 \times 0.16-0.20 ; T₃ 1.38-1.64 (E, Central, S. Afr.) *kempae* (p. 39)
- 4 T₃ shorter in proportion to W, T₃/W index 1.10. *fulleri* (p. 34)
- T₃ longer in proportion to W, T₃/W index over 1.15 5
- 5 Lateral extensions of " fork " of fontanelle wide, reaching half way to ocelli *camerunensis* (p. 26)
- Lateral extensions of " fork " short 6
- 6 Cerci of female shorter than width at base. *arborum* (p. 20)
- Cerci of female as long as width at base *infuscatus* (p. 37)
- 7 Smaller, E under 0.42, W under 1.33 *lujae* (p. 45)
- Larger, E over 0.44, W over 1.33 8
- 8 Smaller, W, 1.35-1.40 ; T₃ under 1.68 *schoutedeni* (p. 48)
- Larger, W over 1.42 ; T₃ over 1.75 9
- 9 Head capsule width immediately behind eyes approximately equal to length to front of postclypeus *latifrons* (p. 41)
- Head capsule width behind eyes slightly less than length to front of postclypeus *chrysopleura* (p. 27)

SOLDIERS

- 1 Whole head capsule and nose with numerous scattered long yellow setae *hirticeps* (p. 36)
- Head capsule with few (0-8), more regularly arranged setae, nose with setae concentrated at tip 2
- 2 Tip of nose markedly hairy (Text-figs. 40, 54, 65, 70, 74, 80, 82, 91, 96) 3
- Tip of nose with 4 prominent setae, and very few small inconspicuous setae behind them, or none (Text-figs. 26, 29, 35, 47, 52, 89) 10
- 3 Postmentum with setae scattered over entire surface (sometimes few and small). No long setae on vertex (Text-figs. 78-87) *latifrons* (p. 41)
- Postmentum with setae confined to anterior margin. Two bilaterally placed long setae usually present on vertex 4
- 4 Antennae 11-12 segmented 5
- Antennae 13-14 segmented 6
- 5 Head profile convex from change of contour at base of nose backwards, or nearly straight with slight over-all convexity ; numerous small setae on vertex (Text-figs. 39-45) *elegantulus* (p. 30)
- Head profile more or less concave, usually slightly angularly so at base of nose ; vertex without such small setae (Text-figs. 51-57) *fulleri* (p. 34)
- 6 Nose, measuring from hind margin of antennal socket, shorter than rest of head capsule 7
- Nose, measured as above, equal to or longer than rest of head capsule 8
- 7 Head profile concave ; nose abruptly tapered at tip (Text-figs. 95-99) (W. Africa, Congo, Uganda) *schoutedeni* (p. 48)
- Head profile more or less straight ; nose more slenderly and evenly tapered to tip (Text-figs. 62-68) (E. and Central Africa) *infuscatus* (p. 37)
- 8 Smaller, T₃ less than 0.90, head profile convex from change of contour at base of nose backwards, or nearly straight with slight over-all convexity (Text-figs. 39-45) *elegantulus* (p. 30)
- Larger, T₃ over 0.90, head profile straight or more or less concave, or sinuate, or straight to well behind base of nose with raised vertex, rarely with very slight over-all convexity, and these much larger, L over 1.61 9



FIGS. 1-23 : *Nasutitermes*, front and side views of imago head capsule. 1-3, *N. arborum*; 4, 5, *N. camerunensis*; 6, 7, *N. chrysopleura*; 8-10, *N. elegantulus*; 11-13, *N. fulleri* (unique morphotype, 12 reconstructed from 11); 14, 15, *N. infuscatus*; 16, 17, *N. kempae*; 18, 19, *N. latifrons*; 20, 21, *N. lujae*; 22, 23, *N. schoutedeni*.

- 9 Larger, L, 1.61–2.05 ; W, 0.88–1.29 ; D, 0.61–0.82 ; T₃, 0.90–1.28. Head profile straight or slightly concave ; rarely with slight over-all convexity (Text-figs. 69–77) (E. and Central Africa) *kempae* (p. 39)
- Smaller, L, 1.25–1.63 ; W, 0.68–0.95 ; D, 0.49–0.63 ; T₃, 0.95–1.18. Head profile straight to well behind base of nose, with vertex raised and rounded (Text-figs. 88–94) (W. Africa, Congo, Uganda) *lujae* (p. 45)
- 10 Antennae 12 segmented *fulleri* (p. 34)
- Antennae 13 segmented 11
- 11 Nose distinctly shorter than rest of head capsule, measuring from hind margin of antennal socket, strongly to very strongly conical in profile (cone angle 18–30 degrees) ; 2–4 prominent setae on top of head at base of nose. Colour, head capsule ferruginous to chestnut brown, nose brownish black with red tip. (Text-figs. 46–50) *ferranti* (p. 32)
- Nose approximately equal to or longer than rest of head capsule, weakly to strongly conical (cone angles 10–25 degrees) ; no such prominent setae present. Colour, yellow to brown, nose sometimes darker, to chestnut brown 12
- 12 Head profile evenly concave ; nose weakly to moderately conical (angle 10–15 degrees). Colour brown, often with darker nose, sometimes banded around its base (Text-figs. 34–38) *diabolus* (p. 29)
- Head profile straight, slightly sinuate, or raised posteriorly, well behind base of nose ; nose moderately to strongly conical (angle 13–25 degrees). Colour orange yellow to ferruginous orange, nose ferruginous to chestnut brown 13
- 13 Vertex with two long bilaterally placed setae. Nose tip usually with several smaller setae in addition to the four prominent apical setae (Text-figs. 88–94) *lujae* (p. 45)
- Vertex without setae. Nose tip with four prominent apical setae only, or with one or two very inconspicuous additional smaller setae (Text-figs. 24–33) *arborum* (p. 20)

Nasutitermes arborum (Smeathman)

(Text-figs. 1–3, 24–33, 157–159, 198–199 ; Map 4)

Termes arborum Smeathman, 1781 : 141, 161. Type locality : SIERRA LEONE. Type material lost or destroyed.

Eutermes maculiventris Sjöstedt, 1904 : 104. Type locality : GABON. **syn. n.**

Termes (*Eutermes*) *maculiventris* (Sjöstedt) Desneux, 1904a : 43.

Eutermes (*Eutermes*) *maculiventris* (Sjöstedt) Holmgren, 1912 : 62.

Eutermes infuscatus var. *perfusca* Silvestri, 1914 : 35. Type locality : DAHOMEY, Cotonou. **syn. n.**

Nasutitermes arboreus (Smeathman) Snyder, 1949 : 266.

Nasutitermes infuscatus var. *perfusca* (Silvestri) Snyder, 1949 : 280.

Nasutitermes maculiventris (Sjöstedt) Snyder, 1949 : 285.

Nasutitermes torquatus (Sjöstedt) ; Sands, 1957 : 12.

Imago. Head capsule dark sepia brown, area between eye and base of mandibles, and postclypeus paler, yellow-brown to brown, postclypeus with darker brown shading from mid-line outwards to a varying extent. Labrum yellow to yellow-brown. Antennae yellow-brown to brown. Pronotum dark sepia brown with slightly paler "T"-shaped mark in middle of front half. Meso- and metanota, pleural and ventral thoracic sclerites yellow-brown to brown. Legs yellow to yellow-brown, slightly darker at ends of femora and bases of tibiae, yellow-brown to brown. Abdominal tergites and lateral parts of sternites sepia brown, middle of abdominal sternites, excepting posterior two or three, yellow to yellow-brown. Wings translucent brown, venation sepia brown.

Posterior margin of head behind eyes distinctly less than semi-circular ; fontanelle variable, in ♂, from a short whitish streak, slightly bifurcate at anterior end, to an indistinct mark only slightly paler than rest of head capsule, and in ♀, from a whitish slit to an indistinct pale patch, in both sexes flat to very slightly depressed posteriorly ; eyes prominent in proportion to own diameter, though not large relative to head width, W/E index 2.8–3.5 (only one specimen recorded under 3.0), nearly circular to angularly oval ; ocelli small to medium sized, separated from eyes by one-third to slightly more than own least diameter, oval ; postclypeus moderately inflated, width 2.5 to 3.0 times length, anterior margin nearly straight to distinctly sinuate, posterior margin convex, rounded, slightly sinuate towards outer corners ; antennae 15 segmented, II slightly longer than IV, III and V subequal, slightly shorter than IV, III slightly narrower than V.

Cerci of ♀ distinctly shorter than width across base, with somewhat mamilliform tip.

Measurements (25 specimens from 7 localities) in millimetres.

	Range	Mean
Head width across eyes	1.16–1.50	1.32
Greatest diameter of eye	0.35–0.48	0.41
Ocellus	0.09–0.14 × 0.13–0.20	0.11 × 0.16
Ocellus to eye	0.04–0.10	0.08
Width of pronotum	0.93–1.18	1.04
Length of pronotum	0.58–0.78	0.66
Length of hind tibia	1.38–1.80	1.57
Length of fore wing	9.40–14.70	11.40

Soldiers. Head capsule orange to ferruginous-orange, nose ferruginous to chestnut-brown. Pronotum and antennae as head capsule. Abdominal tergites and femora of legs yellow, abdominal sternites, tibiae and tarsi pale yellow.

Head capsule in plan view nearly circular, slightly tapering towards front, nose conical. In profile very nearly straight, sometimes very slightly concave or sinuate, nose equal in length or slightly longer than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 15–25 degrees ; postmentum slightly and evenly convex ; antennae 12–13 segmented, usually 13, proportions of segments somewhat variable depending on size, II and IV usually subequal, shorter than V, which may be shorter than or equal to III. Setae on head, excluding appendages, confined to four at tip of nose, with sometimes a very few small fine setae immediately behind them, and a few on anterior margin of postmentum.

Abdominal tergites with scattered minute fine setae, and longer setae on posterior margins of last 3–4 segments ; sternites with shorter scattered setae, and long setae on posterior margins.

Measurements (157 specimens from 32 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.33–1.89	1.58
Head width	0.75–1.13	0.93
Depth of head capsule	0.50–0.75	0.62
Width of pronotum	0.40–0.55	0.48
Length of pronotum	0.18–0.25	0.20
Length of hind tibia	0.93–1.39	1.13

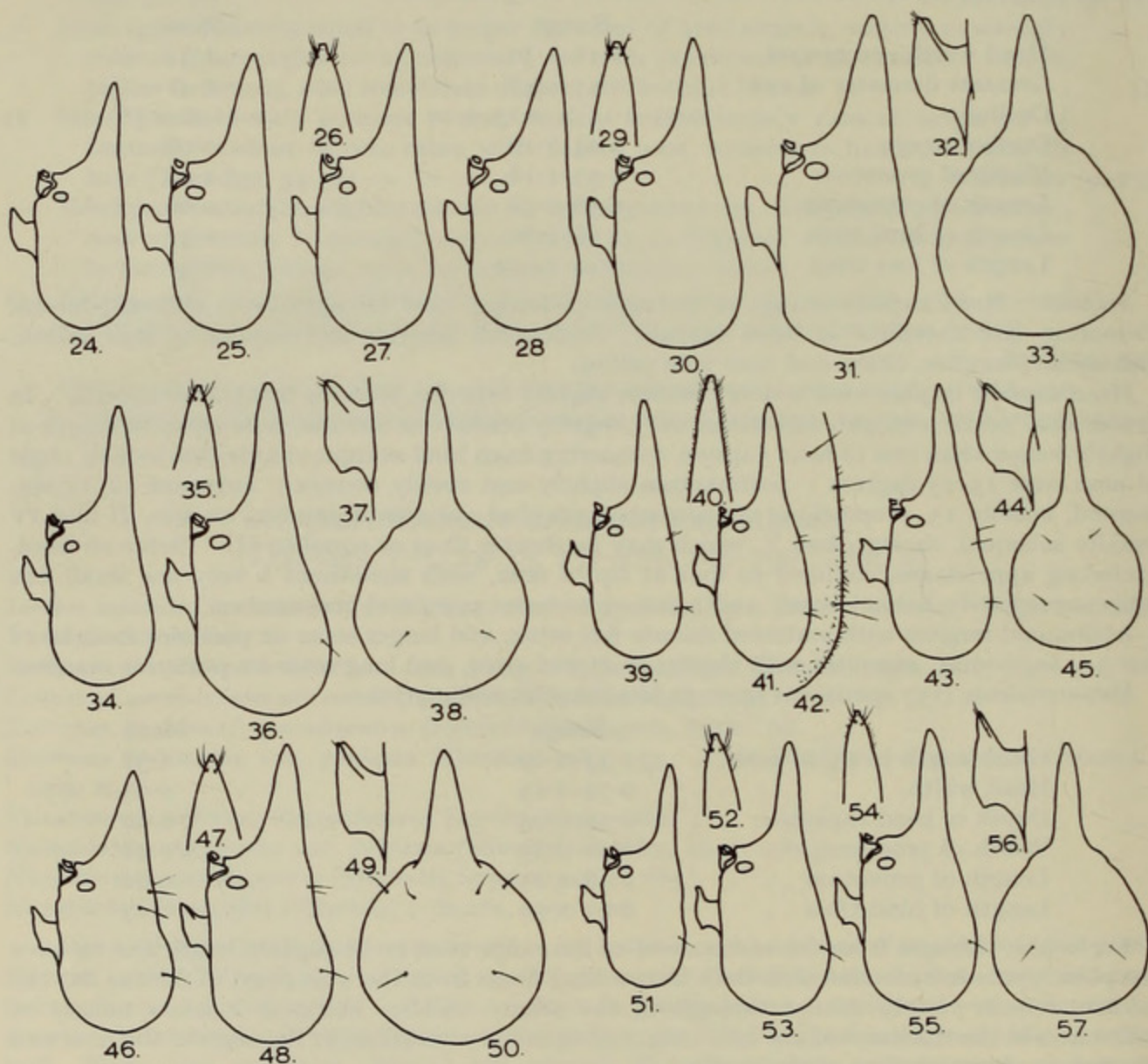
Variation. Imagos from the eastern end of the range tend to be slightly larger and to have the postclypeus less clouded with dark brown than those from the west coast of Africa, but the soldiers remain closely similar throughout the range. Soldier variation consists mainly of differences in the thickness of the nose cone, and of minor alterations in the angle of the nose and the degree of straightness of the profile.

The material from which Smeathman (1781) described this species has never been traced, and was probably never sent to any museum. Griffin (1942) records that the specimens of nests sent to Drury by Smeathman arrived in fragments, and

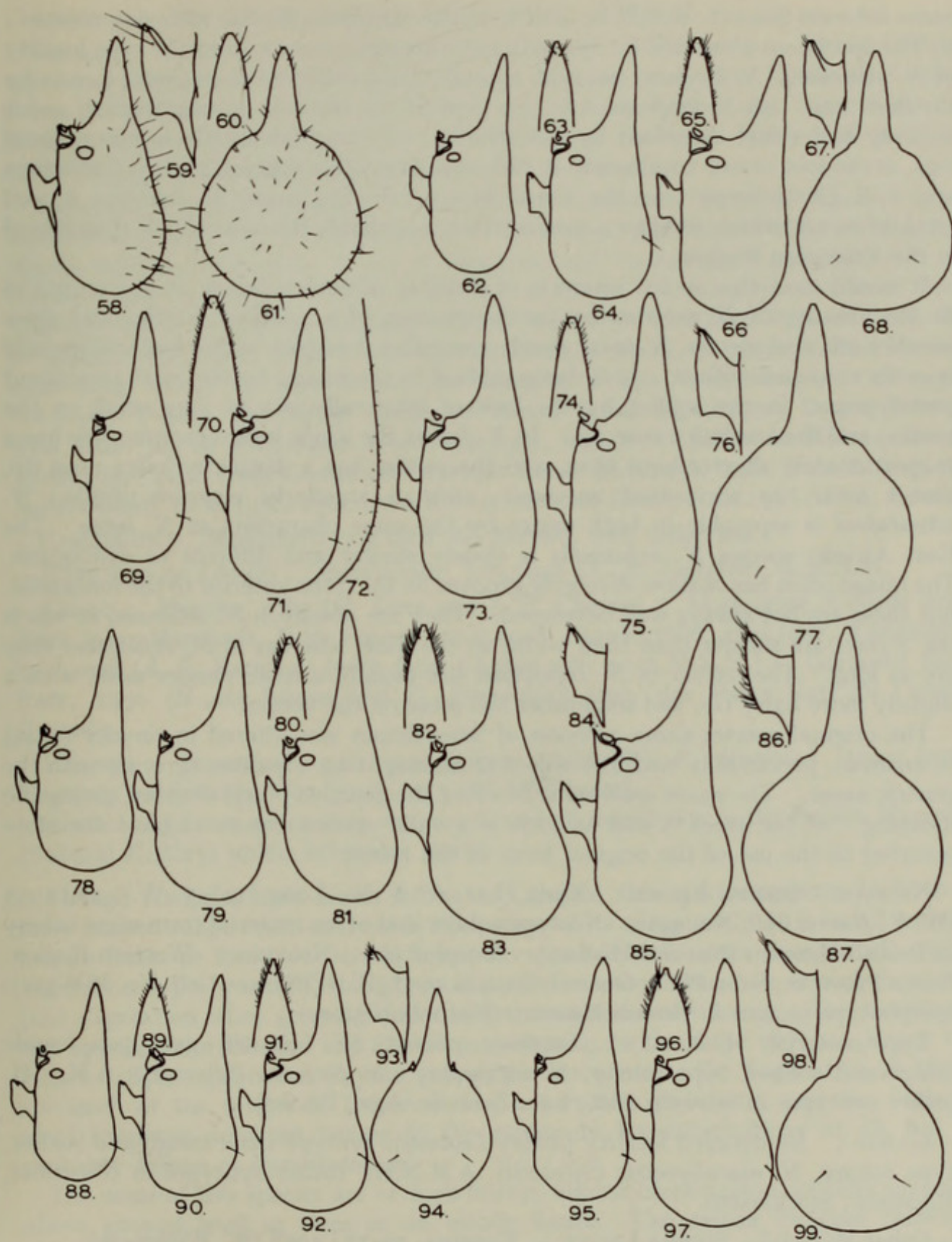
"mouldered to dust", so that no type material either of the termite or its nests now exists.

The commonest truly arboreal species in West Africa has been given various names which appear in the synonymy. It has been collected from a number of places in Sierra Leone, the type locality for *N. arborum*, and I consider it to be the species most likely to have been described by Smeathman under that name.

The name "*Eutermes arborum* (Smeathman)" has been used by several authors, but these references have all been checked back to specimens first identified by Sjöstedt (1900) and, following him, Silvestri (1912). These have been examined, and found to belong to *N. latifrons* (Sjöstedt, 1896). It is most undesirable that the



FIGS. 24-57 : *Nasutitermes*, soldier head capsule, side and plan views, nose tip and postmentum. 24-33, *N. arborum* ; 34-38, *N. diabolus* ; 39-45, *N. elegantulus* ; 46-50, *N. ferranti* ; 51-57, *N. fulleri*.



FIGS. 58-99 : *Nasutitermes*, soldier head capsule, side and plan views, nose tip and post-mentum. 58-61, *N. hirticeps* ; 62-68, *N. infuscatus* ; 69-77, *N. kempae* (72, vertex pilosity) ; 78-87, *N. latifrons* ; 88-94, *N. lujae* ; 95-99, *N. schoutedeni*.

name *arborum* Smeath. should be used to replace *latifrons*, for the following reasons : (i) The specimens identified by Sjöstedt and Silvestri were not from the type locality of *N. arborum*. *N. latifrons* has only recently been collected from Sierra Leone for the first time. (ii) *N. latifrons* is not, in general, an arboreal-nesting species, and is unlikely to be that described by Smeathman. It most commonly occurs in dead logs, at the foot of tree trunks, and in the mounds of other species, such as *Cubitermes* spp. and *Thoracotermes*, on the forest floor. (iii) The name *N. latifrons* is well established and widely used for a species which is probably the most widely distributed in the Ethiopian Region.

It would seem that in the interests of stability of nomenclature, it is essential to fix the identity of *N. arborum* by the designation of a Neotype, particularly since another arboreal species, *N. lujae* closely resembles it in both imago and soldier, and is easily confused with it. It is distinguished in the imago by the more prominent postclypeus ; in the soldier by the lack of bilaterally placed long setae on the vertex, and the less hairy nose tip. In *N. fulleri* the single imago morphotype has a proportionately shorter hind tibia, and the soldier has a distinctly hairy nose tip, vertex setae, 12 segmented antennae, and an angularly concave profile. *N. schoutedeni* is separable in both castes by the same characters as *N. lujae*. The East African species *N. infuscatus* is closely similar and difficult to distinguish. The imago often has shallow diverging grooves on the frons anterior to the fontanelle, but these are not always well developed. They are absent in *N. arborum*, in which the ♀ cerci are shorter than their width at the base, whereas in *N. infuscatus* they are as long. The soldier of *N. infuscatus* has usually a more slender nose, with a slightly more hairy tip, and sometimes has setae on the vertex.

The original species-name *arborum* of Smeathman was altered in Snyder (1949) to *arboreus*, presumably with the object of making it an adjective agreeing with the generic name. The name *arborum* is however the genitive plural of *arbor*, giving the meaning " of the trees ", and as such is a valid species name. I have therefore reverted to the use of the original form of the name.

Neotype. SIERRA LEONE : Njala (Lat. 8° 6' N., Long. 12° 5' W.), 27.i.1955 (W. V. Harris Coll. No. 901). Neotype soldier and other material from same colony in British Museum (Natural History). Morphotype. NIGERIA : Western Region, Benin Province, Sobo Plain, Obanokoro, 9.iii.1957 (W. Wilkinson Coll. No. WW571). Morphotype imagos in British Museum (Natural History).

Type material. DAHOMEY : Cotonou, 7.ii.1913 (F. Silvestri), syntypes, female imago and soldier, type colony, *N. infuscatus* var. *perfusca* (Silvestri), A.M.N.H. (other syntypes in Silvestri Coll., Lab. Zool. Sc. Agr., Portici).

GABON : No detailed locality (Aubry-Lecomte), syntype male imago and soldier, type colony, *N. maculiventris* (Sjöstedt), A.M.N.H., (other syntypes in Naturhist. Riksmus., Stockholm).

Other Material. SIERRA LEONE : Kenema, 12-13.i.1958 (W. Wilkinson).

GUINEA : Kakoulima (between Conakry and Kindia), 1912 (F. Silvestri), A.M.N.H. ; Nimba Mts., 1957 (M. Lamotte), Inst. Franç. d'Afr. Noire, Dakar.

LIBERIA : No detailed locality, 1908 (*Sherer*), A.M.N.H.

GHANA : Yeji, 9.i.1927, Accra, 13.v.1936 (*A. W. J. Pomeroy*) ; Bobiri Forest, 23m. from Kumasi on Accra Road, 21.ii.1959, Kumasi, 22.ii.1959, Ejura, 23.ii.1959, 60m. N. of Ejura on Tamale Road, 24.ii.1959, Awura Forest, 4m. from Ejura on Kintampo Road, 28.iii.1959, 9m. from Nkoranza on Techiman Road, and 12m. N. of Techiman on Wenchi Road, 29.iii.1959 (*W. A. Sands*).

NIGERIA : Western Region ; Sobo Plain, Obanokoro, 8.i.1957, Lagos, Light-house Beach, 10.iv.1957 (*W. Wilkinson*) ; Olokemeji, 30m. W. of Ibadan, 8.xii.1957, Agodi, Ibadan, 10.xii.1957, between Shagamu and Ijebu-Ode, 14.xii.1957 (*W. A. Sands*). Eastern Region ; Port Harcourt, 14-16.iii., 1-2.iv.1957, 29m. from Port Harcourt on Owerri Road, 19.iv.1957 (*W. Wilkinson*). Northern Region ; 6m. N. of Minna, 20.xii.1956, 18m. from Bida on Badeggi Road, 24.xii.1956, Idu Forest, 20m. from Abuja on Keffi Road, and Gwagwa Forest, near Abuja, 28.xii.1956, Gwachipe Forest, 12m. from Abuja on Minna Road, 29.xii.1956, Dogon Forest, 65m. from Jos on Kafanchan Road, 8.ii.1957, 6m. N. of Jebba on Mokwa Road, 16.xii.1957, 42m. from Gboko on Oturkpo Road, 26.ii.1958, 22m. from Lokoja on Kabba Road, 10.iii.1958, 23m. from Kabba on Ondo Road, 11.iii.1958 (*W. A. Sands*).

CAMEROON : Mbalmayo, 7.x.1962 (*G. Becker*), own collection.

REPUBLIC OF CONGO : Brazzaville, 7.vi.1948 (*A. E. Emerson*), A.M.N.H.

CONGO : Basoko, 1909 (*H. Lang* and *J. P. Chapin*) ; 5km. from X-roads near Bilni (near Mambasa, Ituri Forest), 10.v.1948, Stanleyville, 25.v.1948, Yangambi, 30.v.1948 (*A. E. Emerson*) (with *Lang-Chapin* coll., at A.M.N.H.) ; Garamba Nat. Park, 1950 (*H. de Saeger* and *G. Demoulin*), Inst. des Parcs Nat. du Congo, Brussels.

UGANDA : Bwamba, 19.iii.1949, Kigezi, 1947 (*W. V. Harris*) ; 16m. from Kampala on Entebbe Road, 1.iii.1955 (*W. Wilkinson*).

A total of 52 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

Though common from Sierra Leone to Uganda, this species appears to have a more limited range south-eastwards than some of its congeners. It is found mainly in rain forest or forest outliers in forest-savannah mosaic areas (*Keay et al.*, 1959, vegetation types 7 and 8), though occasionally recorded from true savannah-woodland vegetation when growing under moist conditions near forest. The records of this species from Senegal and the Cape (referring to the Cape of Good Hope) by Hagen (1858), repeated in Snyder (1949), are erroneous. The Cape of Good Hope specimen of the soldier is *Trinervitermes trinervoides* (Sjöstedt), and the Senegal alate specimen does not belong to the subfamily Nasutitermitinae at all, but is probably *Termes* or *Promirotermes*.

The nests of this species are of dark brown, almost black carton, usually situated above ground level in trees or on woody lianes. The carton foraging runways extend in all directions for considerable distances, and it is common to find only the foraging workers and soldiers and to be unable to trace the nest.

***Nasutitermes camerunensis* (Sjöstedt) comb. n.**

(Text-figs. 4, 5, and 201; Map 3.)

Eutermes camerunensis Sjöstedt, 1899 : 37. Type locality : CAMEROUN.*Eutermes camerunensis* Sjöstedt : Snyder, 1949 : 349 [not classified].*Microcerotermes* (?) *camerunensis* (Sjöstedt) Weidner, 1955 : 249.

Imago. Head capsule chestnut brown, postclypeus, labrum, and antennae bright yellow-brown, almost orange. Pronotum, meso- and metanota, and abdominal tergites brown, pronotum with paler irregular "T"-shaped mark in middle of front half. Legs yellow. Abdominal sternites pale yellow in middle, clouded with pale brown round stigmata. Wings, membrane very pale brown, almost hyaline, slightly iridescent, veins pale brown outlined with sepia brown.

Posterior margin of head behind eyes distinctly less than semi-circular; fontanelle small, pale, but widely bifurcate anteriorly, lateral arms of "fork" reaching half-way to ocelli; eyes prominent, medium-sized, angularly oval, W/E index 2.9; ocelli medium-sized, oval, separated from eyes by half own least diameter or slightly less; postclypeus moderately inflated, width 2.5 times length, anterior margin nearly straight, posterior margin rounded; antennae 15 segmented, II and IV subequal, slightly longer than III and V.

Cerci (both known specimens are ♂) about as long as width across base, mamilliform.

Measurements (2 specimens, holotype and one other) in millimetres.

	Range
Head width across eyes	1.34-1.35
Greatest diameter of eye	0.46
Ocellus	0.13-0.14 × 0.16-0.19
Ocellus to eye	0.05-0.06
Width of pronotum	1.06-1.10
Length of pronotum	0.64-0.69
Length of hind tibia	1.61

This species is only known from the holotype imago and one other specimen. The soldier and worker castes are unknown. It was first recognized as belonging to *Nasutitermes* by Emerson, and my attention was drawn to it by his unpublished notes. Since then a further specimen has been found in the collection of the Termite Research Unit, confirming its existence as a separate species. It may be noted that only two species from the mainland of Africa are now known only from the soldier caste, namely *N. diabolus* and *N. ferranti*. Similarly only two are known from the imago alone, *N. camerunensis* and *N. chrysopleura*. In view of the widespread records of all the mainland species now known, it seems probable that these soldiers and imagos belong together in two species, although this cannot be settled until all castes are collected together. It is however possible to predict that if this is correct the most likely combinations would seem to be the soldier of *N. diabolus* with the imago *N. chrysopleura* and the soldier of *N. ferranti* with the imago *N. camerunensis*.

N. camerunensis differs from *N. kempae* and *N. elegantulus* in having relatively smaller eyes; the hind tibia is proportionately longer than in *N. fulleri*, and the widely bifurcate fontanelle distinguishes it from *N. arborum* and *N. infuscatus*. In the remaining species the postclypeus is much shorter in proportion to its width.

Material. CAMEROUN : iii.1892 (*H. Brauns*), unique holotype ♂ imago, Mus. Hamburg.

NIGERIA : Eastern Region; Port Harcourt, 15.iii.1957 (*W. Wilkinson*).

Nasutitermes chrysopleura (Sjöstedt)

(Text-figs. 6, 7, and 200; Map 3)

Eutermes chrysopleura Sjöstedt, 1897 : 126. Type locality : CAMEROUN, Victoria.*Termes* (*Eutermes*) *chrysopleura* (Sjöstedt) Desneux, 1904a : 41.*Eutermes chrysopleura* Sjöstedt ; Sjöstedt, 1926 : 324.*Nasutitermes chrysopleura* (Sjöstedt) Snyder, 1949 : 271.

Imago. Head capsule brown, postclypeus, antennae yellow-brown. Pronotum pale brown, legs yellow-brown. Abdominal tergites brown, sternites pale brown round stigmata, yellow-brown in middle. Wings missing in cotype. Colours may be faded in old specimen.

Posterior margin of head behind eyes nearly semi-circular ; fontanelle distinct, pale, tapering posteriorly, and concave rather than bifurcate at anterior end ; eyes medium sized, only moderately prominent in proportion to own diameter, nearly circular, W/E index 3.0 ; ocelli medium sized, separated from eyes by half own greatest diameter, oval ; postclypeus weakly inflated, width 3.8 times length, anterior margin nearly straight, posterior margin convex, widely arched, distinctly sinuate towards outer corners ; antennae damaged, II and V subequal, slightly shorter than IV, III longer than IV. Meso- and metanota with very wide-angled posterior margins. Cerci very short, only about two-thirds width at base, nearly conical.

Measurements (single paratype specimen) in millimetres.

Head width across eyes	1.53
Greatest diameter of eye	0.50
Ocellus	0.14 × 0.19
Ocellus to eye	0.09
Width of pronotum	1.38
Length of pronotum	0.83
Length of hind tibia	1.95

This species is known only from the type material. It closely resembles *N. latifrons*, which is common in the vicinity of the type locality, and it may ultimately prove to be the same species. There are however certain differences, even from the *N. latifrons* from the same area, and it may be that *N. chrysopleura* is the at present unknown imago of *N. diabolus*. The length of the head capsule to the front of the postclypeus is slightly but distinctly more than its width behind the eyes. In *N. latifrons* these dimensions are equal. The posterior margins of the meso- and metanota are more widely angled in *N. chrysopleura*. Though this is not usually a specific character in *Nasutitermes*, they appear to be consistently more narrowly angled in *N. latifrons*. The posterior margin of the postclypeus in *N. latifrons* tends to be straighter, slightly angled in the middle instead of curved, and not sinuate towards the outer corners. The ♀ cerci are also slightly longer and more mamilliform in *N. latifrons*.

N. chrysopleura is therefore retained as a separate species until further specimens are found to clarify its identity. It is unlikely to be confused with any other species, being larger than the rest of those having a short wide postclypeus.

Material. CAMEROUN : Victoria, ix.1873 (*Bucholz*), single paratype ♀ imago, A.M.N.H. (Holotype, in Mus. Greifswald).



MAP 3. "*Procornitermes* branch"; genera and species not mapped individually.

Nasutitermes diabolus (Sjöstedt)

(Text-figs. 34-38; Map 5)

Eutermes diabolus Sjöstedt, 1907 : 250. Type locality : CONGO, Mukimbungu.*Eutermes* (*Eutermes*) *diabolus* Sjöstedt ; Holmgren, 1912 : 62.*Eutermes* (*Eutermes*) *torquatus* Sjöstedt, 1924c : 494. Type locality : CONGO, Stanleyville.**syn. n.***Eutermes diabolus* Sjöstedt : Sjöstedt, 1926 : 318.*Eutermes torquatus* Sjöstedt ; Sjöstedt, 1926 : 321.*Nasutitermes* (*Nasutitermes*) *diabolus* (Sjöstedt) Emerson, 1928 : 477.*Nasutitermes diabolus* (Sjöstedt) ; Snyder, 1949 : 274.*Nasutitermes torquatus* (Sjöstedt) Snyder, 1949 : 299.*Imago*. Unknown, but see discussion on *N. camerunensis* and *chrysopleura*.

Soldier. Head capsule ferruginous to chestnut brown, nose ferruginous, uniform with head capsule, to dark pitchy brown, almost black. Some specimens and colonies have the distal half of the nose ferruginous to chestnut brown, shading paler near the base, and then a distinct brown to dark chestnut brown ring around the base and extending on to the head capsule. All intermediates between this and the uniformly coloured form exist, sometimes in one colony. Pronotum, antennae, legs, and abdominal tergites yellow-brown to brown, abdominal sternites yellow to yellow-brown.

Head capsule in plan view near circular or slightly oval, tapering towards front, nose weakly conical. In profile, evenly concave, sometimes very slightly sinuate at base of nose, nose slightly shorter to slightly longer than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 10-15 degrees ; postmentum evenly moderately convex ; antennae 13 segmented, II, III, and V subequal, or III slightly longer, IV distinctly shorter than these. Vertex with a pair of bilaterally placed long setae in some but not all specimens, and a few very fine microscopic setae ; nose with four long setae at tip, and sometimes a very few minute fine setae immediately behind them ; postmentum with a few long setae on anterior margin only.

Abdominal tergites with scattered very short setae, and longer setae on posterior margins of all except first or first and second, those on posterior tergites longer than rest ; sternites with numerous shorter setae and long setae on posterior margins.

Measurements (25 specimens from 9 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.50-1.80	1.60
Head width	0.80-1.00	0.87
Depth of head capsule	0.58-0.70	0.61
Width of pronotum	0.41-0.50	0.45
Length of pronotum	0.15-0.20	0.18
Length of hind tibia	0.98-1.18	1.05

Variation. The shape and size of the soldier caste is less variable than in some other species, but the colour pattern is highly variable. The form with the banded nose was described separately by Sjöstedt (1924) as *N. torquatus*.

References to *N. torquatus* by subsequent authors (Emerson, 1928, and Sands, 1957) are not correct, and are listed in the appropriate synonymies. The darker coloured and longer-nosed specimens of *N. lujae* have sometimes been confused with this species, but they are distinguishable by the more hairy nose tip and the less evenly concave profile. *N. lujae* also always has a pair of bilaterally placed setae on the vertex, and no smaller hairs have been detected in this position. *N. latifrons* is sometimes similar in general shape, but is easily distinguished by the hairy

postmentum, and the usually paler colouration. *N. schoutedeni* has a sharply tapered and distinctly hairy nose tip. *N. kempae* is East African in distribution, and also has a hairy nose tip.

Type Material. CONGO : Mukimbungu, 1906 (*K. E. Laman*), syntype soldiers from type colony, No. 1011, A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm) ; Stanleyville, 1913 (*H. Kohl*), syntype soldier from type colony, No. 1037, of *N. torquatus* (Sjöstedt), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

Other Material. NIGERIA : Western Region ; Sobo Plain, Obanokoro, 7.iii.1957 (*W. Wilkinson*), B.M.(N.H.). Eastern Region ; 8m. from Port Harcourt on Owerri Road, 10.xii.1957, and Port Harcourt, 18.xii.1957 (*W. Wilkinson*), B.M.(N.H.).

REPUBLIC OF CONGO : Brazzaville, 7.vi.1948 (*A. E. Emerson*), A.M.N.H.

CONGO : 20km. E. of Ndjili and 18km. S. of Leopoldville, 10.vi.1948, Yangambi, 30.v.1948 and Epulu, 23.v.1948 (*A. E. Emerson*) ; Stanleyville, 21.vi.1913 (*H. Kohl*), 18.iii.1948 (*N. A. Weber*), all in A.M.N.H.

A total of 11 nest series were examined.

This species has not been collected further westwards than Western Nigeria, and it seems likely that this is near the limit of its range. It is thus confined to the main forest block of West and Central Africa. It was recorded by Emerson (1928) as being a tree-nesting species, but like the rest of those with this habit, it is most frequently collected from runways on trees, and the nest is not easily located.

Nasutitermes elegantulus (Sjöstedt)

(Text-figs. 8-10, 39-45, 160-162, 202, 203; Map 6)

Eutermes elegantulus Sjöstedt, 1911b : 13. Type locality : CAMEROUN, Victoria.

Eutermes macrophthalmus Silvestri, 1912 : 240. Type locality : ISLAND OF PRINCIPE, Roca Infante.

Eutermes (*Subulitermes*?) *elegantulus* Sjöstedt ; Holmgren, 1912 : 64.

Eutermes (*Eutermes*) *macrophthalmus* Silvestri ; Holmgren, 1912 : 62.

Eutermes (*Eutermes*) *minusculus* Sjöstedt, 1924 : 40. Type locality : CONGO, Lukula. **syn. n.**

Eutermes elegantulus Sjöstedt ; Sjöstedt, 1926 : 309.

Eutermes macrophthalmus Silvestri [= *E. elegantulus* Sjöstedt] ; Sjöstedt, 1926 : 309.

Eutermes minusculus Sjöstedt ; Sjöstedt, 1926 : 308.

Nasutitermes (*Nasutitermes*) *kohli* Emerson, 1928 : 484. Type locality : CONGO, Kandolo, near Stanleyville. **syn. n.**

Nasutitermes (?*Nasutitermes*) *minusculus* (Sjöstedt) Emerson, 1928 : 487.

Nasutitermes elegantulus (Sjöstedt) Snyder, 1949 : 275.

Nasutitermes kohli Emerson ; Snyder, 1949 : 282.

Nasutitermes minusculus (Sjöstedt) ; Snyder, 1949 : 288.

Imago. Head capsule yellow-brown, with three indistinct streaks on vertex, one in mid-line and two diverging laterally, slightly paler, yellow to pale yellow-brown. Postclypeus, labrum, antennae, pronotum, meso- and metanota, and legs yellow to pale yellow-brown. Abdominal tergites yellow-brown to pale brown, slightly darker at sides than in middle ; sternites yellow to pale yellow-brown, darker round stigmata. Wings translucent, pale yellow-brown, subcosta yellow-brown, radius sector yellow to yellow-brown outlined with brown, other venation pale brown.

Posterior margin of head behind eyes less than semi-circular, distinctly sinuate immediately behind eyes ; fontanelle distinct, pale " Y " -shaped, sometimes slightly depressed posteriorly ; eyes large to very large relative to head width, W/E index 2.0 to 2.5, but only moderately prominent in proportion to own diameter, slightly angularly oval ; ocelli small, from almost touching eyes, to separated from them by less than half own least diameter ; postclypeus moderately inflated, width 2.4 to 3.1 times length, anterior margin nearly straight to slightly concave, posterior margin convex, rounded ; antennae 15 segmented, II, III, and IV subequal in length, but III slightly thinner.

Cerci of ♀ as long as width across base, conical.

Measurements (14 specimens from 3 localities) in millimetres.

	Range	Mean
Head width across eyes	1.04-1.18	1.12
Greatest diameter of eye	0.41-0.51	0.47
Ocellus	0.09-0.11 × 0.11-0.14	0.10 × 0.12
Ocellus to eye	0.01-0.04	0.02
Width of pronotum	0.85-1.00	0.94
Length of pronotum	0.55-0.68	0.61
Length of hind tibia	1.25-1.38	1.33
Length of fore wing	9.40-11.80	10.62

Soldier. Head capsule orange-yellow to orange, nose ferruginous orange to ferruginous. Pronotum and antennae as head capsule. Abdominal tergites and legs yellow to orange-yellow, abdominal sternites pale yellow.

Head capsule in plan view oval, tapering towards front, often slightly "shouldered" behind antennae, nose very weakly conical, and slender. In profile, usually with distinct convex change of contour at base of nose, but sometimes nearly straight or somewhat sinuate, nose approximately equal in length or slightly longer than rest of head capsule measured from hind margin of antennal socket ; angle of nose cone 7-15 degrees ; postmentum prominent and distinctly convex ; antennae 11-13 segmented, 4 out of 5 specimens with 12, proportions of segments in the latter, II and V subequal, IV shorter than these or equal, III shorter than IV ; in 13 segmented forms, II and VI subequal longer than V, III and IV shorter than V, sometimes subequal, or III longer than IV. Setae on head consist of a bilaterally placed pair on vertex, two or four across base of nose, and rather hairy nose tip, sometimes with four setae more prominent than those behind them ; microscopic short bristle-like setae scattered on vertex, visible in profile ; postmentum setae confined to anterior margin.

Abdominal tergites with very short scattered setae, and longer setae on posterior margins, more prominent towards the rear ; sternites with more numerous short setae and longer setae on posterior margins.

Measurements (59 specimens from 17 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.18-1.48	1.31
Head width	0.59-0.81	0.70
Depth of head capsule	0.39-0.55	0.46
Width of pronotum	0.33-0.43	0.36
Length of pronotum	0.11-0.16	0.13
Length of hind tibia	0.70-0.90	0.77

Variation. In the imago the main variation is in the relative size of the eyes. Soldier variation is largely in the head profile, and in the development of the small scattered hairs on the vertex, which are sometimes not much in evidence. They are very prone to being rubbed off, and old or battered specimens are likely to have lost most of them.

Only two species show any great resemblance to *N. elegantulus*. The East African species *N. kempae* is similar but larger, and these two would appear to be more closely related to each other and to certain species from other zoogeographical

regions than to any other Ethiopian species. The only species which appears to be somewhat intermediate between these and the other Ethiopian forms is *N. fulleri*, separated from *N. elegantulus* in the soldier by the difference in profile and the lack of small setae on the vertex, and in the alate, by the relatively smaller eyes, with the ocelli more distant from them.

Type Material. CAMEROUN : Victoria, 19.ix.1893 (*Bucholz*), syntype soldier, type colony, *N. elegantulus* (*Sjöstedt*), A.M.N.H.

ISLAND OF PRINCIPE : Roca Infante (*L. Fea*), syntype ♀ imago and soldier, type colony, *N. macrophthalmus* (*Silvestri*), A.M.N.H. (other syntypes in *Silvestri* coll., Lab. Zool., Sc. Agr., Portici).

CONGO : Lukula (*H. Schouteden*), syntype soldier, type colony, *N. minusculus* (*Sjöstedt*), A.M.N.H. (other syntypes in Congo Mus., Brussels) ; Kandolo, near Stanleyville, 13.vii.1913 (*H. Kohl*), paratype soldiers, type colony, *N. kohli* Emerson, A.M.N.H. and B.M.(N.H.) (Holotype in A.M.N.H.).

Other Material. GUINEA : Nimba Mountains, 1957, 3 vials (*M. Lamotte*), Inst. Franç. d'Afr. Noire, Dakar.

GHANA : Bobiri Forest, 23m. from Kumasi on Accra Road, 21.ii.1959, and 9m. from Nkoranza on Techiman Road, 29.iii.1959 (*W. A. Sands*).

NIGERIA : Western Region ; Sobo Plain, Obanokoro, 9.i, 7.iii.1957 (*W. Wilkinson*) ; 30m. from Ijebu-Ode on Benin Road, 12.xii.1957 (*W. A. Sands*). Eastern Region ; 25m. from Enugu on Awgu Road, 2.ii.1957, Nkpoku, 12m. from Port Harcourt on Owerri Road, 17.viii.1957, 8m. from Port Harcourt on Owerri Road, 10.xii.1957, and Port Harcourt, 19.xii.1957 (*W. Wilkinson*). Northern Region ; 18m. from Bida on Badeggi Road, 24.xii.1956, and Idu Forest, 20m. from Abuja on Keffi Road, 28.xii.1956 (*W. A. Sands*).

CAMEROUN : Mbalmayo, 17.x.1962 (*G. Becker*), own collection.

ISLAND OF PRINCIPE : Roca Sundi, 16, 23.ix.1949 (*G. R. Gradwell* and *D. Snow*).

CONGO : Luluabourg, 28.viii.1913 (*Callewaert*) ; Malela, 4.viii.1915 (*J. Bequaert*) ; Epulu, 17.v.1948, 4 vials (*A. E. Emerson*), all in A.M.N.H.

A total of 27 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

This species is widely distributed throughout the West African and Congo forests, but is never common. It has been recorded as building soft carton nests, but is most frequently found in the nests of other genera, in rotting logs, or in narrow runways on trees. The workings have a reticulate shagreen patterned lining of black carton.

Nasutitermes ferranti (Wasmann)

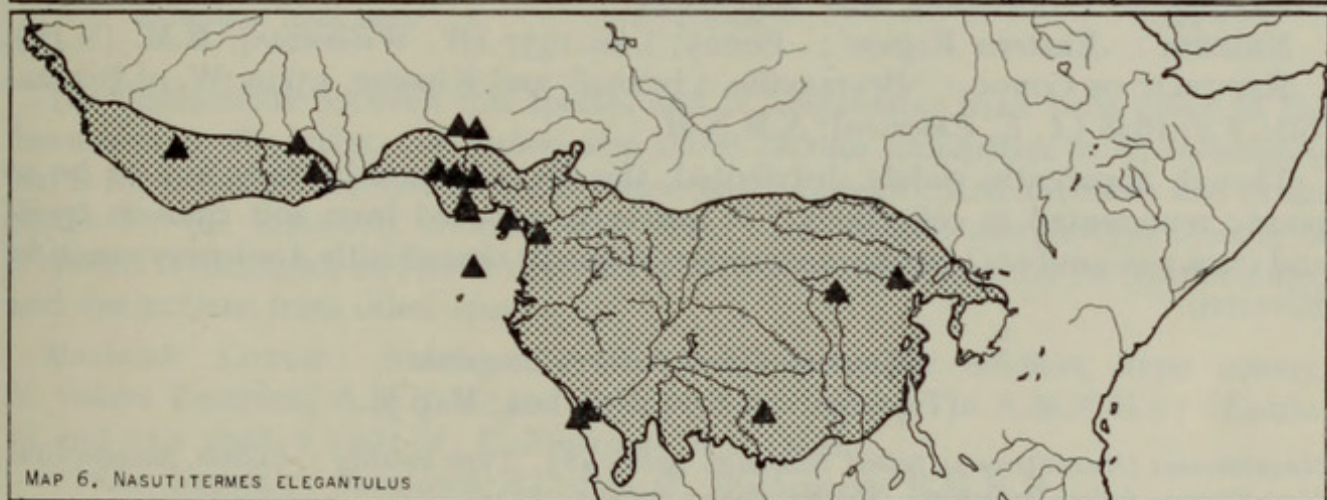
(Text-figs. 46-50; Map 3)

Eutermes ferranti Wasmann, 1911 : 167. Type locality : CONGO, Kasai, Sankuru.

Eutermes (*Eutermes*) *ferranti* Wasmann ; Holmgren, 1912 : 62.

Eutermes ferranti Wasmann ; Sjöstedt, 1926 : 310.

Nasutitermes ferranti (Wasmann) Snyder, 1949 : 276.



MAPS 4-6. (4), *Nasutitermes arborum*. Vegetation types : 7, 8, and 16 ; (5), *Nasutitermes diabolus*. Vegetation type : 7 ; (6), *Nasutitermes elegantulus*. Vegetation types : 7 and 8.

Imago. Unknown, but see discussion on *N. camerunensis* and *N. chrysopleura*.

Soldier. Head capsule ferruginous orange to chestnut brown, nose dark chestnut brown to brownish black, with reddish tip. Pronotum, antennae, and abdominal tergites yellow-brown. Legs yellow, abdominal sternites pale yellow.

Head capsule in plan view nearly circular, nose broadly conical. In profile, near straight or slightly sinuate to well behind base of nose, then raised and rounded to back of head, small hump at base of nose common. Nose distinctly shorter than rest of head capsule, measuring to hind margin of antennal socket, angle of nose cone 18–30 degrees; postmentum weakly convex; antennae 13 segmented, II and V subequal and longer than IV, but shorter than III. Head setae consist of bilaterally placed pair on vertex, two or four across base of nose, four at nose tip, and a few on anterior margin of postmentum; there are also scattered microscopic setae on vertex, only visible at certain angles of illumination.

Abdominal tergites with very sparsely scattered minute setae, and longer setae on posterior margins, four to each tergite arranged in longitudinal rows down abdomen; sternites with sparse short setae, and longer setae on posterior margins, less regularly arranged than on tergites.

Measurements (17 specimens from 4 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.39–1.58	1.49
Head width	0.79–1.00	0.92
Depth of head capsule	0.54–0.65	0.61
Width of pronotum	0.41–0.50	0.44
Length of pronotum	0.15–0.20	0.17
Length of hind tibia	0.95–1.08	1.02

This species had not been recognized since it was first described, but new material has now been discovered. It is distinct from all other African species, with its short, thick nose tipped with only four setae, and the two or four setae across the base of the nose.

Material. CONGO: Kasai, Sankuru (*E. Luja*), unique holotype soldier, *Nasutitermes ferranti* (Wasmann), Mus. Maastricht.

NIGERIA: Eastern Region; Bonny, i.xii.1957 (*W. Wilkinson*), B.M. (N.H.).

REPUBLIC OF CONGO: Brazzaville, i.iv.1948, and Kipome, 13km. W. of Brazzaville, 8.vi.1948 (*A. E. Emerson*), A.M.N.H.

Though apparently widely distributed, this species must be very rare to be so poorly represented in collections. It has been recorded from soft runs on trees, and from a mound of *Odontotermes scrutator* (Sjöstedt) shared with *Amitermes evuncifer* Silvestri.

***Nasutitermes fulleri* Emerson**
(Text-figs. 11–13, 51–57, 204; Map 7)

Nasutitermes (*Nasutitermes*) *fulleri* Emerson, 1928: 483. Type locality: CONGO, Stanleyville. *Nasutitermes fulleri* Emerson; Snyder, 1949: 276.

Imago. Previously undescribed. Head capsule sepia brown, postclypeus paler, yellow-brown, labrum yellow. Pronotum, and abdominal tergites sepia brown, meso- and metanota, pleural and ventral thoracic sclerites and femora brown. Antennae, tibiae and tarsi pale yellow. Abdominal sternites brown laterally, shading to pale yellow-brown in middle. Wings translucent pale brown, subcosta and radius sector yellow-brown, outlined sepia brown, rest of venation brown.

Posterior margin of head less than semi-circular behind eyes, distinctly sinuate immediately behind eyes; fontanelle slightly paler than rest of head, Y-shaped; eyes medium sized relative to head width, W/E index 3.0, not very prominent in proportion to own diameter, slightly angular oval; ocelli rather small, separated from eyes by slightly less than half own least diameter; postclypeus moderately inflated, width 3.0 times length, anterior margin straight, posterior margin convex, rounded; antennae 15 segmented, II slightly longer than III, III than IV, and IV than V.

Cerci of ♀ as long as width across base, mamilliform.

Measurements (unique morphotype ♀) in millimetres.

Head width across eyes	approx. 1.26 (damaged)
Greatest diameter of eye	0.43
Ocellus	0.11 × 0.15
Ocellus to eye	0.05
Width of pronotum	1.00
Length of pronotum	0.60
Length of hind tibia	1.38
Length of fore wing	10.40

Morphotype. UGANDA: Bwamba, 19.iii.1949 (*W. V. Harris* coll. no. 550).
Morphotype ♀ imago in British Museum (Natural History).

Soldier. The new material now available necessitates some additions to the original description, as follows; nose slightly shorter than rest of head capsule, measured from hind margin of antennal socket, weakly conical, angle of nose cone 7–15 degrees, nose tip with four main setae, and sparsely hairy behind them. Postmentum setae confined to anterior margin.

Measurements (36 specimens from 13 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.23–1.53	1.39
Head width	0.65–0.90	0.78
Depth of head capsule	0.43–0.60	0.53
Width of pronotum	0.35–0.45	0.40
Length of pronotum	0.13–0.18	0.17
Length of hind tibia	0.75–0.98	0.85

The distinctions between this species and *N. elegantulus* have been given in the discussion on the latter. *N. fulleri* also shows certain similarities to *N. infuscatus*, but is separated in the soldier by the consistently 12 segmented antennae and in the imago by the relatively shorter hind tibia. The unique morphotype female of *N. fulleri* is damaged, and more material is needed to establish fully its relationships, and distinctions from other species.

Material. CONGO: Stanleyville (*H. Kohl*), paratype soldiers, type colony, *N. fulleri* Emerson, A.M.N.H. and B.M.(N.H.) (Holotype in A.M.N.H.); Epulu, 11 and 23.v.1948, 7 vials (*A. E. Emerson*), A.M.(N.H.).

SIERRA LEONE: Freetown, 8.i.1958 (*W. Wilkinson*), B.M.N.H.

GUINEA: Nimba Mountains, 1957, 2 vials (*M. Lamotte*), Inst. Franç. d'Afr. Noire, Dakar.

NIGERIA: Western Region; Sobo Plain, Obanokoro, 6–7.iii.1957, 2 vials (*W. Wilkinson*), B.M.(N.H.). Northern Region; Idu Forest, 20m. from Abuja on Keffi Road, 28.xii.1956, and Dogon Forest, 65m. from Jos on Kafanchan Road, 8.ii.1957 (*W. A. Sands*), B.M.(N.H.).

CAMEROON : Im. W. of Calabar Junction on Mamfe-Ikom Road, 27.v.1957 (W. Wilkinson), B.M.(N.H.).

CENTRAL AFRICAN REPUBLIC : Bengessa (Bangassou), Bas Mbomu, 12.iii.1948 (N. A. Weber), A.M.N.H.

UGANDA : Ruwenzori Mountains, 10m. E.N.E. of Bundibugyo, 26.viii.1952, 2 vials (G. O. Evans), B.M.(N.H.).

A total of 10 nest series were examined.

This species occurs from Sierra Leone to Uganda. Its southward distribution appears to be more limited, but this may be a reflection of its scarcity and due to failure of collection rather than absence of the species. It has generally been found in woody debris on the forest floor or in small runways on trees. An arboreal nest has been recorded, but this may not have been of its own construction.

Nasutitermes hirticeps sp. n.

(Text-figs. 58-61; Map 3)

Imago. Unknown.

Soldier. Head capsule orange, nose ferruginous orange. Pronotum, antennae and abdominal tergites orange-yellow, abdominal sternites and legs yellow.

Head capsule in plan view almost circular, nose conical. In profile sinuate with distinct hump at base of nose, then rather abruptly raised and rounded to back of head; nose distinctly shorter than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 11-15 degrees; postmentum moderately and evenly convex; antennae 13 segmented, III and V subequal, IV shorter than these, but slightly longer than II.

Entire body and head capsule including nose with long yellow setae, but confined on postmentum to anterior margin; those on head capsule and nose scattered irregularly, nose tip without any concentration of smaller setae; anterior margin of pronotum with row of long conspicuous setae; those on posterior margins of abdominal sternites longer than other abdominal setae.

Measurements (10 specimens randomly selected from type colony) in millimetres.

	Range	Mean
Head length to tip of nose	1.53-1.63	1.57
Head width	0.95-1.03	0.99
Depth of head capsule	0.65-0.70	0.68
Width of pronotum	0.50-0.53	0.51
Length of pronotum	0.20-0.23	0.21
Length of hind tibia	1.25-1.38	1.30

N. hirticeps is quite unlike any other species in the Ethiopian Region, in being conspicuously hairy on both head and body. Its restricted occurrence on a single island on a chain in which both this and other islands also share the mainland fauna, immediately raises the question of possible introduction from elsewhere. In view of the intense activity of the slave trade in that area in times past, such an introduction is not impossible, but a species of *Nasutitermes* would appear a somewhat unlikely candidate for a journey of this type; the distributions of *Coptotermes formosanus* and *Reticulitermes flavipes* do however show that dispersal by human agencies is not confined to Kalotermitidae.

N. hirticeps closely resembles several South American species. *N. nigriceps* (Haldeman, 1858) is not readily distinguishable from it except by its darker colouration; in view of the age of the types it is possible there has been some fading in preservation, though the appearance of the specimens does not suggest this. *N. macrocephalus* (Silvestri, 1903) is larger, and the soldier postmentum bears scattered setae, but it is otherwise closely similar.

I consider it desirable in the circumstances to name *N. hirticeps* as a new species in the list for the Ethiopian Zoogeographical Region, with the proviso that further material and information may lead to its inclusion in an already established species from elsewhere.

Holotype soldier. ISLAND OF SAO THOME: Binda, 1918 (*A. F. de Seabra*, "with *Cephalotermes*"), A.M.N.H.

Paratypes, same data as holotype, A.M.N.H. & B.M.(N.H.).

***Nasutitermes infuscatus* (Sjöstedt)**
(Text-figs. 14, 15, 62-68, 205, 206; Map 8)

Eutermes infuscatus Sjöstedt, 1902: 40. Type locality: NYASALAND, Zomba.

Eutermes usambarensis Sjöstedt, 1904: 103. Type locality: TANGANYIKA, Usambara Mountains.

Termes (Eutermes) infuscatus (Sjöstedt) Desneux, 1904a: 43.

Termes (Eutermes) usambarensis (Sjöstedt) Desneux, 1904a: 46.

Eutermes (Eutermes) infuscatus Sjöstedt; Holmgren, 1912: 62.

Eutermes infuscatus Sjöstedt; Sjöstedt, 1926: 318.

Eutermes usambarensis Sjöstedt; Sjöstedt, 1926: 322.

Nasutitermes infuscatus (Sjöstedt) Snyder, 1949: 280.

Nasutitermes usambarensis (Sjöstedt) Snyder, 1949: 300.

Imago. Head capsule chestnut brown, postclypeus and antennae yellow-brown, labrum pale yellow-brown. Pronotum and abdominal tergites chestnut brown, meso- and metanota brown. Abdominal sternites pale brown laterally, narrowly paler, yellow-brown in mid-line. Legs pale yellow-brown.

Posterior margin of head behind eyes nearly semi-circular, only slightly sinuate immediately behind eyes; fontanelle distinct, paler than rest of head, Y-shaped; eyes short oval, moderately prominent in proportion to own diameter but not large relative to head width, W/E index 3.0-3.5; ocelli small, separated from eyes by slightly less than own least diameter; postclypeus moderately inflated, width 2.8-3.0 times length, anterior margin slightly concave or sinuate, posterior margin convex, rounded, distinctly sinuate towards outer corners; antennae 15 segmented, II longer than III and IV which are subequal and slightly longer than V.

Cerci of ♀ as long as width across base, slightly irregularly conical.

Measurements (11 specimens from 4 localities) in millimetres.

	Range	Mean
Head width across eyes	1.20-1.38	1.31
Greatest diameter of eye	0.37-0.44	0.41
Ocellus	0.10-0.11 × 0.14-0.17	0.11 × 0.15
Ocellus to eye	0.07-0.10	0.08
Width of pronotum	1.00-1.13	1.08
Length of pronotum	0.58-0.72	0.68
Length of hind tibia	1.54-1.73	1.63
Length of fore wing	11.60-11.90	11.77

Soldier. Head capsule yellow to ferruginous orange, nose orange to ferruginous. Pronotum and antennae yellow to orange-yellow. Abdominal tergites and legs yellow, abdominal sternites pale yellow.

Head capsule in plan view short oval, tapering towards front, nose weakly conical. In profile nearly straight, sometimes slightly concave or sinuate with weak hump at base of nose; nose shorter than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 12–15 degrees; postmentum weakly convex; antennae 12–14 segmented, usually 13, II and IV subequal, shorter than V, III longer than V. Head setae confined to four at nose tip with shorter setae behind them, sometimes a bilaterally placed pair on vertex, and several on front margin of postmentum.

Abdominal tergites with very sparse minute setae, and a few fine short setae on posterior margins of some or all segments; sternites with scattered short setae, and longer setae towards posterior margins.

Measurements (22 specimens from 16 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.33–1.70	1.53
Head width	0.63–1.05	0.89
Depth of head capsule	0.50–0.68	0.60
Width of pronotum	0.42–0.64	0.48
Length of pronotum	0.17–0.30	0.21
Length of hind tibia	0.97–1.33	1.08

Variation. The imago has not been found as variable as in some other species. In the soldier caste it is common to find larger soldiers which have slightly different form and proportions from the smaller members of the same colony, with distinct breaks in the range of variation. These are probably derived from a different instar of development, and represent a vestigial or rudimentary dimorphism; they appear only to be found in the more populous colonies.

This species is closely similar to *N. arborum* in certain features of both imago and soldier, and differences have been given under that species. *N. fulleri* is also related, but is separated in the soldier by its 12 segmented antennae, and in the imago by its proportionately shorter hind tibia, and the ocellus being closer to the eye.

Dr. A. E. Emerson has selected and labelled as lectotype one of the type series, but the designation has not been published hitherto:—

Lectotype: NYASALAND: Zomba, iv.1899 (*Cameron*), lectotype imago and paralectotype soldier, *N. infuscatus* (Sjöstedt), Naturhist. Riksmus., Stockholm. Other paralectotype imago and soldier, A.M.N.H.

Type Material. TANGANYIKA: Usambara Mountains, Derema (*Conradt*), syn-type soldiers, *N. usambarensis* (Sjöstedt), Naturhist. Riksmus., Stockholm (others in Berlin Mus.).

Other Material (additional to that recorded in Sands, 1957). CONGO: 8km. N. of Rwindi Camp, 4.v.1948, and Rwindi Camp, 5.v.1948, 3 vials (*A. E. Emerson*), A.M.N.H.

KENYA: Shimba Hills, 4.vi.1952 (*W. A. Sands*) and 13.vi.1952 (*P. B. Kemp*).

TANGANYIKA: Ifakara, 30.ix.1949 (*M. Luscher*), A.M.N.H.; Amani, 7–9.ii.1952, 3 vials, and Mwakijembe, 11.ii.1952 (*W. A. Sands*).

MAFIA ISLAND: 1937 (*W. V. Harris*).

PEMBA ISLAND: Wete, ii.1952 (*Packenham*).

NYASALAND : 15m. from Limbe on Cholo Road, 12.viii.1953, 9m. E. of Mlanje, 18.viii.1953, 2 vials, 12m. E. of Chiradzulu, 21.viii.1953, 25m. from Kota-Kota on Kasungu Road, 17.ix.1953, and 7m. from Nkata Bay on Ekwendeni Road, 22.ix.1953 (*W. A. Sands, W. Wilkinson*).

A total of 32 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

N. infuscatus (Sjöstedt) has been found in the coastal belt of East Africa, and inland up the Great Rift Valley to the borders of the Congo. It has not been found in central Kenya or Tanganyika, and there are no records from the Rift Valley between the northern shoreline of Lake Nyassa and Rwindi. It is thought that it probably occurs in patches of damp woodland on the fringes of all lakes in the Rift Valley, along the western border of Tanganyika.

The nest is commonly arboreal, usually attached to the side of a tree trunk rather than taking the spherical form on a branch or liane seen in some other species.

Nasutitermes kempae Harris

(Text-figs. 16, 17, 69-77, 207, 208; Map 9)

Nasutitermes kempae Harris, 1954 : 135. Type locality : TANGANYIKA, Handeni.

Imago. Some additions to the original description (Sands, 1957) are necessary. W/E index 2.4-2.6; postclypeus inflated, width 2.0-2.3 times length.

Cerci of ♀ slightly shorter to slightly longer than width across base.

Further material has increased the known range of variation in size.

Measurements (14 specimens from 2 localities) in millimetres.

	Range	Mean
Head width across eyes	1.20-1.36	1.27
Greatest diameter of eye	0.48-0.55	0.51
Ocellus	0.13-0.16 × 0.16-0.20	0.14 × 0.19
Ocellus to eye	0.01-0.03	0.02
Width of pronotum	0.94-1.18	1.05
Length of pronotum	0.56-0.72	0.66
Length of hind tibia	1.38-1.64	1.51
Length of fore wing	9.90-12.20	11.18

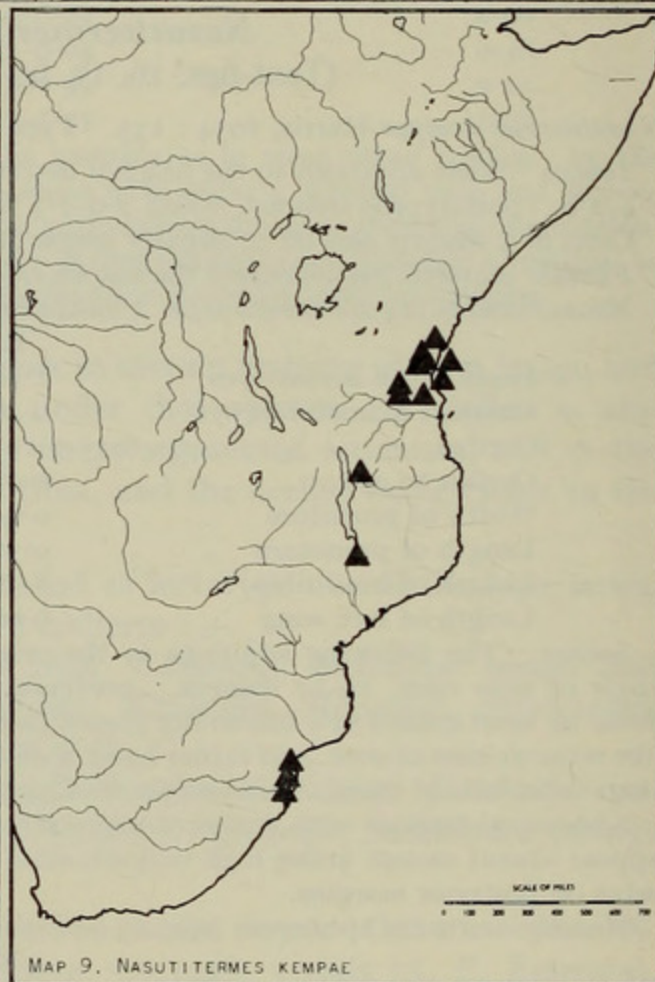
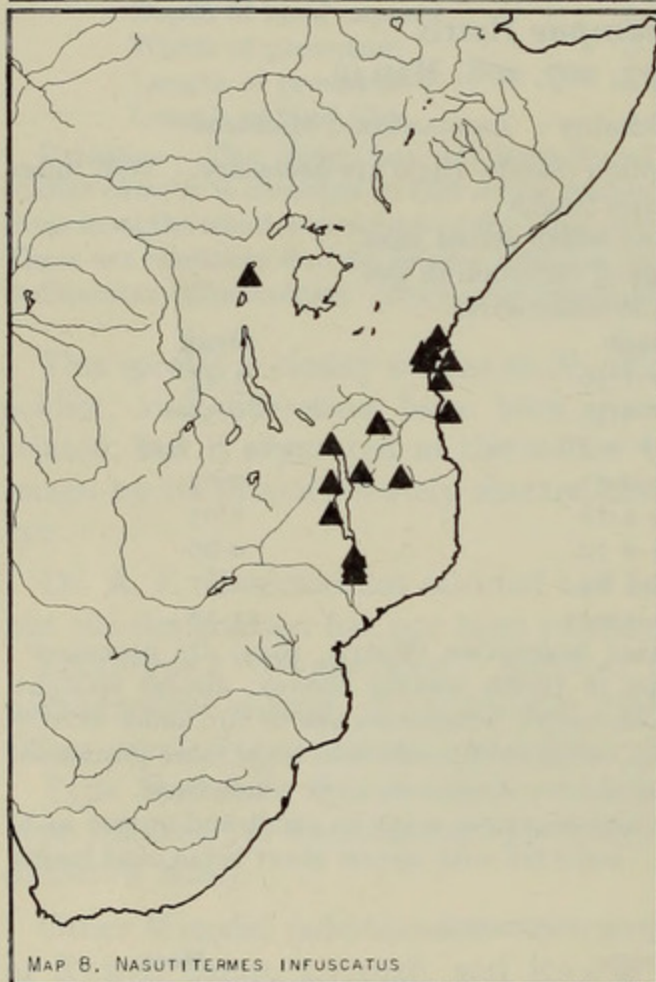
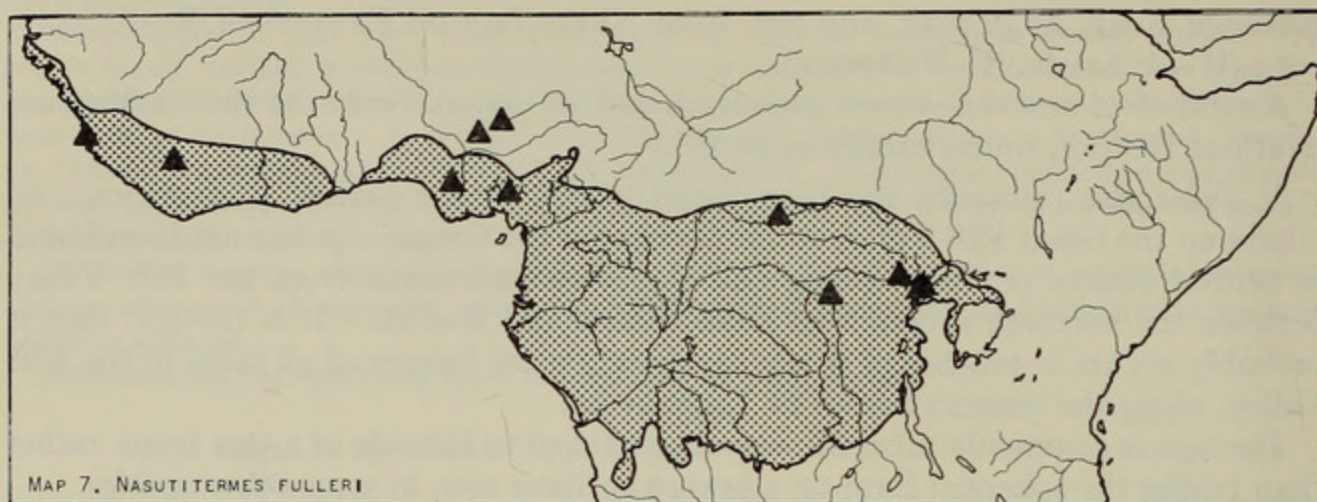
Soldier. The following additions to the original description (Harris, 1954) are necessary : angle of nose cone, 10-17 degrees; postmentum in profile weakly convex, almost straight. Setae on head consist of a bilaterally placed pair on vertex, sometimes one or two small bristle-like setae at base of nose, and rather hairy nose tip, occasionally with four setae more prominent than those behind them; microscopic small setae scattered sparsely over whole head.

Abdominal tergites with scattered short setae and marginal setae so small and sparse as to appear absent except under high magnification; sternites with sparse short setae, and longer setae on posterior margins.

Measurements (29 specimens from 13 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.61-2.05	1.78
Head width	0.88-1.29	1.05
Depth of head capsule	0.61-0.82	0.66
Width of pronotum	0.43-0.64	0.53
Length of pronotum	0.15-0.25	0.22
Length of hind tibia	0.89-1.28	1.04

Variation. This is another species in which the soldier caste in populous colonies appears to be derived from several instars, indicating a residual or possibly rudimentary polymorphism.



MAPS 7-9. (7), *Nasutitermes fulleri*. Vegetation types : 7 and 8 ; (8), *Nasutitermes infuscatus*. Vegetation types : 7 and 9, and small moist woodland and forest patches in Rift Valley ; (9), *Nasutitermes kempae*. Vegetation types : 7 and 9, and small riverain moist woodland and forest patches inland.

The close relationship of this species to *N. elegantulus* has been discussed under the latter, and its distinctions from other species in an earlier paper (Sands, 1957).

Material (additional to that recorded in Harris, 1954, and Sands, 1957).

MOZAMBIQUE : Lourenço Marques, 31.v.1953 (*E. Giddy*), N.C.I., Pretoria.

REPUBLIC OF SOUTH AFRICA : North Zululand, Ubombo, Lake Sibayi, and Sordwana Bay, 19.xi.1955 (*W. G. H. Coaton*), N.C.I., Pretoria, and B.M.(N.H.) ; Ingwavuma, 29.i.1959 (*W. G. H. Coaton*), N.C.I., Pretoria.

A total of 21 nest series were examined.

The new records from Zululand provide a great but not unexpected southward extension of the range of this species, and these must be very near the limit, since the subtropical climate gives place to the temperate zone only a little further south.

Nasutitermes latifrons (Sjöstedt)

(Text-figs. 18, 19, 78-87, 209-212: Map 10)

Eutermes latifrons Sjöstedt, 1896 : 298. Type locality : CAMEROUN, Ekundu.

Eutermes arborum (Smeathman) ; Sjöstedt, 1900 : 204.

Eutermes sjöstedti Wasmann, 1902 : 716. [n. n. for *E. latifrons* Sjöstedt] [Not valid, Desneux 1904 : 151].

Termes latifrons (Sjöstedt) Desneux, 1904 : 151.

Eutermes latifrons Sjöstedt ; Sjöstedt, 1905 : 19.

Eutermes pius Sjöstedt, 1911b : 16. Type locality : CAMEROUN, Victoria. **syn. n.**

Eutermes (*Eutermes*) *latifrons* Sjöstedt ; Holmgren, 1912 : 62.

Eutermes (*Trinervitermes*) *pius* Sjöstedt ; Holmgren, 1912 : 65.

Eutermes (*Eutermes*) *incurvus* Sjöstedt ; 1924a : 41. Type locality : CONGO, Kunungu. **syn. n.**

Eutermes (*Eutermes*) *ueleensis* Sjöstedt, 1924b : 494. Type locality : CONGO, Haut Uélé, Moto. **syn. n.**

Eutermes indoensis Sjöstedt, 1925 : 55. Type locality : REPUBLIC OF CONGO, Indo, Sibiti. **syn. n.**

Eutermes latifrons Sjöstedt ; Sjöstedt, 1926 : 311.

Eutermes incurvus Sjöstedt ; Sjöstedt, 1926 : 320.

Eutermes ueleensis Sjöstedt ; Sjöstedt, 1926 : 317.

Trinervitermes pius (Sjöstedt) Sjöstedt, 1926 : 338.

Eutermes expulsus Sjöstedt, 1926b : 154. Type locality : CONGO, Bas Uélé, Djamba. **syn. n.**

Nasutitermes (*Nasutitermes*) *incurvus* (Sjöstedt) Emerson, 1928, p. 478.

Nasutitermes latifrons (Sjöstedt) Snyder, 1949 : 283.

Nasutitermes incurvus (Sjöstedt) ; Snyder, 1949 : 279.

Nasutitermes ueleensis (Sjöstedt) Snyder, 1949 : 300.

Nasutitermes expulsus (Sjöstedt) Snyder, 1949 : 276.

Nasutitermes incurvus (Sjöstedt) ; Sands, 1957 : 8.

Imago. Head capsule dark chestnut brown to dark sepia brown, slightly paler in front of ocelli, postclypeus yellow-brown, labrum yellow, antennae brown. Pronotum dark sepia brown, with slightly paler patch in middle of front half ; meso- and metanota and other thoracic sclerites sepia brown. Legs yellow, darker at tips of femora and bases of tibiae, brown. Abdominal tergites dark sepia brown, lateral parts of sternites sepia brown, paler, yellow-brown in middle. Wing membrane translucent brown, venation sepia brown, radius sector with dark sepia brown line on inner side.

Posterior margin of head behind eyes regularly rounded but less than semi-circular ; fontanelle not conspicuous, variable, from Y-shaped and slightly paler than head capsule, to almost obsolete, or even slightly darker than head ; eyes nearly circular, moderately prominent to prominent in proportion to own diameter, but not large relative to head width, W/E index 2.9-3.4 ; ocelli medium sized, separated from eyes by two-thirds to distinctly more than own least diameter, oval ; postclypeus weakly inflated, width 3.3-4.2 times length, anterior margin slightly concave or weakly sinuate, posterior margin convex, obtusely angular in middle, near straight or slightly curved to outer corners ; antennae 15 segmented, II and IV subequal, slightly longer than III and V which are also subequal.

Cerci of ♀ somewhat mamilliform conical, shorter than broad at base.

Measurements (25 specimens from 7 localities) in millimetres.

	Range	Mean
Head width across eyes	1.43-1.70	1.54
Greatest diameter of eye	0.44-0.55	0.49
Ocellus	0.11-0.15 × 0.13-0.21	0.13 × 0.18
Ocellus to eye	0.08-0.13	0.10
Width of pronotum	1.18-1.43	1.32
Length of pronotum	0.70-0.88	0.79
Length of hind tibia	1.75-2.13	1.93
Length of fore wing	11.40-13.10	12.32

Soldier. Head capsule orange-yellow to ferruginous orange, nose ferruginous orange to chestnut brown. Pronotum and antennae as head capsule. Abdominal tergites and femora of legs yellow, abdominal sternites, tibiae and tarsi pale yellow.

Head capsule in plan view varies with size : smaller specimens oval, tapering towards front, medium sized, near circular, largest, wider than length to base of nose, often indented in mid line at back of head, and sometimes with small projection on each side of base of nose ; nose weakly to moderately conical. In profile distinctly concave, with back of head raised and rounded, except in smallest specimens, often somewhat sinuate with slight hump at base of nose ; nose distinctly shorter to distinctly longer than rest of head capsule, measuring from hind margin of antennal socket, often within one colony, angle of nose cone 5-17 degrees ; postmentum slightly convex ; antennae 12-14 segmented, usually 13, proportions vary with size, III long, up to twice II, IV and V subequal, slightly longer than II. Head setae confined to the hairy nose tip and scattered over entire surface of postmentum ; dorsal surface of head capsule without prominent setae.

Abdominal tergites with scattered minute setae, and longer setae on posterior margins of last three or four segments ; sternites with scattered shorter setae, and long setae on posterior margins.

Measurements (144 specimens from 35 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.40-2.11	1.93
Head width	0.73-1.35	1.07
Depth of head capsule	0.53-0.95	0.76
Width of pronotum	0.38-0.65	0.50
Length of pronotum	0.13-0.38	0.21
Length of hind tibia	0.93-1.73	1.26

Variation. Imagos from the eastern end of the range tend to be slightly larger, and to have a slightly paler postclypeus than those from the west coast of Africa, as in certain other species.

The soldiers are more variable than in any other species in size, and in the shape of both profile and plan views of the head. The smallest specimens included in the above range of measurements are somewhat nanitic, but even in the more mature colonies the smaller soldiers may be only 1.55mm. long. The nanitic soldiers have a much less concave profile, with the vertex rather abruptly raised. In mature colonies soldiers apparently derived from more than one instar occur, suggesting a residual or rudimentary polymorphism, as in some other species.

The development of the postmentum setae in the soldier appears to form a cline. They are most numerous in specimens from West Africa, gradually decreasing southwards and eastwards, until in the South-East Congo specimens they are sometimes very sparse. It is necessary where they appear absent to examine numerous specimens, because in most samples, some will usually be found with more than the rest.

The nanitic soldiers of *N. latifrons* have been confused with *N. lujae*, from which they differ in having no vertex setae, 11 or 12 segmented antennae, and usually a few postmentum hairs. *N. schoutedeni* resembles the shorter nosed forms in shape, but also has vertex setae, a much more abruptly tapered nose tip, and usually, no postmentum hairs, though one or two may be present very rarely. *N. kempae* lacks postmentum hairs, often has vertex setae, and usually a straight or slightly convex profile. *N. arborum* usually has a straight profile, but also only four main setae at the nose tip, and none on the postmentum surface.

The imago is distinguishable from most species by its larger size. Differences from *N. chrysopleura* and *N. schoutedeni* are discussed under those species.

Though he described *N. latifrons* in 1896, Sjöstedt (1900) referred further specimens to *N. arborum*, and was followed in this by Silvestri (1912) and subsequent authors. The result has been that all the references to *N. arborum* since its original description have in fact been based on specimens of *N. latifrons*. This has been discussed under *N. arborum*, and the position has been stabilized by the selection of a neotype of the latter.

One of the syntype specimens of *N. latifrons* (Sjöstedt) in the Naturhistoriska Riksmuseum, Stockholm, has been selected and labelled as lectotype by Dr. A. E. Emerson. This is as follows :—

Lectotype : CAMEROUN : Ekundu, 1891 (Y. Sjöstedt, No. 964), lectotype ♀ and ♂ paralectotype (other paralectotype in A.M.N.H.).

Type Material. CAMEROUN : Ekundu, 1891 (Y. Sjöstedt), paralectotype ♂ imago *N. latifrons* (Sjöstedt), A.M.N.H. Victoria (Bucholtz), syntype soldier, *Trinervitermes pius* (Sjöstedt), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

REPUBLIC OF CONGO : Indo, Sibiti, 9.ii.1925 (A. Unsgaard), syntype soldiers, type colony, *N. indoensis* (Sjöstedt) A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

CONGO : Kunungu (*H. Schouteden*) syntype soldiers, type colony, *N. incurvus* (Sjöstedt), A.M.N.H. (other syntypes in Mus. Tervuren). Haut Uélé, Moto (*Burgeon*), syntype soldier, type colony, *N. ueleensis* (Sjöstedt) A.M.N.H. (other syntypes, in Naturhist. Riksmus., Stockholm) ; Bas Uélé, Djamba, 17.xii.1924 (*H. Schouteden*), syntype soldier, type colony *N. expulsus* (Sjöstedt) A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

Other material. PORTUGUESE GUINEA : Cassine, 1.ii.1900 (L. Fea), A.M.N.H. GUINEA : Nimba Mountains, viii.1957, 4 vials (M. Lamotte), Inst. Franç. d'Afr. Noire, Dakar.

SIERRA LEONE : 60m. from Freetown, 24.i.1955 (W. V. Harris).

GHANA : Aburi, 15.i.1913 (F. Silvestri), A.M.N.H. ; Bobiri Forest, 23m. from Kumasi on Accra Road, 2.ii.1955 (W. V. Harris), and 21.ii.1959 (W. A. Sands) ;

Kumasi, 22.xi.1957 (*W. Wilkinson*) ; 63m. from Accra on Kumasi Road, 18.ii.1959, and 5½m. from Dunkwa on Obuasi Road, 4.iv.1959 (*W. A. Sands*).

NIGERIA : Eastern Region ; Bugeme, 5.i.1957, 25m. from Onitsha on Owerri Road, 11.i.1957, 39m. from Port Harcourt on Owerri Road, 31.i.1957, 3m. from Ikanga on Calabar Road, 22.iv.1957, 29m. from Port Harcourt, on Owerri Road, 19.vi.1957, 8m. from Port Harcourt on Owerri Road, 10.xii.1957, Port Harcourt, 19.xii.1957 (*W. Wilkinson*). Western Region ; Agege, 1914 (*A. D. Peacock*) ; Sapobar and Sapele, 29.iv.1955 (*E. A. J. Duffy*) ; 34m. from Ibadan on Ife Road, 1955 (*B. J. MacNulty*) ; Obanokoro, 31.i.1956 (*D. Kay*) ; Sobo Plain, Obanokoro, 7.iii. and 7.vii. 1957, and Lagos, 10.iv.1957 (*W. Wilkinson*) ; 27m. S. of Ilorin on Oyo Road, 4.xii.1957, 4 vials, 63m. S. of Ilorin on Oyo Road, 4.xii.1957, 2 vials, Ararome near Ibadan, 9.xii.1957, Balogun, 30m. E. of Ibadan on Ife Road, 11.xii.1957, and 30m. from Ijebu-Ode on Benin Road, 12.xii.1957, 2 vials (*W. A. Sands*) ; Ibadan, 1959 (*H. J. Sutton*). Northern Region ; 11m. from Mokwa on Bida Road, 22.xii.1956, 10m. N. of Bida, 23.xii.1956, Idu Forest, 20m. from Abuja on Keffi Road, 28.xii.1956, 2 vials, and Ayangba (Egume), 6.iii.1958 (*W. A. Sands*).

CAMEROON : Yaounde, 2 vials (*Zenker*), A.M.N.H. ; Longji, 3 vials (*Blank*) ; A.M.N.H. ; Edea, A.M.N.H. ; Debundscha (*Linnel*), A.M.N.H. ; Victoria, 6.i.1913, 2 vials (*F. Silvestri*), A.M.N.H. ; Attogondame, 8.vi.1913 (*Escherich*), A.M.N.H. ; Nyong Forest, 30.xi.1949 and 24.ii.1950 (*J. Birket-Smith*, *J. Dahl*) ; Mbalmayo, 17.x.1962 (*G. Becker*), own collection.

ISLAND OF SAO THOME : 28.vii.1932 (*W. H. T. Tams*).

GABON : Libreville, ii.1913 (*F. Silvestri*), A.M.N.H.

REPUBLIC OF THE CONGO : 13km. W. of Brazzaville, 8.vi.1948, 2 vials (*A. E. Emerson*), A.M.N.H.

CONGO : Stanleyville (*H. Kohl*), A.M.N.H. ; Kasai, Kondue (*E. Luja*), A.M.N.H. ; Sankuru, A.M.N.H. ; Ganda Sundi, Mayumbe, 10.vii.1911, 5 vials, and Limba, 10.vii.1911 (*R. Mayné*), A.M.N.H. ; between Walikale and Lubutu, 25.i.1913 (*J. Bequaert*) ; Lukula, vii.1920, Kai Bumba, 10.x.1920, Eala, i.1921, Luebo, ix.1921, Kidada (Kitobola), 11.1922, and Kasai, Ngombe (*H. Schouteden*), A.M.N.H. ; Stanleyville, 18.iii.1948 (*N. A. Weber*), A.M.N.H. ; Leopoldville, 3.iv.1948, 4 vials, Sona Mpungu, 12.iv.1948, 2 vials, 35km. E. of Mambasa, 10.v.1948, Camp Putnam, Epulu, 12-23.v.1948, 13 vials, Tshopo River, on Epulu Stanleyville Road, 25.v.1948, Stanleyville, 25-27.v.1948, 5 vials, Yangambi, 29.v.1948, 3 vials, Avakubi, on Ituri River. v.1948, 15km. S.W. of Leopoldville, 6.vi.1948, 2 vials, and 20km. E. of Ndjili and 18km. S. of Leopoldville, 10.vi.1948 (*A. E. Emerson*), A.M.N.H. ; Garamba National Park, 26.v.1950 (*G. Demoulin*), Inst. des Parcs Nat. du Congo, Brussels.

SUDAN : Aloma Plateau, Khor Aba, vii-viii.1939 (*N. A. Weber*), A.M.N.H.

UGANDA : Entebbe (*O. John*), A.M.N.H. ; Namanwe, iv.1939 (*G. H. E. Hopkins*) ; Budongo Forest ix.1939 (*C. C. Gowdey*) ; Kyagwe, Lugala Estate, 29.vi.1949, and Budongo Forest, 8.vii.1962, 3 vials (*W. V. Harris*).

A total of 126 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

This is the commonest and most widely distributed species of *Nasutitermes* in Africa. It is found throughout the forest areas in West Africa and the Congo, and in most forest outliers, or riverain gallery forests, in the adjacent savannah areas.

In none of the material examined of *N. latifrons* was an arboreal nest recorded of the type found in *N. arborum*, *N. lujae*, or *N. schoutedeni*. The great majority of records are from dead logs, hollow or rotten tree trunks, and the mounds of other genera such as *Cubitermes*, *Procubitermes*, *Thoracotermes*, and *Microcerotermes*. Sjöstedt (1926) recorded a nest illustrated by Hegg (1922 : 485, fig. 343), as belonging to this species, but the figure is a photograph of a typical mound of *Thoracotermes*. Runways up trees are frequently recorded, but the nest can only rarely, if ever, be arboreal.

***Nasutitermes lujae* (Wasmann) sp. rev.**

(Text-figs. 20, 21, 88-94, 213, 214: Map 11)

Eutermes lujae Wasmann, 1911 (August) : 168. Type locality : CONGO, Kasai, Sankuru.

sp. rev. [ex syn. *N. maculiventris* (Sjöstedt, 1926 : 320)].

Eutermes ekunduensis Sjöstedt, 1911b (December) : 16. Type locality : CAMEROUN, Ekundu.

syn. n.

Eutermes (*Eutermes*) *lujae* Wasmann ; Holmgren, 1912 : 62.

Eutermes (*Eutermes*) *ekunduensis* Sjöstedt ; Holmgren, 1912 : 62.

Eutermes (*Eutermes*) *nanus* Sjöstedt, 1924 : 41. Type locality : CONGO, Barumbu.

Eutermes (*Eutermes*) *impetus* Sjöstedt, 1924b : 493. Type locality : REPUBLIC OF CONGO, Brazzaville. **syn. n.**

Nasutitermes (*Nasutitermes*) *bequaerti* Emerson, 1928 : 416. [New name proposed for *E. nanus* Sjöstedt]. **syn. n.**

Nasutitermes (*Nasutitermes*) *santschii* Emerson, 1928 : 484. Type locality : CONGO, Stanleyville. **syn. n.**

Nasutitermes (*Nasutitermes*) *torquatus* (Sjöstedt) ; Emerson, 1928 : 481.

Nasutitermes bequaerti Emerson ; Snyder, 1949 : 267.

Nasutitermes ekunduensis (Sjöstedt) Snyder, 1949 : 275.

Nasutitermes impetus (Sjöstedt) Snyder, 1949 : 279.

Nasutitermes santschii Emerson ; Snyder, 1949 : 297.

Imago. Head capsule dark sepia brown, postclypeus slightly paler, brown. Labrum yellow-brown. Antennae brown. Pronotum dark sepia brown, meso- and metanota, pleural and ventral thoracic sclerites brown. Legs yellow-brown, brown at ends of femora and bases of tibiae. Abdominal tergites dark sepia brown, sternites sepia brown laterally, shading to pale brown in middle. Wings translucent pale brown, venation sepia brown.

Posterior margin of head behind eyes distinctly less than semi-circular ; fontanelle variable, generally inconspicuous, from a pale slit, sometimes weakly bifurcate in front, to a smooth flat patch without setae, of same colour as rest of head capsule, or sometimes slightly depressed posteriorly ; eyes moderately prominent in proportion to own diameter, but not large relative to head width, (W/E index 3.0-3.5) nearly circular, outline slightly angular ; ocelli small, separated from eyes by slightly less to distinctly more than own least diameter ; postclypeus rather weakly inflated, width 3.2 to 3.7 times length, anterior margin nearly straight, posterior margin convex, rounded, very slightly sinuate towards outer corners ; antennae 15 segmented, II longer than IV, IV slightly longer than V, V longer than III.

Cerci of ♀ distinctly shorter than width across base, mamilliform.

Measurements (22 specimens from 5 localities), in millimetres.

	Range	Mean
Head width across eyes	1.18-1.33	1.26
Greatest diameter of eye	0.36-0.42	0.39
Ocellus	0.09-0.12 × 0.13-0.18	0.11 × 0.14
Ocellus to eye	0.09-0.13	0.10
Width of pronotum	0.95-1.18	1.04
Length of pronotum	0.60-0.70	0.66
Length of hind tibia	1.38-1.65	1.51
Length of fore wing	10.90-11.80	11.40

Soldier. Head capsule orange-yellow to ferruginous orange, nose ferruginous orange to chestnut brown. Pronotum and antennae, orange-yellow. Abdominal tergites and legs yellow, abdominal sternites pale yellow.

Head capsule in plan view a short oval, tapering slightly towards front, nose conical. In profile straight or very weakly sinuate to well behind base of nose, then slightly but rather abruptly raised and rounded to back of head; specimens with completely straight profile are rare. Nose equal in length or slightly longer than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 13-20 degrees; postmentum weakly and evenly convex; antennae 12 or 13 segmented, only one in ten with 12, proportions of segments somewhat variable, in 13 segmented forms, III longer than or equal to II and V, IV shorter than these. Setae on head confined to a bilaterally placed pair on vertex, four at tip of nose with smaller setae behind them, and a few on anterior margin of postmentum.

Abdominal tergites with very short sparsely scattered setae, and longer setae on posterior margins of last three or four segments; sternites with more numerous short setae, and longer setae on posterior margins.

Measurements (59 specimens from 14 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.25-1.63	1.43
Head width	0.68-0.95	0.80
Depth of head capsule	0.49-0.63	0.56
Width of pronotum	0.38-0.48	0.43
Length of pronotum	0.15-0.20	0.17
Length of hind tibia	0.95-1.18	1.04

Variation. The imago is less variable in respect of size and colour than *N. arborum* (Smeath.). Soldier variation consists mainly of slight differences in the thickness and length of the nose and the straightness of the profile. Specimens occasionally occur with one or two setae at the base of the nose in addition to those on the vertex.

The distinctions between this and the closely similar *N. arborum* have been discussed under that species. Darker, thicker-nosed specimens of the soldier have been confused with *N. ferranti*, but this has two or four setae in line across the top of the base of the nose, and only four setae at the nose tip. The smallest specimens of *N. schoutedeni*, with flatter profiles, are very closely similar, but generally have the nose distinctly shorter than the rest of the head capsule, and more abruptly tapered at the tip. The imago of that species is also closely similar, but larger, and has the wing membrane less hairy but with more distinct asters (this character cannot readily be used in a key or illustrated, but is useful if material is available for comparison). The soldier of *N. infuscatus* is similar, but usually has a shorter nose; the imago is quite distinct with a longer more inflated postclypeus.

Sjöstedt (1926) placed the name *Eutermes lujae* Wasmann in synonymy with *E. maculiventris* Sjöstedt. The syntypes from the type colony of both have been

examined, and they are undoubtedly different. The former is the same as the species hitherto called *N. ekunduensis*, and the latter, *N. arborum*. Both *N. lujae* and *N. ekunduensis* were described in 1911, but there is no doubt of the priority of the name *N. lujae* which is now removed from synonymy with *N. arborum* (= *N. maculiventris*).

Type Material. CAMEROUN : Ekundu, 3.xii.1890 (Y. Sjöstedt), syntype soldier, type colony, *N. ekunduensis* (Sjöstedt), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

REPUBLIC OF CONGO : Brazzaville (Roubaud), syntype soldier, type colony, *N. impetus* (Sjöstedt), A.M.N.H. (other syntypes in Mus. Paris and Naturhist. Riksmus., Stockholm).

CONGO : Kasai, Sankuru, 1907 (E. Lujá), syntype soldier, type colony, *Eutermes lujae* Wasmann, A.M.N.H. ; Barumbu (J. Bequaert), syntype soldiers, type colony, *Eutermes nanus* Sjöstedt (*N. bequaerti* Emerson), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm) ; Stanleyville, 1913 (H. Kohl), paratype soldiers and ♂ and ♀ imagos, *N. santschii* Emerson, B.M.(N.H.) and A.M.N.H., including type colony, (Holotype in A.M.N.H.).

Other Material. IVORY COAST : Abengouru, xi.1963, 3 vials (G. Becker), own collection.

GHANA : 7m. S. of Akumadam on Wenchi-Kumasi Road, i.iv.1959 (W. A. Sands), B.M.(N.H.).

CAMEROUN : Nyong Forest, 3.i.1950 (J. Birket-Smith, J. Dahl), B.M.(N.H.) ; Longji, undated (Blank), A.M.N.H. ; Mbalmayo, 17.x.1962 (G. Becker), own collection.

CONGO : Kasai, Kondue, 1919 (E. Lujá) ; Stanleyville, 24.vii.1913, and others (H. Kohl) ; Avakubi, 6.i.1914 (J. Bequaert) ; Basongo, vii.1921 (H. Schouteden) ; Stanleyville, 18.iii.1948 (N. A. Weber) ; Camp Putnam, 15.v.1948, 2 vials, Epulu, 15.v.1948, 4m. N. of Camp Putnam, 20.v.1948, 2 vials, Yangambi, 29.v.1948, 3 vials (A. E. Emerson), all in A.M.N.H.

UGANDA : Sese Islands, Lake Victoria, Bugalla Island, 1918 (C. C. Gowdey), B.M.(N.H.).

A total of 29 nest series were examined.

This species has been recorded from Ghana to Uganda, but is much less common in the north-western parts of its range, and appears to become more numerous in the central and southern Congo Forest. This contrasts with *N. arborum*, and although they have both been collected in the same locality in parts of their range, it would appear that they occupy a similar ecological niche, and that the conditions which suit one may be less favourable to the other. *N. arborum* has certainly been found in drier, more marginal forest outliers, than has *N. lujae*, and a greater tolerance of drier forest conditions would account for its greater abundance in West Africa.

The nest of *N. lujae* is commonly arboreal, and similar to that of *N. arborum* though usually slightly smaller.

***Nasutitermes schoutedeni* (Sjöstedt)**
(Text-figs. 22, 23, 95-99, 215, 216; Map 12)

- Eutermes* (*Eutermes*) *schoutedeni* Sjöstedt, 1924 : 40. Type locality : CONGO, Basongo.
Eutermes (*Eutermes*) *kondouensis* Sjöstedt, 1924 : 40. Type locality : CONGO, Kasai, Kondue.
syn. n.
Eutermes (*Eutermes*) *putidus* Sjöstedt, 1924 : 40. Type locality : CONGO, Kasai, Kondue.
syn. n.
Eutermes (*Eutermes*) *aethiops* Sjöstedt, 1924 : 41. Type locality : CONGO, Luebo. **syn. n.**
Eutermes (*Eutermes*) *dulcis* Sjöstedt, 1924b : 494. Type locality : CONGO, Haut Uélé, Moto.
syn. n.
Eutermes schoutedeni Sjöstedt ; Sjöstedt, 1926 : 314.
Eutermes kondouensis Sjöstedt ; Sjöstedt, 1926 : 307.
Eutermes putidus Sjöstedt ; Sjöstedt, 1926 : 314.
Eutermes aethiops Sjöstedt ; Sjöstedt, 1926 : 318.
Eutermes dulcis Sjöstedt ; Sjöstedt, 1926 : 297.
Nasutitermes chapini Emerson, 1928 : 480. Type locality : CONGO, Ngayu. **syn. n.**
Nasutitermes schoutedeni (Sjöstedt) Snyder, 1949 : 297.
Nasutitermes kondouensis (Sjöstedt) Snyder, 1949 : 282.
Nasutitermes putidus (Sjöstedt) Snyder, 1949 : 294.
Nasutitermes aethiops (Sjöstedt) Snyder, 1949 : 265.
Nasutitermes dulcis (Sjöstedt) Snyder, 1949 : 274.
Nasutitermes chapini Emerson ; Sands, 1957 : 8.

Imago. Previously undescribed. Head capsule dark sepia brown, postclypeus and antennae sepia brown, labrum brown. Pronotum and abdominal tergites dark sepia brown ; meso- and metanota and lateral parts of abdominal sternites sepia brown, legs and middle of abdominal sternites yellow-brown. Wings, membrane pale translucent sepia brown, subcosta and radial sector yellow-brown, radial sector lined posteriorly with dark brown ; other venation brown.

Posterior margin of head capsule behind eyes evenly rounded, less than semi-circular ; fontanelle small, pale, weakly bifurcate in front ; eyes moderately prominent in proportion to own diameter, slightly angular oval, medium sized relative to head width, W/E index 2.9-3.1 ; ocelli medium sized, separated from eyes by a half to threequarters own least diameter ; postclypeus weakly inflated, width 3.6 times length, anterior margin slightly sinuate, posterior convex, almost straight in middle, curved to outer corners ; antennae 15 segmented, II longer than IV, IV longer than V, V longer than III.

Cerci of ♀ about as long as width across base.

Measurements (8 specimens from 2 localities) in millimetres.

	Range	Mean
Head width across eyes	1.33-1.40	1.37
Greatest diameter of eye	0.44-0.46	0.45
Ocellus	0.11-0.13 × 0.15-0.18	0.12 × 0.16
Ocellus to eye	0.08-0.10	0.08
Width of pronotum	1.10-1.17	1.14
Length of pronotum	0.66-0.74	0.71
Length of hind tibia	1.58-1.68	1.63
Length of fore wing	11.50-12.40	11.90

Morphotype. IVORY COAST : Abidjan, xi.1949 (R. Geigy). *Morphotype* ♀ in American Museum, Natural History.

Soldier. Head capsule orange-yellow to ferruginous orange, nose ferruginous to chestnut brown with reddish tip. Pronotum and antennae as head capsule. Abdominal tergites and legs yellow, abdominal sternites pale yellow.

Head capsule in plan view short oval to circular, nose conical with abruptly tapered tip. In profile distinctly concave, often with slight hump at base of nose, back of head raised and rounded. Nose shorter than rest of head capsule, measuring from hind margin of antennal socket, in all but smallest specimens; angle of nose cone 12–15 degrees; postmentum moderately and evenly convex; antennae 12–14 segmented, commonly 13, II and IV subequal, shorter than V, III longer than V. Head setae consist of a bilaterally placed pair on vertex, not always present, a distinctly hairy nose tip, and a few on anterior margin of postmentum; rarely one or two minute setae scattered on rest of postmentum, and usually a few on vertex.

Abdominal tergites with very short scattered setae, and longer setae in four rows on posterior margins of last four segments; sternites with scattered short setae, and six long setae on posterior margin of each segment.

Measurements (39 specimens from 9 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.43–1.75	1.59
Head width	0.85–1.13	0.98
Depth of head capsule	0.55–0.78	0.68
Width of pronotum	0.40–0.57	0.49
Length of pronotum	0.18–0.24	0.19
Length of hind tibia	1.05–1.36	1.12

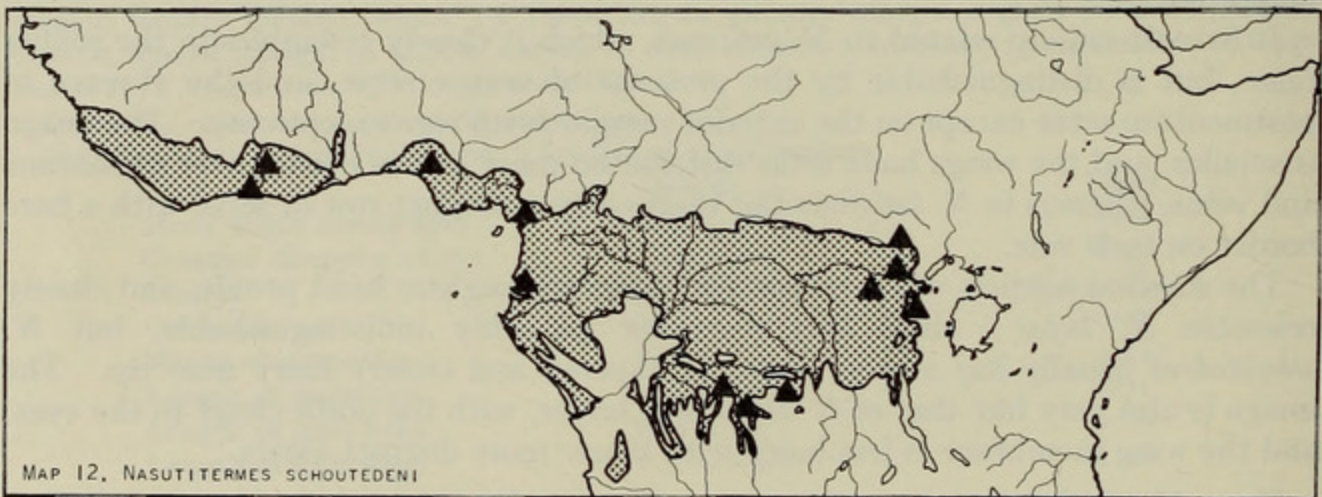
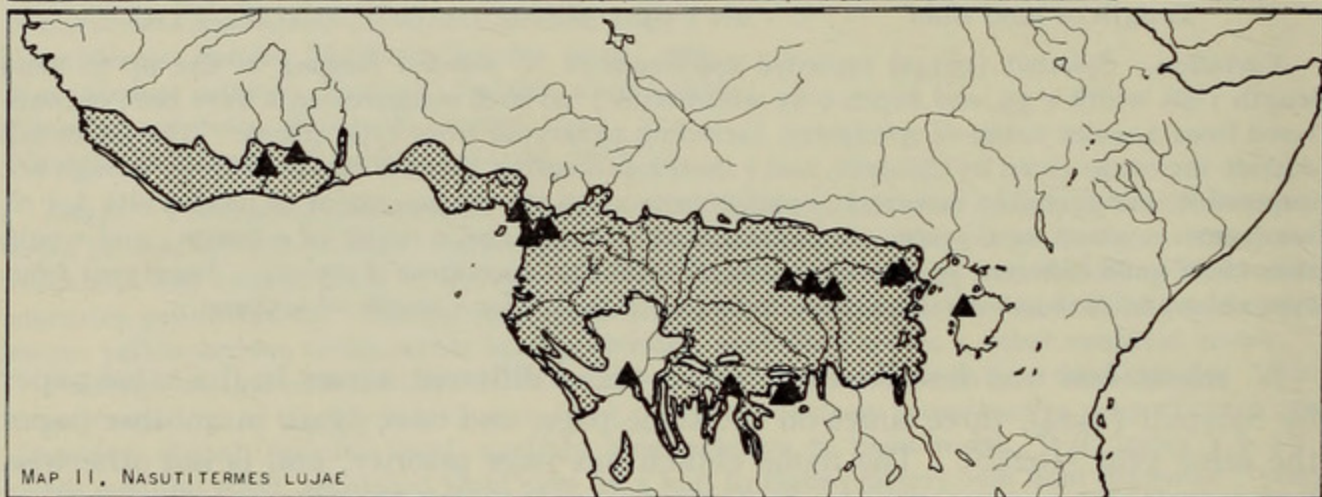
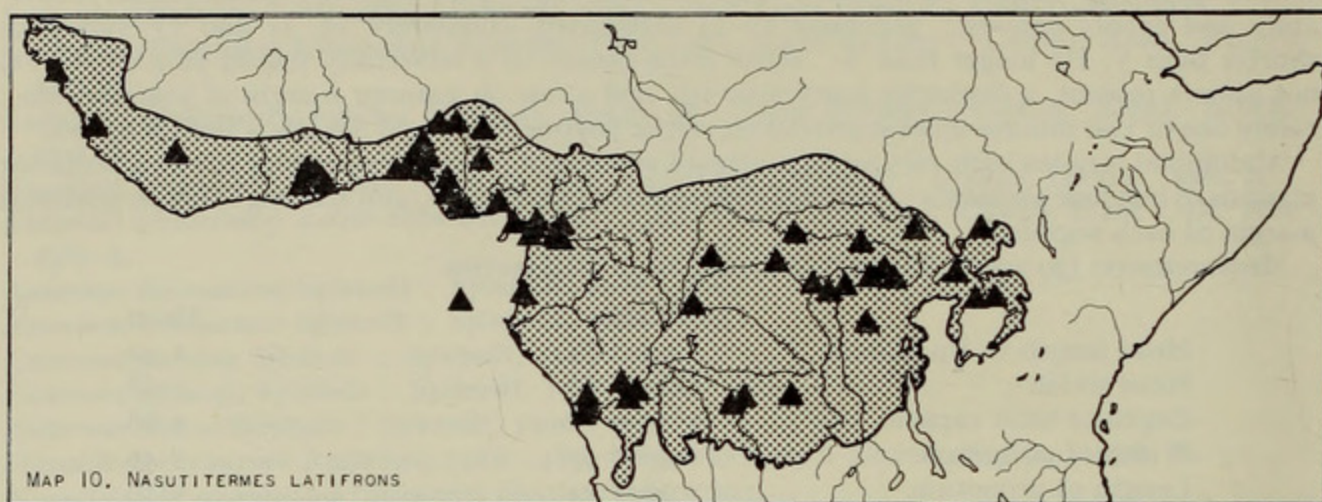
Variation. Sjöstedt (1924a) recorded specimens of *N. putidus* ranging in size up to head length 1.96, width 1.35, and depth 0.85 millimetres; no such measurements have been encountered from a wider range of specimens, including paratypes from type colony. The latter fall outside the range given by Sjöstedt, and I therefore consider that his measurements, though not impossible, are probably incorrect; particularly since the measurement of head width for *N. konduensis* is given as 1.35mm., for a length of 1.65mm. and a depth of 0.60mm., and would thus be of quite different proportions from all the other specimens if correct. Paratypes from type colony of *N. konduensis* measured 0.95mm. in width for a length of 1.58mm.

N. schoutedeni was described four times under different names in the same paper by Sjöstedt (1924), three times on the same page, and once again in another paper the same year (1924b). The name chosen has page priority, and is not otherwise inappropriate.

It is most closely related to *N. latifrons*, which it closely resembles in the soldier caste, but is distinguishable by the presence of vertex setae, and the absence of postmentum setae except on the anterior margin (with rare exceptions). The imago is smaller, and the wings have setae distributed more or less evenly over membrane and veins, whereas in *N. latifrons* the veins carry a distinct row of setae with a bare border on each side.

The smallest soldiers of *N. schoutedeni* have a straighter head profile, and closely resemble *N. lujae*; some specimens are probably indistinguishable, but *N. schoutedeni* usually has a more abruptly tapered and closely hairy nose tip. The imago is also very like that of *N. lujae*, but larger, with the ocelli closer to the eyes, and the wing membrane is less hairy with larger more distinct asters.

Type Material. CONGO: Basongo, vii.1921 (*H. Schoutedeni*), syntype soldier, type colony, *N. schoutedeni* (Sjöstedt), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm); Kasai, Kondue (*E. Luja*), syntype soldier, type colony, *N. putidus* (Sjöstedt), A.M.N.H. (other syntypes in Congo Mus., Brussels); Luebo, ix.1921 (*H. Schoutedeni*), syntype soldier, type colony, *N. aethiops* (Sjöstedt),



MAPS 10-12. (10), *Nasutitermes latifrons*. Vegetation types : 7, 8, and 16 ; (11), *Nasutitermes lujae*. Vegetation type : 7 ; (12), *Nasutitermes schoutedeni*. Vegetation type : 7.

A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm). Haut Uélé, Moto (*L. Burgeon*), syntype soldier, type colony, *N. dulcis* (Sjöstedt), A.M.N.H. (other syntypes in Mus. Tervuren) ; Ngayu, 22.xii.1909 (*H. Lang, J. P. Chapin*), para-type soldiers, type colony, *N. chapini* Emerson, A.M.N.H. and B.M.(N.H.). (Holotype soldier in A.M.N.H.).

Other Material. IVORY COAST : Abengouru, xi.1963, 2 vials (*G. Becker*), own collection.

NIGERIA : Western Region ; 30m. from Ijebu-Ode on Benin Road, 12.xii.1957 (*W. A. Sands*).

CAMEROUN : no data, from N. Holmgren, A.M.N.H. ; Ekododo, 9.ix.1913 (*Escherich*), A.M.N.H.

CONGO : Kasai, Kondue, 2 vials (*E. Luja*) ; Basongo, vii.1921, and Luebo, ix.1921 (*H. Schouteden*) ; Epulu, 17.v.1948 (*A. E. Emerson*), A.M.N.H.

UGANDA : Ankole Province, xi.1939 (*H. B. Johnston*).

A total of 18 nest series were examined, in the British Museum (Natural History) unless otherwise stated.

Although widely distributed from the Ivory Coast to Uganda, this species is not common. The nest is arboreal, more or less spherical, and approximately one foot in diameter.

LEPTOMYXOTERMES gen. n.

(Leptos, Gr. "thin", myxa, Gr., "lamp-nozzle, spout")

Type-species, *Eutermes doriae* Silvestri, 1912 : 242.

Imago. Left mandible with apical tooth as long as first marginal, distance from apical to first marginal half distance between first and third marginals (left mandible index .50), cutting edge between first and third marginals with distinct indentation in front of third marginal ; right mandible with apical and first marginal subequal, posterior cutting edge of first marginal about equal to that of second, this being distinctly concave ; right molar plate in surface view with indentation near basal end of anterior margin, posterior margin extending in rounded flange, first molar ridge forming tooth, remaining 6-7 ridges diminishing towards base (Text-figs. 164, 165). Fontanelle slit-like, not clearly bifurcate anteriorly. Eyes and ocelli very large and prominent.

Soldier. Monomorphic with traces of dimorphism. Nose cylindrical. Vestigial mandibles with small points. Head capsule sharply constricted behind antennae. Antennae 14 segmented.

This genus is proposed to accommodate the single African forest species *doriae* Silvestri, hitherto included with *Rhadinotermes* in *Coarctotermes*, which is now restricted to the Malagasy species. *Leptomyxotermes* is clearly widely different both ecologically and morphologically from the other African constricted-headed genera. Although it shares with *Fulleritermes* the indentation of the cutting edge between first and third marginals of the left mandible, their proportions are different, and the small tooth connecting the molar prominence to the third marginal is retracted below the level of the groove between them, whereas in *Fulleritermes* and *Rhadinotermes* it is clearly visible in surface view. The concavity of the cutting edge of the second marginal of the right mandible is more pronounced than in the other genera,

and the first and second marginals are in line instead of overlapping slightly. The fontanelle and large eyes are also very distinctive.

***Leptomyxotermes doriae* (Silvestri) comb. n.**

(Text-figs. 100, 101, 119-126, 163-165; Map 13)

Eutermes doriae Silvestri, 1912 : 242. Type locality : ISLAND OF FERNANDO POO, Basilé.

Eutermes (*Hospitalitermes*) *doriae* Silvestri ; Holmgren 1912 : 66.

Coarctotermes doriae (Silvestri) Sjöstedt, 1926 : 358.

Imago. Head capsule orange-yellow, clouded with brown between eyes and on frons, darkest on upper rim of ocelli ; postclypeus and labrum, yellow, antennae yellow-brown. Pronotum, meso- and metanota, other thoracic sclerites and legs, yellow. Abdominal tergites brown, sternites pale yellow-brown, paler in mid-line. Wings translucent very pale brown, venation brown, darker at base ; radius sector with brown inner margin, and with adjacent yellow streak in distal half of wing.

Posterior margin of head much less than semi-circular behind eyes, slightly sinuate immediately behind eyes ; eyes oval, very prominent, and large relative to head width, W/E index 2.4 ; ocelli large, oval, scarcely separated from eyes ; postclypeus strongly inflated, width 1.8 times length, anterior margin straight, posterior regularly convex ; antennae 15-16 segmented, II and IV subequal, III longer, or II and III subequal, IV shorter.

Cerci of ♀ mamilliform, shorter than width across base.

Pilosity of vertex confined to a few long paired setae.

Measurements (4 specimens from 2 localities) in millimetres.

	Range	Mean
Head width across eyes	1.15-1.20	1.18
Greatest diameter of eye	0.48-0.51	0.50
Ocellus	0.15 × 0.19-0.22	0.15 × 0.20
Ocellus to eye	0.01-0.02	0.01
Width of pronotum	0.97-1.00	0.99
Length of pronotum	0.59-0.68	0.61
Length of hind tibia	1.54-1.66	1.62
Length of fore wing	10.80	

Soldier. Head capsule yellow to orange, nose orange to ferruginous. Pronotum, antennae and abdominal tergites orange-yellow, legs and abdominal sternites yellow.

Head capsule in plan view with angularly rounded posterior margin. In profile depressed behind base of nose or straight in front of raised posterior lobe ; nose shorter to longer than rest of head measuring from hind margin of antennal socket, maximum angle of taper 5 degrees ; antennae 14 segmented, elongate, II short, IV, V and VI subequal, longer than II, III longer than these, twice length of II. Setae on head confined to four at nose tip and a bilaterally placed pair on vertex.

Abdominal tergites almost glabrous except for 4-6 long yellow setae on posterior margins of each of last 4-5 segments ; sternites with scattered very sparse short setae and longer setae on posterior margins 3 or more times length of short. Remaining characters given in generic diagnosis.

Measurements (26 specimens from 5 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.35-1.93	1.67
Head width	0.55-1.00	0.77
Depth of head capsule	0.43-0.75	0.58

	Range	Mean
Width of pronotum . . .	0.43-0.50 . . .	0.47
Length of pronotum . . .	0.18-0.25 . . .	0.21
Length of hind tibia . . .	1.23-1.73 . . .	1.43

Variation. The profile view of the soldier is the main feature of variation in this species.

L. doriae is unlikely to be confused with any other African species, and its distinguishing features are discussed under the generic heading. It appears to be related far more closely to the *Hospitalitermes* - *Lacessititermes* group of constricted-headed genera than to the *Coarctotermes* - *Fulleritermes* - *Rhadinotermes* group, and in assigning the species to *Hospitalitermes*, Holmgren (1912) was nearer to the truth than subsequent authors. Common features in the soldier are the distribution of setae and the long appendages, and in the imago, the large eyes, pale colour, and not distinctly bifurcate fontanelle, the retracted tooth between left third marginal and molar prominence, and the reduced overlap of right first and second marginals. The right molar plate is however distinctly different; and this, together with the stronger notch in the left mandible, the more concave right second marginal, and the better developed apical teeth, may be an indication of a more primitive position for *L. doriae* in this group.

Material. ISLAND OF FERNANDO POO : Basilé, viii.-ix.1901 (*L. Fea*), syntype soldiers, type colony, *L. doriae* (Silvestri), Silvestri coll., Lab. Zool. Sc. Agr., Portici, A.M.N.H., and B.M.(N.H.).

GUINEA : Nimba Mountains, 1957, 4 vials (*M. Lamotte*), Inst. Franç. d'Afr. Noire, Dakar.

SIERRA LEONE : Freetown, 7.i.1958 (*W. Wilkinson*).

IVORY COAST : Banco Forest, 4.ii.1962 (*C. Noirot*).

GHANA : Aburi 1912-13 (*F. Silvestri*), morphotype king, Silvestri coll., Lab. Zool. Sc. Agr., Portici; 20m. S. of Techiman on Kumasi Road, 1.iv.1959 (*W. A. Sands*).

NIGERIA : Western Region; Benin Province, Obanokoro, Sobo Plain, 4.iii.1957; Eastern Region; 53m. from Port Harcourt on Owerri Road, 6.xii.1957, Port Harcourt, 18.xii.1959 (*W. Wilkinson*).

CAMEROON : Victoria, i.1913 (*F. Silvestri*), A.M.N.H.

CONGO : Ituri, Beni, Irumu, 24.ii.1948 (*N. A. Weber*), A.M.N.H.

A total of 14 nest series, in the British Museum (Natural History) except where otherwise stated.

L. doriae is confined to the rain forests of West Africa and the Congo. It appears to feed almost exclusively on damp, well rotted wood, and to nest in chambers in or under dead logs, or parts of the mounds of other species. It is never common, and the patchy distribution of records reflects the difficulty experienced by collectors rather than the occurrence of the species, which may extend to all parts of the Congo forest.



MAP 13. *Leptomyxotermes doriae*. Vegetation type : 7.

GRALLATOTERMES Holmgren

Eutermes (*Grallatotermes*) Holmgren 1912 : 65. [Subgenus of *Eutermes* Heer.]

Grallatotermes Light, 1930 : 16. Type-species by original designation, *Termes* (*Eutermes*) *grallator* Desneux, 1905.

Imago. Left mandible with apical tooth slightly shorter than first marginal, distance between them one quarter of distance between first and third marginals (left mandible index .25), second marginal separated by deep notch in cutting edge in front of third marginal, small subsidiary tooth connecting third marginal and molar prominence retracted behind gap between them when viewed from above ; right mandible with apical and first marginal subequal, posterior cutting edge of first marginal shorter than that of second, not overlapping anterior edge of second (apparent overlap embedded in smooth shining fused surface), molar plate with no marked irregularity of outline in surface view, and 13-14 ridges, diminishing in size posteriorly. Postclypeus short and lightly inflated, length approximately one-third width. Fontanelle pale, roughly T-shaped. Pronotum almost without raised anterior margin. Pilosity of head rather sparse, fine, and uniform, with few more prominent setae.

Soldier. Monomorphic. Nose thick but weakly conical, tip sharply tapered. Vestigial mandibles with points. Head capsule slightly constricted behind antennae, setae confined to four at nose tip, and bilaterally placed pairs on postclypeus and vertex.

The imago mandibles of this genus are quite distinct from any others of the subfamily in Africa, in combining the notched cutting edge of the left mandible between first and third marginals with the many-ridged right molar plate. The latter feature is typical of the *Hospitalitermes*-*Grallatotermes* group of constricted-headed genera, as also is the retracted subsidiary tooth between left third marginal and molar prominence. *Leptomyxotermes* has a somewhat similar left mandible, but the molar plate and second marginal of the right mandible are very different. In *Fulleritermes* the subsidiary tooth between left third marginal and molar prominence is well developed and the right molar plate is distinct.

***Grallatotermes africanus* Harris**

(Text-figs. 102, 103, 127-129, 166-168, 217, 218; Map 3)

Grallatotermes africanus Harris, 1954 : 135. Type locality : TANGANYIKA, Tanga District, Ngomeni.

Material (additional to that recorded in Harris, 1954). TANGANYIKA : 25m. from Dar es Salaam on Morogoro Road, 21.vii.1954 (*R. M. C. Williams*).

MOZAMBIQUE : Ribauè, 20.v.1932 (*J. Vincent*).

A total of 7 nest series were examined.

The extension of the recorded distribution of this species was not unexpected, and further collecting may show that its distribution is similar to that of *Nasutitermes kempae* Harris, with Zululand as its southernmost extremity.

FULLERITERMES Coaton

Fulleritermes Coaton, 1962 : 151. Type-species, by original designation, *Eutermes contractus* Sjöstedt, 1913a.

Imago. Left mandible with apical tooth as long as first marginal, distance from apical to first marginal more than one-third distance between first and third marginals (left mandible index .36-.43), cutting edge between first and third marginals with notch separating third marginal ;

right mandible with apical and first marginal subequal as left, first marginal with small subsidiary tooth near basal junction with apical, relative lengths of cutting edge of first and second marginals variable; right molar plate in surface view with very weak to strong indentation near basal end of anterior margin, posterior margin extending in rounded flange, first molar ridge forming stout tooth, remaining 7-9 ridges diminishing towards base (Text-figs. 169-180). Fontanelle slit-like, distinctly bifurcate anteriorly, usually paler than head.

Soldier. Mono- or dimorphic. Nose cylindrical or conical. Vestigial mandibles with small to medium-sized points. Head capsule scarcely to sharply constricted behind antennae, posterior lobe commonly more than one-fourth wider than anterior. Antennae 12-13 segmented.

This genus was separated by Coaton (1962) from *Coarctotermes* on the basis of the notched cutting edge in front of the third marginal tooth of the left imago mandible. It contains four species, *contractus* (Sjöstedt), *coatoni* sp. n., *mallyi* (Fuller) and *tenebricus* (Silvestri).

This character is convenient for separating *Fulleritermes* from *Coarctotermes* and *Rhadinotermes*, but it is shared by two other African constricted-headed genera, *Grallatotermes* and *Leptomyxotermes*; however both these have much larger eyes and ocelli in the imago, and in *Grallatotermes* the right molar plate has many ridges.

Within *Fulleritermes* itself there are specific differences. In *F. mallyi* the left third marginal tooth of the imago is asymmetrical, the anterior edge being longer than the posterior and slightly concave, and the right molar plate scarcely indented in outline. In the other species the left third marginal is equilaterally triangular and the right molar plate deeply indented in outline, with fewer ridges. The soldier caste of *F. mallyi* is also distinct in shape and colour from the other species which closely resemble each other.

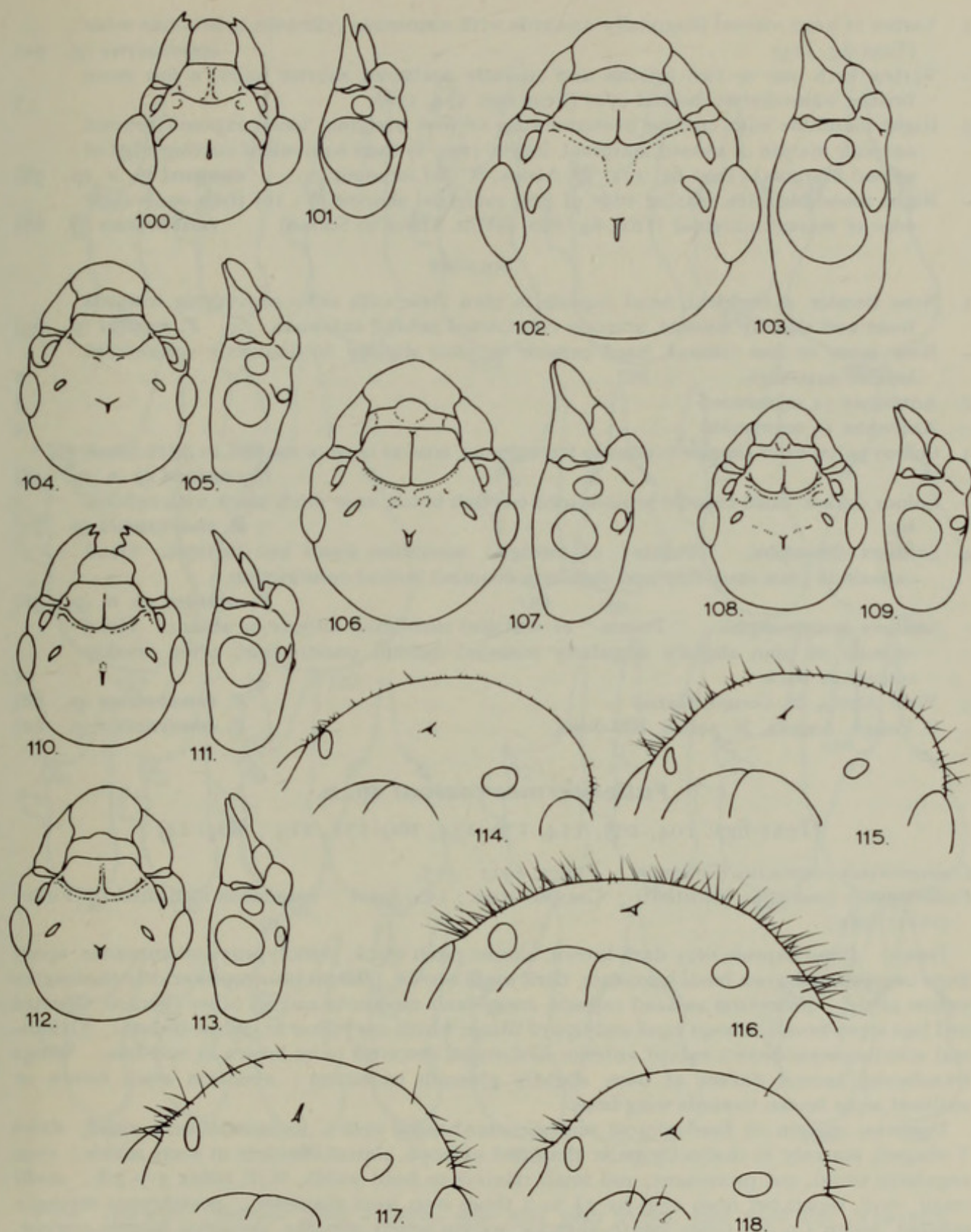
I do not consider it desirable to separate *F. mallyi* generically from the other species at present because further work is required to evaluate fully the importance of these rather small differences in imago mandible characteristics.

The genus occurs in the savannah and other drier open vegetation zones, and only occasionally enters the forest edges, being absent from the depths of true rain forest. Of the four species recognized in this paper, one occurs north of the Congo forest block, one to the south, one in tropical South Africa, (Transvaal, Natal, northern Cape Province) and the last in the Montane and Karroo vegetation of temperate and subtropical South Africa. There is apparently no overlap in their distribution, each exploiting a separate and distinct vegetation type or set of types. The genus appears to occupy a subsidiary or minor ecological "niche" in the termite fauna of these areas, being never found abundantly and usually scarce and difficult to discover. It may however be close to the evolutionary stem from which more abundant specialized genera such as *Trinervitermes* arose. It is absent from East Africa, where *Rhadinotermes* is found, but it is thought that *R. coarctatus* occupies a rather different ecological "niche" because of the differences in its imago and worker mandibles.

KEYS TO *FULLERITERMES* AND *RHADINOTERMES*

IMAGO (*FULLERITERMES* only)

- | | | |
|---|---|-----------------------|
| 1 | Antennae 14 segmented, though with segment III long, sometimes partly subdivided. | |
| | Wings under 10mm. in length | 2 |
| - | Antennae 15 segmented. Wings over 10mm. in length | <i>mallyi</i> (p. 65) |



FIGS. 100-113 : Imago head capsule, front and side views, 114-118, vertex pilosity. 100, 101, *Leptomyxotermes doriae* ; 102, 103, *Grallatotermes africanus* ; 104, 105, 114, *Fulleritermes coaloni* ; 106, 107, 116, *F. mallyi* ; 108, 109, 118, *F. tenebricus* ; 110, 111, 115, *F. contractus* ; 112, 113, 117, *Rhadinotermes coarctatus*.

- 2 Vertex of head viewed diagonally upwards with numerous yellowish bristle-like setae (Text-fig. 115) **contractus** (p. 61)
- Vertex with one or two bristles and sparsely scattered shorter hairs, a few more bristles immediately behind eyes (Text-figs. 114, 118) 3
- 3 Right mandible with cutting posterior edge of first marginal tooth exposed beyond anterior margin of second marginal, longer (10 : 8) than equivalent cutting edge of second marginal (Text-fig. 171) (S. Africa, S. of Limpopo) . . . **coatoni** sp. n. (p. 58)
- Right mandible with cutting edge of first marginal shorter (8 : 10) than equivalent edge of second marginal (Text-fig. 180) (West Africa to Sudan) . . . **tenebricus** (p. 68)

SOLDIER

- 1 Nose slender, cylindrical, head capsule in plan view with sides converging towards front and slightly sinuate, scarcely constricted behind antennae . . . **F. mallyi** (p. 65)
- Nose more or less conical, head capsule in plan slightly to distinctly constricted behind antennae 2
- 2 Antennae 12 segmented 3
- Antennae 13 segmented 4
- 3 Colour paler, head capsule orange to ferruginous, nose as head or darker, to pitch black . . . **F. coatoni** sp. n. (p. 58)
- Colour darker, head capsule sepia-brown to pitch black, nose pitch black with reddish tip **R. coarctatus** (p. 71)
- 4 Soldiers dimorphic. "Points" of vestigial mandibles small but distinct. Head capsule in plan smoothly and regularly rounded behind constriction . . . **F. coatoni** sp. n. (p. 58)
- Soldiers monomorphic. "Points" of vestigial mandibles minute or absent. Head capsule in plan slightly angularly rounded behind constriction, often weakly sulcate at back 5
- 5 West Africa, N. Congo, Sudan **F. tenebricus** (p. 68)
- S. Congo, Angola, N. and S. Rhodesia **F. contractus** (p. 61)

***Fulleritermes coatoni* sp. n.**

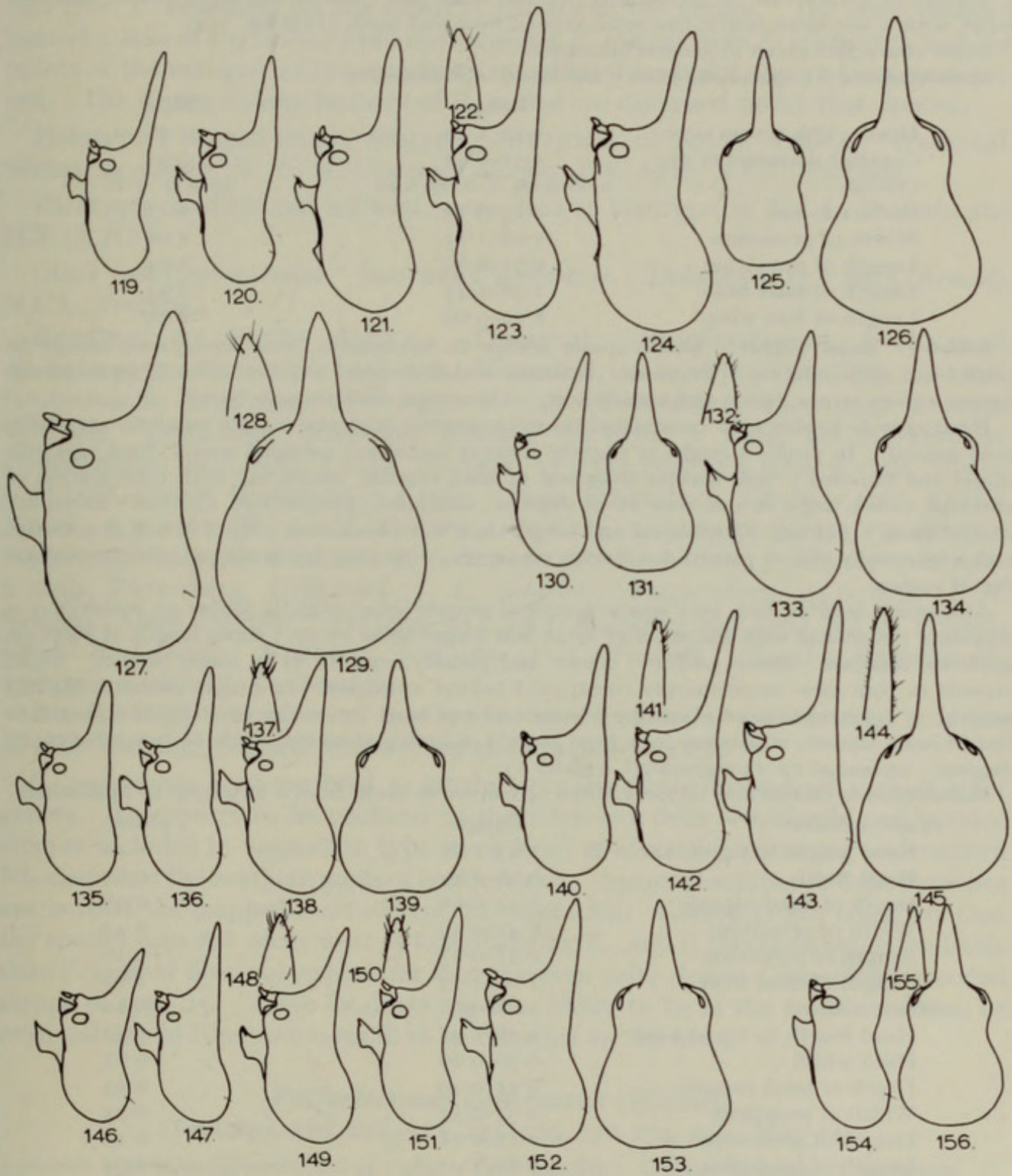
(Text-figs. 104, 105, 114, 130–134, 169–171, 219 ; Map 14)

Coarctotermes contractus (Sjöstedt) ; Fuller, 1922 : 117.

Fulleritermes contractus (Sjöstedt) ; Coaton, 1962 : 152, [part : specimens identified by Fuller (1922) only].

Imago. Head capsule very dark brown, almost pitch black, postclypeus and antennae, apart from two yellow-brown basal segments, dark sepia brown, labrum brown posteriorly shading to yellow at tip. Pronotum as head capsule, meso- and metanota and all other thoracic sclerites and legs sepia-brown, except tarsi and tips of tibiae, which are yellow to yellow-brown. Abdominal sclerites sepia-brown except anterior abdominal sternites paler brown in mid-line. Wings translucent brown, darker at base, slightly greenish iridescent ; venation sepia brown or outlined sepia brown towards wing base.

Posterior margin of head almost semi-circular behind eyes ; fontanelle very small, short Y-shaped, scarcely to distinctly paler than rest of head, almost obsolete in some males ; eyes angularly ovoid, not prominent, and small relative to head width, W/E index 3.5–3.8 ; ocelli small, oval, separated from eyes by $1\frac{1}{2}$ to 2 times own least diameter ; postclypeus strongly inflated, width 1.9–2.0 times length, anterior margin nearly straight, posterior margin convex, rounded ; antennae 14–15 segmented, usually 14, II, V and VI subequal, longer than IV, III twice IV, often partly subdivided ; right mandible with posterior cutting edge of first marginal exposed beyond second, longer than that of second marginal, molar plate moderately indented near base, with 8 ridges.



FIGS. 119-156 : Soldier head capsule, side and plan views, and nose tip. 119-126, *Leptomyxotermes doriae* ; 127-129, *Grallatotermes africanus* ; 130-134, *Fulleritermes coatoni* ; 135-139, *F. contractus* ; 140-145, *F. mallyi* ; 146-153, *F. tenebricus* ; 154-156, *Rhadinotermes coarctatus*.

Cerci of ♀ as long as width across base, slightly mamilliform conical.

Pilosity of vertex, one or two long bristle-like setae and sparsely scattered shorter hair-like setae, with a few more bristle-like setae around eyes and ocelli (Text-fig. 114).

Other characters given in generic discussion.

Measurements (11 specimens from 5 localities) in millimetres.

	Range	Mean
Head width across eyes	1.12-1.19	1.16
Greatest diameter of eye	0.31-0.33	0.32
Ocellus	0.06-0.09 × 0.09-0.11	0.08 × 0.10
Ocellus to eye	0.13-0.15	0.13
Width of pronotum	1.02-1.17	1.08
Length of pronotum	0.71-0.79	0.74
Length of hind tibia	1.38-1.45	1.41
Length of fore wing	8.20-9.60	8.99

Soldiers. Major soldier: head capsule orange to ferruginous, nose ferruginous orange to pitch black with paler tip. Pronotum, antennae and abdominal tergites brown to sepia-brown, femora of legs brown, tibiae and tarsi yellow. Abdominal sternites pale brown.

Head capsule in plan view constricted behind antennae, posterior margin regularly rounded; nose conical. In profile straight or slightly concave to behind antennal socket, then abruptly raised and rounded; nose shorter than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 15-20 degrees; antennae 13 segmented, II and IV subequal, shorter than V, III and VI subequal and longer than V. Head setae consist of 6-8 at nose tip, and a bilaterally placed pair of small setae on vertex, with very few scattered minute setae on dorsal surface.

Abdominal tergites with very sparse scattered minute setae, slightly longer on posterior 2-3 segments; sternites with sparse short setae and longer setae up to 3 times length of short on posterior margins. Minor soldier: colour and pilosity, exactly as in major soldier. Head capsule in plan view more sharply constricted behind antennae. In profile concave, slightly sinuate, or indented in front of smaller posterior lobe of head; nose shorter to equal in length to rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 10-17 degrees; antennae 12-13 segmented, usually 13.

Measurements (Major and minor soldiers 14 specimens each, from 8 localities) in millimetres.

<i>Major soldiers</i>		Range	Mean
Head length to tip of nose		1.43-1.61	1.52
Head width		0.78-0.89	0.80
Depth of head capsule		0.54-0.66	0.58
Width of pronotum		0.41-0.49	0.43
Length of pronotum		0.18-0.23	0.19
Length of hind tibia		1.00-1.17	1.08
<i>Minor soldiers</i>		Range	Mean
Head length to tip of nose		1.28-1.44	1.33
Head width		0.56-0.66	0.61
Depth of head capsule		0.41-0.49	0.45
Width of pronotum		0.33-0.37	0.35
Length of pronotum		0.13-0.18	0.15
Length of hind tibia		0.82-1.02	0.94

Variation. Like *F. mallyi*, this species has proved to have relatively little variation over its comparatively short geographical range. The most variable caste is the minor soldier.

This species is retained in *Fulleritermes* in spite of its distinct soldier dimorphism because of its very close similarity in all respects, morphological and ecological, to *F. tenebricus* and *F. contractus*, with which latter species it has in the past been

confused. It is separable from both by the differences of the right imago mandible, and from *F. contractus* by the different pilosity of the vertex. The more rounded posterior lobe of the soldier head distinguishes *F. coatoni* from *F. contractus*, and the points of the vestigial soldier mandibles are often though not always more pronounced. The distinguishing features of *F. mallyi* are discussed under that species.

Holotype ♀ winged imago, allotype ♂, REPUBLIC OF SOUTH AFRICA : Transvaal, Sibasa, 24.x.1959 (*W. G. H. Coaton*), Coll. No. T.M. 6716, N.C.I., Pretoria.

Paratypes, soldiers and workers, same data as holotype, in N.C.I., Pretoria and B.M.(N.H.).

Other paratype material. SOUTHERN RHODESIA : Bulawayo, 13.v.1915 (*Arnold*), N.C.I., Pretoria.

REPUBLIC OF SOUTH AFRICA : Transvaal ; Bronkorstspruit, 6-12.v.1938, 23-24.ix.1957, 26.vii.1960, 10 vials, Warmbad, 12.iv.1938, 25.ix.1957, 3 vials, Groblersdahl, 21.ii.1939, 26.ix.1957, 2 vials, Pietersburg, 25.v.1939, 5.x.1960, Witbank, 30.viii.1959, Schweizer Reneke, 3.x.1956, 2 vials, N.C.I., Pretoria, Potgietersrus, 26.ix.1957, 2 vials, Pretoria, 23-25.ix.1957, 3.x.1960, 5 vials, Sibasa, 8.vii.1960, 3 vials, Waterberg, 3.x.1960, 2 vials, Rustenburg, 1 & 26.ix.1961, 2 vials, Marico, 1.ix.1961 (*W. G. H. Coaton*) ; Pretoria, 12.xi.1957, Sibasa, 30.xii.1959, Waterberg, 6.i.1960, Rustenburg, 6-8.i.1960 (*P. C. Joubert*) ; Sibasa, 15.x.1960, 2 vials, Pietersberg, 2.viii.1961 (*J. L. Sheasby*) ; Soutpansberg, 24.iv.1958 (*J. H. Grobler*) ; Cape Province ; Vryburg, 25.ii.1961, Mafeking, 26.ii.1962, N.C.I., Pretoria (*W. G. H. Coaton*) ; Kimberly, 7.xi.1960 (*P. C. Joubert*) ; Natal ; Entonjaneni, 13.i.1962, 2 vials (*J. L. Sheasby*).

A total of 56 nest series of this species were examined, and material is in the British Museum (Natural History) unless otherwise stated.

F. coatoni has been recorded as inhabiting parts of the mounds of various other genera. It appears to be confined to the relatively drier woodlands and wooded steppes included in vegetation type 20 of Keay *et al.* (1959), occurring in Southern Rhodesia and the northern parts of South Africa. Several localities in Cape Province are beyond the mapped limit of type 20 vegetation. Coaton (1962) considers that the species does not occur west of Longitude 24°E., and it therefore seems probable that *F. coatoni* does not extend far into the even drier *Acacia-Commiphora* wooded steppe of type 25. These localities are thus likely to be in the transition zone, or even outliers of type 20 too small to be recorded on the map.

***Fulleritermes contractus* (Sjöstedt)**

(Text-figs. 110, 111, 115, 135-139, 172-174, 220 ; Map 15)

Eultermes contractus Sjöstedt, 1913a : 384. Type locality : CONGO, Katanga, Welgelegen.

Coarctotermes contractus (Sjöstedt) Fuller, 1922 : 117. [unjustified emendation of generic name *Coarctotermes* Holmgren].

Coarctotermes contractus (Sjöstedt) ; Sjöstedt, 1926 : 356.

Coarctotermes brunneus Noirot, 1955 : 150. Type locality : ANGOLA, Humpata, Leba. **syn. n.**

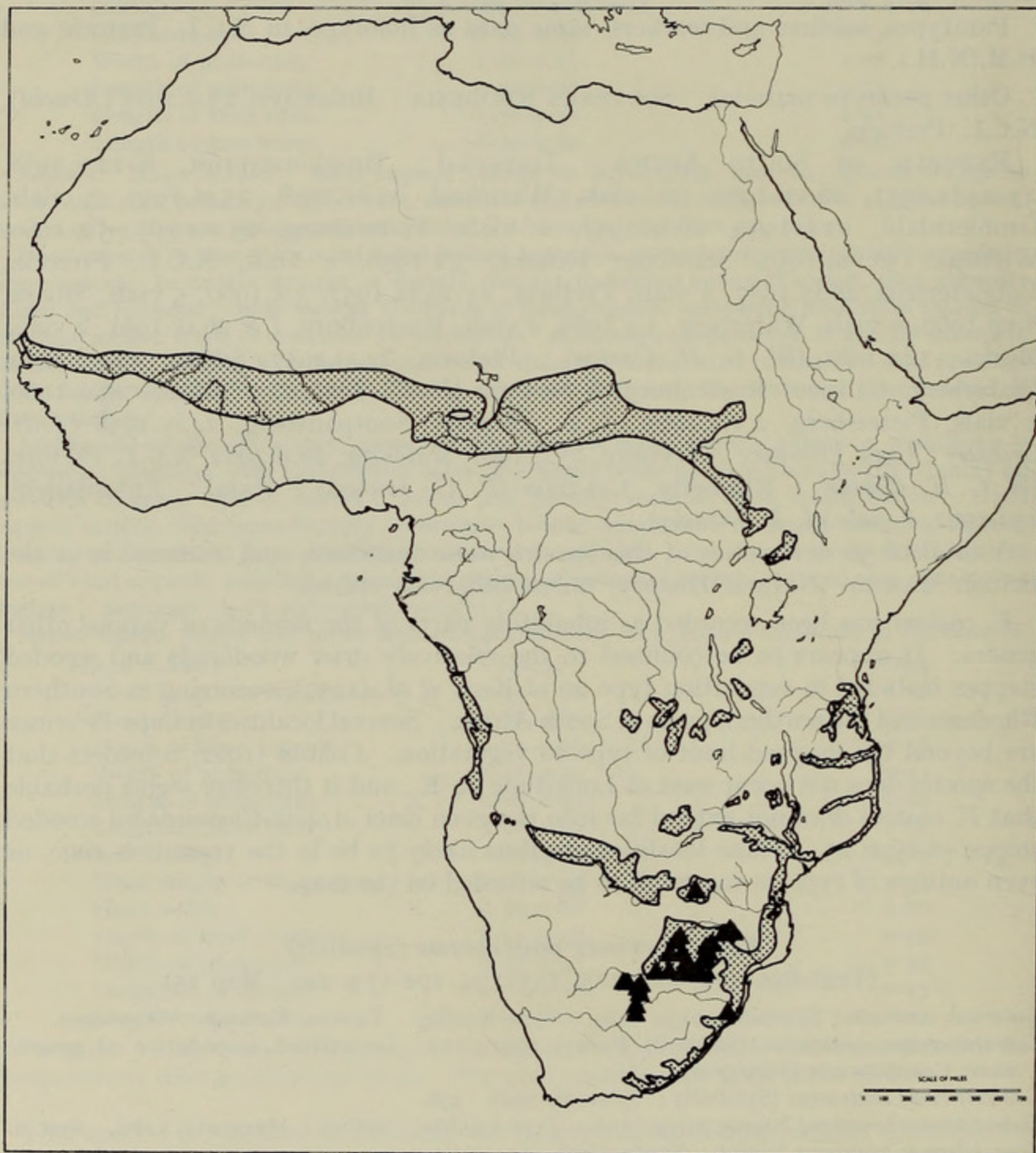
Coarctotermes brunneus Noirot ; Sands, 1957 : 14.

Fulleritermes contractus (Sjöstedt) Coaton, 1962 : 152.

Fulleritermes brunneus (Noirot) Coaton, 1962 : 153.

Imago. Head capsule pitch black, postclypeus very dark sepia brown, labrum sepia brown with hyaline tip ; antennae sepia brown. Pronotum very dark sepia brown, meso- and meta-nota, other thoracic sclerites and legs (apart from tarsi) sepia brown, tarsi paler brown. Abdominal tergites sepia brown, sternites paler in mid-line. Wings brown, darker at base, green and purple iridescent, venation sepia brown, outlined near base.

Posterior margin of head behind eyes semi-circular ; fontanelle small clear-cut Y-shaped, distinctly paler than head, in profile with small raised bump in front of fork ; eyes angular



MAP 14. *Fulleritermes coatonii*. Vegetation type : 20.

oval, not prominent, small relative to head width, W/E index 3.4–3.5; ocelli small, oval, separated from eyes by about twice own least diameter; postclypeus strongly inflated, width 1.8–2.1 times length, anterior margin slightly concave, posterior margin convex, rounded; antennae 14 segmented, II, V and VI subequal, slightly longer than IV, III twice IV, sometimes partly subdivided; right mandible with posterior cutting edge of first marginal tooth exposed beyond second, shorter than that of second marginal, molar plate deeply indented near base, with 8 ridges.

Cerci of ♀ shorter than width across base, slightly mamilliform conical.

Pilosity of vertex of rather coarse long yellow setae scattered among shorter setae, slightly less dense on "crown". (Text-fig. 115.)

Other characters mentioned in generic diagnosis.

Measurements (3 specimens from 2 localities) in millimetres.

	Range
Head width across eyes	0.94–1.10
Greatest diameter of eye	0.28–0.31
Ocellus	0.06–0.08 × 0.09
Ocellus to eye	0.13–0.14
Width of pronotum	0.92–1.05
Length of pronotum	0.64–0.79
Length of hind tibia	1.15–1.43
Length of fore wing	7.20

Soldier. Head capsule ferruginous orange to sepia brown, nose ferruginous to pitch black with reddish tip. Pronotum, antennae, abdominal tergites and femora of legs sepia brown, abdominal sternites and tibiae and tarsi of legs paler, brown.

Head capsule in plan view, strongly constricted behind antennae, posterior margin usually somewhat angularly rounded and often sulcate in the middle to a varying degree; nose moderately conical. In profile, dorsal surface of nose straight to well behind antennal socket, or slightly sinuate with small hump at base of nose, with or without slight indentation in front of raised and rounded posterior lobe of head; nose shorter, to equal in length to rest of head capsule measuring from hind margin of antennal socket, angle of nose cone 10–20 degrees; antennae 12–13 segmented, usually 13, II and V subequal, slightly longer than IV and shorter than III. Head setae confined to 6–8 at nose tip, and one bilaterally placed pair on vertex.

Abdominal tergites with very sparse, minute scattered setae, slightly longer upon last two; sternites with sparse short setae and longer setae on posterior margins up to twice length of short.

Measurements (30 specimens from 7 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.14–1.50	1.39
Head width	0.54–0.83	0.73
Depth of head capsule	0.40–0.55	0.50
Width of pronotum	0.32–0.45	0.41
Length of pronotum	0.15–0.18	0.16
Length of hind tibia	0.68–1.05	0.93

Variation. Imago variation cannot be assessed. The soldier varies considerably in colour and proportions, though slightly less than in *F. tenebricus*. Angularity of the head capsule and the sulcate posterior margin appear to be commoner at the eastern end of the range, but material from the west is meagre.

The soldiers of *F. contractus* are very difficult to separate from *F. tenebricus*, having a slightly thicker nose on average, slightly less pronounced posterior lobe of the head capsule, and proportionately shorter hind tibia. The ranges of all these characters overlap however. The imagos of *F. contractus* are distinguishable by

the more hairy vertex, the small bump or tubercle in front of the fontanelle, and the wider separation of ocelli from eyes. The distinguishing features from *F. coatoni* are discussed under that species.

A lectotype has been selected from among the syntype series of *F. contractus*, and labelled as such.



MAP 15. *Fulleritermes contractus*. Vegetation types : 8, 16, 18, and 19.

Lectotype : CONGO : Katanga, Welgelegen, 14.vi.1912 (*J. Bequaert*), lectotype queen, paralectotype soldiers and workers, Mus. Tervuren. Other paralectotype soldiers, type colony, A.M.N.H. and B.M.(N.H.).

Type Material. ANGOLA : Humpata, Leba, 17.ix.1949 (*A. de Barros Machado*), paratype soldier, type colony, *F. brunneus* (Noirot), A.M.N.H.

Other Material. CONGO : Leopoldville, Kitona, 9.viii.1959 (*J. Ruelle*), N.C.I., Pretoria ; Katanga, Keyberg, 11° 47' S., 27° 25' E., 19-25.iv.1948, 2 vials (*A. E. Emerson*), A.M.N.H.

ANGOLA : Munhango, 24.x.1927 (*M. Burr*).

NORTHERN RHODESIA : Abercorn, iii.1947 (*P. E. Glover*) ; Lusaka, xi.1963 (*E. N. Cooling*).

SOUTHERN RHODESIA : Salisbury, 1911 (*G. A. K. Marshall*). The last 4 nest series in British Museum (Natural History). 9 nest series were examined.

The habits of this species seem to be similar to those of *F. tenebricus* in the northern savannahs, sharing the mounds of other species and occasionally constructing its own small mound, or carton nest around a branch stump on a tree. It occurs in the savannah zones south of the Congo forest block, comprising vegetation types 8, 16, 18, and 19 of Keay *et al.* (1959), thus having a somewhat more restricted distribution than its northern congener.

Fulleritermes mallyi (Fuller)

(Text-figs. 106, 107, 116, 140-145, 175-177, 221, 222 ; Map 16)

Tenuirostritermes mallyi Fuller, 1922 : 115. Type locality : REPUBLIC OF SOUTH AFRICA, Cape Province, Malmesbury.

Eutermes mallyi (Fuller) Sjöstedt, 1926 : 310.

Coarctotermes mallyi (Fuller) Snyder, 1949 : 311.

Fulleritermes mallyi (Fuller) Coaton, 1962 : 152.

The following additions to Fuller's descriptions are necessary :

Imago. Posterior margin of head almost semi-circular behind eyes ; eyes small relative to head width, W/E index 3.8-4.4, moderately prominent in proportion to own diameter ; ocelli small, separated from eyes by slightly more than to nearly twice own least diameter ; post-clypeus very strongly inflated, width 1.7-1.8 times length, anterior margin almost straight, posterior regularly convex ; posterior cutting edge of first marginal tooth of right mandible exposed beyond second, longer than that of second marginal.

Cerci of ♀ shorter than width across base, mamilliform.

Pilosity of vertex densely scattered rather long yellow bristle-like setae of varying length, rest of body with yellow hair- and bristle-like setae. Other characteristics described in generic diagnosis.

Measurements (24 specimens from 7 localities) in millimetres.

	Range	Mean
Head width across eyes	1.37-1.43	1.40
Greatest diameter of eye	0.31-0.36	0.34
Ocellus	0.09-0.10 × 0.10-0.16	0.09 × 0.13
Ocellus to eye	0.10-0.19	0.16

	Range	Mean
Width of pronotum .	1.22-1.40	1.32
Length of pronotum .	0.71-0.84	0.80
Length of hind tibia .	1.63-1.79	1.71
Length of fore wing .	11.50-14.30	12.71

Soldier. Setae on head consist of a bilaterally placed pair on vertex, four at nose tip with sparse shorter setae behind them, and one or two towards base of nose.

Abdominal tergites with very short sparsely scattered setae and longer setae on posterior margins; sternites with more numerous short setae and longer setae on posterior margins 2-3 times length of short.

Antennae, 12 (6 out of 10) to 13 segmented.

Measurements (53 specimens from 16 localities) in millimetres.

	Range	Mean
Head length to tip of nose .	1.43-1.86	1.59
Head width .	0.64-0.94	0.82
Depth of head capsule .	0.43-0.64	0.57
Width of pronotum .	0.38-0.51	0.44
Length of pronotum .	0.18-0.28	0.23
Length of hind tibia .	0.89-1.30	1.12

Variation. The 5% size variation shown by the imagos over their entire distribution range is extremely low, and other characters varied similarly little. In the soldier there was more variation in the proportional lengths of nose and head capsule and in antennal length, with slight indications of a cline in these characters from south-west to north-east. Colour varied little in both castes.

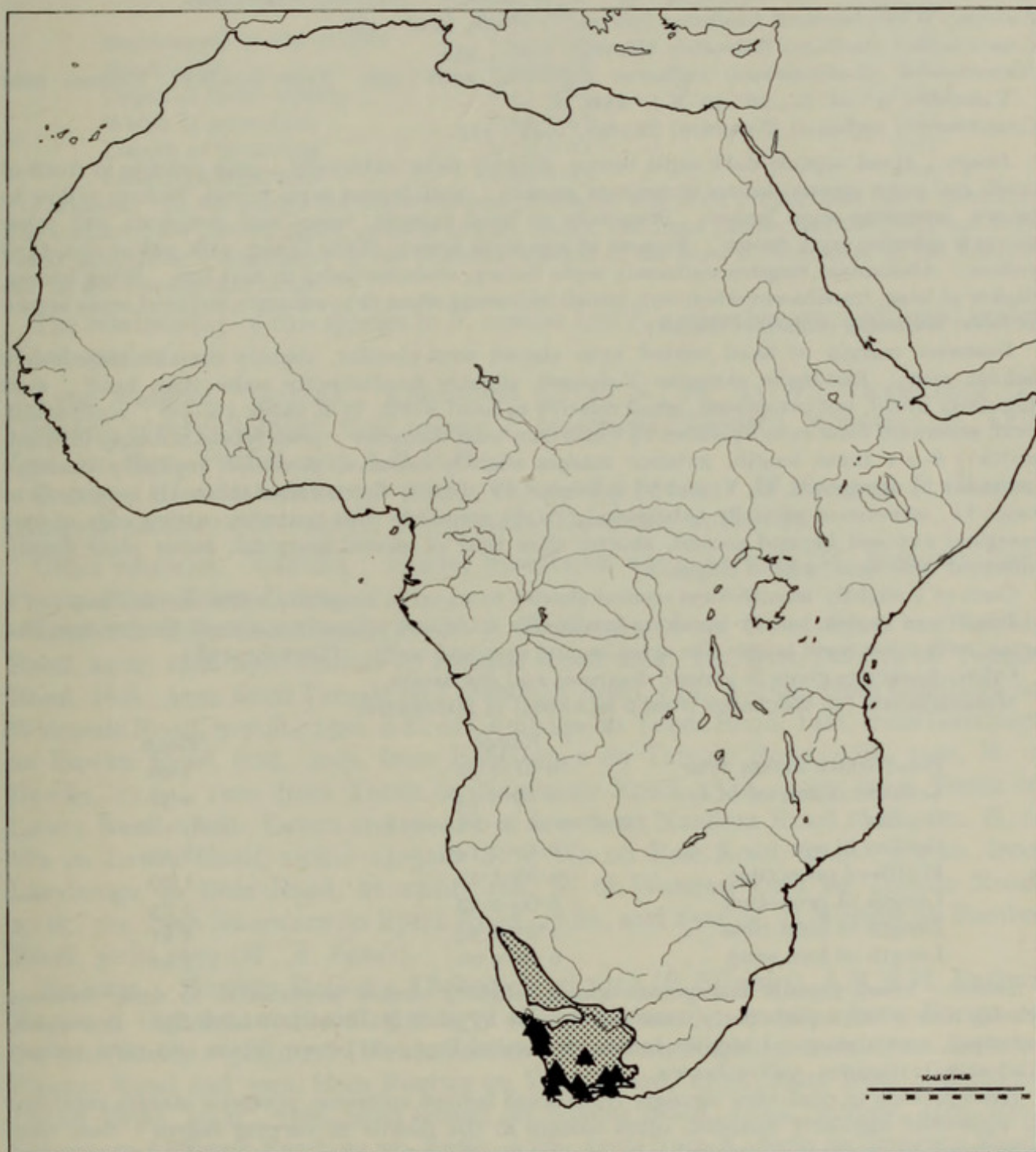
Though placed in *Fulleritermes*, the relationships of *F. mallyi* are open to doubt. The long wings and 15 segmented antennae of the imago together with the preponderantly 12 segmented antennae of the soldier, show closer resemblance to *R. coarctatus* than to the other species of its own genus.

These characters, the slender cylindrical nose and comparatively weak head constriction of the soldier, and the larger size of both imago and soldier castes, distinguish it from other *Fulleritermes* and *R. coarctatus*. It is unlikely to be confused with any other African species.

Material. REPUBLIC OF SOUTH AFRICA: Cape Province, Malmesbury, x.1920 (*R. Birch*), syntype female imagos and soldiers, type colony, *F. mallyi* (Fuller), A.M.N.H. (other syntypes in N.C.I., Pretoria); Malmesbury, 19.ii.1956, Clan William, 21.iii.1956-20.ii.1961, 7 vials, Calvinia, 6.x.1956-15.i.1958, 6 vials, Willowmore, 18.ix.1961, 4 vials, Beaufort West, 19.ix.1961, Aberdeen, 20.ix.1961, 3 vials (*W. G. H. Coaton*); Laingsburg, 15.xi.1960, 4 vials, Ladismith, 16.xi.1960 (*P. C. Joubert, H. P. Nieman*); Uniondale, 12.ii.1961, Ceres, 19.ii.1961, Clanwilliam and Calvinia, 20.ii.1961, Namaqualand, 15-19.x.1961, 17 vials, Van Rhynsdorp, 20.x.1961, 5 vials (*J. L. Sheasby, G. F. Pretorius*).

A total of 54 nest series were examined, and material is in the British Museum (Natural History) unless otherwise stated.

This species appears to be confined to the Karroo and related neighbouring vegetation types of Cape Province, South Africa. It has commonly been collected from beneath stones and from mounds of other species such as *Amitermes hastatus* (Haviland).



MAP 16. *Fulleritermes mallyi*. Vegetation types : 28 and 29.

Fulleritermes tenebricus (Silvestri)

(Text-figs. 108, 109, 118, 146-153, 178-180, 223, 224 ; Map 17)

Eutermes tenebricus Silvestri, 1914 : 44. Type locality : GUINEA, Kakoulima.*Eutermes* (*Coarctotermes*) *tenebricus* Silvestri ; Hegh, 1922 : 469.*Coarctotermes tenebricus* (Silvestri) Sjöstedt, 1926 : 355.*Nasutitermes* (*Coarctotermes*) *suffuscus* Emerson, 1928 : 496. Type locality : CONGO, near Yakuluku (4° 20' N., 28° 50' E.) **syn. n.***Coarctotermes suffuscus* (Emerson) Snyder, 1949 : 311.

Imago. Head capsule dark sepia brown, slightly paler anteriorly ; pale patches in front of ocelli and paler coronal suture sometimes present ; postclypeus sepia brown, labrum yellow to brown, antennae sepia brown. Pronotum as head capsule, meso- and metanota and other thoracic sclerites sepia brown. Femora of legs sepia brown, tibiae brown with yellow tips, tarsi yellow. Abdominal tergites uniformly sepia brown, sternites paler in mid-line. Wing brown, darker at base, translucent when wet, bluish iridescent when dry, venation outlined sepia brown at base, becoming indistinct distally.

Posterior margin of head behind eyes almost semi-circular, slightly sinuate immediately behind eyes ; fontanelle elongate Y-shaped, slightly to distinctly paler than head ; eyes angularly ovoid, not prominent, small relative to head width, W/E index 3.2-3.6 ; ocelli small, oval, separated from eyes by about 1½ times own least diameter ; postclypeus strongly inflated, width 1.8-2.1 times length, anterior margin slightly concave, posterior, regularly convex ; antennae 14 segmented, II, V, and VI subequal, IV slightly shorter than these, III longer, up to twice IV, sometimes partially subdivided ; right mandible with posterior cutting edge of first marginal exposed beyond second, shorter than that of second marginal, molar plate deeply indented near base, with 8 ridges.

Cerci of ♀ slightly mamilliform conical shorter to equal in length to width across base.

Pilosity of vertex, one or two long bristle-like setae and sparsely scattered shorter hair-like setae, with a few more bristle-like setae around eyes and ocelli. (Text-fig. 118.)

Other characters given in generic diagnosis and discussion.

Measurements (18 specimens from 6 localities) in millimetres.

	Range	Mean
Head width across eyes	0.91-1.22	1.06
Greatest diameter of eye	0.29-0.34	0.31
Ocellus	0.06-0.09 × 0.10-0.12	0.08 × 0.11
Ocellus to eye	0.10-0.14	0.12
Width of pronotum	0.88-1.23	1.09
Length of pronotum	0.60-0.88	0.75
Length of hind tibia	1.25-1.54	1.41
Length of fore wing	6.10-9.00	7.42

Soldier. Head capsule ferruginous orange, slightly darker posteriorly, to dark chestnut brown, nearly black posteriorly, nose ferruginous to pitch black with reddish tip. Pronotum, antennae, and abdominal tergites brown, femora of legs pale brown, tibiae and tarsi yellow. Abdominal sternites yellow-brown.

Head capsule in plan view strongly constricted behind antennae, posterior margin regularly to somewhat angularly rounded, often sulcate in the middle to varying degree ; nose near cylindrical to moderately conical. In profile dorsal surface of nose straight to well behind antennal socket, or slightly sinuate with small hump at base of nose, with or without slight indentation in front of raised and rounded posterior lobe of head ; nose shorter to slightly longer than rest of head capsule measuring from hind margin of antennal socket, angle of nose cone 5-17 degrees ; antennae 13 segmented, II short, IV, V, and VI progressively slightly longer, III longer up to twice II. Head setae confined to 6-8 at nose tip, one bilaterally placed pair on vertex and sometimes another at base of nose.

Abdominal tergites with very sparse scattered minute hair-like setae slightly longer on posterior margins; sternites with denser short setae and longer setae up to 3 times length of short on posterior margins.

Measurements (30 specimens from 19 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.15-1.50	1.36
Head width	0.59-0.86	0.75
Depth of head capsule	0.43-0.61	0.54
Width of pronotum	0.38-0.47	0.43
Length of pronotum	0.15-0.21	0.17
Length of hind tibia	0.94-1.23	1.06

Variation. In the imago the variation was chiefly in size with proportions fairly constant. The soldiers have proved highly variable in size, colour, and head profile, but the range has been found indivisible. Angularity of the posterior margin of the head is commoner at the western end of the distribution range.

The relationship of this species to *F. coatoni* and *F. contractus* are mentioned under those species.

Type Material. GUINEA: Kakoulima (9° 40' N., 13° 25' W.), 12.viii.1912 (*F. Silvestri*), syntype soldiers, type colony, *F. tenebricus* (*Silvestri*), *Silvestri* Coll., Lab. Zool. Sc. Agr., Portici, and A.M.N.H.

CONGO: near Yakuluku (4° 20' N., 28° 50' E.), xii.1911 (*H. Lang*, *J. P. Chapin*) paratype soldier, type colony, *F. suffuscus* (*Emerson*), A.M.N.H.

Other material. GUINEA: Nimba Mountains, 1957, 10 vials (*M. Lamotte*), Inst. Franc. d'Afr. Noire, Dakar.

GHANA: Yeji, 10.xii.1926 (*A. W. J. Pomeroy*); 60m. N. of Ejura on Tamale Road, 24.ii., 12m. S. of Tamale on Kumasi Road, 26.ii., 4m. from Daboya on Tamale Road, 28.ii., 55m. from Tamale on Larabanga Road, 3.iii., 4-15m. from Gambaga on Walewale Road, 5-7.iii., 25m. S.E. of Gambaga on Yendi Road, 14m. from Gambaga on Bawku Road, 6.iii., 20m. from Bolgatanga on Tamale Road, 9.iii., 10m. N. of Bawku, 11.iii., 11m. from Tumu on Navrongo Road, 15.iii., 40m. from Tumu on Lawra Road, 16.iii., Lawra and 9m. N. of Lawra on Nandom Road 18.iii., 6m. N. of Wa on Lawra Road, 19.iii., 24-52m. S. of Wa on Bole Road, 20.iii., 3-23m. from Larabanga on Bole Road, 21-22.iii., 6m. N. of Wangasi-Turu on Tamale Road, 27.iii., 7m. from Nkoranza on Ejura Road, 28.iii., and 25m. N. of Wenchi on Bamboi Road, 30.iii.1959 (*W. A. Sands*).

NIGERIA: Western Region; Olokemeji, xi.1912 (*F. Silvestri*), A.M.N.H. Eastern Region; Onitsha, 20.i. and 5.ix.1957 (*W. Wilkinson*); 7-12m. from Enugu on Onitsha Road, 2-3.iii.1958 (*W. A. Sands*). Northern Region: 20m. from Zaria on Funtua Road and 30m. from Funtua on Yashi Road, 14.xi., 25m. from Katsina on Daura Road, 19.xi., 71m. from Gusau on Sokoto Road, 22.xi., 2 vials, 45m. from Sokoto on Argungu Road, 23.xi., Zaria, 4.xii., 33m. from Kaduna on Zungeru Road, 20.xii., 16m. S. of Zungeru on Bida Road, 21.xii., Bida, 23.xii., 39m. from Abuja on Bida Road, 24.xii., and Gwagwa Forest near Abuja 28.xii.1956, 5m. from Jos on Bukuru Road, 6.ii., 42-7m. from Jos on Wamba Road, 8.ii., 40m. from Jos on Bauchi Road 11.ii., Bauchi, and 25m. from Bauchi on Jos Road, 12-13.ii., 18, 20, and 29m. from Jos on Pankshin Road, 14.ii., 3.iv., and 25.vii., 16m. from Kaduna

on Zungeru Road, 15.ii., 39m. from Bauchi on Gombe Road 6m. from Gombe on Hinna Road, 9.v., Tula, 37m. S.E. of Gombe, 10.v., 2 vials, 10m. S. of Mayo Faran, 14.v., 34-54m. from Yola on Jalingo Road, 14-16.v., 60m. S.W. of Jalingo on Takum Road 19.v., 15m. N.N.W. of Tibak, Schebschi Mountains, 24.v., 80m. from Yola on Biu Road, 28.v., 32m. from Damaturu on Potiskum Road, 5.vi., and 5m. S. of Yashi on Funtua Road, 3.x.1957, 24m. from Gboko on Makurdi Road, 25.ii., and 22m. from Kabba on Ikole Road, 11.iii.1958 (W. A. Sands).



MAP 17. *Fulleritermes tenebricus*. Vegetation types : 8, 16, 17, and 20.

CENTRAL AFRICAN REPUBLIC : Haut Mbomu, Zemio, iii.1948 (N. A. Weber), A.M.N.H.

CONGO : Niangara, 20.v.1913 (H. Lang, J. P. Chapin) ; Dika,* 26.iii.1925 (H. Schouteden), A.M.N.H. ; Tora, 26.ix.1926, 2 vials (H. Burgeon) ; Garamba Nat. Park, 6.vii.1951 (Miss. de Seager), Inst. des Parcs Nat. du Congo, Brussels.

SUDAN : Delami, 20.v.1927 (W. Rutledge).

A total of 86 nest series were examined and material is in the British Museum (Natural History) except where otherwise stated.

F. tenebricus is a species occurring in the Guinean savannah vegetation zones from the forest edge to the relatively dry Sudan type (Keay *et al.*, 1959, vegetation types 8, 16, 17, and 20). In this respect its distribution north of the Congo forest is as wide as the combined distributions of its two congeners *F. coatonii* and *F. contractus* in similar vegetation zones to the south of the forest block. It sometimes constructs a small hard earth mound with dark carton interior but is more commonly found inhabiting parts of mounds constructed by other genera such as *Cubitermes*, *Trinervitermes* and *Macrotermes*. It is also found under stones, in dead branches on trees, and in narrow earth runways which it constructs in foraging.

RHADINOTERMES gen. n.

(Rhadinus, Gr., " tapering ")

Type-species, *Eutermes coarctatus* Sjöstedt, 1902a : 304.

Imago. Left mandible with apical tooth as long as first marginal or slightly shorter, distance from apical to first marginal about one-third distance between first and third marginals (left mandible index .32-.36), second marginal obsolete, cutting edge between first and third marginals entire ; right mandible with apical and first marginals subequal as left, first marginal with small subsidiary " tooth " near basal junction with apical, and with posterior cutting edge exposed beyond anterior edge of second marginal longer than posterior cutting edge of latter ; right molar plate in surface view with weak indentation near basal end of anterior margin, posterior margin extending in rounded flange, first molar ridge forming a stout tooth, 6-7 remaining ridges diminishing towards base (Text-figs. 182, 183). Fontanelle, very narrow slit-like, scarcely bifurcate anteriorly in ♂, more clearly in ♀, slightly to distinctly paler than head.

Soldier. Monomorphic. Nose conical. Vestigial mandibles with small points. Head capsule sharply constricted behind antennae, posterior lobe commonly only about one-fourth wider than anterior. Antennae 12 segmented.

This genus is proposed to accommodate the single African mainland species *coarctatus* Sjöstedt, hitherto included, because of similarities in the soldier castes, in the Malagasy genus *Coarctotermes* of which the type-species is *Eutermes clepsydra* Sjöstedt, 1904 : 108. The imago differs from *Rhadinotermes coarctatus* in a number of features. The left mandible index is .30, and the third marginal tooth in fresh

*A note on the locality Dika, recorded by Emerson (1928) as 7° 50' N., 18° 45' E., i.e. near Ft. Crampel, C. Afr. Rep.

Other localities of this name exist at 4° 25' N., 21° 41' E.; 5° 59' N., 15° 13' E.; 5° 33' N., 20° 00' E., in C. Afr. Rep., at 4° 36' N., 28° 36' E. in Sudan, and in Congo at 4° 17' N., 27° 42' E., and 4° 09' N., 27° 40' E., one of these last probably being that known to H. Schouteden.

unworn specimens has been completely absorbed in the cutting edge joining it to the first marginal. The fontanelle is a rounded equilateral triangle with long side arms. It is a very much larger insect, having a head width across eyes of approximately 2mm., and much more prominent eyes and ocelli. The posterior margin of the pronotum is deeply indented. In its general appearance and superficially in its ecology, *R. coarctatus* closely resembles the genus *Fulleritermes* Coaton, 1962 : 151-4 from which it has recently been separated on the basis of the presence in the latter of a notch in the cutting edge in front of the third marginal tooth of the left mandible. This is discussed further under that genus. Other differences such as the greater proportionate length of this cutting edge and also that of the right first marginal in *Rhadinotermes*, and the much less prominent molar regions indicate that this genus is probably adapted to a somewhat different ecological niche, especially since it has been recorded from the same localities as members of *Fulleritermes*.

It is convenient to include *R. coarctatus* in the keys to *Fulleritermes*. The account of distribution follows the specific description.

***Rhadinotermes coarctatus* (Sjöstedt) comb. n.**

(Text-figs. 112, 113, 117, 154-156, 181-183, 225, 226 ; Map 18)

Eutermes coarctatus Sjöstedt, 1922a : 304. Type locality : NYASALAND, Zomba.

Eutermes (*Coarctotermes*) *coarctatus* Sjöstedt ; Holmgren, 1912 : 65.

Coarctatotermes coarctatus (Sjöstedt) Fuller 1922 : 118. [Unjustified emendation of generic name.]

Coarctotermes coarctatus (Sjöstedt) Sjöstedt, 1926 : 355.

Coarctotermes coarctatus (Sjöstedt) ; Sands, 1957 : 14.

Imago. Head capsule very dark brown to pitch black, postclypeus and antennae dark sepia brown. Labrum sepia brown, shading to yellow at tip. Pronotum as head capsule, meso- and metanota, pleural and ventral thoracic sclerites dark sepia brown. Legs dark sepia brown apart from paler tips of tibiae and yellow tarsi. Abdominal tergites dark sepia brown, outer ends paler, sternites sepia brown, pale brown in mid-line. Wings translucent pale brown, venation yellow-brown, radius sector with brown streak along posterior margin.

Posterior margin of head almost semi-circular behind eyes ; eyes not prominent, small relative to head width W/E index 3.4-3.8, somewhat angularly ovoid ; ocelli small, oval, separated from eyes by about $1\frac{1}{2}$ times own least diameter ; postclypeus strongly inflated, width 2.2 times length, anterior margin slightly concave, posterior, indistinct, convex ; antennae 15 segmented, II, IV, and V subequal in length, II thinner, III longer than these.

Cerci of ♀ shorter than width across base, mamilliform.

Pilosity of vertex scattered rather long yellow bristle-like setae rest of body with pale yellow hair- and bristle-like setae. Other characteristics described in generic diagnosis.

Measurements of 8 specimens from 3 localities were given in an earlier paper (Sands, 1957), these being all the material known apart from one nest series described by Fuller (1922) and falling within this size range.

Soldier. Head capsule sepia brown to pitch black, nose pitch black with reddish tip. Pronotum, antennae and abdominal tergites sepia brown. Legs, femora brown, tibiae and tarsi yellow to pale brown. Abdominal sternites yellow-brown to brown.

Head profile raised and rounded behind constriction, more or less straight in front. Nose equal in length or shorter than rest of head capsule, measuring from hind margin of antennal

socket, angle of nose cone 10–20 degrees ; antennae 12 segmented, II short, IV and V longer, and III subequal or slightly longer than these. Setae on head confined to four at nose tip and bilaterally placed pair on vertex, with a few short curved setae scattered on dorsal surface of head including nose.

Abdominal tergites with very short sparsely scattered setae, and longer setae on posterior margins ; sternites with more numerous short setae and longer setae on posterior margins 2–3 times length of short. Remaining characteristics given in generic diagnosis.

Measurements (25 specimens from 16 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.17–1.39	1.28
Head width	0.54–0.66	0.60
Depth of head capsule	0.40–0.49	0.45
Width of pronotum	0.33–0.38	0.36
Length of pronotum	0.15–0.18	0.17
Length of hind tibia	0.92–1.10	1.01

Variation. Imago variation was very slight in the small amount of material known. In the soldier caste small variations in length and angle of nose occur.

The relationships of this species are discussed under the generic heading. It is unlikely to be confused with any species other than small dark specimens of *Fulleritermes contractus*, and then only then in the case of the soldier caste collected alone.

Material (additional to that recorded in Sands, 1957). NYASALAND : Zomba, 1899 (Cameron), syntype soldiers and workers, *R. coarctatus* (Sjöstedt), A.M.N.H. (other syntypes in Mus. Cambridge, and Naturhist. Riksmus., Stockholm).

NORTHERN RHODESIA : Choma, 16.i.1957, 2 vials, Magoye, 17.i.1957, Lusaka, 19.i.1957, Broken Hill, 20.i.1957 (*W. G. H. Coaton*).

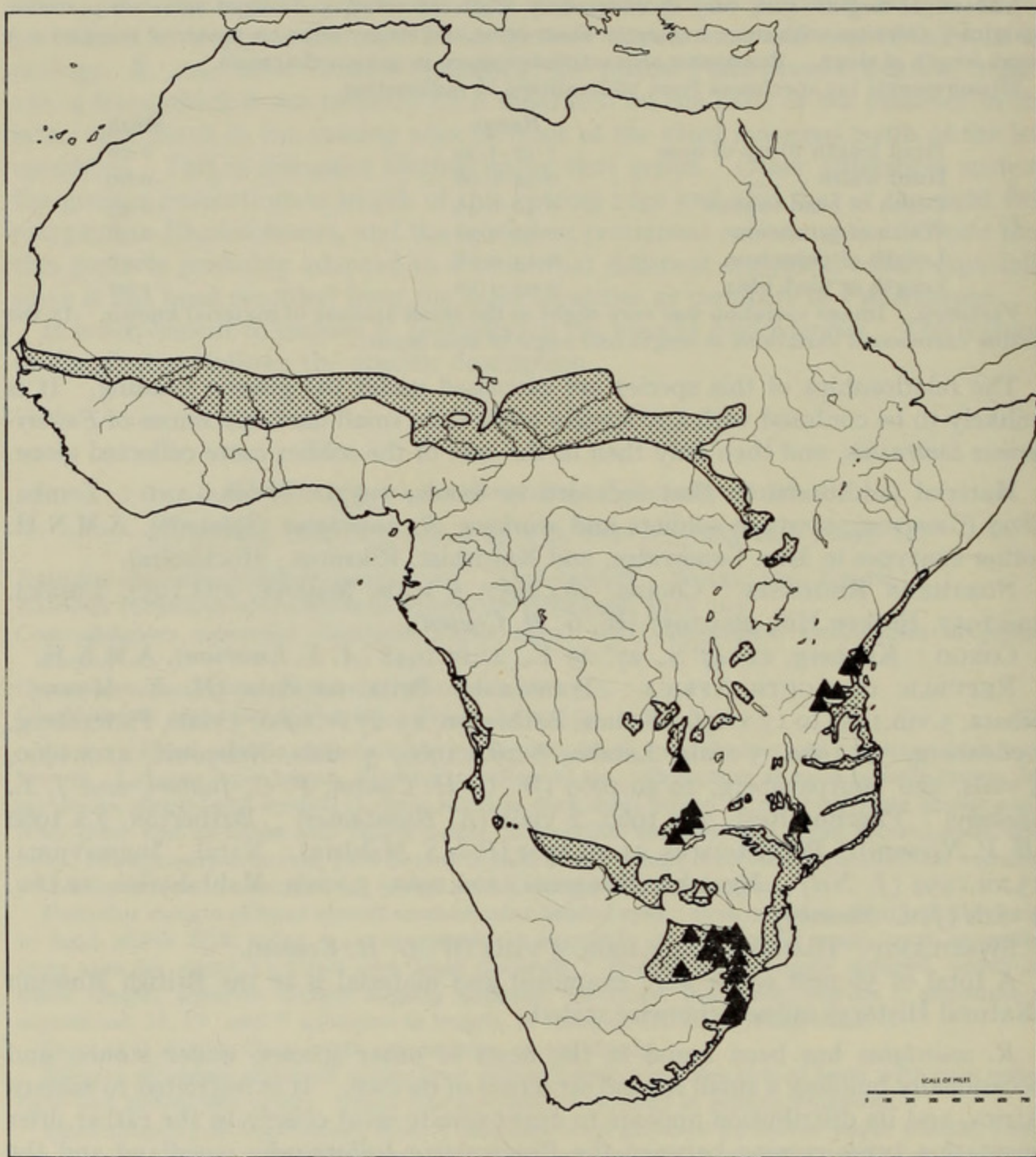
CONGO : Keyberg, 11° 47' S., 27° 25' E., 21.iv.1948 (*A. E. Emerson*), A.M.N.H.

REPUBLIC OF SOUTH AFRICA : Transvaal ; Brits, no date (*H. K. Munro*) ; Sibasa, 5.viii.1959 to 13.x.1960, 8 vials, Barberton, 23–27.iv.1960, 3 vials, Pietersberg, Lydenberg, 5.x.1960, 3 vials, Letaba, 8–16.x.1960, 5 vials, Nelspruit, 21.x.1960, 3 vials, and Soutpansberg, 10.xii.1960 (*W. G. H. Coaton*, *P. C. Joubert*, and *J. L. Sheasby*) ; Pilgrims Rest, 3.ix.1960, 2 vials (*A. Boonzaaier*) ; Barberton, 7.x.1960 (*H. P. Nieman*) ; Potgietersrus, 21.xii.1961 (*P. le S. Milstein*) ; Natal ; Ingwavuma, 13.xii.1959 (*J. Nel*) ; Ngotshe, Nongoma, 10.i.1962, 5 vials, Mahlabatini, 12.i.62, 2 vials (*J. L. Sheasby*).

SWAZILAND : Hlatikulu, 24.x.1960, 3 vials (*W. G. H. Coaton*).

A total of 56 nest series were examined and material is in the British Museum (Natural History) unless otherwise stated.

R. coarctatus has been found in the nests of other species, under stones, and occasionally building a small mound structure of its own. It is restricted to eastern Africa, and its distribution appears to approximate most closely to the rather drier vegetation types coming between the *Brachystegia-Julbernardia* woodland and the *Acacia-Commiphora* steppes, grouped in Keay *et al.* (1959) under vegetation type 20. It also occurs in the coastal savannah-forest mosaic, type 9, which has similar rainfall to type 20. These vegetation types are more widely distributed in fact than can be shown on the map, as small areas fringing the other types around mountain blocks and plateaux, and in valleys.



MAP 18. *Rhadinotermes coarctatus*. Vegetation types : 9 and 20.

MYCTEROTERMES gen. n.

(Mycteros, Gr., "beak")

Type-species, *Mycterotermes meringocephalus* sp. n.*Imago*. Unknown.

Soldier. Dimorphic. Major soldier, nose short, cylindrical, vestigial mandibles with small but distinct points showing trace of marginal as well as apical tooth; head capsule very weakly constricted behind antennae, vertex and nose with short but distinct bristle-like setae. Minor soldier, as major soldier, except nose weakly conical, head capsule more definitely constricted behind antennae. Antennae probably 13 segmented in major, 12 segmented in minor soldier.

There is no doubt that these specimens belong to a new genus of some phylogenetic importance, being close to but more primitive than *Trinervitermes*, and possibly even ancestral to it. The distinguishing features given in the diagnosis have much in common with the Neotropical genus *Diversitermes* and it appears most probable that *Trinervitermes* arose from this branch of the hypothetical phylogenetic tree in which Ahmad (1950) placed *Velocitermes*, *Tenuirostritermes*, and *Ceylonitermes*, and to which I (Sands, 1957) added *Coarctotermes* sensu lat. (*Fulleritermes*, *Rhadinotermes*, and *Coarctotermes* s. str.). At least 3 of these genera have become adapted to grass feeding and two to grass storage convergently with *Trinervitermes*, occupying equivalent ecological niches in their respective zoogeographical areas (Neotropical, Ethiopian, and Malagasy). Other genera of similar habits and appearance from the Australian region have not been studied in detail but may also be related.

Mycterotermes is unlikely to be confused with any genus other than *Trinervitermes* in the area covered by this revision. Its occurrence in Western Aden brings it into the Ethiopian Zoogeographical Region.

***Mycterotermes meringocephalus* sp. n.**

(Text-figs. 388–395; Map 3)

Imago. Unknown.

Soldiers. Major; Head capsule orange-yellow, nose ferruginous. Antennae yellow, pronotum and abdominal tergites yellow-brown. Abdominal sternites and legs pale yellow.

Head capsule in plan view tapering slightly towards front, sides slightly sinuate behind antennae, posteriorly weakly sulcate in mid-line, nose cylindrical to near base. In profile level from tip of nose to downward curve at back of head, with slight hump at base of nose and very weak constriction behind antennae; nose distinctly shorter than rest of head capsule, measuring from hind margin of antennal socket. Antennae, broken, II and IV subequal and shorter than V, III nearly twice as long as II.

Abdominal tergites with sparse fine minute setae, sternites with sparse shorter setae and longer setae on posterior margins.

Minor; as major soldier except antennae, II shorter than III, IV, and V which are subequal. Remaining characters given in generic diagnosis.

Measurements (Unique holotype major soldier, 2 minor soldiers).

	Major soldier	Minor soldiers
Head length to tip of nose	1.63	1.22
Head width	1.00	0.54
Depth of head capsule	0.59	0.38

	Major soldier	Minor soldiers
Width of pronotum	0.51	0.41
Length of pronotum	0.23	0.18
Length of hind tibia	both broken	0.94-1.00

Since this is a monotypic genus, its relationships have already been discussed under the generic heading. There is a slight possibility that the imagos described as *Trinervitermes saudiensis* sp. n. from Jiddah belong to this species, in view of their unusually wide fontanelle and small eyes, but this cannot be settled without further collecting.

Holotype, major soldier, ADEN PROTECTORATE : Burum, W. of Mukalla, 12.xii. 1951 (W. V. Harris, coll. no. 796), in B.M.(N.H.).

Morphotype and one paratype minor soldiers, same data as holotype, also in B.M.(N.H.).

It is recorded as found with *Trinervitermes arabiae* Harris in small loose sand heaps over narrow exit holes.

TRINERVITERMES Holmgren

Eutermes (*Trinervitermes*) Holmgren, 1912 : 59 [Subgenus of *Eutermes* Heer].

Trinervitermes Fuller, 1921 : 19 [full generic status]. Type species, by subsequent designation (Sjöstedt, 1926 : 325), *Trinervitermes trinervius* (Rambur, 1842).

Holmgren (1912) on first creating the subgenus, *Eutermes* (*Trinervitermes*) included a total of sixteen species, but did not designate the type-species. Fuller (1921) raised *Trinervitermes* to full generic status, consequent on the substitution by Banks (1919) of the name *Nasutitermes* for *Eutermes* s. str. as used by Holmgren (1912), but again, did not designate a type-species. *Termes trinervius* Rambur, 1842 was designated by Sjöstedt (1926) as type-species of the genus *Trinervitermes*. This choice was unfortunate because the unique holotype of *T. trinervius* (Ramb.) is a pinned dried ♂, from which the head capsule has been removed or lost, and the species is the most confused in the genus as a result of subsequent misidentifications. There is however no doubt of its correct assignment to the genus, in spite of its somewhat uncertain specific identity. The usage of *Trinervitermes* as a genus or subgenus was subject to some variation between 1921 and 1951, but it is now generally accepted as having full generic status.

Imago. Left mandible with apical tooth as long as or slightly shorter than first marginal, distance from apical to first marginal slightly less to slightly more than one-third distance between first and third marginals (left mandible index .29-.41), second marginal obsolete, cutting edge between first and third marginals straight ; right mandible with apical and first marginal subequal as left, cutting posterior edge of first marginal distinctly longer than that of second marginal, molar plate with no marked irregularity of outline in surface view, and 5-9 transverse ridges, first much larger than rest, forming a blunt tooth, the more posterior ridges less prominent (Text-figs. 185-195). Postclypeus length slightly less to slightly more than half width. Fontanelle pale coloured, slit-like, forked anteriorly, to approximately triangular, lateral arms

dilated terminally or tapering. Pilosity of head capsule rather evenly fine, arising from small sockets of regular size with a few larger scattered sockets among them.

Soldier. Dimorphic in most species, with traces of subdivision of "major" and "minor" or almost complete inter-gradation occurring in some colonies or local populations of some species. Nose cylindrical to strongly conical. Vestigial mandibles usually without points. Head capsule without any constriction behind antennae, and devoid of prominent setae except on nose (major soldier only, minor soldier often has constricted head capsule).

The longer cutting edges of the imago mandibles, and the right molar plate, distinguish this genus from *Nasutitermes*. The only genus closely resembling *Trinervitermes* in this respect is *Baucaliotermes* gen. nov., included in *Trinervitermes* by Emerson (1960) but differing in having monomorphic soldiers and certain other features.

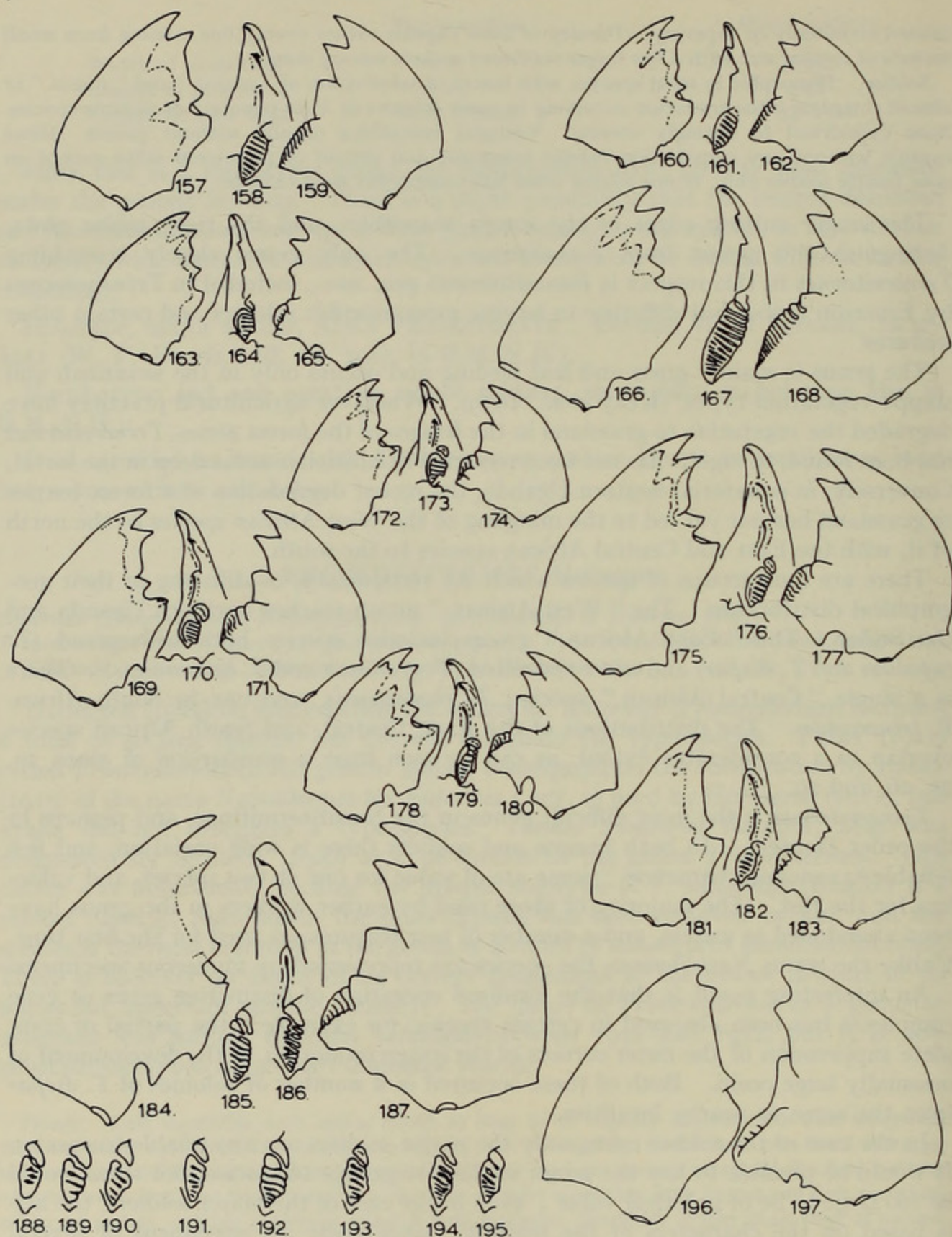
The genus is mainly grass and leaf feeding and occurs only in the savannah and steppe vegetation types, (Keay *et al.*, 1959). Wherever agricultural practices have degraded the vegetation to grassland in the fringes of the forest zones, *Trinervitermes* has been found, though it has not been recorded from similar areas deep in the forest. Conversely, in equatorial western Uganda, the recent degradation of a forest barrier to grassland has not yet led to the mingling of the West African species to the north of it, with the East and Central African species to the south.

There are four groups of species which are recognizable as differing in their geographical distribution. The "West African" group reaches northern Uganda and the Sudan. The "East African" group includes species both widespread (*T. rapulum* and *T. dispar*) and more restricted (*T. graciosus* and *T. bettonianus*). There is a single "Central African" species, *T. rhodesiensis*, and one in South Africa, *T. trinervoides*. The distributions of the East, Central, and South African species overlap to a considerable extent, as can be seen from a comparison of maps 20, 25, 26, and 29.

Trinervitermes is the most difficult genus in the Nasutitermitinae, and perhaps in the order Isoptera. In both imagos and soldiers there is wide variation, and few reliable taxonomic characters; some are of value for one or two species, and valueless for the rest. The majority of those used by earlier workers in the genus have been abandoned as useless, and a number of new features are used for the first time. Unlike the genus *Nasutitermes*, the species are represented by numerous specimens.

An interesting result is that the localised operation of distinctive genes or gene complexes has been observed in certain species, for example: the partial or complete suppression of the outer corners of the imago pronotum, or the development of unusually large ocelli. Both of these occurred in a number of colonies of *T. dispar* from the same or nearby localities.

In the case of the soldier caste, only the major soldiers are identifiable to species. It would be possible to key the minor soldiers to groups of species, but these would be too large to be of practical value; even in the case of the major soldiers, the key is based on the characters of the majority, since there are specimens of several species which cannot be reliably identified in the absence of their imago. On the other hand, some species are more readily separated in the soldier caste than in the imago.

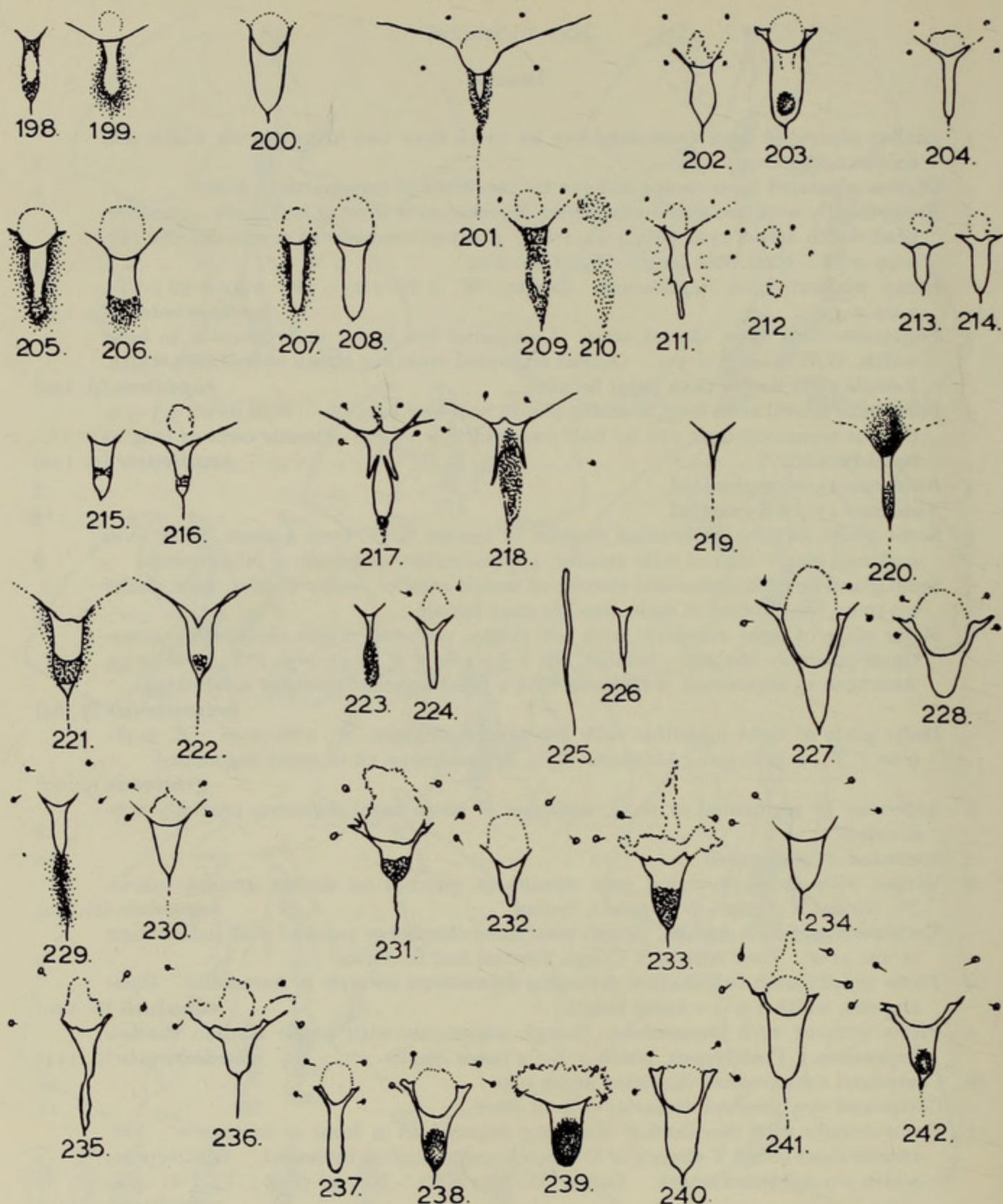


FIGS. 157-197 : Imago mandibles of "Procornitermes branch", showing details of right molar plate. 157-159, *Nasutitermes arborum* ; 160-162, *N. elegantulus* ; 163-165, *Leptomyxotermes doriae* (late nymph) ; 166-168, *Grallatitermes africanus* ; 169-171, *Fulleritermes coatoni* ; 172-174, *F. contractus* ; 175-177, *F. mallyi* ; 178-180, *F. tenebricus* ; 181-183, *Rhadinotermes coarctatus* ; 184-187, *Trinervitermes trinervoides* ; 188-190, *T. bettonianus* ; 191, *T. dispar* ; 192, *T. graciosus* ; 193, *T. rapulum* ; 194, 195, *T. rhodesiensis* ; 196, 197, *Baicalitermes hainesi*.

KEY TO SPECIES

IMAGOS

- 1 Ocellus separated from compound eye by more than two-fifths of own width (i.e. shortest diameter) 2
- Ocellus separated from compound eye by two-fifths of own width or less 4
- 2 Frons usually with two shallow diverging depressions in front of fontanelle. Smaller, head width across eyes (W), 1.45-1.83; greatest diameter of compound eye (E), 0.43-0.58; hind tibia length (T_3), 1.81-2.24 3
- Frons without such depressions. Larger, W, 1.61-2.03; E, 0.42-0.56; T_3 , 2.02-2.47 *trinervoides* (p. 132)
- 3 Fontanelle with short lateral arms. Compound eye larger in proportion to head width, W/E index 3.0-3.5. Ocellus separated from eye by up to half own width. Female cerci longer than basal breadth *rapulum* (p. 110)
- Fontanelle lateral arms long, reaching almost half way to ocelli. W/E index 3.5-3.9. Ocellus separated from eye by half own width or more. Female cerci as long as basal breadth *saudiensis* (p. 120)
- 4 Antennae 15-16 segmented 5
- Antennae 17-18 segmented 14
- 5 Scent gland on fifth abdominal sternite of female large, over 1.0mm. wide, over 0.25mm. long; that of male smaller, approximately as female of other species 6
- Scent gland on fifth abdominal sternite of female smaller, under 0.9mm. wide, under 0.23mm. long; that of male, smaller than female 7
- 6 Molar plate of right mandible with 5-6 ridges, posterior ridges obsolescent, sometimes unevenly shaped. Smaller, W, 1.55-1.82; E, 0.47-0.59; T_3 , 1.98-2.43. Antennae 15 segmented, sometimes with a basal segment partially subdivided *bettonianus* (p. 84)
- Molar plate of right mandible with 8-9 ridges. Larger, W, 1.80-1.96; E, 0.58-0.60; T_3 , 2.32-2.50. Antennae, 63% of specimens 16 or more segmented *gratiosus* (p. 97)
- 7 Antennae 16 segmented or if 15, with one or more basal segments partially subdivided 8
- Antennae 15 segmented 10
- 8 Vertex with three diverging pale streaks or patches on darker ground colour. W. Africa, N. Congo, N. Uganda, Sudan *togoensis* (p. 122)
- Vertex without such streaks, though sometimes clouded or patched with paler colour in one area. East Africa, S. Congo, Central and S. Africa 9
- 9 Frons usually with two shallow diverging depressions anterior to fontanelle. Postclypeus, width 1.9-2.2 times length *rapulum* (p. 110)
- Frons without such depressions, though sometimes with single median shallow depression. Postclypeus, width 2.2-2.5 times length *rhodesiensis* (p. 114)
- 10 Compound eye, greatest diameter under 0.50 11
- Compound eye, greatest diameter 0.50 or more 12
- 11 Frons usually with two shallow diverging depressions in front of fontanelle; fontanelle short broad Y-shaped or U-shaped, margins often indistinct. Postclypeus, width 1.9-2.2 times length. Larger, W, 1.45-1.83; E, 0.47-0.58; T_3 , 1.81-2.20 *rapulum* (p. 110)
- Frons without paired depressions, sometimes with single median shallow depression in front of fontanelle, sometimes flat; fontanelle slender Y-shaped, sometimes with dark patch at posterior end. Postclypeus, width 2.1-2.5 times length. Smaller W, 1.35-1.58; E, 0.43-0.50 (one only recorded); T_3 , 1.63-1.99 *dispar* (p. 87)



FIGS. 198-242: Imago fontanelle. 198, ♂, 199, ♀, *Nasutitermes arborum*; 200, ♀, *N. chrysopleura*; 201, ♂, *N. camerunensis*; 202, ♂, 203, ♀, *N. elegantulus*; 204, ♀, *N. fulleri*; 205, ♂, 206, ♀, *N. infuscatus*; 207, ♂, 208, ♀, *N. kempae*; 209, 210, ♂, 211, 212, ♀, *N. latifrons*; 213, ♂, 214, ♀, *N. lujae*; 215, ♂, 216, ♀, *N. schoutedeni*; 217, ♂, 218, ♀, *Grallatitermes africanus*; 219, ♂, ♀, *Fulleritermes coatonii*; 220, ♂, ♀, *F. contractus*; 221, ♂, 222, ♀, *F. mallyi*; 223, ♂, 224, ♀, *F. tenebricus*; 225, ♂, 226, ♀, *Rhadinotermes coarctatus*; 227, ♂, 228, ♀, *Trinervitermes bettonianus*; 229, ♂, 230, ♀, *T. dispar*; 231, 232, ♂, 233, 234, ♀, *T. geminatus*; 235, ♂, 236, ♀, *T. gratiosus*; 237, 238, ♂, 239, 240, ♀, *T. occidentalis*; 241, ♂, 242, ♀, *T. oecconomus*.

- 12 Frons usually with two shallow diverging depressions in front of fontanelle . . . 13
 – Frons without such depressions, though sometimes with single median depression (see also 9 above) . . . *rhodesiensis* (p. 114)
- 13 Eye relatively smaller, W/E index 3.0–3.5. Postclypeus more inflated, width 1.9–2.2 times length. Ocelli separated from compound eyes by one-fifth to one-half own shortest diameter. East, Central, South Africa. . . *rapulum* (p. 110)
 – Eye relatively larger, W/E index 2.6–3.0. Postclypeus less inflated, width 2.2–2.6 times length. Ocelli separated from compound eyes by one-tenth to one-fifth own shortest diameter. W. Africa, N. Congo, S. Sudan, N. Uganda *occidentalis* (p. 100)
- 14 Pilosity of “forehead” consisting of a “pelt” or “mat” of short, curved setae of even length, with scattered long setae 3–5 times longer than these (Text-figs. 383, 385). Scent gland on fifth abdominal sternite of female smaller, width usually under 0.9mm., length under 0.2mm. (some *T. trinervius* larger, approach the larger dimensions of *T. oeconomus*) . . . 15
 – Pilosity of “forehead” uneven, setae generally straight or slightly curved, length variable from very short to long, not forming an even “pelt” (Text-fig. 384). Scent gland on fifth abdominal sternite of female larger, width over 1.0mm., length over 0.3mm. (some *T. geminatus* have more uneven pilosity, but these have the small scent gland on the fifth female abdominal sternite) . . . 16
- 15 Postclypeus, more strongly inflated, width 2.2–2.4 times length. Eyes larger in proportion to head width, W/E index 2.3–2.9. Cerci of female usually longer than basal breadth, some equal . . . *trinervius* (p. 127)
 – Postclypeus, less inflated, width 2.4–2.8 times length. Eyes smaller in proportion to head width, W/E index 2.7–3.0. Cerci of female shorter than basal breadth, rarely equal . . . *geminatus* (p. 92)
- 16 Pilosity of “forehead” sparse and fine. Postclypeus more inflated, width 2.0–2.3 times length. Ocelli separated from eyes by one-sixth to two-fifths own shortest diameter. Cerci of female as long as basal breadth, or shorter. East Africa, S. Uganda, S. Congo, N. Angola . . . *gratiosus* (p. 97)
 – Pilosity of “forehead” abundant and coarse (Text-fig. 384). Postclypeus less inflated, width 2.3–2.6 times length. Ocelli separated from eyes by one-fifteenth to one-quarter own shortest diameter. Cerci of female longer than basal breadth. W. Africa across to N. Uganda and Sudan . . . *oeconomus* (p. 105)

SOLDIERS (MAJOR SOLDIERS ONLY)

- 1 Nose in profile cylindrical or weakly conical (angle of cone 0–14 degrees) . . . 2
 – Nose in profile moderately to strongly conical (angle of cone 15–25 degrees) . . . 11
- 2 Nose tip distinctly hairy . . . 3
 – Nose tip with four prominent setae at most, often fewer or none, and with a few minute, pale setae behind them, or none . . . 6
- 3 Antennae 13 segmented . . . 4
 – Antennae 14 segmented . . . 5
- 4 Fontanelle large, 0.05mm. to over 0.1mm. across. Nose in profile more broadly conical towards base. Head capsule in plan view “shouldered” behind base of antennae (Text-figs. 282–289) . . . *occidentalis* (p. 100)
 – Fontanelle small 0.03–0.05mm. across. Nose in profile evenly tapered to near base. Head capsule evenly rounded in plan view (Text-figs. 351–358, 376–378) *T. arabiae* (p. 82) and *togoensis* (p. 122)
- 5 Nose usually as long as or longer than rest of head capsule measuring from hind margin of antennal socket. South Africa, parts of South-Central Africa *trinervoides* (p. 132)
 – Nose usually shorter than rest of head capsule, measuring from hind margin of antennal socket. West Africa, N. Congo, across to Sudan, N. Uganda . . . 12

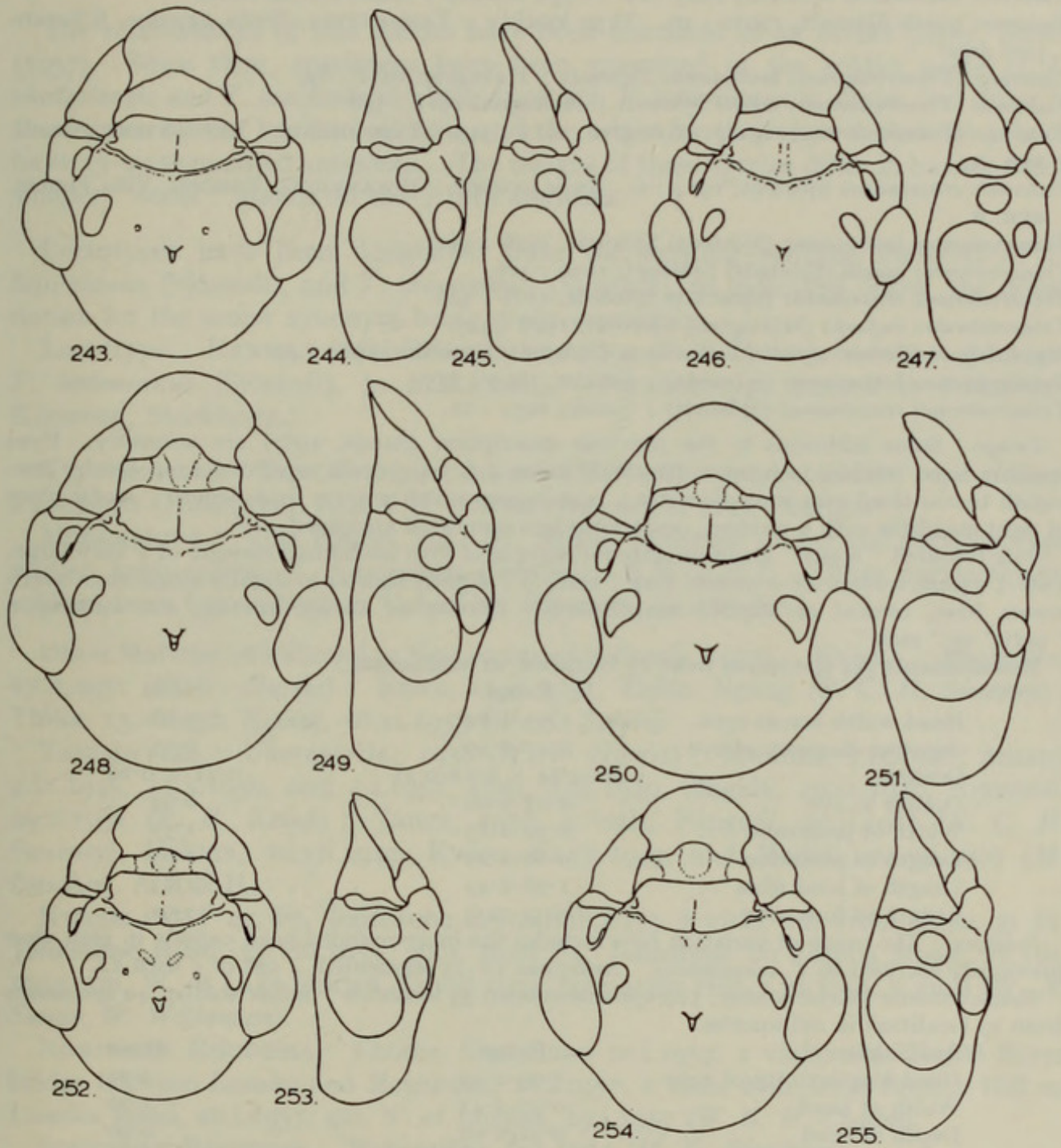
- 6 Head capsule in plan view "shouldered" behind base of antennae 7
 - Head capsule outline various, not "shouldered" in front 8
- 7 Head capsule in profile rising from base of nose above antennal socket in almost a straight line to near highest point, before downward curve to occiput. Nose always shorter than rest of head capsule, measuring from hind margin of antennal socket (Text-figs. 338-343) *rapulum* (p. 110)
 - Head capsule in profile scarcely rising in a curve from base of nose to behind antennal socket, then commencing convex curve to highest point, continuous with downward curve to occiput. Nose often equal, sometimes longer than rest of head capsule, measuring as above, sometimes shorter (Text-figs. 344-350) *rhodesiensis* (p. 114)
- 8 Hind tibia under 1.39mm. in length *dispar* (p. 87)
 - Hind tibia over 1.39mm. in length 9
- 9 Paler coloured, head capsule yellow to ferruginous, nose darker, orange to chestnut brown, with paler tip. West Africa, N. Congo, Sudan, N. Uganda *oeconomus* (p. 105)
 - Darker coloured, head capsule ferruginous to pitchy brownish black, nose darker than head, chestnut brown to jet black with red tip 10
- 10 Head capsule in profile rising from base of nose in front of antennal socket more or less straight to highest point of head, nose always shorter than rest of head capsule. East Africa, Southern Congo, Angola *gratiosus* (p. 97)
 - Head capsule in profile scarcely rising in a curve to behind antennal socket, then convex to highest point. Nose often equal to or longer than rest of head capsule. West Africa, N. Congo, Sudan, N. Uganda *trinervius* (p. 127)
- 11 Antennae 12-13 segmented. E. and Central Africa *bettonianus* (p. 84)
 - Antennae 14 segmented. W. Africa, N. Congo, Sudan, N. Uganda 12
- 12 Middle abdominal tergites, seen in profile, with distinct (though minute) setae over entire surface. Colour of head capsule usually darker, ferruginous orange, to dark sepia brown, nose darker with red tip (Text-figs. 270-275) *geminatus* (p. 92)
 - Middle abdominal tergites, seen in profile, with setae so minute and pale as to appear absent except at high magnifications. Colour of head capsule usually paler, yellow to ferruginous, nose darker, orange to chestnut brown, with paler tip (Text-figs. 290-296) *oeconomus* (p. 105)

Trinervitermes arabiae Harris

(Text-figs. 376-378 ; Map 3)

Trinervitermes arabiae Harris, 1957 : 430. Type locality : WESTERN ADEN PROTECTORATE, Dhala.

The soldier caste of this species is indistinguishable taxonomically from *T. togoensis* (Sjöstedt), but the nearest recorded locality of the latter is in Uganda, a distance of about 1,000 miles. In the absence of the imago caste and of examples of the soldier from intermediate localities, I consider it undesirable to reduce *T. arabiae* to a synonym at present. It may be noted however, that evidence from other genera shows that species typically found in the Guinean to Sahel vegetation zones (Keay *et al.*, 1959, types 8, 16, 17, 20, and 25) also occur in South-West Arabia.



FIGS. 243-255 : *Trinervitermes*, front and side views of imago head capsule. 243-245, *T. bettonianus* ; 246, 247, *T. dispar* ; 248, 249, *T. geminatus* ; 250, 251, *T. gratiosus* ; 252, 253, *T. occidentalis* ; 254, 255, *T. oeconomicus*.

Trinervitermes bettonianus (Sjöstedt)

(Text-figs. 188-190, 227, 228, 243-245, 256-261 ; Map 29)

Eutermes bettonianus Sjöstedt, 1905 : 19. Type locality : KENYA, Athi River.*Eutermes segelli* Sjöstedt, 1907a : 26. Type locality : TANGANYIKA, Boma ngombe, Kilimanjaro area.*Eutermes* (*Trinervitermes*) *bettonianus* Sjöstedt ; Holmgren 1912 : 64.*Eutermes* (*Trinervitermes*) *segelli* Sjöstedt ; Holmgren 1913 : 348.*Eutermes* (*Trinervitermes*) *ruficeps* Holmgren, 1913 : 343. Type locality : TANGANYIKA, Amani.**syn. n.***Eutermes crassinasus* Sjöstedt, 1914 : 6. Type locality : MOZAMBIQUE, Zambesi, Villa Fontes.**syn. n.***Trinervitermes bettonianus* (Sjöstedt) Sjöstedt, 1926 : 332.*Trinervitermes segelli* (Sjöstedt) Sjöstedt, 1926 : 326.*Trinervitermes crassinasus* (Sjöstedt) Sjöstedt, 1926 : 326.*Trinervitermes ruficeps* (Holmgren) Sjöstedt, 1926 : 327.*Nasutitermes* (*Trinervitermes*) *bettonianus* (Sjöstedt) Emerson, 1928 : 492.*Trinervitermes bettonianus* (Sjöstedt) ; Snyder, 1949 : 323.*Trinervitermes crassinasus* (Sjöstedt) ; Sands, 1957 : 21.

Imago. Some additions to the previous description (Sands, 1957) are necessary. Eyes medium sized relative to head width, W/E index 2.9-3.4 ; ocelli separated from eye by one-eighth to one-third own least diameter ; postclypeus width 2.0-2.5 times length ; molar plate of right mandible with 5-6 ridges, posterior ridges somewhat atrophied.

Pale coloured " scent " gland on anterior margin of fifth abdominal sternite of ♀ very large, 1.07-1.33mm. wide, 0.28-0.51mm. long ; cerci of ♀ slightly shorter to slightly longer than width across base, conical or slightly mamilliform. Pilosity of vertex uneven, not forming a " pelt " or " mat ".

Measurements (34 specimens from 13 localities) in millimetres.

	Range	Mean
Head width across eyes	1.55-1.82	1.68
Greatest diameter of eye	0.47-0.59	0.53
Ocellus	0.20-0.24 × 0.22-0.31	0.21 × 0.26
Ocellus to eye	0.03-0.06	0.04
Width of pronotum	1.39-1.85	1.57
Length of pronotum	0.88-1.22	1.03
Length of hind tibia	1.98-2.43	2.13
Length of fore wing	14.2-22.3	17.95

Soldiers. The range of variation now includes the more rounded head capsule in plan view previously ascribed to *T. crassinasus*. Antennae 12-13 segmented, 4 out of 5 with 12.

Measurements (Major soldier, 119 specimens from 35 localities ; minor soldier, 40 specimens from 25 localities) in millimetres.

<i>Major Soldiers</i>		Range	Mean
Head length to tip of nose		1.93-2.49	2.21
Width of head		0.97-1.43	1.20
Depth of head		0.72-1.07	0.90
Width of pronotum		0.54-0.72	0.63
Length of pronotum		0.22-0.32	0.27
Length of hind tibia		1.11-1.57	1.34
<i>Minor Soldiers</i>		Range	Mean
Head length to tip of nose		1.33-1.82	1.58
Width of head		0.57-0.93	0.75
Depth of head		0.43-0.70	0.57

Minor Soldiers	Range	Mean
Width of pronotum	0.40-0.54	0.47
Length of pronotum	0.18-0.25	0.22
Length of hind tibia	0.95-1.40	1.18

The relationships of this species have been discussed in an earlier paper, Sands (1957). Since then, specimens have been examined of the soldier caste of *T. rhodesiensis* and *T. occidentalis* which approach *T. bettonianus* in shape, but differ in the former by the less conical nose and the latter by the larger fontanelle; both have 13-14 segmented antennae. The imagos of these species differ in having much smaller "scent" glands on the ♀ fifth sternites.

Lectotypes have been designated from the existing syntype material of *T. bettonianus* (Sjöstedt), and *T. crassinasus* (Sjöstedt), as indicated below, the designation for the senior synonym being given separately.

Lectotype: KENYA: Athi River, 8-19.v.1899 (*C. S. Betton*), lectotype ♂ imago, *T. bettonianus* (Sjöstedt), in B.M.(N.H.). (Paralectotype imagos in Naturhist. Riksmus., Stockholm.)

Type Material. TANGANYIKA: Amani, (*Morstatt*), syntype soldier, type colony, *T. ruficeps* (Holmgren), A.M.N.H. (Other syntypes in Mus. Stuttgart.)

MOZAMBIQUE: Villa Fontes, 1914 (*H. Swale*), lectotype soldier and paralectotype soldier, type colony, *T. crassinasus* (Sjöstedt), B.M.(N.H.). (Other paralectotype soldiers from type colony in Naturhist. Riksmus., Stockholm.)

Other Material (additional to that recorded in Sands, 1957). KENYA: Machakos, 17.ii.1951 (*W. V. Harris*); Ruiru, 11.iii.1951, Thika, Ngong (R. C. H. *Sweeney*); Thika, 15.v.1952, Ngong, 16.vi.1953 (*W. A. Sands*).

TANGANYIKA: Ukerewe Is., 1938 (*W. V. Harris*); Mwanza, 4.ix.1948, Amani, 4.ix.1949, 11.x.1950, and 4.i.1952, Itigi, 8.ix.1949, Singida, 10.ix.1949, Ngomeni, 19.v.1951 (*P. B. Kemp*); Tanga, 1950, 4 vials, Pangani, 20.ii.1951 (R. C. H. *Sweeney*), Hakara, 10.vii.1949, Kwirow, 20.vii.1949, and Madidi, 24.vii.1949 (*M. Luscher*), A.M.N.H.

NYASALAND: nr. Ft. Johnstone, 23-24.viii.1953, 2 vials, 2m. from Bilila on Ft. Johnstone Road, 27.viii.1953, 20m. from Ft. Johnstone on Zomba Road, 28.viii.1953, 1m. W. of Lake Shirwa, 31.viii.1953, Namatalu Hill, 1.xi.1953, 2 vials (*W. A. Sands*, *W. Wilkinson*).

NORTHERN RHODESIA: Choma, Siamambo 10.i.1957, 2 vials, near Kafue River bridge between Lusaka and Mazabuka, 18.i.1957, 2 vials, 26m. from Broken Hill on Lusaka Road, 20.i.1957, 4m. N. of Lusaka, 19.i.1957 (*W. G. H. Coaton*).

SOUTHERN RHODESIA: Rekomitjie, 6.x.1964 (*M. G. Bingham*).

A total of 79 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

The distribution and biology of this species were discussed in an earlier paper, Sands (1957). Further study and new records suggest that *T. bettonianus* does not extend far to the south of the valley of the River Zambesi. Areas of apparently

suitable vegetation types occur considerably further south, but it has not been collected, whereas its less conspicuous congener, *T. dispar*, has been recorded from Natal.



MAP 19. *Trinervitermes bettonianus*. Vegetation types : 9, 20, 22, and 25.

Trinervitermes dispar (Sjöstedt)

(Text-figs. 191, 229, 230, 246, 247, 262-269 ; Map 20)

Eutermes dispar Sjöstedt, 1920a : 303. Type locality : NYASALAND, Zomba.*Eutermes gemellus* Sjöstedt, 1920a : 303. Type locality : REPUBLIC OF SOUTH AFRICA.**syn. n.***Termes (Eutermes) dispar* (Sjöstedt) Desneux, 1904a : 41.*Termes (Eutermes) gemellus* (Sjöstedt) Desneux 1904a : 42.*Eutermes dispar* Sjöstedt ; Sjöstedt, 1904 : 107.*Eutermes gemellus* Sjöstedt ; Sjöstedt, 1904 : 98.*Eutermes kulloensis* Sjöstedt, 1912 : 13. Type locality, ETHIOPIA, Eritrea, Mt. Kullo, Maggio.**syn. n.***Eutermes (Trinervitermes) dispar* Sjöstedt ; Holmgren, 1912 : 64.*Eutermes (Trinervitermes) gemellus* Sjöstedt ; Holmgren, 1912 : 65.*Eutermes katangensis* Sjöstedt, 1913 : 382. Type locality, CONGO, Katanga, Elizabethville.**syn. n.***Eutermes (Trinervitermes) erythrae* Holmgren, 1913 : 345. Type locality : ETHIOPIA, Eritrea.**syn. n.***Eutermes grootfonteinsis* Sjöstedt, 1914a : 86. Type locality : SOUTH WEST AFRICA, Grootfontein. **syn. n.***Trinervitermes umzinduzii* Fuller, 1922 : 114. Type locality : REPUBLIC OF SOUTH AFRICA, Natal, Pietermaritzburg. **syn. n.***Trinervitermes dispar* (Sjöstedt) Fuller, 1922 : 108.*Trinervitermes gemellus* (Sjöstedt) Fuller, 1922 : 110.*Trinervitermes kulloensis* (Sjöstedt) Sjöstedt, 1926 : 328.*Trinervitermes katangensis* (Sjöstedt) Sjöstedt, 1926 : 328.*Trinervitermes erythrae* (Holmgren) Sjöstedt, 1926 : 327.*Trinervitermes grootfonteinsis* (Sjöstedt) Sjöstedt, 1926 : 330.*Trinervitermes eldirensis* Ghidini, 1941 : 33. Type locality : ETHIOPIA, El Dire. **syn. n.**

Imago. Some additions to the previous description (Sands, 1957) are necessary. Eyes medium sized relative to head width, W/E index 2.90-3.3 ; ocelli separated from eye by slightly less than one-sixth to slightly less than two-fifths own shortest diameter ; postclypeus width 2.1-2.5 times length ; molar plate of right mandible with 7-8 ridges.

Pale coloured " scent " gland on anterior margin of fifth abdominal sternite of ♀ very small, 0.45-0.54mm. wide, 0.15-0.18mm. long ; cerci of ♀ distinctly longer than width across base, conical.

Pilosity of vertex uneven, not forming a " pelt " or " mat ".

Measurements (41 specimens from 17 localities) in millimetres.

	Range	Mean
Head width across eyes	1.35-1.58	1.44
Greatest diameter of eye	0.42-0.50	0.46
Ocellus	0.15-0.20 × 0.17-0.26	0.18 × 0.22
Ocellus to eye	0.03-0.06	0.04
Width of pronotum	1.20-1.48	1.32
Length of pronotum	0.76-0.97	0.84
Length of hind tibia	1.63-1.99	1.77
Length of fore wing	14.00-18.90	16.10

Soldiers. The following additions to the previous description of the major soldier are necessary : nose cylindrical to moderately conical, angle of cone 0-20 degrees, usually less than 14 degrees. Head capsule in plan view rounded oval, rarely slightly shouldered behind antennae. Nose tip with four prominent setae, and a few minute pale setae behind them.

Measurements (Major soldiers, 151 specimens from 39 localities, minor soldiers, 28 specimens from 13 localities).

<i>Major Soldier</i>	Range	Mean
Head length to tip of nose	1.71-2.23	2.02
Width of head	0.93-1.36	1.05
Depth of head	0.68-0.99	0.84
Width of pronotum	0.54-0.68	0.58
Length of pronotum	0.18-0.25	0.23
Length of hind tibia	1.04-1.39	1.19
<i>Minor Soldier</i>	Range	Mean
Head length to tip of nose	1.18-1.61	1.41
Width of head	0.43-0.64	0.53
Depth of head	0.36-0.50	0.43
Width of pronotum	0.38-0.47	0.41
Length of pronotum	0.13-0.20	0.16
Length of hind tibia	0.82-1.18	1.01

A darker coloured form of the imago with dusky pronotum has been recorded from South Africa, but it is less variable in size and shape than most other species. It only overlaps in size range with *T. bettonianus* and *T. rapulum* among East African species, and *T. occidentalis* and *T. togoensis* among West African.

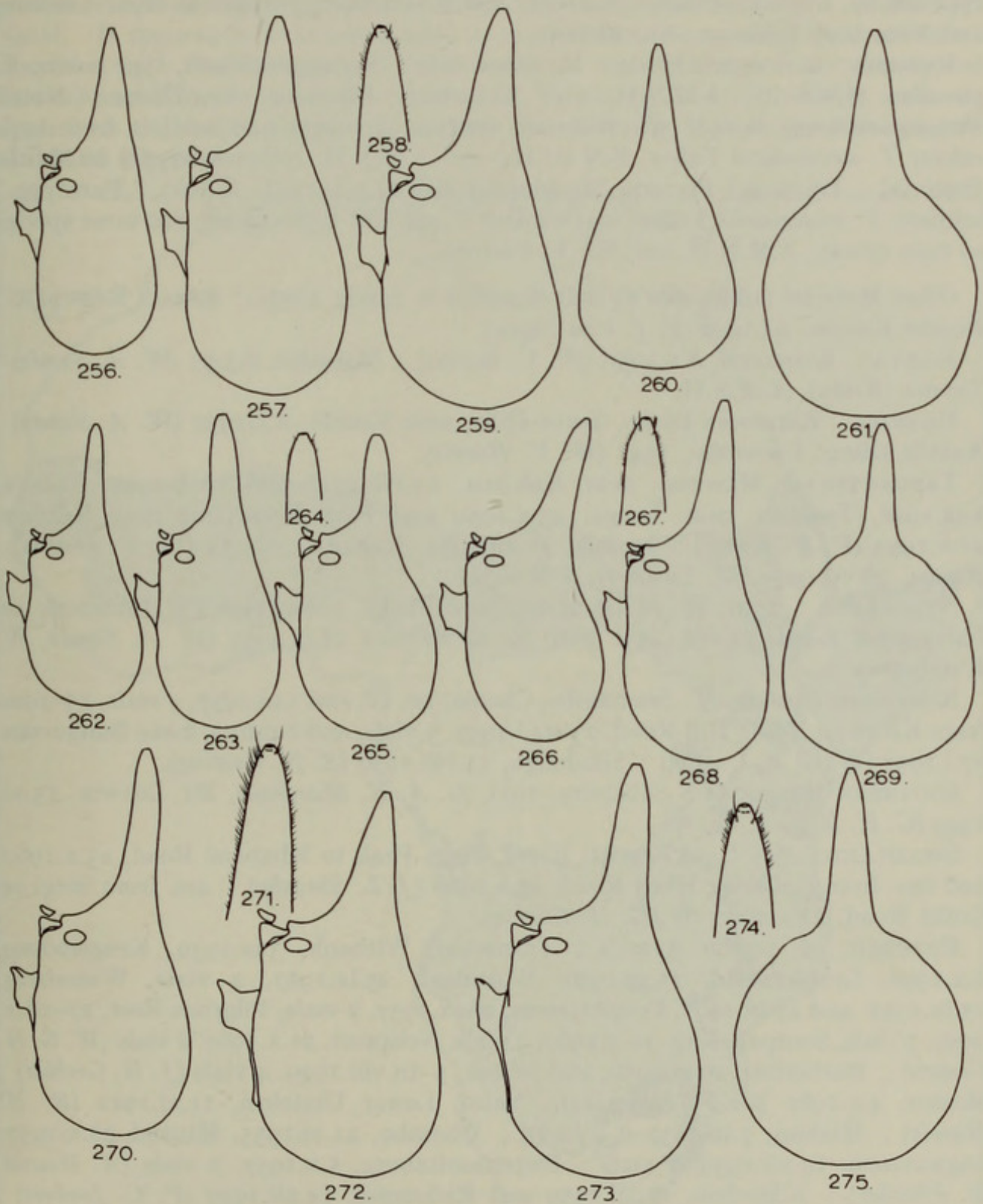
T. dispar differs from *T. bettonianus* in the very much smaller "scent" gland on the ♀ fifth abdominal sternite, in the narrower fontanelle, and in the 7-8 ridges on the right molar plate. *T. rapulum* differs in the shape of the fontanelle, in the somewhat more inflated postclypeus, and in most specimens, in having two small diverging depressions in front of the fontanelle, though these are not always present. *T. togoensis* has usually 16 segmented antennae, and three diverging pale coloured streaks on the vertex; *T. occidentalis* has larger eyes.

The range of variation in the soldier caste overlaps with *T. rhodesiensis*, *T. rapulum*, and *T. togoensis*. Some specimens of *T. rhodesiensis* and *T. rapulum* are indistinguishable from some *T. dispar*, but *T. togoensis* is usually separable by the more densely hairy nose tip, and the other two species by slight differences of profile and plan view of the head capsule, given in the key.

Type Material. ETHIOPIA: Eritrea, Mt. Kullo 1871 (*Antinori*), *T. kulloensis* (Sjöstedt), ♂ imago specimen labelled "co-typus", unique, Mus. Civ. Stor. Nat., Genoa. The additional material recorded by Sjöstedt as deposited at the Naturhist. Riksmus., Stockholm, was reported in September 1962, to be lost; Eritrea (*Escherich*), syntype soldiers from type colony, *T. erythrae* (Holmgren) A.M.N.H. and B.M.(N.H.); El Dire, 18.v.1939 (*G. M. Ghidini*), paratype soldiers from type colony, *T. eldirensis* Ghidini B.M.(N.H.) and A.M.N.H. (Holotype in Mus. Civ. Stor. Nat., Genoa.)

NYASALAND: Zomba (*Cameron*), syntype soldiers, *T. dispar* (Sjöstedt) Naturhist. Riksmus., Stockholm.

CONGO: Katanga, Elizabethville (*J. Bequaert*), syntype soldiers, type colony, *T. katangensis* (Sjöstedt) A.M.N.H. (other syntypes listed by Sjöstedt (1926) as in Naturhist. Riksmus., Stockholm).



FIGS. 256-275 : *Trinervitermes*, soldier head capsule, side and plan views, and nose tip.
 256-261, *T. bettonianus* ; 262-269, *T. dispar* ; 270-275, *T. geminatus*.

SOUTH-WEST AFRICA : Grootfontein 7.vi.1911 (*W. Michaelsen*), syntype soldiers, type colony, *T. grootfonteinensis* (Sjöstedt) A.M.N.H. (other syntypes, in Mus. Hamburg and Naturhist. Riksmus., Stockholm).

REPUBLIC OF SOUTH AFRICA : No other data. Syntype soldiers, type colony *T. gemellus* (Sjöstedt), A.M.N.H. and Naturhist. Riksmus., Stockholm ; Natal, Pietermaritzburg xi.1918 (*E. Warren*), syntype ♀ imago and soldiers from type colony *T. umzinduzii* Fuller, B.M.(N.H.) and A.M.N.H. (other syntypes at N.C.I., Pretoria) ; Transvaal, Pretoria, Meukleneuk Hill 22.x.1914 (*C. Fuller*), " Paratype " soldiers, *T. pretoriensis* Fuller, vial number F.491, not type colony, not same species as type colony, A.M.N.H. and N.C.I., Pretoria.

Other Material (additional to that recorded in Sands, 1957). SOMALI REPUBLIC : Bender Kassim, 9.i.1952 (*E. J. Van Ingen*).

KENYA : Rumuruti, 8.x.1950 (*W. V. Harris*) ; Marsabit, 6.3.53 (*W. A. Sands*) ; Taveta (*Kirby*), A.M.N.H.

UGANDA : Karamoja Distr., Toror Hills, near Kotido, 8.x.1952 (*W. A. Sands*) ; Ankole Distr., Luentobo, 1947 (*W. V. Harris*).

TANGANYIKA : Mkweme, near Kahama, 13.viii.1948 and 18.iii.1949, Tabora, 7.ix.1948, Tongoni, near Tanga, 25.x.1950 and Pare Mountains near Kihurio, 21.v.1952 (*P. B. Kemp*) ; Igalula, 21.xii.1934, Kahama, v.1935 (*W. V. Harris*) ; Mkasu, 26.vii.1949 (*M. Luscher*), A.M.N.H.

NYASALAND : 17m. W. of Blantyre, 20.viii.1953, 18m. from Ft. Johnstone on Farringdon Road, 24.viii.1953, 36m. N. of Mzimba 28.ix.1953 (*W. A. Sands*, *W. Wilkinson*).

NORTHERN RHODESIA : Siamambo, Choma, 10, 11, and 14.i.1957, 3 vials, 15-19m. from Kitwe on Ndola Hill Road, 23-24.i.1957, 3 vials, and Samfya, Lake Bangueulu, 27.i.1957 (*W. G. H. Coaton*) ; Sikalongo, 11.viii.1959 (*E. N. Cooling*).

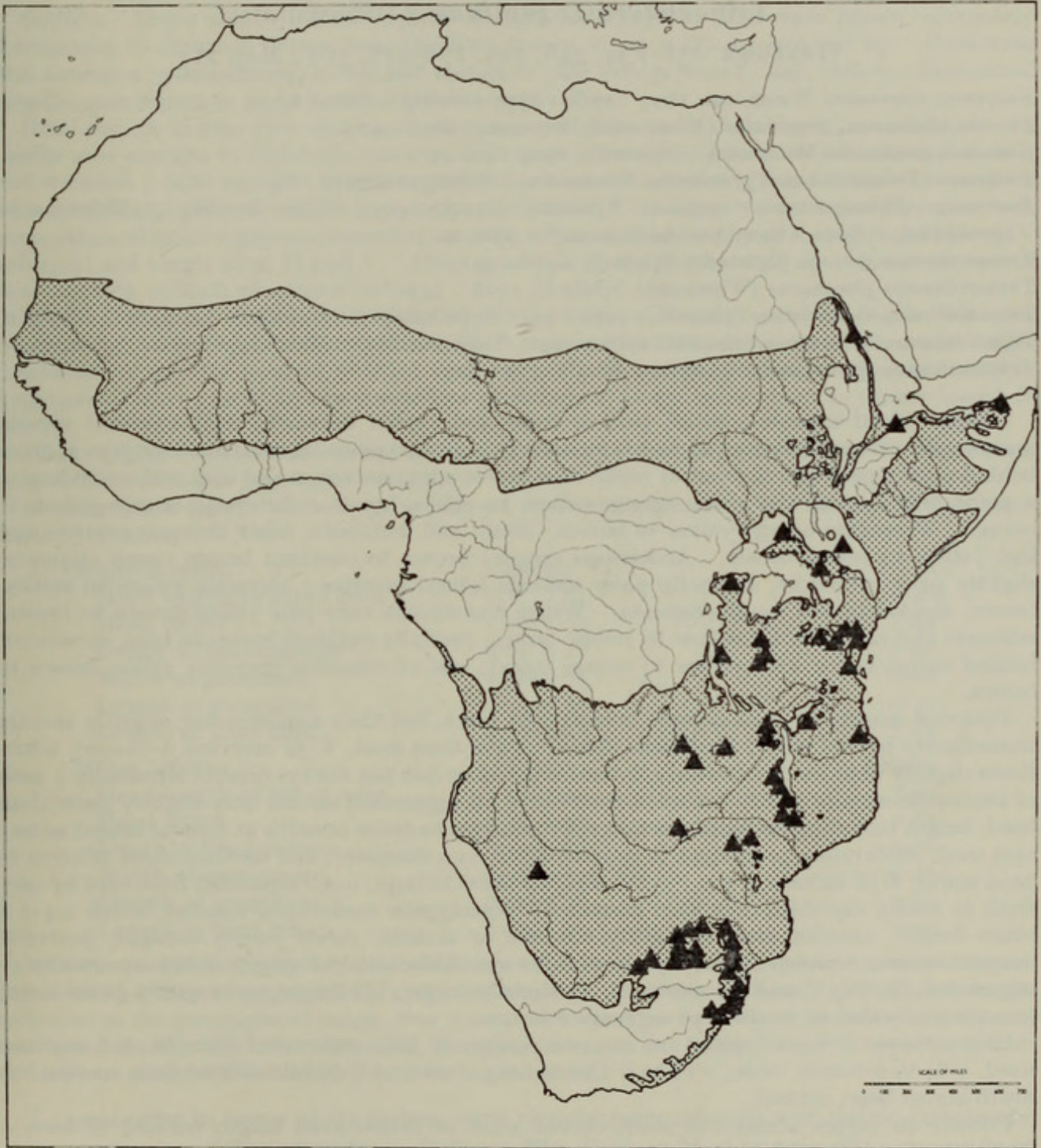
SOUTHERN RHODESIA : Salisbury, 1911 (*G. A. K. Marshall*), Mt. Darwin, 15.vi.1949 (*G. H. Bunsli*).

SWAZILAND : 3m. S. of Komati River, Piggs Peak to Mbabane Road, 23.x.1960, and 6m. from Gollel on Hluti Road, 25.x.1960 (*J. L. Sheasby*) ; 4m. from Stegi on Gollel Road, 24.x.1960 (*W. G. H. Coaton*).

REPUBLIC OF SOUTH AFRICA : Transvaal, Witbank, 3.ix.1939, Krugersdorp, 1.x.1956, Groblersdahl, 15.xi.1956, Warmbad, 25.ix.1957, 2 vials, Waterberg, 25.ix.1957, and 27.ix.1961, Potgietersrus, 26.ix.1957, 2 vials, Pilgrims Rest, 27-28.x.1959, 3 vials, Soutpansberg, 10.x.1960, 3 vials, Nelspruit, 21.x.1960, 2 vials (*W. G. H. Coaton*) ; Barberton, 29.xi.1956, and Sibasa, 5-10.viii.1959, 4 vials (*J. H. Grobler*) ; Marico, 4.x.1961 (*G. F. Pretorius*). Natal, Lower Umfolosi, 11.xi.1922 (*R. H. Harris*) ; Hlabisa, 7.iii.1937 (*C. Jacot*) ; Ubombo, 21.xi.1955, Mtuzini, 28.x.1957, Ingwavuma, 14.xii.1959, 2 vials ; Pietermaritzburg, 5.x.1957, 7 vials (*A. Hewett*, *D. Fletcher*) ; Ndwedwe, 11.xii.1959 and Richmond, 14.xii.1959 (*P. C. Joubert*) ; Nongoma, 10.i.1962, Entonjaneni, 13.i.1962 and Nkandhla, 14.i.1962 (*J. L. Sheasby*), Cape Province, Mafeking, 6.x.1961 (*G. F. Pretorius*).

A total of 111 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

This species is distributed over a much greater area than was recorded in a previous paper (Sands, 1957), from Mount Kullo in northern Eritrea, to southern Natal. It appears to be found mainly in vegetation types ranging from savannah woodland with *Brachystegia* and *Julbernardia* to wooded steppe with *Acacia* and *Commiphora* (Keay *et al.*, 1959, types 9, 18, 19, 20, 25, and 26). These areas are shaded on the map. It has only rarely been found in *Colophospermum mopane* woodland (Type 22).



MAP 20. *Trinervitermes dispar*. Vegetation types : 18, 19, 20, and 22.

It appears to fill an equivalent ecological niche to *T. togoensis* with which its distribution only marginally overlaps, and its exclusion from the Guinean and Sudan vegetation zones may result partly from the biotic barrier caused by this similarity.

***Trinervitermes geminatus* (Wasmann)**

(Text-figs. 231–234, 248, 249, 270–275, 385 ; Map 21)

Eutermes geminatus Wasmann, 1897 : 170. Type locality : GHANA.

Termes (*Eutermes*) *geminatus* (Wasmann) Desneux, 1904a : 42.

Eutermes geminatus Wasmann ; Sjöstedt, 1904 : 40, 44.

Eutermes (*Trinervitermes*) *geminatus* Wasmann ; Holmgren, 1912 : 64.

Eutermes (*Trinervitermes*) *grossus* Sjöstedt, 1924b : 493. Type locality : MAURITANIA (probable), " Côte Atlantique du Sahara ". **syn. n.**

Trinervitermes grossus (Sjöstedt) Sjöstedt, 1926 : 342.

Trinervitermes geminatus (Wasmann) Sjöstedt, 1926 : 343.

Trinervitermes ebenerianus Sjöstedt, 1925a : 73. Type locality : SUDAN, " Tanguru ". **syn. n.**

Trinervitermes ibidanicus Sjöstedt, 1926 : 347. Type locality : NIGERIA, Ibadan. **syn. n.**

Trinervitermes ebenerianus Sjöstedt ; Sands, 1957 : 24.

Imago. Head capsule, central part of frons and vertex brown to dark chestnut brown, vertex with three diverging yellow-brown streaks ; postclypeus, labrum, anterior part of frons behind postclypeus and in front of ocelli, area surrounding antennae and eyes and extending to a point behind eyes also paler, orange-yellow to yellow-brown. Antennae orange-yellow to orange. Pronotum orange-yellow to brown. Meso- and metanota, other thoracic sclerites and legs yellow to yellow-brown. Abdominal tergites brown to chestnut brown round stigmata, slightly paler in middle, distinctly paler towards lateral margins ; sternites yellow to yellow-brown, shaded brown round stigmata. Wings translucent very pale yellow-brown to brown, subcosta and radius sector yellow to yellow-brown, partially outlined brown at base, membrane behind radius sector with yellow to orange streak, rest of venation narrowly yellow-brown to brown.

Posterior margin of head capsule behind eyes much less than semi-circular, slightly sinuate immediately behind eyes ; fontanelle distinct, paler than head, V- or inverted A-shaped, sometimes slightly depressed posteriorly, lateral arms often but not always dilated terminally ; area of fontanelle usually partly occluded posteriorly by pigmented cuticle only slightly paler than head, length including occluded portion approximates to twice breadth at base of lateral arms ; eyes oval, moderately prominent in proportion to own diameter, and medium-sized relative to head width, W/E index 2.7–3.0 ; ocelli medium sized to large, oval, separated from eyes by one-sixth to nearly one-third own least diameter ; postclypeus moderately inflated, width 2.4–2.8 times length, anterior margin slightly concave or sinuate, rarely nearly straight, posterior margin convex, rounded ; molar plate of right mandible with 7–8 ridges, antennae usually 17 segmented, II, IV, V, and VI subequal, VI slightly longer, III longer up to nearly twice these, sometimes divided to produce 18 segmented forms.

Pale coloured " scent " gland on anterior margin of fifth abdominal sternite of ♀ medium sized, 0.64 to 0.80mm. wide, 0.15 to 0.18mm. long ; cerci of ♀ female shorter than or equal to width across base, conical.

Pilosity on vertex consists of short curved setae of rather even length tending to form a " pelt " or " mat ", with scattered setae 3–5 times as long. (Text-fig. 385.)

Measurements (31 specimens from 5 localities) in millimetres.

	Range	Mean
Head width across eyes	1.78-2.03	1.88
Greatest diameter of eye	0.59-0.72	0.65
Ocellus	0.20-0.26 × 0.24-0.34	0.22 × 0.27
Ocellus to eye	0.02-0.06	0.05
Width of pronotum	1.60-1.89	1.76
Length of pronotum	1.00-1.18	1.10
Length of hind tibia	2.43-2.80	2.58
Length of fore wing	17.90-21.90	19.90

Soldiers. Major soldier : head capsule ferruginous orange to dark sepia brown, commonly ferruginous to chestnut brown, nose chestnut brown to pitch black, with red tip. Pronotum and antennae yellow-brown, meso- and metanota pale yellow-brown, legs yellow. Abdominal tergites pale brown to sepia brown, sternites pale yellow.

Head capsule in plan view short oval, circular, or slightly wider than length, nose conical. In profile near straight to distinctly concave, with back of head rising from above antennal socket, and rounded ; nose equal in length to distinctly shorter than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone, 8-22 degrees ; antennae 14 segmented, proportions of basal segments somewhat variable with size, usually II and V subequal, III and IV subequal and longer than II and V. Head setae confined to hairy nose tip ; dorsal surface of head capsule without prominent setae.

Middle abdominal tergites with scattered minute setae, distinctly visible in profile, posterior tergites with longer setae. Sternites with short backwardly directed scattered setae, and longer downward or slightly forward directed setae on posterior margins, arranged approximately in longitudinal rows 3 on each side of mid-line of abdomen, longer setae about 2-3 times length of shorter.

Minor soldier : Colour as darker specimens of major soldier, antennae 13-14 segmented, proportions of basal segments variable.

Measurements (Major soldiers, 57 specimens from 13 localities, minor soldiers, 8 specimens from 5 localities).

<i>Major Soldiers</i>	Range	Mean
Head length to tip of nose	2.17-2.64	2.40
Head width	1.17-1.73	1.45
Depth of head capsule	0.84-1.22	1.02
Width of pronotum	0.56-0.75	0.68
Length of pronotum	0.25-0.36	0.32
Length of hind tibia	1.57-2.19	1.84
<i>Minor Soldiers</i>	Range	Mean
Head length to tip of nose	1.51-2.04	1.70
Head width	0.59-1.00	0.75
Depth of head capsule	0.49-0.77	0.60
Width of pronotum	0.38-0.51	0.47
Length of pronotum	0.20-0.26	0.23
Length of hind tibia	1.40-1.76	1.59

Variation. The full range of variation in colour and form in both imagos and soldiers is sometimes found within a comparatively restricted locality. On the other hand, specimens from the extremes of the geographical range, over 3,000 miles apart, are clearly of the same species, and no character clines have been detected, though a tendency has been noticed for specimens from the moister parts of West Africa to be darker in colour.

T. geminatus in some of its forms, very closely resembles its sympatric congeners, *T. oeconomus* and *T. trinervius*. It is readily distinguishable from *T. oeconomus* in the ♀ imago by the much smaller abdominal "scent" gland and the shorter cerci,

also in most specimens by the differing pilosity of the vertex ; the ♂ is less readily separable because the ♂ cerci of all species are longer than in the ♀, and the ventral "scent" glands are smaller. The soldiers are usually darker in colour, and have visible small setae on the middle abdominal tergites, but specimens which are virtually indistinguishable do occur.

T. geminatus is more readily distinguished from *T. trinervius* in the soldier caste, by the distinctly more hairy nose tip, and usually by the darker pigmentation of the abdominal tergites. The imagos are less easily separable, having usually proportionately smaller eyes and less inflated postclypeus ; in addition, the cerci of the ♀ *T. trinervius* are usually longer, and somewhat irregular in outline, and the shorter vertex setae very regular in length. There is little likelihood of confusion with any other species apart from the larger, darker soldiers of *T. togoensis*, but some individuals in any nest series of this species have 13 segmented antennae with the basal segments only partially or not subdivided.

Dr. A. E. Emerson has selected and labelled a specimen from the type series as lectotype, but the designation has not been published hitherto:

Lectotype : GHANA : no other data, lectotype pinned major soldier, *T. geminatus* (Wasmann) (in Mus. Maastricht). Paralectotypes, Naturhist. Riksmus., Stockholm, and A.M.N.H.

Type Material. MAURITANIA (Probable) : " Côte Atlantique du Sahara " no date (*A. Gruvel*), syntype soldier, from type colony *T. grossus* (Sjöstedt), A.M.N.H. (other syntypes, Mus. Paris, and Naturhist. Riksmus., Stockholm).

GHANA : no other data. Paralectotype soldiers from type colony, *T. geminatus* (Wasmann), A.M.N.H.

NIGERIA : Ibadan, 5.viii.1922 (*A. W. J. Pomeroy*), syntype imagos and soldiers from type colony *T. ibidanicus* Sjöstedt, A.M.N.H. (other syntypes, Naturhist. Riksmus., Stockholm).

SUDAN : " Tanguru " (= Tungaru, 10° 14' N, 30° 42' E), 7.iv.1914 (*R. Ebner*), syntype soldiers from type colony *T. ebenerianus* Sjöstedt, A.M.N.H. (other syntypes Mus. Vienna and Naturhist. Riksmus., Stockholm).

Other Material. SIERRA LEONE : Samaia, 29.v.1948 (*F. A. Squires*).

GHANA : Accra, 29.vi.1926 (*A. W. J. Pomeroy*) ; 1926 (*W. H. Patterson*) ; Achimota, 21.i.1955 (*W. V. Harris*) ; Prampram, 16.xi.1955, 54m. from Accra on Ada Road, 17.xi.1955, Afienya, and Nungoa, near Accra, 13-16.vi.1956, 10 vials (*W. Belfield*) ; 30m. N.E. of Accra, iii.1958 (*R. Hamilton*) ; 12m. from Accra on Kumasi Road, 18.ii.1959, 12m. S. of Tamale on Kumasi Road, 27.ii.1959, 5m. and 16m. from Daboya on Tamale Road, 28.ii.1959, 2 vials, 28m. from Tamale on Bolgatanga Road, 1.iii.1959, 55m. from Tamale on Larabanga Road, 3.iii.1959, 35m. from Tamale on Yendi Road, 4.iii.1959, 4m. from Gambaga on Walewale Road, 5.iii.1959, 25m. S.E. of Gambaga on Yendi Road, and 17m. N.E. of Gambaga on Bawku Road, 6.iii.1959, 20m. from Bolgatanga on Bawku Road, 8.iii.1959, 20m. from Bolgatanga on Tamale Road, and 9m. from Bolgatanga on Navrongo Road, 9.iii.1959, 31m. from Navrongo on Tumu Road, 13.iii.1959, 11m. from Tumu on

Navrongo Road, 15.iii.1959, 9m. from Lawra on Nandom Road, 18.iii.1959, 6m. from Wa on Lawra Road, 19.iii.1959, and 52m. from Wa on Bole Road, 20.iii.1959 (*W. A. Sands*).

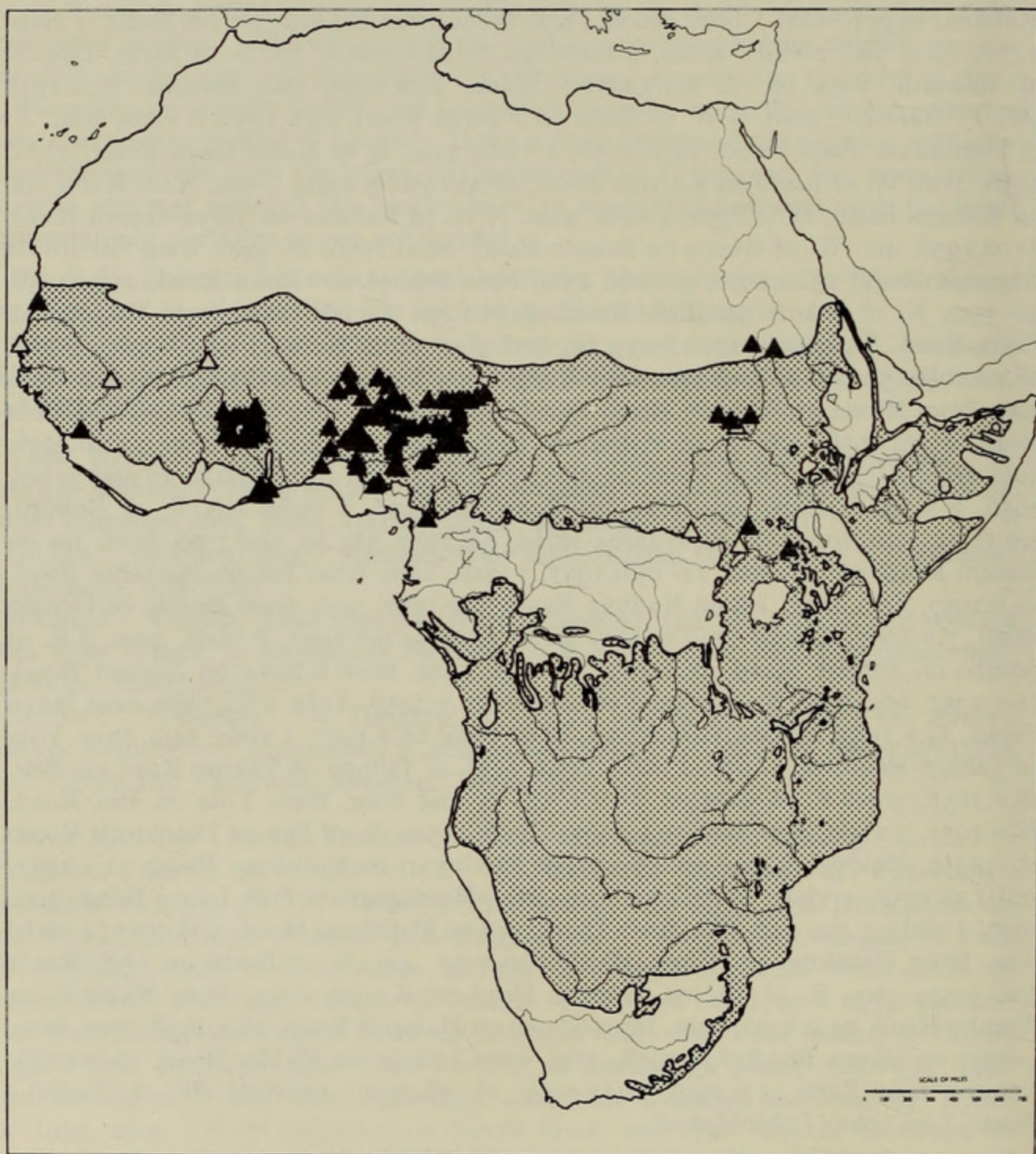
UPPER VOLTA : 15m. N. of Bawku (Ghana), 11.iii.1959 (*W. A. Sands*).

NIGERIA : Eastern Region ; 14m. from Enugu on Abakaliki Road, 1.ii.1957, and 13m. from Awgu on Okigwe Road, 2.ii.1957 (*W. Wilkinson*). Northern Region ; Katsina, 1933 (*Anon*) ; 60m., 100m., and 140m. from Kaduna on Jos Road, 4 vials, 125m. S. of Jos, 2 vials, Kano, 2 vials, 5m. S. of Funtua, 7m. S. of Zaria, 13m. S. of Makurdi, 1954 (*B. J. McNulty*) ; Kano, 21.ii.1955, and Samaru, 23.ii.1955 (*W. V. Harris*) ; 20m. N.W. of Zaria on Funtua Road, 14.ii.1956, 6 vials, 30m. N. of Funtua on Yashi Road, 14.xi.1956, 3 vials, 43m. E. of Kano, Gaya River, 17.xi.1956, 21m. W. of Kano on Katsina Road, 18.xi.1956, 5 vials, 3-9m. N. of Kafin Soli on Katsina Road, 20.xi.1956, 3 vials, 41m. N.W. of Katsina on Jibya-Gusau Road, 21.xi.1956, 4m. W. of Gusau on Sokoto Road, 22.xi.1956, 28-44m. from Sokoto on Argungu Road, 23.xi.1956, 5 vials, 25m. from Sokoto on Gusau Road, 25.xi.1956, 30-35m. N. of Sokoto on Illela Road, 26.xi.1956, 2 vials, 18m. from Kaduna on Zaria Road, 8.xii.1956, 16, 18, 33, 68, and 76m. from Kaduna on Zungeru Road, 18.xii.1956, 5 vials, 27 and 45m. from Zungeru on Kaduna Road, 19.xii.1956, 2 vials, 26m. from Minna on Zungeru Road, 20.xii.1956, 3 vials, 16m. S. of Zungeru on Bida Road, 21.xii.1956, 41m. from Mokwa on Bida Road, 22.xii.1956, Bida, 23.xii.1956, 40m. from Abuja on Bida Road, 24.xii.1956, Diko, 10m. from Abuja, 27 and 31.xii.1956, 2 vials, Kudaru, on Zaria-Jos Road, 5.ii.1957, 2 vials, 4m. E. of Bukuru, 7.ii.1959, 42m. from Jos on Wamba Road, 8.ii.1957, 16, 40, and 75m. from Jos on Bauchi Road, and Bauchi, 11-13.ii.1957, 7 vials, 18m. from Jos, on Pankshin Road, 14.ii.1957, 32m. from Jos on Kaduna Road, 5.iv.1957, 39m. from Bauchi on Gombe Road, 7.v.1957, Gombe, and 6-30m. E. of Gombe, 9.v.1957, 6 vials, 40m. S.E. of Gombe on Numan Road, 10.v.1957, 2 vials, 92m. from Gombe on Numan Road, 11.v.1957, 6m. from Numan on Yola Road, 11.v.1957, Yola, 13.v.1957, near Mayo Faran, 14.v.1957, 2 vials, Faro River, E. of Yola, 15.v.1957, 2 vials, 54m. from Yola on Jalingo Road, 16.v.1957, 2 vials, 125m. S.W. of Jalingo on Takum Road via Beli, 18.v.1957, 50m. S. of Jalingo, 19.v.1957, 35 and 80m. from Yola on Biu Road, 28.v.1957, 3 vials, near Biu, 29.v.1957, 2 vials, 55m. N. of Biu on Damaturu Road, 29.v.1957, Maiduguri, and 20-43m. from Maiduguri on Potiskum Road, 31.v.1957, and 1.vi.1957, 4 vials, 43-50 and 77m. from Maiduguri on Fort Lamy Road, 3.vi.1957, 3 vials, 3, 32, and 55m. from Damaturu on Potiskum Road, 5.vi.1957, 4 vials, 30m. from Potiskum on Kano Road, 6.vi.1957, 4m. S. of Ilorin on Oyo Road, 4.xii.1957, 45m. S. of Jos on Wamba Road, 23.ii.1958, 85m. from Makurdi on Wamba Road, 24.ii.1958, 24m. from Gboko on Makurdi Road, 25.ii.1958, 30m. from Lokoja on Okene Road, 8.iii.1958, 47m. from Lokoja on Kabba Road, 10.iii.1958, Samaru, near Zaria, 3.ii.1956, 10.ix.1957, vi, vii.1959, 12 vials (*W. A. Sands*) ; Bussa, 1.xii.1961 (*J. McMahon*).

SUDAN : Kadugli, 1.vii. to xii.1952, 7 vials (*R. C. H. Sweeney*) ; 100m. N. of Malakal, 1952 (*R. H. Gunn*) ; 20m. W. of Omdurman, 3.i.1963 (*J. Cloudsley Thompson*).

UGANDA : 40m. from Moroto on Soroti Road, 12.x.1952 (*W. A. Sands*) ; 3m. from Moyo on Arua Road, 22.ii.1952 (*W. Wilkinson*).

A total of 187 nest series were examined and all material is in the British Museum (Natural History) unless otherwise stated.



MAP 21. *Trinervitermes geminatus*. Vegetation types : 8, 16, 17, 20, 21, 25, and possibly also 31.

T. geminatus (Wasmann) has previously been recorded as West African in distribution (Snyder, 1949). The amalgamation of the species listed in the synonymy, and much new material, has made it clear that it extends from the extreme west coast of Africa, across to the foothills of the Ethiopian Massif, in the Guinean, Sudan, and Sahel savannah-woodland vegetation zones (Keay *et al.*, 1959, types 8, 16, 17, 20, and 25). It is, in fact, the most abundant species in these areas, where it builds a small mound from a few inches to two or three feet in diameter and height. The biology of this species has been described in detail under its better-known synonym, *T. ebenerianus* Sjöstedt, in earlier papers (Sands, 1961, 1961a, 1963).

***Trinervitermes gratiosus* (Sjöstedt)**

(Text-figs. 192, 235, 236, 250, 251, 276–281; Map 22)

Eutermes (*Trinervitermes*) *gratiosus* Sjöstedt, 1924 : 42. Type locality : CONGO, Luluabourg.

Eutermes (*Trinervitermes*) *carbo* Sjöstedt, 1924 : 42. Type locality : CONGO, Luluabourg.

syn. n.

Trinervitermes gratiosus (Sjöstedt) Sjöstedt, 1926 : 349.

Trinervitermes carbo (Sjöstedt) Sjöstedt, 1926 : 351.

Imago. Head capsule, central part of frons and vertex pale brown to brown ; vertex with three diverging yellow-brown streaks, middle one dilated terminally immediately behind fontanelle ; postclypeus, labrum, anterior margin of frons behind postclypeus, around antennal socket, and a triangular area behind eye paler, yellow brown. Antennae yellow-brown. Pronotum yellow, meso- and metanota yellow with posterior margins yellow-brown, other thoracic sclerites pale yellow, legs yellow, bases of tibiae shaded darker, yellow-brown. Abdominal tergites yellow-brown ; sternites yellow, yellow-brown round stigmata. Wings, membrane translucent pale yellow-brown, subcosta yellow, and radius sector yellow, partially outlined yellow-brown, rest of venation narrowly yellow-brown.

Posterior margin of head behind eyes much less than semi-circular, slightly sinuate immediately behind eyes ; fontanelle distinct, pale Y- or inverted A-shaped, lateral arms sometimes somewhat dilated terminally ; eyes oval, prominent in proportion to own width, and medium sized relative to head width, W/E index 2.8–3.1 ; ocelli medium sized, separated from eyes by one-fifth to two-fifths own diameter ; postclypeus inflated, width 2.0–2.3 times length, anterior margin slightly concave, posterior convex, rounded ; molar plate of right mandible with 8–9 ridges ; antennae, among eleven specimens examined, four had 15 segments, five 16, and two 17, proportions of basal segments variable.

Pale coloured "scent" gland on anterior margin of fifth abdominal sternite of ♀ large, 1.15mm. wide, 0.38mm. long ; cerci of ♀ shorter than or equal to width across base, conical.

Pilosity of vertex fine, silky, sparse, and of uneven length, not forming a "pelt" or "mat", head capsule appears more shining than in many species.

Measurements (11 specimens from 5 localities) in millimetres.

	Range	Mean
Head width across eyes	1.80–1.96	1.89
Greatest diameter of eye	0.58–0.68	0.64
Ocellus	0.20–0.22 × 0.23–0.29	0.21 × 0.27
Ocellus to eye	0.04–0.08	0.06
Width of pronotum	1.65–1.85	1.79
Length of pronotum	1.00–1.18	1.12
Length of hind tibia	2.32–2.50	2.36
Length of fore wing	17.30–23.20	20.79

Soldiers. Major soldier : head capsule orange-yellow to chestnut brown, nose ferruginous orange to pitch black with very short red tip. Antennae orange-yellow to orange. Pronotum yellow-brown to brown, meso- and metanota yellow to yellow-brown, legs yellow. Abdominal tergites yellow-brown to brown, sternites pale yellow to yellow.

Head capsule in plan view short oval to circular, nose weakly conical. In profile distinctly concave, with back of head rising from base of nose in front of antennal socket, and rounded ; nose distinctly shorter than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone, 5–12 degrees ; antennae 13–14 segmented, two out of three specimens with 14, many of those with 13 have basal segments partially subdivided, proportions variable. Head setae confined to nose tip, these few, short, and fine apart from 4 apical setae.

Abdominal tergites apart from posterior one or two almost devoid of setae ; sternites with sparse scattered short backwardly directed setae about half length of longer setae on posterior margins, approximately in longitudinal rows, 2 or 3 on each side of mid-line, directed downwards and slightly forwards.

Minor soldiers : colour as major soldiers. Antennae 12–13 segmented, proportions of basal segments variable.

Measurements (Major soldiers, 64 specimens from 21 localities, minor soldiers, 14 specimens from 8 localities) in millimetres.

<i>Major Soldier</i>	Range	Mean
Head length to tip of nose	2.11–2.93	2.47
Head capsule width	1.18–1.81	1.49
Depth of head capsule	0.86–1.25	1.07
Width of pronotum	0.61–0.84	0.72
Length of pronotum	0.29–0.43	0.36
Length of hind tibia	1.54–1.96	1.72
<i>Minor Soldier</i>	Range	Mean
Head length to tip of nose	1.61–1.94	1.80
Head capsule width	0.75–1.06	0.89
Depth of head capsule	0.57–0.82	0.66
Width of pronotum	0.47–0.61	0.54
Length of pronotum	0.22–0.25	0.24
Length of hind tibia	1.22–1.68	1.41

Variation. The soldier caste is not always clearly divided into "major" and "minor" categories, intermediates being found in the largest colonies.

Sjöstedt (1924) in describing *T. gratiosus* referred only to the major soldier, although the material from the type colony included the imago which he described subsequently (1926). The lectotype of this species therefore should be selected from among the soldier syntypes. *T. carbo* was described immediately after *T. gratiosus* on the same page of the same paper, from specimens from the same locality. In this case the imago alone was described, and the soldiers stated to be very near *T. gratiosus*. The description of the imago is clearly not a *Trinervitermes*, and the specimens were identified by Dr. A. E. Emerson (in unpublished notes) as *Cubitermes minitabundus* (Sjöstedt). Sjöstedt placed the species in *Trinervitermes* on the basis of the soldier caste, however, and the lectotype would therefore again be selected from among the soldier syntypes.

The resemblance between *T. gratiosus* and its partially sympatric congener *T. bettonianus* was discussed in an earlier paper (Sands, 1957 : 19). It also resembles the "West African" *T. oeconomus* and shorter-nosed paler soldiers of *T. trinervius*. *T. oeconomus* is distinguishable in the imago by the more pilose head capsule, less



MAP 22. *Trinervitermes gratiosus*. Vegetation types : 20, 24, 25, 26, and 27.

inflated postclypeus, longer ♀ cerci, and ocelli nearer the eyes. The differing distribution is the only consistent feature on which to separate the soldiers, though the majority of *T. gratiosus* are darker than *T. oeconomus* and paler than *T. trinervius*, with a shorter nose than either.

Type Material. CONGO : Luluabourg, no date (*P. Callewaert*), syntype imagos and soldiers, type colony, *T. gratiosus* (Sjöstedt), Naturhist. Riksmus., Stockholm,

and A.M.N.H. (others in Mus. Tervuren.) ; Luluabourg, no date (*P. Callewaert*), syntype soldiers, type colony, *T. carbo* (Sjöstedt), A.M.N.H. (others in Naturhist. Riksmus., Stockholm.)

Other Material (additional to that listed in Sands, 1957). CONGO : Gihinga, 14.vii.1941 (*H. Bredo*) ; Rwindi River, no date (*H. Kirby*), A.M.N.H.

ANGOLA : Sao Paola de Loanda, 22.ii.1913 (*F. Silvestri*), A.M.N.H. ; 4m. S. of Luanda, 23.vii.1949 (*G. R. Gradwell*, *D. Snow*), B.M.(N.H.).

KENYA : 1° 25' S., 35° 10' E., to 1° 38' S., 35° 17' E., ii.1948 (*N. A. Weber*), A.M.N.H.

A total of 24 nest series were examined.

It has been noted (Sands, 1957) that this species tolerates drier conditions than many, and the additional records are from relatively dry areas also.

The type locality, Luluabourg, is well within the forest-savannah mosaic zone (Keay *et al.*, 1959, type 8) on the southern border of the rain forest, and thus appears to be in more moist conditions, but there are in that area many patches of dry grass steppe on Kalahari sand, and other drier savannah types (Keay *et al.*, 1959, types 20 and 24). *T. gratiosus* appears to occur in these, though absent from the surrounding moister savannah woodland, where *T. rhodesiensis* is the common species.

Sjöstedt (1926) recorded *T. carbo* from Haut Uélé, but this must be a misidentification since *T. gratiosus* is an East and Central African species.

Trinervitermes occidentalis (Sjöstedt)

(Text-figs. 237–240, 252, 253, 282–289 ; Map 23)

Eutermes occidentalis Sjöstedt, 1904 : 93. Type locality : PORTUGUESE GUINEA, Bissau.

Termes (*Eutermes*) *occidentalis* (Sjöstedt) Desneux, 1904a : 44.

Eutermes (*Trinervitermes*) *occidentalis* Sjöstedt ; Holmgren, 1912 : 64.

Trinervitermes occidentalis (Sjöstedt) Sjöstedt, 1926 : 332.

Trinervitermes auriterrae Sjöstedt, 1926a : 3. Type locality : GHANA, Keta. **syn. n.**

Trinervitermes maudanicus Sjöstedt, 1926b : 156. Type locality : CONGO, Haut Uélé, Mauda. **syn. n.**

Nasutitermes (*Trinervitermes*) *bettonianus* subsp. *sulciceps* Emerson, 1928 : 493. Type locality : CONGO, Garamba. **syn. n.**

Nasutitermes (*Trinervitermes*) *lutzi* Emerson, 1928 : 494. Type locality : CONGO, Niangara. **syn. n.**

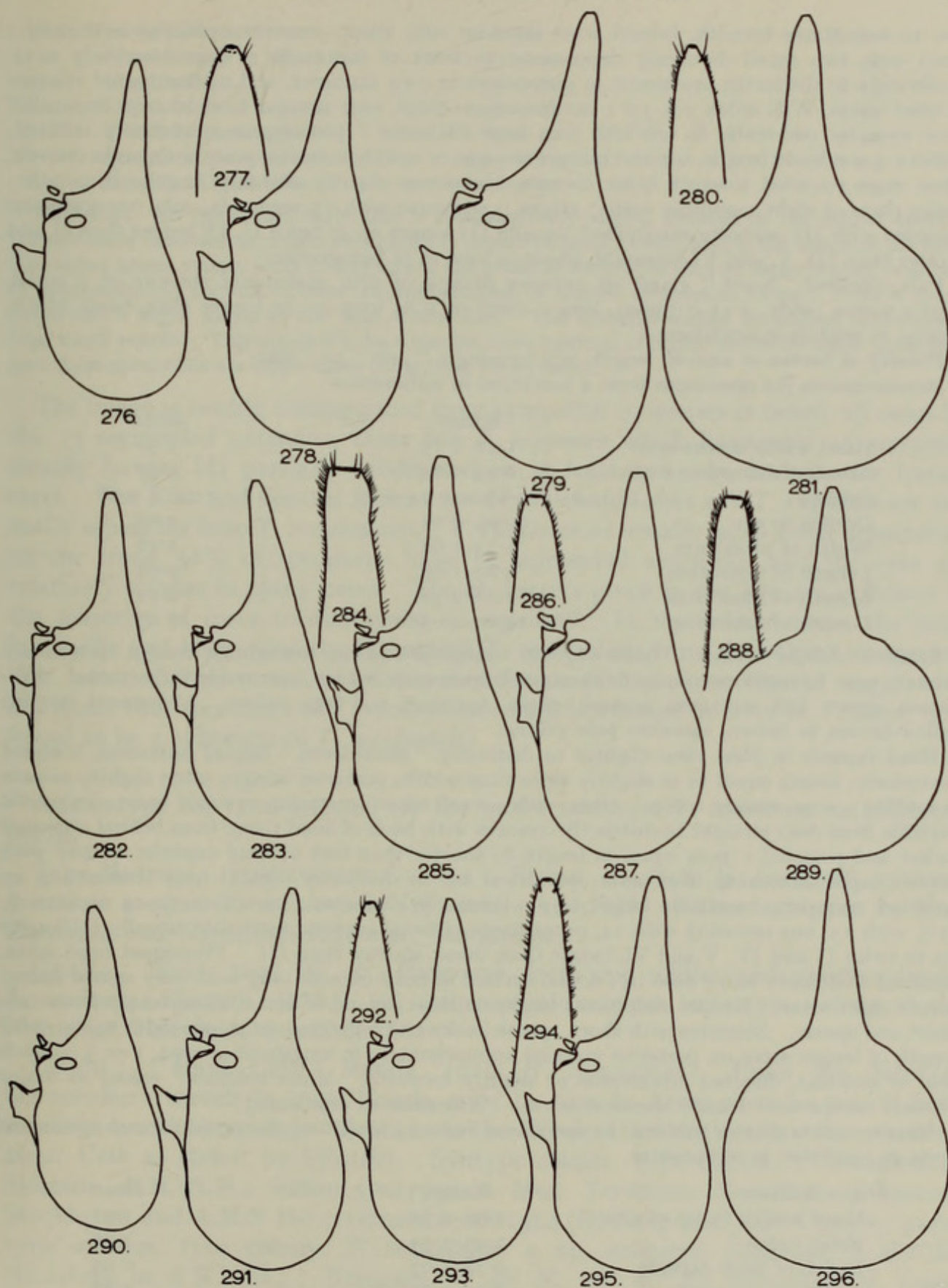
Trinervitermes bettonianus subsp. *sulciceps* (Emerson) Snyder, 1949 : 323.

Trinervitermes lutzi (Emerson) Snyder, 1949 : 328.

Trinervitermes auriterrae Sjöstedt ; Sands, 1957 : 16.

Imago. Head capsule brown to chestnut brown ; vertex with two or three indistinct diverging yellow-brown patches or streaks, or sometimes one median pale patch, postclypeus, labrum, areas in front of ocelli and small area behind each eye paler yellow-brown to brown. Antennae yellow. Pronotum yellow to yellow-brown, meso- and metanota, other thoracic sclerites and legs yellow. Abdominal tergites brown, darker sepia-brown around stigmata ; sternites pale yellow to yellow-brown, brown around stigmata. Wings translucent pale brown, subcosta and radius sector yellow, the latter outlined sepia-brown at base, fading to yellow-brown distally ; bright orange streak in membrane behind radius sector ; rest of venation brown.

Posterior margin of head capsule behind eyes much less than semi-circular, slightly sinuate immediately behind eyes ; fontanelle Y-shaped, often slightly depressed posteriorly, length



FIGS. 276-296 : *Trinervitermes*, soldier head capsule, side and plan views, and nose tip.
 276-281, *T. graciosus* ; 282-289, *T. occidentalis* ; 290-296, *T. oekonomus*.

two to four times breadth, lateral arms short or very short, sometimes dilated terminally; frons with two small diverging depressions in front of fontanelle; eyes commonly oval, moderately to distinctly prominent in proportion to own diameter, and medium-sized relative to head width, W/E index 2.6-3.0; ocelli medium sized, near circular to short oval, separated from eyes by one-tenth to one-fifth own least diameter; postclypeus moderately inflated, width 2.2-2.6 times length, anterior margin straight or weakly concave, posterior margin convex, often more rounded towards outer corners, sometimes slightly obtusely angular in middle; molar plate of right mandible with 7 ridges; antennae with 15 segments, only one specimen recorded with III partially subdivided, usually III longer up to twice II, IV longer than II and shorter than III, V, and VI subequal, about as long as II but stouter.

Pale coloured "scent" gland on anterior margin of fifth abdominal sternite of ♀ small, 0.56-0.64 mm. wide, 0.11-0.13 mm. long; cerci of ♀ as long as, or longer than basal width, conical or slightly mamilliform.

Pilosity of vertex of uneven length, not forming a "pelt" or "mat".

Measurements (22 specimens from 4 localities) in millimetres.

	Range	Mean
Head width across eyes	1.48-1.75	1.57
Greatest diameter of eye	0.53-0.63	0.57
Ocellus	0.19-0.25 × 0.24-0.29	0.21 × 0.26
Ocellus to eye	0.03-0.04	0.03
Width of pronotum	1.33-1.68	1.48
Length of pronotum	0.80-1.08	0.93
Length of hind tibia	1.98-2.38	2.21
Length of fore wing	14.10-20.30	17.07

Soldiers. Major soldier: head capsule orange-yellow to ferruginous orange, commonly orange, nose ferruginous-orange to chestnut brown with red tip, commonly ferruginous. Pronotum, meso- and metanota orange yellow, antennae and legs yellow. Abdominal tergites yellow-brown to brown, sternites pale yellow.

Head capsule in plan view slightly to distinctly "shouldered" behind antennae, rounded posteriorly, length equal to or slightly more than width, posterior margin often slightly sulcate in middle; nose weakly conical, often with curved taper increasing towards base. In profile variable from near straight to distinctly concave with back of head rising from behind antennal socket and rounded; nose equal in length to shorter than rest of head capsule, usually with curved taper increasing from near cylindrical tip to distinctly conical base (resembling an inverted trumpet), fontanelle large, 0.05-0.10 mm. in diameter; antennae 12-14 segmented, 87% with 13, one recorded with 14, proportions of basal segments variable, usually III longer up to twice II and IV, V and VI longer than these, shorter than III. Prominent head setae, confined to densely hairy nose tip, dorsal surface of head capsule only with very sparse microscopic short setae. Middle abdominal tergites almost devoid of setae, those on posterior two short and sparse. Sternites with short, sparse backwardly directed setae, one-sixth to one-third length of longer setae on posterior margins approximately in longitudinal rows, 2 or 3 on each side of mid-line, directed downwards or slightly forwards. Minor soldiers: colour as major soldiers except nose usually chestnut brown. Antennae 12 segmented.

Measurements (Major soldiers, 92 specimens from 24 localities, minor soldiers 26 specimens from 20 localities) in millimetres.

<i>Major Soldiers:</i>	Range	Mean
Head length to tip of nose	1.90-2.50	2.21
Head width	1.05-1.54	1.26
Depth of head capsule	0.78-1.07	0.92
Width of pronotum	0.50-0.68	0.58
Length of pronotum	0.23-0.29	0.25
Length of hind tibia	1.20-1.55	1.37

<i>Minor Soldiers :</i>	Range	Mean
Head length to tip of nose	1.35-1.79	1.51
Head width	0.55-0.80	0.64
Depth of head capsule	0.45-0.64	0.52
Width of pronotum	0.35-0.47	0.41
Length of pronotum	0.15-0.22	0.19
Length of hind tibia	1.08-1.33	1.19

Variation. In the imago caste this is comparatively slight, whereas in the soldier there is considerable variation in profile view, both in degree of straightness, and in the shape of the nose. The latter arises mainly from differences in the point at which the curved taper begins, resulting in approximately conical, inverse trumpet-shaped, or almost cylindrical forms: there is sometimes also a slight hump at the base of the nose. The vestigial soldier mandibles occasionally bear small points. This appears to be a species more tolerant of higher altitudes up to 5,000 feet, and these specimens are larger than those from lower down.

The imago is readily distinguished from sympatric congeners in nearly all cases by the 15 segmented antennae, those few *T. togoensis* which have only 15 segments usually having III partially subdivided on at least one side, and shorter female cerci. The East and Central African species *T. rhodesiensis* and *T. rapulum* are not easily separable from *T. occidentalis*. *T. rhodesiensis* usually lacks small depressions on the frons, 50% of specimens have 16 segmented antennae, and the eyes are relatively smaller in many cases. The characters given in the key are sufficient in the majority of cases to distinguish *T. rapulum*. In the soldier caste, the large fontanelle and hairy nose tip distinguish *T. occidentalis* from the other two species. The latter character was not recognized in an earlier paper (Sands, 1957) with the result that specimens of *T. rhodesiensis* were attributed in error to *T. lutzi*, now found to be a synonym of *T. occidentalis*.

A lectotype has been selected for the junior synonym *T. auriterrae* as indicated below.

Type Material. PORTUGUESE GUINEA: Bissau, 4.x.1898 (*H. Ehrhardt*), syntype ♂ and ♀ imagos, *T. occidentalis* (Sjöstedt), A.M.N.H. (Other syntypes in Mus. Hamburg and Naturhist. Riksmus., Stockholm.)

GHANA: Keta, 1926 (*W. H. Patterson*), lectotype soldier and paralectotypes, *T. auriterrae* Sjöstedt, B.M.(N.H.) (other paralectotypes from type colony in the Naturhist. Riksmus., Stockholm).

CONGO: "Haut Uélé" Mauda, 1925 (*H. Schouteden*). From the dates of Schouteden's travels in 1925, Mauda must be near to Arebi since he was in both localities on the same day. Arebi is in the Kibale-Ituri district, not the adjoining Haut Uélé as stated by Sjöstedt. Syntype soldier, type colony, *T. maudanicus* Sjöstedt, B.M.(N.H.) (other syntypes in Mus. Tervuren, Naturhist. Riksmus., Stockholm, and A.M.N.H.); Garamba, vii.1912 (*H. Lang* and *J. P. Chapin*), paratype soldiers, type colony, *T. bettonianus* s. sp. *sulciceps*, Emerson, A.M.N.H. (Holotype in A.M.N.H.); Niangara, 3° 40' N., 26° 50' E., 20.v.1913 (*H. Lang*, *J. P. Chapin*), paratype soldiers, type colony, *T. lutzi* Emerson, B.M.(N.H.) and A.M.N.H. (Holotype soldier in A.M.N.H.)

Other Material. IVORY COAST : Dabou, 50km. W. of Abidjan, 1962-4, 8 vials (*P. Bodot*).

GHANA : 2m. W. of Adafon, 7.xi.1955 (*W. Belfield*) ; 10m. N. of Yeji on Tamale-Kumasi Road, 25.ii.1959, 12m. S. of Tamale on Kumasi Road, 27.ii.1959, 35m. from Tamale on Yendi Road, 4.iii.1959, 5m. from Nakpanduri on Gambaga Road, 6.iii.1959, 20m. from Bolgatanga on Tamale Road, 9.iii.1959, Navrongo, 12.iii.1959,



MAP 23. *Trinervitermes occidentalis*. Vegetation types : 8, 16, 17, and 20.

2 vials, 31m. from Navrongo on Tumu Road, 13.iii.1959, 11m. from Tumu on Navrongo Road, 15.iii.1959, 6m. from Tumu on Lawra Road, 16.iii.1959, 9m. N. of Lawra on Nandom Road, 18.iii.1959, 6m. N. of Wa on Lawra Road, 19.iii.1959, 24 and 52m. S. of Wa on Bole Road, 20.iii.1959, 2 vials, 3m. from Larabanga on Bole Road, 22.iii.1959, 22m. from Larabanga on Tamale Road, 24.iii.1959 (*W. A. Sands*).

NIGERIA : Western Region ; Ibadan, 1937 (*F. Toovey*), A.M.N.H. ; Lagos, Lighthouse Beach, 9.iv.1957 (*W. Wilkinson*). Eastern Region ; Enugu, ii.1955 (*W. V. Harris*) ; Onitsha, 5.iv.1957 (*W. Wilkinson*) ; 7 and 12m. from Enugu on Onitsha Road, 2-3.iii.1958, 2 vials, Enugu, xii.1958 (*W. A. Sands*). Northern Region ; 28 and 44m. from Sokoto on Argungu Road, 23.xi.1956, 3 vials, 26m. from Minna on Zungeru Road, 20.xii.1956, Mokwa, 21.xii.1956, 2 vials, 39m. from Abuja on Bida Road, 24.xii.1956, Diko, 10m. W. of Abuja, 27.xii.1956, 22m. from Kaduna, on Kachia Road, 30.i.1957, 5m. from Jos on Bukuru Road, 7.ii.1957, 5m. from Bukuru on Vom Road, 7.ii.1957, 34m. from Yola on Jalingo Road, 14.v.1957, 114-125m. S.W. of Jalingo on Takum Road, via Beli, 18.v.1957, 2 vials, Adamawa, Tiba, 10m. N.W. of Tibak, 24.v.1957, 5 vials, and Gangoro 25.v.1957, 32m. from Damaturu on Potiskum Road, 5.vi.1957, Samaru near Zaria, 10.ix.1957, and vi-vii. 1959, 3 vials, 4m. from Gboko on Oturkpo Road, 26.ii.1958, 2 vials, and 47m. from Lokoja on Kabba Road, 10.iii.1958 (*W. A. Sands*).

CENTRAL AFRICAN REPUBLIC : Haut Mbomu, Djema, 6° 5' N., 25° 12' E., iii.1948 (*N. A. Weber*), A.M.N.H..

CONGO : Garamba, 25.i.1950 (*H. de Saeger*), Inst. des Parcs Nat. du Congo, Brussels.

UGANDA : Mbale, 6.xi.1937, Serere, x.1948 (*W. V. Harris*).

A total of 68 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

T. occidentalis is one of the typically "Guinean" species, occurring in savannah vegetation zones ranging from moist savannah patches in forest zones, to the moderately dry "Sudan" savannah from the west coast across to the Sudan and Uganda (*Keay et al.*, 1959, types 8, 16, 17, and 20). Its nest and feeding habits have been described elsewhere (*Sands*, 1961, 1961a). Though never abundant in any habitat and usually very scarce compared with the other four sympatric species, it is thought to be one of the most primitive of the genus, sharing with *T. rapulum* the habit of feeding on woody material in addition to the more usual grass and leaves.

Trinervitermes oeconomus (Trägårdh)

(Text-figs. 241, 242, 254, 255, 290-296, 384 ; Map 24)

Eutermes oeconomus Trägårdh, 1904 : 23. Type locality : SUDAN, Kaka.

Eutermes mobilis Sjöstedt, 1904 : 91. Type locality : MALI, Alahina. **syn. n.** [ex syn. *T. trinervius* (Rambur) ; Snyder, 1949 : 332].

Termes (*Eutermes*) *oeconomus* (Trägårdh) Desneux, 1904a : 44.

Termes (*Eutermes*) *mobilis* (Sjöstedt) Desneux, 1904a : 43.

Eutermes tchadensis Sjöstedt, 1911b : 14. Type locality : CHAD, "Tchari-Tchad" [probably Ft. Lamy area]. **syn. n.**

- Eutermes* (*Trinervitermes*) *oeconomus* Trägårdh ; Holmgren, 1912 : 64.
Eutermes (*Trinervitermes*) *mobilis* Sjöstedt ; Holmgren, 1912 : 65.
Eutermes (*Trinervitermes*) *tchadensis* Sjöstedt ; Holmgren, 1912 : 68.
Eutermes schubotzianus Sjöstedt, 1914b : 93. Type locality : CHAD, Ft. Crampel. **syn. n.**
Eutermes (*Trinervitermes*) *schubotzianus* Sjöstedt ; Hegh, 1922 : 693.
Trinervitermes oeconomus (Trägårdh) Sjöstedt, 1925a : 73.
Trinervitermes tchadensis (Sjöstedt) Sjöstedt, 1926 : 353.
Trinervitermes schubotzianus (Sjöstedt) Sjöstedt, 1926 : 383.
Trinervitermes mobilis (Sjöstedt) Sjöstedt, 1926 : 353.

Imago. Head capsule, central part of frons and vertex brown to dark chestnut brown ; vertex with three diverging yellow-brown streaks ; postclypeus, and area surrounding eyes, extending to a point behind eyes and to mandible base in front, yellow-brown ; labrum and antennae yellow to yellow-brown. Pronotum yellow to yellow-brown, meso- and metanota, other thoracic sclerites and legs yellow. Abdominal tergites brown to dark chestnut brown, slightly darker round stigmata, with yellow to yellow-brown border, and slightly paler towards lateral corners of front margin ; sternites yellow to yellow-brown, brown round stigmata. Wings translucent pale brown, subcosta and radius sector yellow, paler distally, latter outlined brown at base, membrane between them shaded brown for short distance from suture ; membrane behind radius sector with or without orange-yellow streak ; rest of venation narrowly yellow-brown to brown.

Posterior margin of head capsule behind eyes much less than semi-circular, slightly sinuate immediately behind eyes ; fontanelle distinct, usually Y-shaped with lateral arms dilated terminally, sometimes slightly depressed or occluded posteriorly, length approximately twice breadth at base of lateral arms ; eyes slightly angularly oval and moderately prominent in proportion to own diameter, medium-sized relative to head width, W/E index 2.6-3.0 ; ocelli medium sized to large, separated from eyes by one-fifteenth to one-fourth own least diameter ; postclypeus moderately inflated, width 2.3 to 2.5 times length, anterior margin nearly straight, posterior margin convex, rounded ; molar plate of right mandible with 7-8 ridges ; antennae 17 segmented, II, IV, and V subequal, VI slightly and III distinctly longer than these.

Pale coloured "scent" gland on anterior margin of fifth abdominal sternite of ♀ large, 0.97-1.07mm. wide, 0.26-0.41mm. long ; cerci of ♀ longer than wide across base, conical.

Pilosity of vertex of varying length, setae not forming a "pelt" or "mat" (Text-fig. 384).

Measurements (40 specimens from 9 localities) in millimetres.

	Range	Mean
Head width across eyes	1.72-1.95	1.82
Greatest diameter of eye	0.58-0.74	0.66
Ocellus	0.19-0.25 × 0.25-0.31	0.22 × 0.28
Ocellus to eye	0.02-0.05	0.03
Width of pronotum	1.58-1.95	1.69
Length of pronotum	0.98-1.18	1.09
Length of hind tibia	2.30-2.68	2.48
Length of fore wing	16.10-20.80	18.61

Soldiers. Major soldier ; head capsule yellow to ferruginous, commonly orange-yellow, nose orange to chestnut brown with reddish tip. Antennae and pronotum orange-yellow, meso- and metanota, and legs yellow. Abdominal tergites brown, sternites pale yellow.

Head capsule in plan view short oval or circular, nose conical. In profile near straight to distinctly concave, with back of head rising from above antennal socket, and rounded ; nose equal in length to distinctly shorter than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 5-18 degrees ; antennae 13-14 segmented, only one in twenty with 13, proportions of basal segments variable, in 13 segmented forms, II and IV subequal, shorter than V and VI which are also subequal, III twice II and IV, in 14 segmented, III, V and VI subequal, IV slightly longer and II slightly shorter. Head setae confined to four

at nose tip with smaller setae behind them, sometimes very sparse; dorsal surface of head without prominent setae. Middle abdominal tergites with very sparse scattered minute setae, scarcely visible in profile, only slightly longer on posterior tergites. Sternites with short backward directed scattered setae, and longer downward or slightly forward directed setae on posterior margins, arranged approximately in 6 longitudinal rows, 3 or more times length of shorter setae.

Minor soldier; head capsule orange-yellow to reddish chestnut brown, nose ferruginous orange to brownish black with red tip. Antennae 13-14 segmented, proportions of basal segments variable.

Measurements (Major soldiers, 60 specimens from 20 localities, minor soldiers, 11 specimens from 9 localities) in millimetres.

<i>Major Soldiers :</i>	Range	Mean
Head length to tip of nose	1.95-2.65	2.33
Head width	1.13-1.63	1.39
Depth of head capsule	0.80-1.08	0.97
Width of pronotum	0.55-0.73	0.65
Length of pronotum	0.23-0.36	0.30
Length of hind tibia	1.40-1.82	1.64
<i>Minor Soldiers :</i>	Range	Mean
Head length to tip of nose	1.50-1.82	1.66
Head width	0.64-0.82	0.74
Depth of head capsule	0.50-0.64	0.57
Width of pronotum	0.43-0.50	0.46
Length of pronotum	0.18-0.25	0.22
Length of hind tibia	1.20-1.50	1.40

T. oeconomus is similarly variable to its sympatric congeners, with which it is easily confused. It is distinguishable in the ♀ imago from *T. geminatus* by the larger "scent" gland on the fifth sternite and the longer cerci, and from both this and *T. trinervius* by the uneven vertex pilosity. In the soldier caste, *T. trinervius* is much darker in colour and has few nose setae. Most *T. geminatus* are also darker, with slightly more prominent abdominal setae, but indistinguishable specimens do occur. Larger, paler specimens of *T. togoensis* have been found to occur at greater altitudes, and these sometimes have 14 segmented soldier antennae, thus also becoming indistinguishable from *T. oeconomus*. Of the allopatric species, the closest is *T. gratiosus*, in which the imago has a more inflated postclypeus, ocelli usually further from the eyes, and shorter female cerci. The paler coloured soldiers of this species are almost indistinguishable from *T. oeconomus*, except that the nose tip of the latter has more setae in the majority of specimens.

The synonymy of this species is straight-forward apart from *T. mobilis*, which was described from imagos collected at light. The syntype material consists of two species, the larger of which corresponds to the original description, the smaller being *T. togoensis*. Snyder (1949) synonymised *T. mobilis* with *T. trinervius*, but the accepted usage of the latter is for the species also named *T. posselensis* and *T. carbonarius*. This I regard as correct and therefore use the next oldest name, *T. oeconomus* for the species to which the specimens named *T. mobilis* by Sjöstedt also belong.

A specimen has been selected and labelled by Dr. A. E. Emerson as lectotype for the junior synonym, *T. tchadensis*, but the designation has not been published hitherto. It is given under the type material heading.

Type Material. SUDAN : Kaka, iii.1901 (*I. Trägårdh*), syntype soldier from type colony, *T. oeconomus* (*Trägårdh*), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

MALI : Alahina, (near Toukoto?), vi.1903 (*Kermorgant*), syntype imago from type series, *T. mobilis* (*Sjöstedt*), A.M.N.H. (other syntypes in Mus. Paris and Naturhist. Riksmus., Stockholm).

CHAD : Tchari-Tchad, no date, (*no collector*), paralectotype soldier from type colony, *T. tchadensis* (*Sjöstedt*), A.M.N.H. (lectotype soldier and other paralectotypes, in Naturhist. Riksmus., Stockholm).

CENTRAL AFRICAN REPUBLIC : Fort Crampel, 6.i.1911 (*A. Schubotz*), paratype soldier from type colony, *T. schubotzianus* (*Sjöstedt*), A.M.N.H. (Holotype soldier and other paratype, in Mus. Hamburg, other paratypes in Naturhist. Riksmus., Stockholm.)

Other Material. SIERRA LEONE : Samaia, 24.v.1948 (*F. A. Squires*).

IVORY COAST : Toumodi, 120km. N.W. of Abidjan, 1962-1964, 3 vials (*P. Bodot*).

GHANA : Cape Coast Castle, no date (*G. Williams*) ; Accra, 26.v-29.vi.1926, 3 vials (*A. W. J. Pomeroy*) ; Nungua, 16.i. and 21.vi.1956, 3 vials, Achimota, 19.i.1953 and 6.i.1956, 3 vials (*W. Belfield*) ; Accra, 16.ii.1959, 11½m. from Accra on Kumasi Road, 18.ii.1959, 2 vials, Ejura, 21.ii.1959, 33-60m. N. of Ejura on Tamale Road, 24.ii.1959, 2 vials, 10m. N. of Yeji on Tamale Road, 25.ii.1959, 12m. S. of Tamale on Kumasi Road, 26.ii.1959, 5 and 16m. from Daboya on Tamale Road, 28.ii.1959, 2 vials, 30m. from Tamale on Larabanga Road, 3.iii.1959, 35m. from Tamale on Yendi Road, 4.iii.1959, 25m. S.E. of Gambaga on Yendi Road, 6.iii.1959, Volta Bridge on Bolgatanga-Bawku Road, 8.iii.1959, Navrongo, 12.iii.1959, 29m. from Navrongo on Tumu Road, 13.iii.1959, 12m. N. of Navrongo, 14.iii.1959, 11m. from Tumu on Navrongo Road, 15.iii.1959, 40m. from Tumu on Lawra Road, 16.iii.1959, 9m. N. of Lawra on Nandom Road, 18.iii.1959, 24 and 52m. from Wa on Bole Road, 20.iii.1959, 3 vials, 3m. from Larabanga on Bole Road, 22.iii.1959, 12m. from Accra on Takoradi Road, 7.iv.1959 (*W. A. Sands*).

NIGERIA : Eastern Region, Enugu, 12.xi.1955 (*W. V. Harris*) ; Abakaliki, 28.v.1957 (*W. Wilkinson*) ; Northern Region ; Yashi, 3.ix.1954, 2 vials, Kano, 4.ix.1954 (*B. J. McNulty*) ; 43m. E. of Kano, Gaya River, 17.xi.1956, 31m. W. of Kano on Katsina Road, 18.xi.1956, Katsina, 18.xi.1956, Kaura Namoda, 21.xi.1956, 71m. from Gusau on Sokoto Road, 22.xi.1956, 25m. from Sokoto on Gusau Road, 25.xi.1956, 30m. N. of Sokoto on Illela Road, 26.xi.1956, Samaru, near Zaria, 3.xi.1956, 2 vials, and 14.v.1959, 18m. from Kaduna on Zaria Road, 8.xii.1956, 2 vials, 33m. from Kaduna on Zungeru Road, 18.xii.1956, 45m. from Zungeru on Kaduna Road, 19.xii.1956, 29m. from Minna on Zungeru Road, 20.xii.1956, 2 vials, 16m. from Zungeru on Bida Road, 21.xii.1956, 3 vials, 41m. from Mokwa on Bida Road, 22.xii.1956, 39m. from Abuja on Bida Road, 24.xii.1956, 22m. from Kaduna on

Kachia Road, 30.i.1957, Kудару on Zaria-Jos Road, 5.ii.1957, 4 vials, 5m. from Jos on Bukuru Road, 6.ii.1957, 2 vials, Naraguta, near Jos, 10.ii.1957, 16 and 40m. from Jos on Bauchi Road, 11.ii.1957, 4 vials, 25m. from Bauchi on Jos Road, 13.ii.1957, 50m. from Kaduna on Jos Road, 15.ii.1957, Afaka, 16m. from Kaduna on Zungeru Road, 28.ii.1957, 4 vials, 24-32m. from Jos on Kaduna Road, 3.iv.1957, 4 vials,



MAP 24. *Trinervitermes oeconomus*. Vegetation types : 8, 16, 17, 20, 21, and 25, and possibly also 31.

7-39m. from Bauchi on Gombe Road, 7.v.1957, 3 vials, Gombe, and 30m. E. of Gombe, 8-9.v.1957, 5 vials, 22m. from Gombe on Numan Road, 10.v.1957, 2 vials, 40-52m. S.E. of Gombe on Numan Road, 10.v.1957, 5 vials, 92m. from Gombe on Numan Road, 11.v.1957, 2 vials, 6m. from Numan on Yola Road, 12.v.1957, 24-34m. from Yola on Jalingo Road, 14.v.1957, 4 vials, 54 and 75m. from Yola on Jalingo Road, 16.v.1957, 2 vials, 3m. from Jalingo on Yola Road, 17.v.1957, 125m. S.W. of Jalingo on Takum Road via Beli, 18.v.1957, 35 and 80m. from Yola on Biu Road, 28.v.1957, 2 vials, 15 and 55m. N. of Biu on Damaturu Road, 29.v.1957, 2 vials, Maiduguri, 1.vi.1957, 43m. from Maiduguri on Fort Lamy Road, 3.vi.1957, 32m. from Damaturu on Potiskum Road, 5.vi.1957, 2 vials, 4m. S. of Ilorin on Oyo Road, 4.xii.1957, 45m. S. of Jos on Wamba Road, 23.ii.1958, 2 vials, 12m. from Keffi on Makurdi Road, 24.ii.1958, 30m. from Lokoja on Okene Road, 8.iii.1958, Lokoja, 9.iii.1958 (*W. A. Sands*) ; Bussa, 1.xii.1961 (*J. McMahon*).

CONGO : Garamba Nat. Park, 29.ix.1951 (*H. de Saeger*), Inst. des Parcs Nat. du Congo, Brussels.

SUDAN : Renk, 4.vii.1909 (*H. H. King*) ; Darfur Province, Kulme, 12° 36' N., 23° 27' E., 26.vi.1921 (*H. Lynes*) ; Port Sudan, vi.1939 (*F. M. Telford*) ; Lake Keilak, 30.vi.1952, Kadugli, 22.vii.1952 (*R. C. H. Sweeney*).

UGANDA : additional to those recorded in Sands (1957) ; Serere, 17.vii.1939 (*P.R.S.*), Fort Portal, ii.1948 (*N. A. Weber*), A.M.N.H. ; 15m. from Kampala on Masindi Road, 7.xi.1955 (*R. M. C. Williams*).

LIBYA? : " Tripoli ", no date (*Walker*).

A total of 146 nest series were examined and all material is in the British Museum (Natural History) unless otherwise stated.

T. oeconomus was recognized by Sjöstedt (1925a) as occurring from the Sudan across to Ghana, and further records have extended the range to include vegetation types ranging from forest-savannah mosaic, to the Sahel and even in the case of the Port Sudan record, subdesert steppe (*Keay et al.*, 1959, types 8, 16, 17, 20, 25, and 31). The specimen recorded as *T. trinervius* by Walker (1853) from " Tripoli " has been examined, and is undoubtedly *T. oeconomus*. There must be considerable doubt attached to the locality from which it was recorded. According to Capra (1938), no other *Trinervitermes* has been found in North Africa, and it seems probable that this specimen originated in the Sudan.

The wide distribution of this species may partly be explained by its habit of commonly building its low wide mound in shaded or sheltered locations, and often occupying parts of mounds of various species of Macrotermitinae.

Trinervitermes rapulum (Sjöstedt)

(Text-figs. 193, 297, 298, 308-313, 338-358 ; Map 25)

Eutermes rapulum Sjöstedt, 1904 : 99. Type locality : TANGANYIKA, Tanga.

Termes (*Eutermes*) *rapulum* (Sjöstedt) Desneux, 1904a : 44.

Eutermes (*Trinervitermes*) *rapulum* Sjöstedt ; Holmgren, 1912 : 65.

Eutermes (*Trinervitermes*) *dispar* form *zuluensis* Holmgren, 1913d : 340. Type locality : REPUBLIC OF SOUTH AFRICA, Zululand, Mfolosi Drift, Mkosi. **syn. n.**

Eutermes (*Trinervitermes*) *dispar* form *disparioides* Holmgren, 1913 : 342. Type locality : REPUBLIC OF SOUTH AFRICA, Zululand. Mhlazinga.

Trinervitermes zuluensis (Holmgren) Fuller, 1922 : 113 [including *Trinervitermes dispar* form *disparioides* Holmgren as a synonym].

Trinervitermes pretoriensis Fuller 1922 : 114. Type locality : REPUBLIC OF SOUTH AFRICA, Pretoria. **syn. n.**

Trinervitermes rapulum (Sjöstedt) Sjöstedt, 1926 : 348.

Additions to the previous descriptions (Sands, 1957) of both imago and soldier castes are necessary.

Imago. Head capsule, central part of frons and vertex yellow-brown to dark chestnut brown, vertex often with median pale patch, pale yellow to yellow-brown ; postclypeus, labrum, antennae, and area surrounding eye, ocellus and antennal socket paler, pale yellow to yellow-brown. Pronotum yellow to yellow-brown, other thoracic sclerites and legs yellow. Abdominal tergites yellow to brown, often darker round stigmata, sternites pale yellow to yellow, sometimes brown round stigmata. Wings translucent pale brown, subcosta and radius sector, outlined brown at base ; membrane behind radius sector with orange streak ; rest of venation outlined brown.

Posterior margin of head capsule behind eyes much less than semi-circular, slightly sinuate immediately behind eyes ; fontanelle rather small, shape varies in ♂ from U- to near Y-shaped, ♀ from Y-shaped to triangular with concave anterior margin, lateral arms short, not dilated terminally ; frons usually with two small diverging depressions in front of fontanelle ; eyes prominent in proportion to own diameter but not large relative to head width, W/E index 3.0-3.5 ; ocelli separated from eyes by one-fifth to more than half own least diameter ; postclypeus width 1.9-2.2 times length ; molar plate of right mandible with 7-8 ridges ; antennae, 70% of specimens with 15 segments, 30% with 16.

Pale coloured " scent " gland on anterior margin of ♀ fifth abdominal sternite small, 0.56-0.71mm. wide, 0.15-0.20mm. long ; cerci of ♀ as long as or longer than basal width, slightly mamilliform.

Pilosity of vertex of uneven length, not forming a " pelt " or " mat ".

Measurements (38 specimens from 11 localities) in millimetres.

	Range	Mean
Head width across eyes	1.45-1.83	1.64
Greatest diameter of eye	0.47-0.58	0.52
Ocellus	0.15-0.23 × 0.20-0.30	0.19 × 0.24
Ocellus to eye	0.03-0.10	0.06
Width of pronotum	1.25-1.70	1.49
Length of pronotum	0.78-1.05	0.93
Length of hind tibia	1.81-2.20	2.02
Length of fore wing	14.30-22.10	17.31

Soldiers. Major soldier : head capsule yellow to ferruginous orange, nose ferruginous to pitch black with red tip, antennae pale yellow to orange-yellow. Pronotum, meso- and meta-nota yellow to yellow-brown, legs pale yellow to yellow. Abdominal tergites yellow to brown, sternites pale yellow.

Head capsule in plan view slightly " shouldered " behind antennae, rounded posteriorly, nose cylindrical to weakly conical. In profile distinctly concave, with lowest point above or slightly in front of antennal socket, rising in a weak curve or nearly straight line to highest point near back of head, before downward curve to occiput ; nose shorter than rest of head, measuring from hind margin of antennal socket, angle of nose cone 0-14 degrees.

Head setae consist of four at nose tip with a few smaller setae behind them, and occasionally scattered sparse minute setae on vertex. Middle abdominal tergites with scattered small setae,

longer on posterior segments, sternites with short backward directed setae up to one-third length of longer downward or slightly forward directed setae on posterior margins, arranged in 4-6 longitudinal rows.

Minor soldier : colour as major soldier except nose always dark, antennae 12-13 segmented, usually 12.

Measurements (Major soldiers, 74 specimens from 18 localities, minor soldiers, 9 specimens from 6 localities) in millimetres.

<i>Major Soldiers :</i>		Range	Mean
Head length to tip of nose	.	1.85-2.33	2.10
Head width	.	1.07-1.50	1.30
Depth of head capsule	.	0.75-1.07	0.91
Width of pronotum	.	0.54-0.71	0.61
Length of pronotum	.	0.22-0.29	0.25
Length of hind tibia	.	1.07-1.53	1.25
<i>Minor Soldiers :</i>		Range	Mean
Head length to tip of nose	.	1.43-1.62	1.49
Head width	.	0.57-0.64	0.60
Depth of head capsule	.	0.45-0.54	0.48
Width of pronotum	.	0.40-0.45	0.42
Length of pronotum	.	0.18-0.22	0.19
Length of hind tibia	.	1.04-1.25	1.11

T. rapulum is extremely difficult to separate from *T. rhodesiensis* in many samples of both imago and soldier castes, and these may be regarded as siblings, being partially sympatric. Most but not all imagos of *T. rapulum* have small diverging depressions on the frons, and are slightly smaller, with a slightly more inflated postclypeus than *T. rhodesiensis*; the fontanelle is often smaller and slightly differently shaped (Text-figs. 308-313). Soldiers of *T. rapulum* have usually a shorter nose and a slightly different profile, but specimens occur which are virtually indistinguishable from some *T. rhodesiensis*. Where the two species occur together in one locality, they are usually recognizably different, and the difficulty arises when attempting identification of meagre material of only one. Comparisons with *T. dispar* and *T. occidentalis* are made in the discussion of those species.

Type Material. TANGANYIKA : Tanga, no date (*v. Reden*), syntype soldiers, type colony, *T. rapulum* (Sjöstedt), Naturhist. Riksmus., Stockholm (other syntypes in Mus. Berlin and A.M.N.H.).

REPUBLIC OF SOUTH AFRICA : Natal, Zululand, Mfolosi Drift, Mkosi, 1905 (*I. Trägårdh*), syntype ♂ imago, type colony, *T. zuluensis* (Holmgren), A.M.N.H. (other syntypes stated by Holmgren to be in Mus. Göteborg); Transvaal, Pretoria, Meukleneuk Hill, 3.x.1916 (*C. Rudolph*), paratype ♀ imagos, type colony *T. pretorien-sis* Fuller, B.M.(N.H.). (Holotype in N.C.I., Pretoria.)

Other Material (additional to that recorded in Sands (1957)). TANGANYIKA : Dar-es-salaam, no date (*Regner*); Iringa, 8.i.1935, 2 vials (*H. Kirby*), A.M.N.H.

SOUTHERN RHODESIA : Salisbury, iv.1917 (*R. W. Tucker*); also 6.iv. and 3.vii. 1949, and 5.xii.1950 (*G. H. Bunsli*); Guluene River, 21° 41' S., 31° 47' E., 13.ix. 1962 (*J. C. Felton*).

REPUBLIC OF SOUTH AFRICA : Transvaal; Letaba, 23.ix.1919 (*C. Fuller*). Olifant River, x.1927 (*H. Lang*), A.M.N.H.; Pietersburg, 8.xii.1936, Groblersdal,

26.ix.1957, Marico, 2.ix.1961 (*W. G. H. Coaton*) ; Nelspruit, 15.xi.1958, Marico, 5.xii.1958, Sibasa, 29-30.1959, 2 vials, Waterberg, 6.i.1960 (*P. C. Joubert*) ; Soutpansberg, 10.viii.1960 (*J. L. Sheasby*) ; Lydenburg, 7.ix.1961 (*L. J. de Weerd*) ; Warmbad, 2.x.1961 (*G. F. Pretorius*) ; Natal, Ubombo, i.1926 (*Collins*) ; also 8.xii.1959, 2 vials (*W. G. H. Coaton*).

A total of 42 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.



MAP 25. *Trinervitermes rapulum*. Vegetation types : 9, 20, and 22.

T. rapulum shares with *T. occidentalis* the features of comparative rarity and primitive habit of feeding at least partly on woody material. It appears to have a restricted distribution along the east coast of Africa, where it is usually found in somewhat dry conditions, (Keay *et al.*, 1959, vegetation types 20, 22), though there are also records from the moister coastal savannah (type 9). It has not often been recorded from the true *Brachystegia-Julbernardia* woodland (type 18), though its close similarity to *T. rhodesiensis* may have led to a few records being wrongly assigned to that species. *T. rapulum* and *T. occidentalis* may be relic members of the genus, less well adapted to grass feeding in the savannah zones than commoner congeners.

***Trinervitermes rhodesiensis* (Sjöstedt)**

(Text-figs. 194, 195, 299–300, 314–319, 344–350 ; Map 26)

- Eutermes rhodesiensis* Sjöstedt, 1911a : 186. Type locality : SOUTHERN RHODESIA, Salisbury.
Eutermes brutus Sjöstedt, 1911b : 13. Type locality : CONGO, Mukimbungu. **syn. n.** [ex
 syn. *T. bettonianus* (Sjöstedt) ; Emerson, 1928 : 492].
Eutermes (*Trinervitermes*) *brutus* Sjöstedt ; Holmgren, 1912 : 65.
Eutermes (*Trinervitermes*) *rhodesiensis* Sjöstedt ; Holmgren, 1912 : 65.
Eutermes agricola Sjöstedt, 1913a : 380. Type locality : CONGO, Katanga, Mufungwa. **syn. n.**
Eutermes rufonasalis Sjöstedt, 1913a : 383. Type locality : CONGO, Katanga, Sankisia.
syn. n.
Eutermes (*Trinervitermes*) *roseni* Holmgren, 1913 : 344. Type locality : RHODESIA [according
 to Holmgren], CONGO, Banana [according to Sjöstedt, 1926 : 336]. **syn. n.**
Eutermes (*Trinervitermes*) *kalaharicus* Holmgren, 1913 : 346. Type locality : BECHUANALAND
 PROT., Kalahari, Kooa, Sekgoma-Khakea. **syn. n.**
Trinervitermes gemellus form *kalaharicus* (Holmgren) Fuller, 1922 : 110.
Trinervitermes abassas Fuller, 1922 : 114. Type locality : REPUBLIC OF SOUTH AFRICA,
 Namaqualand, Abassas on Orange River. **syn. n.**
Trinervitermes thermarum Fuller, 1922 : 114. Type locality : REPUBLIC OF SOUTH AFRICA,
 Transvaal, Warmbad. **syn. n.**
Eutermes (*Trinervitermes*) *diplacodes* Sjöstedt, 1924 : 41. Type locality : CONGO, Boma,
 [syn. *T. roseni* (Holmgren) Emerson, 1928 : 491].
Eutermes (*Trinervitermes*) *muneris* Sjöstedt, 1924 : 42. Type locality : CONGO, Boma. [syn.
T. roseni (Holmgren) Emerson, 1928 : 491].
Eutermes (*Trinervitermes*) *loubetsiensis* Sjöstedt, 1924c : 496. Type locality : REPUBLIC OF
 CONGO, Loubetsi. **syn. n.**
Trinervitermes rhodesiensis (Sjöstedt) Sjöstedt, 1926 : 346.
Trinervitermes brutus (Sjöstedt) Sjöstedt, 1926 : 331.
Trinervitermes agricola (Sjöstedt) Sjöstedt, 1926 : 329.
Trinervitermes rufonasalis (Sjöstedt) Sjöstedt, 1926 : 334.
Trinervitermes roseni (Holmgren) Sjöstedt, 1926 : 336.
Trinervitermes loubetsiensis (Sjöstedt) Sjöstedt, 1926 : 333.
Trinervitermes lutzi Emerson ; Sands, 1957 : 25.

Imago. Head capsule, central part of frons and vertex brown to dark chestnut brown, vertex with median pale patch, yellow to brown, sometimes partly subdivided into indistinct streaks ; area surrounding eyes and antennal socket, in front of ocelli, and bordering posterior margin of postclypeus yellow to yellow-brown ; postclypeus and labrum yellow to yellow-brown, antennae yellow. Pronotum yellow to yellow-brown, sometimes darker at edges, meso- and metanota, other thoracic sclerites and legs yellow. Abdominal tergites yellow to yellow-

brown, clouded brown around stigmata, middle tergites sometimes narrowly brown between stigmata; sternites yellow, yellow-brown round stigmata. Wings translucent pale brown, subcosta and radius sector outlined brown at base, posterior outline of radius sector becoming orange distally; membrane behind radius sector with orange streak.

Posterior margin of head capsule behind eyes much less than semi-circular, slightly sinuate immediately behind eyes; fontanelle distinct, usually rather long slender Y-shaped, with lateral arms often but not always dilated terminally, length often more than twice breadth at base of lateral arms; eyes short oval, prominent in proportion to own diameter, medium sized relative to head width, W/E index 2.8–3.4; ocelli medium-sized, separated from eyes by one-seventh to two-fifths own least diameter; postclypeus moderately inflated, width 2.2–2.5 times length, anterior margin slightly concave, posterior margin convex, more strongly rounded laterally, more lightly arched in middle; molar plate of right mandible with 7–8 ridges; antennae 15–16 segmented, approximately half with each, basal segments variable, in 15 segmented, II and V subequal, IV and VI subequal and slightly longer, III longer than these, in 16 segmented, II and IV subequal, III and VI subequal and slightly longer, V slightly longer still.

Pale coloured "scent" gland on anterior margin of fifth abdominal sternite of ♀ medium-sized, 0.69–0.90mm. wide, 0.13–0.23mm. long; cerci of female longer than width across base, conical.

Pilosity of vertex of varying length, setae not forming a "pelt" or "mat".

Measurements (30 specimens from 10 localities) in millimetres.

	Range	Mean
Head width across eyes	1.60–1.84	1.70
Greatest diameter of eye	0.50–0.59	0.54
Ocellus	0.16–0.23 × 0.21–0.30	0.19 × 0.25
Ocellus to eye	0.03–0.08	0.06
Width of pronotum	1.43–1.73	1.56
Length of pronotum	0.88–1.08	0.98
Length of hind tibia	1.93–2.43	2.17
Length of fore wing	16.40–20.10	18.33

Soldiers. Major soldier: head capsule orange-yellow to ferruginous, nose ferruginous to chestnut brown with reddish tip. Antennae, legs, and abdominal sternites yellow, pronotum, meso- and metanota, and abdominal tergites orange-yellow to brown.

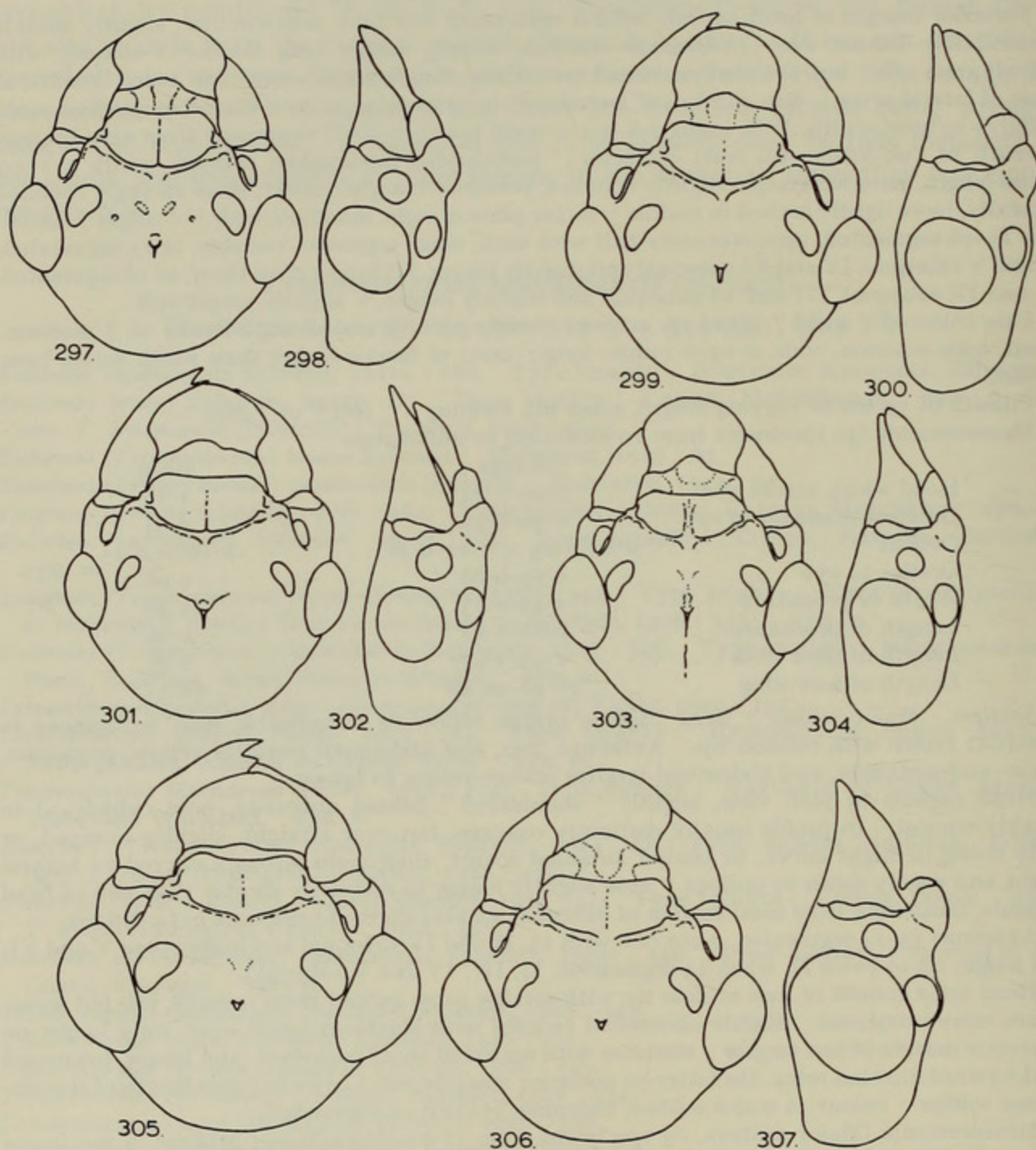
Head capsule in plan view, slightly "shouldered" behind antennae, nose cylindrical to weakly conical. In profile usually distinctly concave, but near straight, slightly humped, or only rising in slight curve, to behind antennal socket, then more strongly curved to highest point and evenly down to occiput; nose slightly longer to distinctly shorter than rest of head capsule, measuring from hind margin of antennal socket, angle of nose cone 0–14 degrees.

Antennae 13–14 segmented, 7 out of 8 with 13, II and IV subequal and longer than V and VI, III longer up to twice II, when 14 segmented, II, III, IV and V subequal.

Head setae consist of four at nose tip with smaller setae behind them, usually few but sometimes more numerous. Middle abdominal tergites with scattered small setae, only longer on posterior margin of last tergite; sternites with scattered short backward, and longer downward and forward directed setae, the latter on posterior margins and 3 or more times length of shorter. Minor soldier: colour as major soldier, antennae usually 12 segmented.

Measurements (Major soldiers, 63 specimens from 17 localities, minor soldiers, 9 specimens from 7 localities) in millimetres.

<i>Major Soldiers:</i>	Range	Mean
Head length to tip of nose	1.98–2.55	2.28
Head width	1.08–1.50	1.28
Depth of head capsule	0.78–1.14	0.94
Width of pronotum	0.53–0.74	0.62
Length of pronotum	0.20–0.32	0.27
Length of hind tibia	1.16–1.68	1.41



FIGS. 297-307 : *Trinervitermes*, front and side views of imago head capsule. 297, 298, *T. rapulum* ; 299, 300, *T. rhodesiensis* ; 301, 302, *T. saudiensis* ; 303, 304, *T. togoensis* ; 305-307, *T. trinervius*.

<i>Minor Soldiers :</i>	Range	Mean
Head length to tip of nose	1.50-1.79	1.65
Head width	0.61-0.78	0.69
Depth of head capsule	0.50-0.64	0.57
Width of pronotum	0.38-0.54	0.45
Length of pronotum	0.18-0.23	0.20
Length of hind tibia	1.08-1.39	1.27

Variation. In the imago, the fontanelle is sometimes partly occluded posteriorly by cuticle of slightly darker pigmentation than that surrounding it ; this has been observed in specimens from the lower Congo, and from the Transvaal. There may occasionally be small diverging depressions in front of the fontanelle, but these are not as common as in *T. rapulum*. In the soldier, specimens from the lower Congo tend to have slightly more conical noses than those from Rhodesia and S. Africa, but there is considerable overlap.

The difficulty of separating this species from *T. rapulum* has been stated under that species. Imagos of *T. rhodesiensis* often have paler cuticle behind the entire width of the posterior margin of the postclypeus, whereas in *T. rapulum* the darker pigmentation of the frons extends to this margin in the middle.

The specimens attributed to *T. lutzi* in an earlier paper (Sands, 1957) were based on comparison of the soldier castes alone. These are closely similar, but in *T. rhodesiensis* the fontanelle is smaller and the nose tip less hairy, a character not then recognized. The differences of the imagos of *T. occidentalis* and *T. bettonianus* have been discussed under those species. The large setae around the imago fontanelle noted in that paper are not a constant feature of the species.

A lectotype has been selected for *T. rhodesiensis* and labelled accordingly :

Lectotype soldier : SOUTHERN RHODESIA : Salisbury, 1911 (G. A. K. Marshall), and paralectotype from type colony, *T. rhodesiensis* (Sjöstedt), B.M.(N.H.) (other paralectotypes in A.M.N.H., and Naturhist. Riksmus., Stockholm).

Type Material. CONGO : Mukimbungu, 1904 (K. E. Laman), syntype soldiers, type colony, *T. brutus* (Sjöstedt), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm) ; Katanga, Mufungwa, 12.xii.1911 (J. Bequaert), syntype soldiers, type colony, *T. agricola* (Sjöstedt), A.M.N.H. and Naturhist. Riksmus., Stockholm ; Sankisia, 16.viii.1911 (J. Bequaert), syntype soldiers, type colony, *T. rufonasalis* (Sjöstedt), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm) ; Boma, viii.1920, and Moanda, 28.viii.1920 (H. Schouteden), syntype soldiers, *T. diplacodes* (Sjöstedt), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm) ; Boma 4.xi.1913 (Styckzynski), syntype soldiers, type colony, *T. muneris* (Sjöstedt) A.M.N.H., and Naturhist. Riksmus., Stockholm.

REPUBLIC OF CONGO : Loubetsi, approx. 3° 40' S., 12° 15' E., no date (A. Nillson), syntype soldiers, type colony, *T. loubetsiensis* Sjöstedt, A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

BECHUANALAND : Kooa, Sekgoma Khakea, no date (A. Schulze), syntype, *T. kalaharicus* Holmgren, A.M.N.H.

REPUBLIC OF SOUTH AFRICA : Namaqualand, Abassas on Orange River, iii.1921 (J. H. C. Kraphal), paratype ♂ imagos, *T. abassas* Fuller, B.M.(N.H.) (Holotype and other paratypes in N.C.I., Pretoria) ; Transvaal, Warmbad, xii.1916 (C.

Rudolph), paratype ♀ imagos, *T. thermarum* Fuller, B.M.(N.H.) (Holotype and other paratypes in N.C.I., Pretoria.)

Other Material. REPUBLIC OF CONGO : 13km. W. of Brazzaville, 8.vi.1948, 2 vials (*A. E. Emerson*), A.M.N.H.

CONGO : Luluabourg, no date (*P. Callewaert*) ; Mukimbungu, 1904 (*K. E. Laman*) ; Boma, 4.xi.1913 (*Styckzynski*) ; Thysville, i.vi.1915 (*H. Lang, J. P. Chapin*) ; also 3.vi.1915, 2 vials, and Matadi, 18.vi.1915 (*J. Bequaert*) ; Boma, 10-12.viii.1920, 4 vials, and Moanda, viii.1920 (*H. Schouteden*) ; Gihinga, 14.viii.1941 (*H. Bredo*) ; Sona Mpangu, 10-12.iv.1948, 7 vials, and 18km. S. of Leopoldville, 9.vi.1948 (*A. E. Emerson*), all in A.M.N.H.

ANGOLA : St. Antonio, viii.1915 (*H. Lang, J. P. Chapin*), A.M.N.H. ; Porto Alexandre, 1954 (*J. Balfour-Browne*).

NORTHERN RHODESIA : Lake Mweru, Masenka Flats, 8.viii.1942 (*H. Bredo*), A.M.N.H. ; Abercorn, iii.1947, and xi.-xii.1948, 6 vials (*P. E. Glover*).

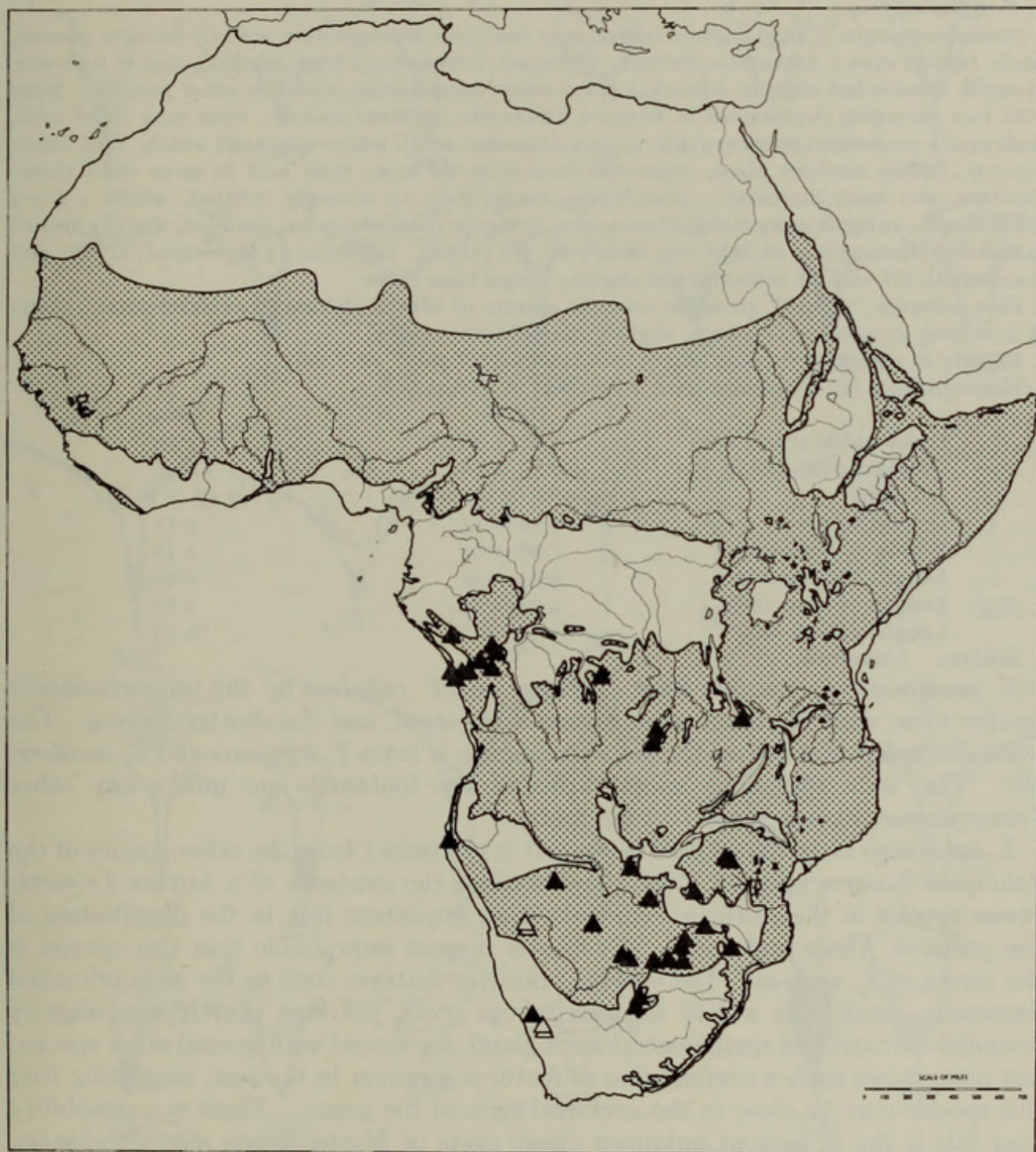
SOUTHERN RHODESIA : Salisbury, no date (*W. Barbrook*) ; ditto, 1911 (*G. A. K. Marshall*) ; Worldsvew, 1920 (*C. W. Mally*) ; Concession, 20.v.1927 (*R. Jack*).

BECHUANALAND : Topsis, 11.ii.1921 (*C. E. Godman*) ; Tsukutsa Pan, 3.viii.1924 (*C. W. Mally*) ; Tsotsoroga Pan, viii.1930, and Makarikari Pan, 5.viii.1930 (*H. Lang*), A.M.N.H. ; Gantsena Pan, 1955, and 60m. S. of Ghanzi, viii.1955 (*R. Story*).

REPUBLIC OF SOUTH AFRICA : Cape Province ; Taungs, 3.x.1956, Barkly West, 4.x.1956 (*W. G. H. Coaton*). Transvaal ; Potgeitersrust, 17.ix.1918, and Letaba, 20.ix.1918 (*C. Fuller*) ; Waterberg, 25.ix.1957, and Soutpansburg, 11.x.1960 (*W. G. H. Coaton*) ; Soutpansburg, 1.i.1960, Waterberg, 6.i.1960, and Marico, 9.i.1960, 2 vials (*P. C. Joubert*) ; Rustenburg, 4.x.1961 (*G. F. Pretorius*).

A total of 64 nest series were examined and all material is in the British Museum (Natural History) unless otherwise stated.

The distribution range of *T. rhodesiensis* overlaps to a limited extent with its sibling congener, *T. rapulum*, in Southern Rhodesia and the Transvaal. *T. rhodesiensis* covers the *Brachystegia-Julbernardia* savannah woodland and the other savannah gradations to semi-desert, from the southern border of the Congo forest southwards to the beginnings of the Karroo, Macchia, and temperate grasslands of the Cape. The East-West barrier separating the species from the Zambesi northwards appears to approximate to the Great Rift Valley. A few of the most South-Western records are from areas mapped by Keay *et al.*, (1959) as desert, but these are near the Orange River and it is presumed that the conditions are locally subdesert, and that full desert would constitute an ecological barrier. The distribution of *T. rhodesiensis* to the south of the Congo Rain forest approximates in climatic and vegetation range to that of *T. oeconomus* (Träg.) to the north.



MAP 26. *Trinervitermes rhodesiensis*. Vegetation types : 8, 16, 18, 19, 20, 25, and 31.

Trinervitermes saudiensis sp. n.

(Text-figs. 301, 302, 320, 321; Map 3.)

Imago. Colouration uncertain due to fading in old dried specimens, but thought to be similar to *T. rapulum*.

Posterior margin of head capsule behind eyes less than semi-circular, slightly sinuate immediately behind eyes; fontanelle distinct, Y-shaped, lateral arms long, reaching almost half-way to ocelli, slender but slightly dilated at point where termination occurs in other species; frons with two diverging depressions in front of fontanelle, or these united; eyes very short oval, moderately prominent in proportion to own diameter, small relative to head width, W/E index 3.5-3.9; ocelli medium sized, separated from eyes by more than half to more than three-quarters own least diameter; postclypeus moderately to strongly inflated, width 2.1-2.4 times length, anterior margin slightly concave, posterior margin convex, rounded, slightly arched in middle; molar plate of right mandible with 7-8 ridges; antennae 15 segmented, II, IV, and V subequal, III and VI subequal and slightly longer than these.

Pale coloured "scent" gland on anterior margin of fifth ♀ abdominal sternite small; cerci of ♀ as long as width across base, slightly mamilliform conical.

Pilosity of vertex of varying length, not forming a "pelt" or "mat".

Measurements (10 specimens from 1 locality) in millimetres.

	Range	Mean
Head width across eyes	1.61-1.76	1.66
Greatest diameter of eye	0.43-0.48	0.46
Ocellus	0.16-0.18 × 0.20-0.25	0.17 × 0.22
Ocellus to eye	0.10-0.13	0.11
Width of pronotum	1.38-1.61	1.48
Length of pronotum	0.84-0.94	0.90
Length of hind tibia	2.04-2.24	2.17
Length of fore wing	15.50-16.30	15.73

Soldiers. Unknown.

T. saudiensis is separable from *T. dispar* and *T. rapulum* by the proportionately smaller eyes, with the ocelli more distant from them, and the shorter ♀ cerci. The same characters apart from the cerci distinguish it from *T. togoensis* and *T. occidentalis*. The wide spreading lateral arms of the fontanelle are unlike any other *Trinervitermes* except some *T. trinervoides*.

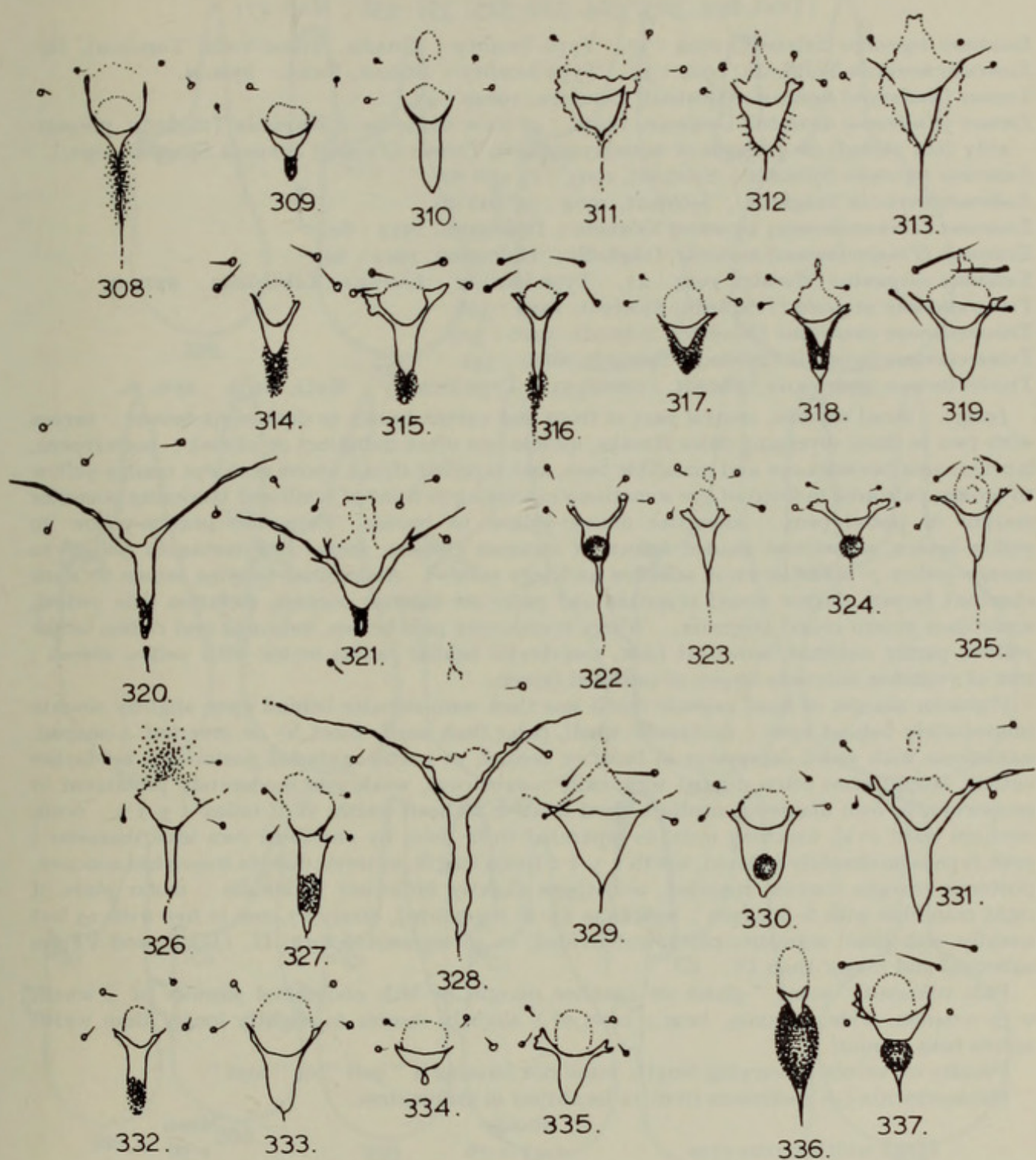
T. saudiensis is described here because it is so distinct from the other species of the Ethiopian Zoogeographical Region and because the existence of a further *Trinervitermes* species in the Arabian Peninsula is an important link in the distribution of the genus in Africa and India. I consider it most improbable that this species is the imago of *T. arabiae*. The various primitive features such as the wide branched fontanelle, small eyes widely separated from ocelli, the long postclypeus, slightly mamilliform cerci and small ventral scent gland, are shared with several other species. but none shows such a combination of features common to the rest, suggesting that this species may be close to the ancestral form of the genus. There is a possibility that this is the at present unknown imago caste of *Mycterotermes meringocephalus*, which might be expected to show a similar combination of features.

Two vials of this species were studied.

Holotype ♂, SAUDI ARABIA: Jidda, 24.xi.1926 (*H. St. J. B. Philby*), B.M.(N.H.).

Allotype ♀, same data as holotype, B.M.(N.H.).

Paratypes ♂, same data as above and also 3.ii.1934 (*G. L. Bates*), B.M.(N.H.).



FIGS. 308-337: Imago fontanelle. 308-310, ♂, 311-313, ♀, *Trinervitermes rapulum*; 314-316, ♂, 317-319, ♀, *T. rhodesiensis*; 320, ♂, 321, ♀, *T. saudiensis*; 322, 323, ♂, 324, 325, ♀, *T. togoensis*; 326-328, ♂, 329-331, ♀, *T. trinervoides*; 332, 333, ♂, 334, 335, ♀, *T. trinervius*; 336, ♂, 337, ♀, *Baucaliotermes hainesi*.

Trinervitermes togoensis (Sjöstedt)

(Text-figs. 303, 304, 322-325, 351-358 ; Map 27)

Eutermes togoensis Sjöstedt, 1899 : 37. Type locality : GHANA, Trans-Volta Togoland, Ho.*Eutermes terricola* Trägårdh, 1904 : 31. Type locality : SUDAN, Kaka. **syn. n.***Termes (Eutermes) togoensis* (Sjöstedt) Desneux, 1904a : 45.*Termes (Eutermes) terrestris* Desneux, 1904a : 45 [new name for *E. terricola* Trägårdh, presumably (not stated) on grounds of homonymy with *Termes (Termes) terricola* Sjöstedt, 1902].*Eutermes togoensis* Sjöstedt ; Sjöstedt, 1904 : 27 and 87.*Eutermes terricola* Trägårdh ; Sjöstedt, 1904 : 39 and 96.*Eutermes (Trinervitermes) togoensis* Sjöstedt ; Holmgren, 1912 : 62.*Eutermes (Trinervitermes) terricola* Trägårdh ; Holmgren, 1912 : 64.*Eutermes suspensus* Silvestri, 1914 : 41. Type locality : GUINEA, Kakoulima. **syn. n.***Trinervitermes terricola* (Trägårdh) Sjöstedt, 1926 : 326.*Trinervitermes suspensus* (Silvestri) Sjöstedt, 1926 : 329.*Trinervitermes togoensis* (Sjöstedt) Sjöstedt, 1926 : 331.*Trinervitermes nigeriensis* Sjöstedt, 1926 : 333. Type locality : MALI, Belia. **syn. n.**

Imago. Head capsule, central part of frons and vertex brown to dark sepia brown ; vertex with two or three diverging paler streaks, middle one often indistinct or absent ; postclypeus, labrum, area between eye and mandible base, and tapering streak above each eye orange-yellow to brown, pale area in front of eye sometimes extending in front of ocelli and bordering posterior margin of postclypeus ; antennae orange-yellow to brown. Pronotum orange-yellow to yellow-brown, sometimes shaded brown at anterior corners, meso- and metanota yellow to orange-yellow ; other thoracic sclerites and legs yellow. Abdominal tergites brown to dark chestnut brown, darker round stigmata and paler on anterior corners, sternites pale yellow, sometimes brown round stigmata. Wings translucent pale brown, subcosta and radius sector yellow, partly outlined brown at base, membrane behind radius sector with yellow streak ; rest of venation narrowly brown or outlined brown.

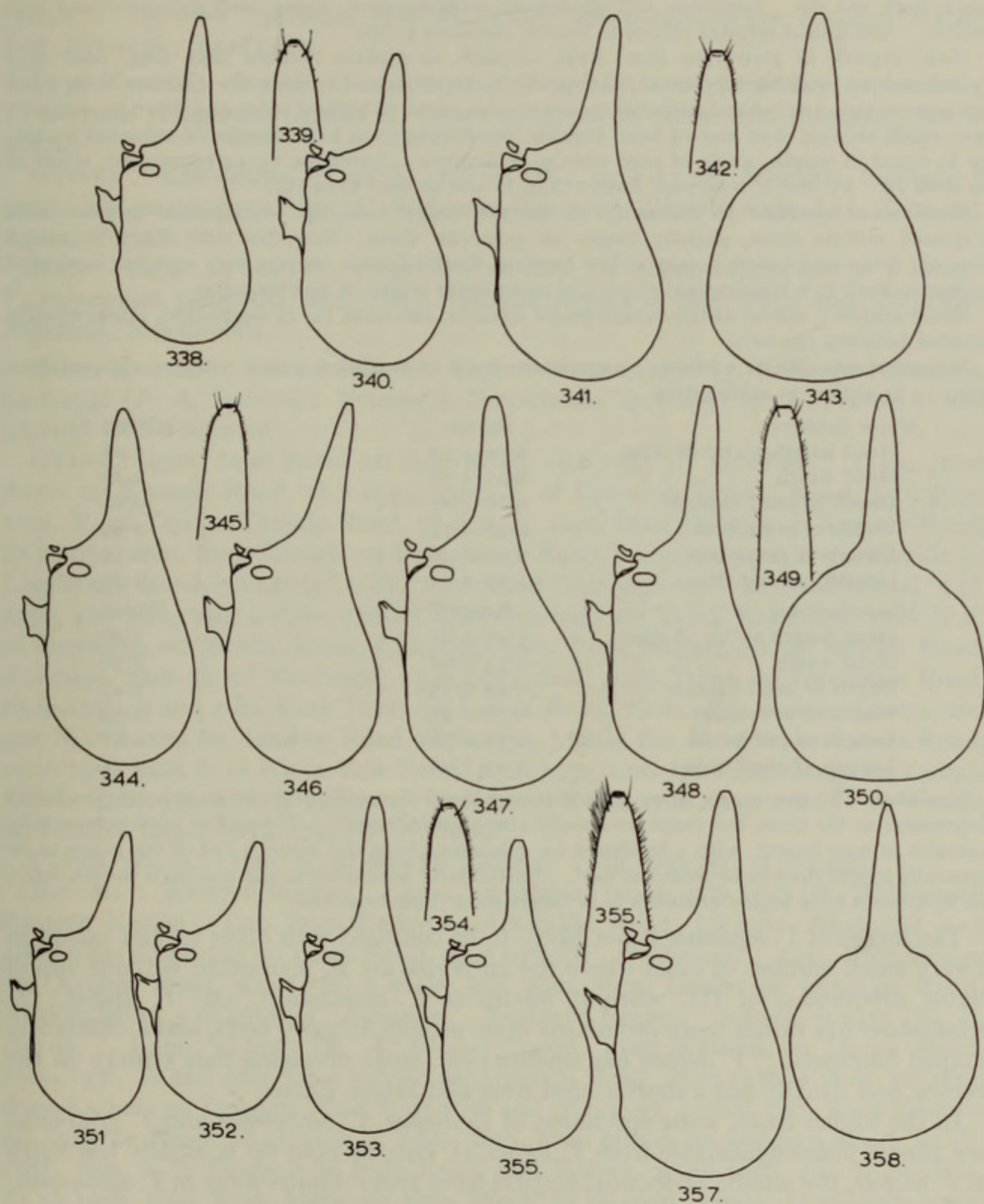
Posterior margin of head capsule much less than semi-circular behind eyes, slightly sinuate immediately behind eyes ; fontanelle small, paler than head, short Y- or inverted A-shaped, sometimes with small depression in front or behind, or partly occluded posteriorly by darker cuticle, lateral arms often dilated terminally ; eyes oval, weakly to moderately prominent in proportion to own diameter, medium sized relative to head width, W/E index 2.5-3.2 ; ocelli medium sized oval, touching eyes, to separated from them by one-third own least diameter ; postclypeus moderately inflated, width 2.3-2.6 times length, anterior margin somewhat concave, posterior margin convex, rounded, sometimes slightly indistinct in middle ; molar plate of right mandible with 6-8 ridges ; antennae 15-16 segmented, rarely 17, one in five with 15 but usually with basal segments partly subdivided, in 16 segmented form II, III, V, and VI are subequal and longer than IV.

Pale coloured "scent" gland on anterior margin of fifth abdominal sternite of ♀ small, 0.35-0.64mm. wide, 0.13mm. long ; cerci of ♀ slightly shorter to slightly longer than width across base, conical.

Pilosity on vertex of varying length, setae not forming a "pelt" or "mat".

Measurements (36 specimens from 12 localities) in millimetres.

	Range	Mean
Head width across eyes	1.43-1.76	1.56
Greatest diameter of eye	0.50-0.63	0.55
Ocellus	0.15-0.22 × 0.20-0.28	0.19 × 0.24
Ocellus to eye	0.00-0.05	0.03
Width of pronotum	1.30-1.59	1.43
Length of pronotum	0.83-1.05	0.91
Length of hind tibia	1.95-2.43	2.20
Length of fore wing	14.20-21.00	17.14



FIGS. 338-358 : *Trinervitermes*, soldier head capsule, side and plan views, and nose tip.
 338-343, *T. rapulum* ; 344-350, *T. rhodesiensis* ; 351-358, *T. togoensis*.

Soldiers. Major soldier : head capsule orange to chestnut brown, nose ferruginous to pitch black with red tip. Antennae and pronotum orange-yellow, meso- and metanota and legs yellow. Abdominal tergites yellow to brown, sternites yellow.

Head capsule in plan view short oval, circular, to slightly broader than long, nose near cylindrical to moderately conical. In profile near straight to distinctly concave with head rising from above or behind antennal socket in even curve to highest point and down to occiput ; nose much shorter than rest of head capsule, measuring from hind margin of antennal socket, up to equal in length, angle of nose cone 0-16 degrees. Antennae 13-14 segmented, 9 out of 10 with 13. IV and V subequal, longer than II and shorter than III.

Head setae confined to distinctly to sparsely hairy nose tip. Abdominal tergites with scattered minute setae, slightly longer on posterior three. Sternites with short backward directed setae and longer downward or forward directed setae on posterior margins, arranged approximately in 6 longitudinal rows, 3 or more times length of shorter setae.

Minor soldier : colour as the darker major soldiers, antennae 12-13 segmented, about equally divided between the two.

Measurements (Major soldiers, 70 specimens from 18 localities, minor soldiers, 13 specimens from 13 localities) in millimetres.

<i>Major Soldiers :</i>		Range	Mean
Head length to tip of nose	.	1.70-2.43	2.01
Head width	.	0.95-1.58	1.17
Depth of head capsule	.	0.68-1.07	0.84
Width of pronotum	.	0.48-0.77	0.55
Length of pronotum	.	0.20-0.36	0.24
Length of hind tibia	.	1.23-1.71	1.39
<i>Minor Soldiers :</i>		Range	Mean
Head length to tip of nose	.	1.35-1.63	1.46
Head width	.	0.53-0.68	0.59
Depth of head capsule	.	0.43-0.53	0.47
Width of pronotum	.	0.38-0.45	0.39
Length of pronotum	.	0.18-0.20	0.18
Length of hind tibia	.	1.03-1.28	1.21

Variation. In the imago, there are sometimes small diverging depressions or a single median depression on the frons, but these are usually absent or indistinct. The soldier caste is especially variable in nose length, with a tendency for specimens from the western end of the range to be generally longer than those from the east. Particularly noticeable in this species is the tendency for specimens from higher altitudes to be larger than those from low.

The imago of *T. togoensis* is not likely to be confused with other species except in a very small number of cases where the antennae are 15 segmented without appreciable subdivision of III, when it resembles *T. occidentalis*, and *T. dispar*. *T. occidentalis* has rather more prominent eyes, usually longer ♀ cerci, and a differently shaped fontanelle ; *T. dispar* has smaller eyes, lacks diverging pale streaks on the vertex, and usually has a shorter hind tibia and longer ♀ cerci.

In the soldier caste, some specimens of *T. dispar*, *T. oekonomus* and *T. geminatus* are almost indistinguishable from *T. togoensis*, but the nose tip is usually less hairy in *T. dispar*, the middle abdominal tergites have fewer minute setae in *T. oekonomus*, and the antennae of *T. geminatus* are always 14 segmented.

Specimens have been selected and labelled as lectotypes of *T. togoensis* and *T. nigeriensis* by Dr. A. E. Emerson, but the designations have not been published hitherto ; that of the senior synonym is given separately :

Lectotype : GHANA : Trans-Volta Togoland, Ho, 1892 (*Rossmann*), lectotype ♀ imago, *T. togoensis* (Sjöstedt), Mus. Hamburg, and paralectotype ♀ imago, Naturhist. Riksmus., Stockholm.

Type Material. SUDAN : Kaka, 1901 (*I. Trägårdh*), syntype soldier, type colony, *T. terricola* (Trägårdh), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

GUINEA : Kakoulima, 9° 40' N., 13° 25' W., 1912-13 (*F. Silvestri*), holotype ♀ imago and paratype soldiers, *T. suspensus* (Silvestri), Silvestri Coll., Lab. Zool., Sc. Agric., Portici.

MALI : Belia, 15° 26' N., 1° 45' W., no date (*R. Chudeau*), lectotype ♀ imago, *T. nigeriensis* (Sjöstedt), Mus. Paris. (Paralectotypes in Mus. Paris and Naturhist. Riksmus., Stockholm).

Other Material. SIERRA LEONE : Cape S. Leone, 1858 (*J. Foxcroft*) ; Samaia, 24.v.1948 (*F. A. Squires*) ; Freetown, Brookfields, 27.v.1956 (*P. F. Prevett*) ; and 9.i.1958 (*W. Wilkinson*).

GHANA : 45m. from Accra on Ada Road, 16.ii.1955 (*W. Belfield*) ; 11½m. from Accra on Kumasi Road, 18.ii.1959, 33m. N. of Ejura on Tamale Road, 24.ii.1959, 10m. N. of Yeji on Tamale Road, 25.ii.1959, 16m. from Daboya on Tamale Road, 28.ii.1959, 28m. from Tamale on Bolgatanga Road, 1.iii.1959, 55m. from Tamale on Larabanga Road, 3.iii.1959, 4 and 15m. from Gambaga on Wale Wale Road, 5.iii.1959, and 7.iii.1959, 4 vials, 25m. S.E. of Gambaga on Yendi Road, and 17m. N.E. of Gambaga on Bawku Road, 6.iii.1959, 20m. from Bolgatanga on Bawku Road, 8.iii.1959, 12m. N. of Navrongo, 14.iii.1959, 11m. from Tumu on Navrongo Road, 15.iii.1959, 6 and 40m. from Tumu on Lawra Road, 16.iii.1959, 2 vials, Lawra, and 9m. N. of Lawra on Nandom Road, 18.iii.1959, 3 vials, 6m. N. of Wa on Lawra Road, 19.iii.1959, 52m. S. of Wa on Bole Road, 20.iii.1959, 22m. from Larabanga on Tamale Road, 24.iii.1959, 41m. S. of Tamale on Kumasi Road, 27.iii.1959, 25m. N. of Wenchi on Bamboi Road, 30.iii.1959 (*W. A. Sands*).

UPPER VOLTA : 15m. N. of Bawku (Ghana), 11.iii.1959 (*W. A. Sands*).

NIGERIA : Western Region ; Lagos, Lighthouse beach, 9.iv.1957 (*W. Wilkinson*). Eastern Region ; 14m. from Enugu on Abakaliki Road, 1.ii.1957, Abakaliki, and 40m. from Abakaliki on Ikom Road, 27.v.1957 (*W. Wilkinson*) ; 12m. from Enugu on Onitsha Road, 2.iii.1958, 2 vials, and 20m. from Enugu on Oturkpo Road, Nsukka Hills, 5.iii.1958 (*W. A. Sands*). Northern Region ; Sokoto, 11.ii.1955 (*W. V. Harris*) ; Kano, 11.ii.1957 (*R. A. Blease*) ; 25m. from Katsina on Daura Road, 19.xi.1956, 28 and 42m. from Sokoto on Argungu Road, 23.xi.1956, 2 vials, 11-18m. from Kaduna on Zungeru Road, 8.xii.1956 and 28.ii.1957, 4 vials, 70m. from Kaduna on Zungeru Road, 18.xii.1956, 2 vials, 26m. from Minna on Zungeru Road, 20.xii.1956, 16m. S. of Zungeru on Bida Road, and Mokwa, 21.xii.1956, 4m. N. of Bida, 23.xii.1956, 26m. from Abuja on Bida Road, 24.xii.1956, Abuja, 31.xii.1956, 22m. from Kaduna on Kachia Road, 30.i.1957, 2 vials, 4-16m. from Jos on Bauchi and Bukuru Roads, 6-11.ii.1957, 5 vials, 40m. from Jos on Bauchi Road, 11.ii.1957, Bauchi, and 25m. from Bauchi on Jos Road, 12-13.ii.1957, 18-24m. from Jos on Pankshin Road, 14.ii.-3.iv.1957, 9 vials, 56m. from Kaduna on Jos Road, 15.ii.1957,

25-32m. from Jos on Kaduna Road, 5.iv.1957, 2 vials, 39m. from Bauchi on Gombe Road, 7.v.1957, Yola, 13.v.1957, 54m. from Yola on Jalingo Road, 16.v.1957, 7, 45, and 53m. S.W. of Jalingo on Takum Road, 17.v.1957, 3 vials, 125m. and 114m. S.W. of Jalingo on Takum Road via Beli, 18.v.1957, 3 vials, 55m. from Damaturu on Potiskum Road, 5.vi.1957, 4m. S. of Ilorin on Oyo Road, 4.xii.1957, 5m. S. of Kunya on Kano Road, 4.x.1957, 24m. from Gboko on Makurdi Road, 25.ii.1958,



MAP 27. *Trinervitermes togoensis*. Vegetation types : 8, 16, 17, 20, and 25.

4m. from Gboko on Oturkpo Road, 26.ii.1958, 30m. from Lokoja on Okene Road, 8.iii.1958, Samaru, near Zaria, vi-vii.1959, 8 vials (*W. A. Sands*).

SUDAN : Darfur Province, Kulme, 12° 30' N., 23° 27' E., 6 and 26.vii.1921, 2 vials (*H. Lynes*).

UGANDA : Karamoja Distr., Toror Hills, near Kotido, 8.x.1952 (*W. A. Sands*).

A total of 108 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

T. togoensis is another of the species which extend from the extreme West Coast of Africa across the "Guinean" and "Sudan" vegetation zones (*Keay et al.*, 1959 types 8, 16, 17, and 20) to the Sudan and Uganda.

Its biology and feeding habits have been described in detail in other papers (*Sands*, 1961, 1961a). It seldom builds a mound structure of its own, being commonly found in the mounds of other *Trinervitermes* species, or those of *Cubitermes*, *Thoracotermes* (record of *Silvestri*, 1914), *Macrotermes*, *Pseudacanthotermes*, and *Odontotermes*. In this respect it appears to occupy a closely similar ecological niche to that of *T. dispar* in the East and Central Africa fauna.

Trinervitermes trinervius (Rambur)

(Text-figs. 305-307, 332-335, 371-375, 383 ; Map 28)

Termes trinervius Rambur, 1842 : 308. Type locality : SENEGAL.

Termes (Eutermes) trinervius Rambur ; Hagen, 1858 : 216.

Eutermes trinervius (Rambur) Sjöstedt, 1900 : 198.

Eutermes holmgreni von Rosen, 1912 : 224. Type locality : LIBERIA. [syn. *T. trinervius* (Rambur) Sjöstedt, 1926 : 340].

Eutermes (Trinervitermes) trinervius (Rambur) ; Holmgren, 1912 : 64.

Eutermes (Trinervitermes) holmgreni von Rosen ; Holmgren, 1912 : 65.

Eutermes posselensis Sjöstedt, 1914b : 94. Type locality : CHAD, Fort Possel. **syn. n.**

Termes (Eutermes) trinervius Rambur ; Desneux, 1915 : 9.

Trinervitermes trinervius (Rambur) Fuller, 1922 : 107.

Trinervitermes posselensis (Sjöstedt) Sjöstedt, 1926 : 348.

Trinervitermes carbonarius Sjöstedt, 1926b : 158. Type locality : CONGO, Haut Uélé, Mauda.

syn. n.

Trinervitermes carbonarius Sjöstedt ; Sands, 1957 : 20.

Imago. Head capsule, frons and vertex dark chestnut to very dark sepia brown, area surrounding eye, extending to point behind and to mandible base in front paler, yellow-brown to brown ; vertex with three diverging paler streaks, and area in front of ocelli brown ; labrum yellow, postclypeus yellow-brown, clouded with brown ; antennae yellow-brown. Pronotum orange yellow to brown, meso- and metanota and other thoracic sclerites yellow, legs orange-yellow, slightly darker at base of tibia. Abdominal tergites dark sepia brown with yellow-brown margin of varying width, paler at anterior corners and sometimes in middle ; sternites yellow to orange-yellow, brown around stigmata. Wings translucent pale brown, subcosta and radius sector orange-yellow, outlined brown at base, posterior outline of radius sector continuing to near wing tip ; membrane behind radius sector with indistinct yellow-brown streak ; rest of venation narrowly brown or outlined brown.

Posterior margin of head capsule much less than semi-circular behind eyes, slightly sinuate immediately behind eyes; fontanelle pale, sharply contrasting with surrounding cuticle, Y-shaped, to short triangular owing to occlusion of posterior part by pigmented cuticle, lateral arms short, sometimes dilated terminally; eyes oval, moderately prominent in proportion to own diameter, medium sized to large relative to head width, W/E index 2.4-2.9, ocelli medium sized to large, oval, separated from eyes by one-fourteenth to three-tenths own least diameter; postclypeus moderately inflated, width 2.3-2.4 times length, anterior margin near straight to slightly concave, posterior margin convex, rounded, sometimes slightly indistinct or with slight bulge in middle; molar plate of right mandible with 7-8 ridges; antennae 17 segmented, II and III subequal, longer than VI, IV and V subequal and shorter than IV.

Pale coloured "scent" gland on anterior margin of fifth abdominal sternite of ♀ medium-sized, 0.70-1.02mm. wide, 0.20-0.30mm. long; cerci of ♀ equal to or longer than width across base, conical with somewhat irregular outline.

Pilosity on vertex consists of short curved setae of even length forming a "pelt" or "mat", and scattered longer setae among them. (Text-fig. 383).

Measurements (22 specimens from 7 localities) in millimetres.

	Range	Mean
Head width across eyes	1.78-2.17	1.85
Greatest diameter of eye	0.65-0.85	0.74
Ocellus	0.20-0.29 × 0.26-0.35	0.24 × 0.30
Ocellus to eye	0.02-0.06	0.04
Width of pronotum	1.63-2.07	1.86
Length of pronotum	1.03-1.15	1.11
Length of hind tibia	2.33-2.86	2.49
Length of fore wing	16.40-21.50	19.96

Soldiers. Major soldier: head capsule, chestnut brown to nearly pitch black, nose dark chestnut brown to pitch black with reddish tip; antennae yellow-brown. Pronotum, anterior lobe yellow-brown, posterior lobe, meso- and metanota, legs and abdominal sternites yellow; abdominal tergites yellow to brown.

Head capsule in plan view short oval to slightly wider than length, nose near cylindrical to weakly conical. In profile distinctly concave, with back of head rising from above or slightly behind antennal socket, and evenly rounded; nose slightly shorter to distinctly longer than rest of head capsule, measuring from antennal socket, angle of nose cone 5-10 degrees; antennae 13-14 segmented, 6 out of 7 with 14, II, IV, V, and VI subequal and slightly shorter than III, in 13 segmented forms III longer and usually partly subdivided. Head setae confined to 4 at nose tip and very few small pale setae behind these; dorsal surface of head capsule without prominent setae, sometimes minute traces of bilaterally placed pair on vertex present.

Middle abdominal tergites with scattered minute setae, visible in profile, longer on posterior two tergites; sternites with short backward and longer downward and forward directed setae, the latter on posterior margins and 2 or more times length of shorter.

Minor soldier: colour as major soldier, antennae 12-14 segmented, proportions of basal segments variable.

Measurements (Major soldiers, 64 specimens from 19 localities, minor soldiers, 6 specimens from 4 localities) in millimetres.

<i>Major Soldiers:</i>	Range	Mean
Head length to tip of nose	2.11-2.70	2.47
Head width	1.18-1.73	1.48
Depth of head capsule	0.86-1.20	0.88
Width of pronotum	0.53-0.74	0.68
Length of pronotum	0.28-0.38	0.32
Length of hind tibia	1.48-2.01	1.78

Minor Soldiers :	Range	Mean
Head length to tip of nose	1.73-2.04	1.90
Head width	0.78-0.94	0.86
Depth of head capsule	0.58-0.72	0.65
Width of head capsule	0.43-0.55	0.50
Length of pronotum	0.20-0.29	0.24
Length of hind tibia	1.39-1.68	1.54

Variation. In the imago, there are sometimes small diverging depressions on the frons. The large variation in eye size results in specimens of very different general appearance, and there is some indication of a cline in this character from moister to drier areas, the largest eyes occurring in the moister southern vegetation types.

The "major" and "minor" soldier castes are not always distinctly separable. It appears to be characteristic of the largest colonies that a complete gradation of intermediate forms develops.

The imago of *T. trinervius* closely resembles that of *T. geminatus*, but is usually darker in colour, with larger eyes, a slightly more inflated postclypeus and longer ♀ cerci; there is however an overlap in all these characters, and since the two species are sympatric, they constitute a further example of near-siblings among termites. The soldiers are usually distinguishable by the more hairy nose tip and darker coloured abdominal tergites of *T. geminatus*. *T. oeconomus* is also closely similar in the imago, but is distinguished by the vertex pilosity.

Among allopatric species, only the darker soldiers of *T. gratiosus* closely resemble *T. trinervius*, and are in some cases virtually indistinguishable, though usually much shorter-nosed.

The close similarity of *T. trinervius* to *T. geminatus* and *T. oeconomus* has in the past led to confusion which has arisen mainly because the unique holotype ♂ imago lacks the head. Rambur (1842) omitted mentioning the head or its absence, while including it in descriptions of other species; it can thus be presumed that the holotype was headless when he described it. Hagen (1858) noted the deficiency.

Walker (1853) described as *T. trinervius* a specimen of *T. oeconomus* labelled "Tripoli", but this must have come from tropical Africa, probably the Sudan. The reference of Sjöstedt (1900) is included in the synonymy because of the change of genus involved; the specimens described were probably again *T. oeconomus*, though some from South Africa were included. The specimens described by Silvestri have not been examined, but would appear to have been *T. geminatus*; some of the material collected by Silvestri in Senegal was however *T. trinervius*.

I have found no reliable specific characters in the pronotum shape, colour, or pilosity, nor are the outlines of meso- and metanota of any value in *Trinervitermes*. The legs are not distinctive in closely related species, and the abdominal characters occur in the ♀. I therefore think it unlikely that the use of Rambur's name will ever be finally settled by examination of the holotype. The general appearance, the colouration, and the shape of the ♂ cerci of this specimen, though not conclusive, appear to me to be most consistent with the species hitherto known as *T. posselensis* of which *T. carbonarius* is a junior synonym. In spite of usage by some authors subsequent to Rambur, I consider it inadvisable to use *T. trinervius* as senior synonym to *T. oeconomus*, since that species is well known and established under its present name, with adequate type material and several junior synonyms.

Type Material. SENEGAL : no detailed locality, no date, holotype, unique headless ♂ imago, *T. trinervius* (Rambur), Selys Longchamps coll., Inst. R. Sci. Nat., Brussels.

CENTRAL AFRICAN REPUBLIC : Fort Possel, xi.1910 (*H. Schubotz*), syntype soldiers, type colony, *T. posselensis* (Sjöstedt), A.M.N.H. (other syntypes in Mus. Hamburg and Naturhist. Riksmus., Stockholm).

CONGO : " Haut Uélé ", Mauda, 27.ii.1925 (*H. Schouteden*). [See discussion on Type locality of *T. maudanicus* Sjöstedt.] Syntype soldiers, type colony, *T. carbonarius* Sjöstedt, Naturhist. Riksmus., Stockholm (other syntypes in Mus. Tervuren).

Other Material. SENEGAL : Dakar, 2.viii.1912 (*F. Silvestri*), A.M.N.H.

GUINEA : Conakry, 8.viii.1912 (*F. Silvestri*), A.M.N.H. ; Mt. Nimba, 1957, 4 vials (*M. Lamotte*), Inst. Franc. d'Afr. Noire, Dakar.

SIERRA LEONE : Cape S. Leone, 1858 (*J. Foxcroft*).

LIBERIA : 1908 (*Scherer*), A.M.N.H. [? paratype *E. holmgreni* von Rosen].

IVORY COAST : Dabou, 50km. W. of Abidjan, 1962-1964, 12 vials (*P. Bodot*).

GHANA : 36m. from Accra on Ada Road, 18.ii.1955, Nungua, 16.ii.1955, and 14-16.vi.1956, 5 vials (*W. Belfield*) ; Accra and 11½m. from Accra on Kumasi Road, 14-16.vi.1959, 60m. N. of Ejura on Tamale Road, 24.ii.1959, 16m. from Daboya on Tamale Road, 28.ii.1959, 55m. from Tamale on Larabanga Road, 3.iii.1959, Volta Bridge on Bolgatanga-Bawku Road, 8.iii.1959, 12m. N. of Navrongo, 14.iii.1959, 11m. from Tumu on Navrongo Road, 15.iii.1959, 6m. from Tumu on Lawra Road, 16.iii.1959, 9m. N. of Lawra on Nandom Road, 18.iii.1959, 52m. from Wa on Bole Road, 20.iii.1959, 22m. from Larabanga on Tamale Road, 24.iii.1959, 16m. from Nkoranza on Kintampo Road, 28.iii.1959 (*W. A. Sands*).

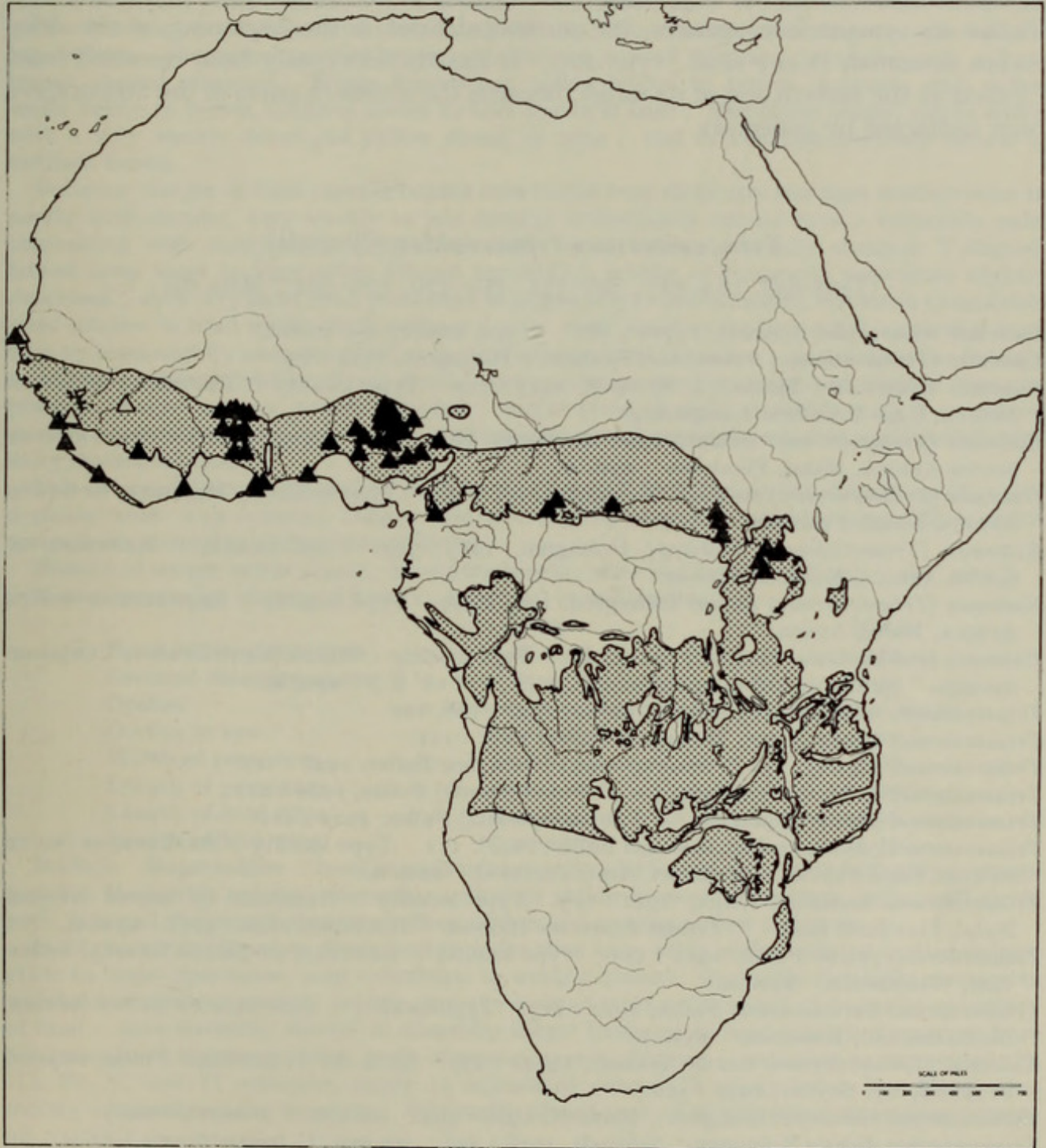
NIGERIA : Western Region ; Lagos, Ebute Metta, 7.v.1936 (*T. Scott*). Northern Region ; 13m. S. of Makurdi, 1954, 18m. from Kaduna on Zaria Road, 1954, 60m. from Kaduna on Jos Road, 1954, and 7m. S. of Zaria, 1954 (*J. B. MacNulty*) ; 17m. S. of Zungeru on Bida Road, 21.xii.1956, 40m. from Abuja on Bida Road, 24.xii.1956, 20m. from Abuja on Keffi Road, Idu, 28.xii.1956, 18-22m. from Kaduna on Kachia Road, 30.i.1957, 4 vials, Kудару, on Zaria-Jos Road, 5.ii.1957, 4 vials, 5m. from Jos on Bukuru Road, and 6m. from Jos on Bauchi Road, 6.ii.1957, 42m. from Jos on Wamba Road, 8.ii.1957, 18m. from Jos on Pankshin Road, 14.ii.1957, 50 and 56m. from Kaduna on Jos Road, 15.ii.1957, 2 vials, 11m. from Kaduna on Zungeru Road, 28.ii.1957, 24m. from Jos on Pankshin Road, 3.iv.1957, and 27.x.1957, 2 vials, 25-32m. from Jos on Kaduna Road, 5.iv.1957, 2 vials, 7m. from Bauchi on Gombe Road, 7.v.1957, 3m. from Jalingo on Yola Road, 17.v.1957, 114m. S.W. of Jalingo on Takum Road via Beli, 18.v.1957, 4-6m. S. of Ilorin on Oyo Road, 4.xii.1957, 2 vials, 12m. from Keffi on Makurdi Road, 24.ii.1958, 4m. from Gboko on Oturkpo Road, 26.ii.1958, 22m. from Lokoja on Kabba Road, 10.iii.1958, and Samaru, near Zaria, 10.ix.1957, vi-vii.1959, 4 vials (*W. A. Sands*).

CAMEROUN : Near Mbalmayo, Presidency halt, 18.x.1962 (*G. Becker*), own collection.

CENTRAL AFRICAN REPUBLIC : Bangui, 1948 (*A. E. Emerson*), Bangassou, iii.1948 (*N. A. Weber*), A.M.N.H.

CONGO : Faradje, 1912 (*H. Lang, J. P. Chapin*), A.M.N.H. ; Garamba Nat. Park, 30.vii.1952 (*H. de Saeger*), Inst. des Parcs Nat. du Congo, Brussels.

UGANDA : Ngotokwe, Lango, iii.1942, and Serere, x.1948 (*W. V. Harris*) ; Lale,



MAP 28. *Trinervitermes trinervius*. Vegetation types : 8, 16, and 17.

Lake Kyoga near Soroti, 15.x.1952 (*W. A. Sands*) ; Kampala, iv.1955, 55 and 58m. from Kampala on Masindi Road, 2 vials, 7.xi.1955 (*R. M. C. Williams*).

A total of 92 nest series were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

The biology of this species has been discussed under its junior synonym *T. carbonarius* in earlier papers (Sands, 1961, 1961a). It is another of the species occurring in the Guinean savannah vegetation zones (Keay *et al.*, 1959, types 8, 16, and 17). Unlike its sympatric congeners, its northward limit is the beginning of the drier Sudan savannah (Keay *et al.*, type 20). It has therefore only been recorded from Uganda at the eastern end of its range, because the southern parts of the Sudan have been neglected by collectors.

Trinervitermes trinervoides (Sjöstedt)

(Text-figs. 184-187, 326-331, 359-370, 379-382 ; Map 29)

Eutermes trinervoides Sjöstedt, 1911a : 186. [Type locality not stated].

Eutermes (*Trinervitermes*) *trinervoides* Sjöstedt ; Holmgren, 1912 : 65.

Eutermes trinervoides Sjöstedt ; Sjöstedt, 1913 : 720. Type locality : REPUBLIC OF SOUTH AFRICA, Cape Province, Laingsburg.

Eutermes (*Trinervitermes*) *trinerviformis* Holmgren, 1913 : 336. Type locality : REPUBLIC OF SOUTH AFRICA, Natal, Pinetown. **syn. n.**

Eutermes (*Trinervitermes*) *auriceps* Holmgren, 1913 : 338. Type locality : REPUBLIC OF SOUTH AFRICA, Natal, Pinetown.

Eutermes (*Trinervitermes*) *bulbiceps* Holmgren, 1913 : 339. Type locality : REPUBLIC OF SOUTH AFRICA, Natal, Pinetown.

Eutermes (*Trinervitermes*) *dubius* Holmgren, 1913 : 339. Type locality : REPUBLIC OF SOUTH AFRICA, Natal, Avoca.

Eutermes hentschelianus Sjöstedt, 1914a : 88. Type locality : SOUTH WEST AFRICA, " Otjosondyombo " [probably Otjosongombe, 20° 31' S., 17° 18' E.]. **syn. n.**

Trinervitermes trinervoides (Sjöstedt) Fuller, 1922 : 108, 110.

Trinervitermes trinerviformis Holmgren Fuller, 1922 : 111.

Trinervitermes auriceps [= *T. trinerviformis*] Holmgren Fuller, 1922 : 111.

Trinervitermes bulbiceps Holmgren [= *T. trinerviformis*] Fuller, 1922 : 111.

Trinervitermes dubius Holmgren [= *T. trinerviformis*] Fuller, 1922 : 111.

Trinervitermes gemellus subsp. *thomsoni* Fuller, 1922 : 111. Type locality : REPUBLIC OF SOUTH AFRICA, Cape Province, Somerset West, Pearston. **syn. n.**

Trinervitermes havilandi Fuller, 1922 : 113. Type locality : REPUBLIC OF SOUTH AFRICA, Natal, Haviland Rail. [" *Termes trinervius* Rambur " Haviland, 1898 : 421]. **syn. n.**

Trinervitermes fuscus Fuller, 1922 : 113. Type locality : REPUBLIC OF SOUTH AFRICA, Transvaal, Warmbaths. **syn. n.**

Trinervitermes kurumanensis Fuller, 1922 : 113. Type locality : REPUBLIC OF SOUTH AFRICA, Bechuanaland, Kuruman. **syn. n.**

Eutermes (*Trinervitermes*) *messor* Sjöstedt, 1924a : 257. [n. n. for *T. havilandi* Fuller, reduced to synonymy, Snyder, 1949 : 326.]

Trinervitermes bulbiceps Holmgren ; Sjöstedt, 1926 : 342. [ex syn. *T. trinerviformis*.]

Trinervitermes dubius Holmgren ; Sjöstedt, 1926 : 342. [ex syn. *T. trinerviformis*.]

Trinervitermes auriceps Holmgren [= *T. trinervoides*]; Sjöstedt, 1926 : 346. [ex syn. *T. trinerviformis*.]

Trinervitermes hentschelianus (Sjöstedt) Sjöstedt, 1926 : 344.

Nasutitermes (*Trinervitermes*) *messor* (Sjöstedt) Emerson, 1928 : 416.

Trinervitermes hilli Snyder and Emerson ; in Snyder, 1949 : 327. [n. n. for *Eutermes* (*Trinervitermes*) *bulbiceps* Holmgren, junior primary homonym of *Eutermes* (*Eutermes*) *bulbiceps* Holmgren.] **syn. n.**

Imago. Head capsule, frons and vertex yellow-brown to dark sepia brown, sometimes paler around eyes, in front of ocelli, and bordering posterior margin of postclypeus ; vertex with or without one to three diverging paler streaks ; labrum yellow, postclypeus yellow to yellow-brown, strikingly paler than head in dark forms ; antennae yellow to yellow-brown. Pronotum yellow to sepia brown, meso- and metanota yellow to yellow-brown, other thoracic sclerites and legs yellow. Abdominal tergites brown, sepia brown around stigmata ; sternites pale yellow, brown around stigmata. Wings translucent yellow-brown to brown, subcosta and radius sector yellow to brown, outlined brown to dark brown at base ; membrane behind radius sector with a very weakly developed yellow streak or none ; rest of venation narrowly brown or outlined brown.

Posterior margin of head capsule behind eyes varies from distinctly less than semi-circular to nearly semi-circular, very weakly or not sinuate immediately behind eyes ; fontanelle pale, contrasting with surrounding cuticle especially in dark forms, usually elongate Y-shaped, lateral arms short to long, often dilated terminally, middle of fontanelle sometimes slightly depressed ; eyes very short oval, prominent in proportion to own diameter, but small to medium-sized relative to head width, W/E index 3.3–3.9, ocelli small to medium-sized, separated from eyes by from slightly over one-third to more than own least diameter ; postclypeus moderately to strongly inflated, width 1.8–2.4 times length, anterior margin straight or slightly concave, posterior margin convex, evenly rounded ; molar plate of right mandible with 8–10 ridges, usually 9 ; antennae 15–17 segmented, proportions of basal segments variable, partly subdivided in 15 segmented forms.

Pale coloured " scent " gland on anterior margin of ♀ fifth abdominal sternite small, 0.46–0.56mm. wide, 0.13–0.20mm. long ; cerci of ♀ slightly shorter to slightly longer than width across base, conical or slightly mamilliform.

Pilosity of vertex rather sparse, of varying length, setae not forming a " pelt " or " mat ".

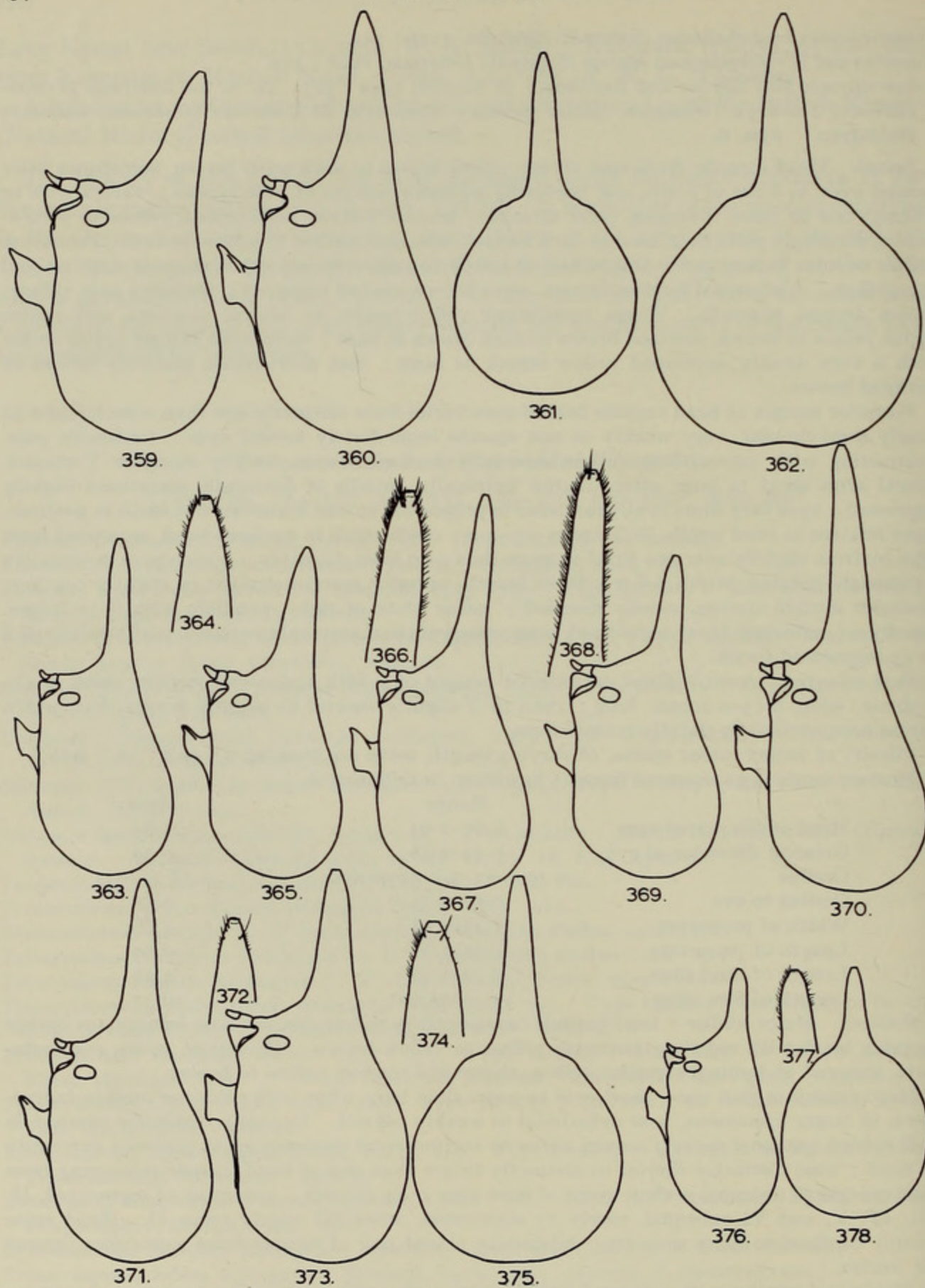
Measurements (43 specimens from 25 localities) in millimetres.

	Range	Mean
Head width across eyes	1.61–2.03	1.80
Greatest diameter of eye	0.43–0.56	0.50
Ocellus	0.10–0.23 × 0.16–0.25	0.18 × 0.24
Ocellus to eye	0.07–0.15	0.10
Width of pronotum	1.48–1.94	1.66
Length of pronotum	0.92–1.18	0.99
Length of hind tibia	2.02–2.47	2.26
Length of fore wing	15.30–22.60	19.37

Soldiers. Major soldier : head capsule orange-yellow to ferruginous, nose ferruginous orange to pitch black with red tip ; antennae yellow to yellow-brown. Pronotum, meso- and metanota, legs and abdominal sternites yellow, abdominal tergites yellow to brown.

Head capsule in plan view, short oval to wider than long, often with posterior median indentation in larger specimens, nose cylindrical to weakly conical. In profile distinctly concave to well behind antennal socket, convex curve to occiput most pronounced at posterior extremity of head ; nose distinctly shorter to distinctly longer than rest of head capsule measuring from hind margin of antennal socket, angle of nose cone 0–14 degrees ; antennae 14 segmented, II, III, IV, V, and VI subequal, rarely 13 segmented, when III nearly twice II. Head setae mainly confined to hairy nose tip ; bilaterally placed pair of minute setae sometimes present on vertex.

Abdominal tergites with scattered minute setae and longer setae on hind margins, becoming more pronounced on posterior tergites ; sternites with scattered shorter backwardly directed



FIGS. 359-378 : *Trinervitermes*, soldier head capsule, side and plan views, and nose tip.
 359-370, *T. trinervoides* ; 371-375, *T. trinervius* ; 376-378, *T. arabiae*.

setae, up to two-thirds length of long fine setae on posterior margins directed downwards and slightly forwards.

Minor soldiers : as major soldiers, except head capsule in plan more oval, sometimes slightly constricted behind antennae.

Measurements (Major soldiers, 56 specimens from 20 localities, minor soldiers, 15 specimens from 8 localities) in millimetres.

<i>Major Soldiers :</i>		Range	Mean
Head length to tip of nose	.	2.04-2.96	2.45
Head width	.	1.09-1.76	1.32
Depth of head capsule	.	0.78-1.17	0.91
Width of pronotum	.	0.55-0.84	0.65
Length of pronotum	.	0.26-0.46	0.34
Length of hind tibia	.	1.43-2.45	1.75
<i>Minor Soldiers :</i>		Range	Mean
Head length to tip of nose	.	1.64-2.00	1.86
Head width	.	0.78-1.00	0.82
Depth of head capsule	.	0.59-0.75	0.65
Width of pronotum	.	0.48-0.61	0.52
Length of pronotum	.	0.18-0.25	0.24
Length of hind tibia	.	1.38-1.89	1.54

Variation. The range of variation in this species is very great : specimens from different localities may differ from each other more than some genuine species from other parts of the African continent.

In the imago, the extremes of colour have been given, but there is also variation in the distribution of lighter and darker shades of pigmentation on head and body. The variation in shape of head capsule, size of eyes and ocelli, and degree of inflation of postclypeus may combine with colour patterns to produce a very different appearance. The soldier caste often provides more reliable identification in this species.

There appear to be variant forms of imago and soldier castes occurring more frequently in certain ecological conditions, especially those associated with altitude. Several of these forms were given specific names by earlier authors, on the basis of the more limited samples of material available to them. These variants appear to be locally stable in limited populations, but it must be emphasized that in the large amount of material now examined, every gradation of intermediate between them has been found, and in addition a number of other minor forms of only very local importance have been observed.

In the most distinctive of these variants the imago head is dark brown and the pronotum sepia brown, associated with a soldier caste in which the nose is rather short, slender, and dark in colour. This was described by Fuller (1922) as *fuscus*, and appears commonest at altitudes from 3,000-5,000 feet.

The name *trinervoides* was applied by Sjöstedt (1911a) to another form, most frequent in the southern part of Cape Province, at moderate to low altitudes. The imago head capsule is more broadly rounded posteriorly, and chestnut brown in colour ; the pronotum is yellow. The associated soldiers have a rather short, thicker nose, though a thinner-nosed form was described by Fuller (1922) as *gemellus* subsp. *thomsoni*. In these southern specimens the postclypeus is often more inflated than in those from further north.

The third important variant is that in which the soldier caste is large with the nose longer than the rest of the head ; the imago is similar in shape to *fuscus* although generally larger, with *trinervoides*-type colouration, and often with larger eyes in proportion to its size than the southern specimens. This form has been named *hentschelianus* (Sjöstedt), *trinerviformis* (Holmgren), *havilandi* and *kurumanensis* Fuller, and *hilli* Snyder and Emerson, from various localities. It appears to be most common in the rather dry *Acacia-Commiphora* wooded steppe and the slightly less dry intermediate savannah (Keay *et al.*, 1959, vegetation types 25 and 20)

of the more northern Cape Province and Transvaal at altitudes from 1,600 to 3,000–4,000 feet. It also occurs in parts of Natal and the Orange Free State.

In the moist lowlands of Zululand the smallest and palest coloured specimens are found, and these if placed alongside the *fuscus* form appear completely dissimilar. The gradual change can be followed inland with specimens from increasing altitudes through Natal to the uplands of Transvaal.

I have considered retaining the specific names of the synonyms to designate subspecies ; in view of the occurrence of every gradation of intermediate between the variants, and of apparent exceptions to the geographical distributions outlined above, I believe it is inadvisable to do so at present.

The situation in *T. trinervoides* would seem to be as follows :

It is the only species of *Trinervitermes* inhabiting the limits of subtropical and temperate South Africa. In so doing it has left behind congeners which might compete with it. South Africa has a very wide range of ecological conditions, which have given rise to correspondingly wide variation in this species. Whether or not the forms recognized constitute true allopatric subspecies, sections of one or more clines, or genetically heterogeneous variants of similar appearance induced by similar ecological conditions in different areas ("polytopic" subspecies, Mayr, 1953) can only be shown by further studies. It may be noted that a "*fuscus*"-like form of *T. dispar* has also been found at an altitude of 3,000–5,000 feet in Natal, perhaps lending weight to the latter suggestion. It has also been observed that the nose-length of soldiers of all species and genera tends to be greater in the drier steppe vegetation of the interior.

The smaller specimens of *T. trinervoides* resemble *T. rapulum* in both imago and soldier castes. In addition to the characters given in the keys, the imago has usually a larger and differently shaped fontanelle and the head viewed from above is straight between the ocelli rather than indented in the middle around the fontanelle. The soldier has a much more hairy nose tip, and is distinguished from both *T. rapulum* and *T. rhodesiensis* by the rounder plan view of the head capsule. The imago differs from *T. rhodesiensis* in having the ocelli further from the eye, and the ventral "scent" gland distinctly smaller.

The larger, more typical specimens of *T. trinervoides* are unlikely to be confused with either of their partly sympatric congeners. The 9 or 10 ridges on the molar plate of the right imago mandible are a useful additional character, and the ♀ cerci are usually shorter.

Type Material. REPUBLIC OF SOUTH AFRICA : Cape Province, Laingsburg, no date (*Brunnthal*), syntype ♀ imago and soldiers, type colony, *T. trinervoides* (Sjöstedt), A.M.N.H., (other syntypes in Naturhist. Riksmus., Stockholm) ; Natal, Pinetown, 1905 (*I. Trägårdh*), syntype soldier, type colony, *T. trinerviiformis* Holmgren, A.M.N.H. and B.M.(N.H.), (other syntypes in Naturhist. Riksmus., Stockholm) ; Cape Province, Somerset West, Pearston, xi.1920 (*F. Thomsen*), syntype ♀ imago and soldier, type colony, *T. gemellus* ssp. *thomsoni* Fuller, A.M.N.H. (other syntypes in N.C.I., Pretoria) ; Natal, Haviland Rail, 1894 (*G. D. Haviland*), syntype soldiers from type colony, *T. havilandi* Fuller, A.M.N.H. and B.M.(N.H.),

(other syntypes in N.C.I., Pretoria) ; Transvaal, Warmbaths, xi.1920 and De Wildt, xi.1920 (*C. Fuller*), syntype ♂ and ♀ imagos and soldiers, *T. fuscus* Fuller, A.M.N.H. and B.M.(N.H.), (other syntypes in N.C.I., Pretoria) ; Cape Province, Kuruman, xi.1916 (*F. Thomsen*), syntype soldiers, type colony, *T. kurumanensis* Fuller, A.M.N.H. and B.M.(N.H.), (other syntypes in N.C.I., Pretoria) ; Natal, Haviland Rail, 1894 (*G. D. Haviland*), syntype queen and soldiers, type colony,



MAP 29. *Trinervitermes trinervoides*. Vegetation types : 6, 9, 15, 20, 25, 28, and 29.

E.(T). messor Sjöstedt, A.M.N.H. and B.M.(N.H.) ; Natal, Pinetown, 1905 (*I. Trägårdh*), syntype, type colony, *T. hilli* Snyder and Emerson (*T. bulbiceps* Holmgren), A.M.N.H. (other syntypes in Naturhist. Riksmus., Stockholm).

SOUTH WEST AFRICA : "Otjosondyombo am Eiab", vi.1909 (*O. Hentschel*) [probably Otjosongombe, 20° 31' S., 17° 18' E.], syntype soldiers, type colony, *T. hentschelianus* (Sjöstedt), A.M.N.H., (other syntypes in Mus. Hamburg and Naturhist. Riksmus., Stockholm).

Other Material. SOUTHERN RHODESIA : Salisbury, 16.xii.1936, and Inyanga, i.1939 (*A. Cuthbertson*).

MOZAMBIQUE : Chinavane, Lourenço Marques, 18.xii.1918 (*C. Fuller*) ; 17.x.1952 (*W. V. Harris*).

SWAZILAND : no data (*J. B. Buchanan*) ; N. of Umbuluzi R., vi.1921 (*C. Fuller*) ; 7 and 13m. from Mbabane on Bremersdorp Road, and 2m. from junction of Piggs Peak and Lochiel-Mbabane Roads, 8.vi.1956 (*J. H. Gröbler*) ; Piggs Peak to Komati R., 22-3.x.1960, 4 vials, 4m. from Stegi on Gollel Road, 24.x.1960, 2 vials, 6m. from Gollel on Hluti Road, 9m. from Goedgedund on Mankaiana Road, and 2m. from Mankaiana on Mbabane Road, 25.x.1960 (*W. G. H. Coaton* and *J. L. Sheasby*).

BASUTOLAND : no detailed locality, 1.xii.1939 (*no collector*).

REPUBLIC OF SOUTH AFRICA : In addition to that already at the B.M.(N.H.), all the material from the N.C.I., Pretoria has been received and examined. This covers every part of the Republic, and there is no point in giving details of localities or collectors, although a list is available at the B.M.(N.H.). The numbers examined have been as follows : Transvaal, 123 nest series ; Orange Free State, 83 nest series ; Cape Province, 406 nest series. A total of exactly 800 nest series of this species were examined, and all material is in the British Museum (Natural History) unless otherwise stated.

T. trinervoides is the commonest species south of the River Limpopo in sub-tropical and temperate South Africa, and its most northerly records are from Salisbury, Southern Rhodesia. It covers a wide range of climatic and vegetation types, from the dry subdesert steppe of the interior of Cape Province to the moist tropical coastal savannah forest mosaic of Natal and Mozambique (*Keay et al.*, 1959, types 6, 9, 15, 20, 25, 28, 29, and 30).

The mounds of this species have been described as varying from hemispherical up to 6 feet in diameter, to columnar, 6 feet high. Quantities of cut grass are stored in the mounds as in many other species.

BAUCALIOTERMES gen. n.

(Baucalion, Gr. "narrow-necked bottle").

Type-species, *Subulitermes hainesi* Fuller.

Imago. Left mandible with apical and first marginal teeth subequal, distance from apical to first marginal (worn specimen) slightly less than one-third distance between first and third marginals (index 30), second marginal obsolete, cutting edge between first and third marginals entire, straight ; right mandible with apical and first marginal subequal as left, cutting posterior edge of first marginal longer than that of second marginal, molar plate with no marked irregu-

larity in surface view, and 7-8 transverse ridges, first much larger than rest, forming a blunt tooth, the more posterior ridges less prominent. Postclypeus, length slightly less than half width. Fontanelle in ♂, small, pale, irregularly Y-shaped; in ♀, trapezoid with lateral arms extending from anterior corners and slightly dilated terminally; both sexes with smooth shallowly depressed area behind fontanelle coloured as rest of head. Pilosity of head capsule uneven, sockets of varying size from small to large, the latter numerous and conspicuous.

Soldier. Monomorphic. Nose very thin and cylindrical, at most slightly tapering. Vestigial mandibles without points. Head capsule not constricted. Antennae 12-14 segmented, usually 14. Sockets of minute setae clearly visible as pale spots scattered over entire head capsule including nose.

This genus is named to accommodate the single species *B. hainesi*, known only from the arid areas of Cape Province, South Africa, which was first described in the genus *Subulitermes* and latterly transferred to *Trinervitermes*. However, the coarser pilosity with more conspicuous seta sockets distinguishes it from all known *Trinervitermes*, and in addition the distribution of the lighter coloured areas of the imago head does not agree with that genus. In the soldier, the visible seta sockets are again the main distinguishing feature, being absent in *Trinervitermes*, which also has a dimorphic soldier caste. It is expected that when fresh winged imagos of *Baucalitermes* are discovered, further generic differences will become clearer; for example, in the queen secondary sclerotizations of the abdomen obscure the outlines of the "scent" gland on the front margin of the 5th abdominal sternite, but it appears to be very small, and absent in the king. In *Trinervitermes* this gland is clearly visible even when not large.

These two genera are closely related, as is shown by the similarity of imago and worker mandibles, which are distinct from other genera of the Ethiopian Zoogeographical Region.

***Baucalitermes hainesi* (Fuller) comb. n.**

(Text-figs. 196, 197, 336, 337, 386, 387, 396-398; Map 3)

Subulitermes hainesi Fuller, 1922: 115. Type locality: REPUBLIC OF SOUTH AFRICA, Cape Province, Steinkopf, Wolfdoon, Kenhardt.

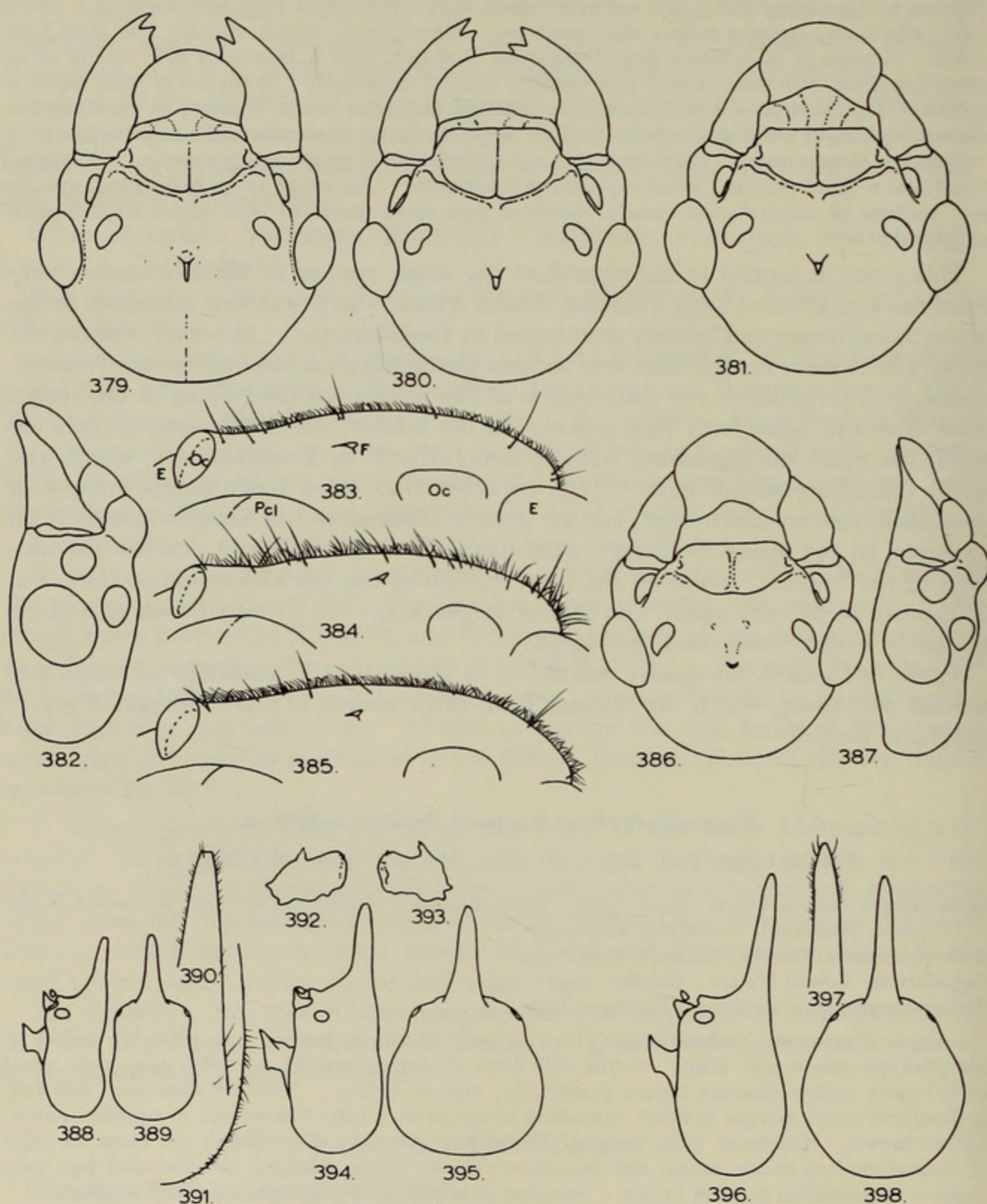
Eutermes hainesi (Fuller) Sjöstedt, 1926: 310.

Subulitermes hainesi Fuller; Snyder, 1949: 339.

Trinervitermes hainesi (Fuller) Emerson, 1960: 2.

Imago. Previously undescribed. Head capsule chestnut brown, but probably faded in morphotype queen and king; vertex with faint diverging streaks scarcely paler than rest; postclypeus yellow clouded brown posteriorly, labrum yellow. Area between eye, antennal socket, and lower margin of head, extending along latter a little behind eye in rounded patch, yellow-brown. Antennae pale yellow. Pronotum yellow, yellow-brown in front of pale Y-shaped median patch, meso- and metanota yellow; other thoracic sclerites and legs pale yellow. Abdominal tergites brown; sternites pale yellow-brown, brown around stigmata.

Posterior margin of head capsule behind eyes much less than semi-circular, slightly sinuate immediately behind eyes; eyes somewhat angularly oval, moderately prominent in proportion to own diameter, small relative to head width, W/E index 3.2-3.4; ocelli small, oval, separated from eyes by under one-third to over two-fifths own least diameter; postclypeus moderately inflated, width 2.0-2.4 times length, anterior margin nearly straight, posterior margin convex, rounded; antennae broken, II and V subequal, and longer than III which is longer than IV.



FIGS. 379-398 : 379-382, *Trinervitermes trinervoides*, front and side views of imago head capsule ; 383-385, *Trinervitermes* vertex pilosity (383, *T. trinervius*, 384, *T. oekonomus*, 385, *T. geminatus*) ; 386, 387, and 396-398, *Baucaliotermes hainesi*, imago and soldier head capsules ; 388-395, *Mycterotermes meringocephalus*, head capsules of major and minor soldiers (391, vertex pilosity, 392, 393, major soldier mandibles).

Cerci of ♀ longer than width across base, conical.

Other characters are given in the generic diagnosis.

Measurements (2 specimens from 1 locality) in millimetres.

	Range
Head width across eyes	1.61-1.66
Greatest diameter of eye	0.47-0.53
Ocellus	0.16 × 0.23
Ocellus to eye	0.05-0.07
Width of pronotum	1.45-1.53
Length of pronotum	0.82-0.92
Length of hind tibia	2.09-2.12

Morphotype : REPUBLIC OF SOUTH AFRICA : 70m. from Kliprand on Pofadder Road, 8.iv.1963 (*A. Barnard* and *J. N. Diederichs*), morphotype queen in N.C.I., Pretoria.

Soldier. Head capsule brown to dark sepia brown, paler around antennal socket, nose sepia brown to pitch black with yellow-brown to ferruginous tip. Pronotum and antennae yellow, legs yellow-white. Abdominal tergites yellow-brown, sternites pale yellow.

Head capsule in plan view short oval, tapering slightly towards front. In profile concave, back of head raised and rounded well behind antennal socket ; nose equal to or slightly longer than rest of head capsule, measuring from hind margin of antennal socket ; antennae, in 14 segmented form, III and V subequal, II similar length but thicker, IV and VI subequal and longer than these.

Head setae consist of a bilaterally placed pair on vertex, one or two pairs near base of nose, four at nose tip with smaller setae behind them, and minute setae scattered over entire head capsule and nose. Abdominal tergites with scattered very short setae becoming longer on hind margins and posterior segments ; sternites with short setae, and longer on hind margins.

Measurements (18 specimens from 3 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.63-2.09	1.87
Head width	0.79-1.15	0.98
Depth of head capsule	0.59-0.79	0.68
Width of pronotum	0.46-0.56	0.51
Length of pronotum	0.23-0.28	0.25
Length of hind tibia	1.25-1.79	1.55

The relationships and distinctive features of *B. hainesi* have been discussed under the generic heading.

Material. REPUBLIC OF SOUTH AFRICA : Bushmanland, Wolfdoon, and Wortel, near Gella, 1 and 5.ix.1917 (*F. Thomsen*), syntype soldiers, *B. hainesi* (Fuller), A.M.N.H. and B.M.(N.H.) ; 16m. from Pella on Springbok Road, 15.x.1961 (*J. L. Sheasby*) ; 70m. from Kliprand on Pofadder Road, 8.iv.1963, further vial with king (*A. Barnard*, *J. N. Diederichs*).

EUTERMELLUS Silvestri

Eutermellus Silvestri, 1912 : 243.

Eutermes (*Eutermellus*) Holmgren, 1912 : 64.

Eutermellus Sjöstedt, 1926 : 358.

Type species, by original designation, *Eutermellus convergens* Silvestri, 1912.

Imago. Left mandible with apical tooth distinctly longer than first marginal, but distance between them slightly shorter than that from first to third marginals (left mandible index

·96-·98), cutting edge between the latter sinuate and indented in front of third marginal, which is approximately equilateral, small subsidiary tooth just visible in gap between third marginal and molar prominence ; right mandible, apical and first marginal as left, second marginal small but distinct with concave posterior edge, molar plate in surface view without basal indentation, asymmetrical with large posterior rounded flange and smaller anterior, weakly ridged. Post-clypeus inflated, width 1·8-2·5 times length. Fontanelle variable, Y-shaped, triangular, dumb-bell-shaped or near obsolete. Eyes scarcely to distinctly set out from sides of head. Pilosity of head not particularly regular in length, with numbers of conspicuous long setae tending to occur in symmetrical pairs. Pronotum, sides weakly convergent to rounded posterior margin, length approximately two-thirds width.

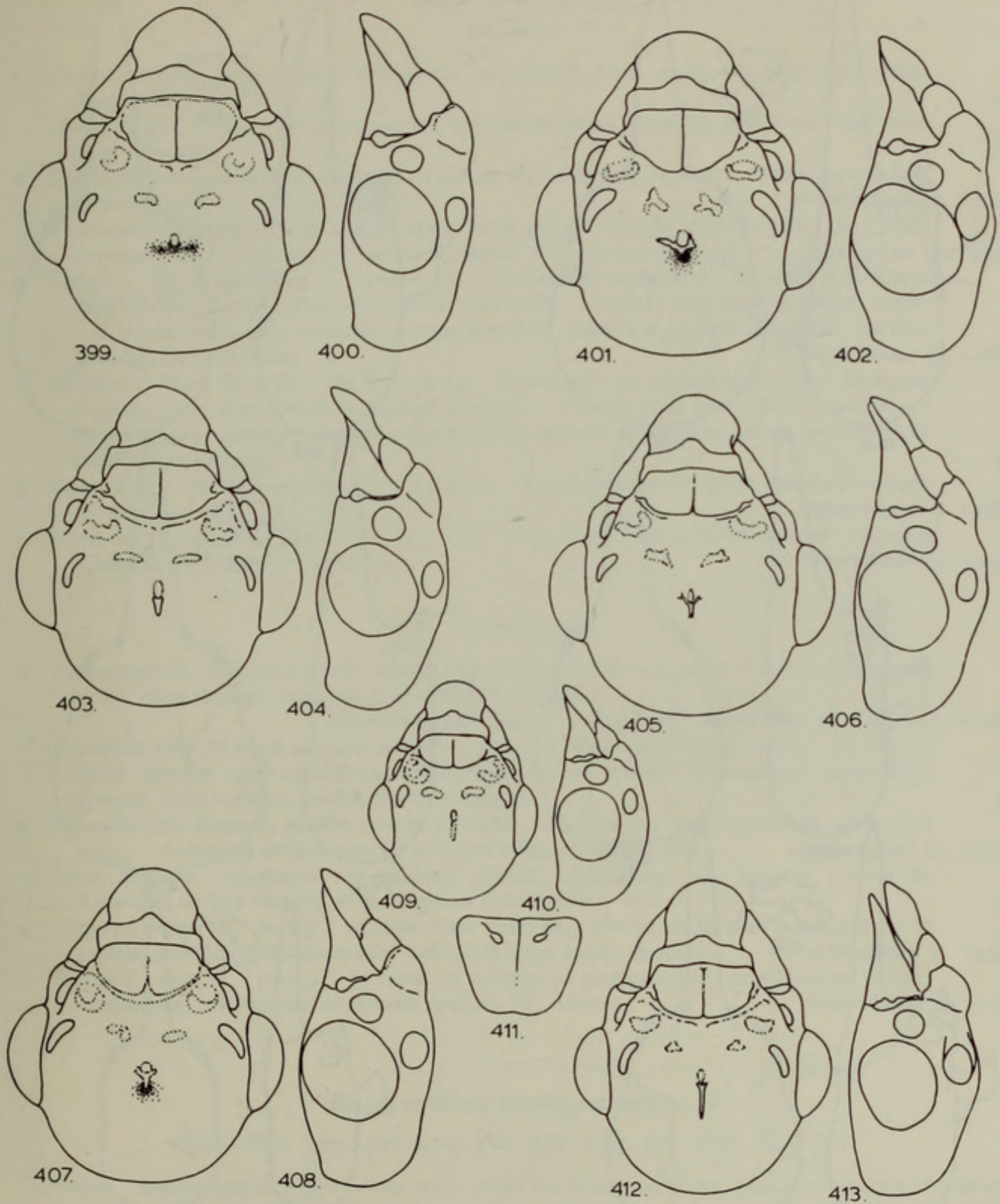
Soldier. Monomorphic. Nose conical to cylindrical, tapering to fine point, distinctly rugose. Vestigial mandibles with minute points or without, labrum with tri-lobed anterior margin. Head capsule very weakly to moderately constricted behind antennae. Antennae 13 segmented. Head and nose with scattered fine very short setae, longer at nose tip, and conspicuous longer setae arranged approximately in two rows, one in front and one behind the constriction, front row with 4-10 setae ; posterior row with 2-10. Rest of body with scattered setae of irregular length, longer on posterior margins of tergites and sternites, and towards rear of abdomen, legs with conspicuous long setae, 1 on each coxa, 3-6 on each femur and tibia, among the shorter more typical setae.

Worker. Mandibles as imago except apical tooth longer in proportion (left mandible index 1·24-1·62) and molar areas more pronounced.

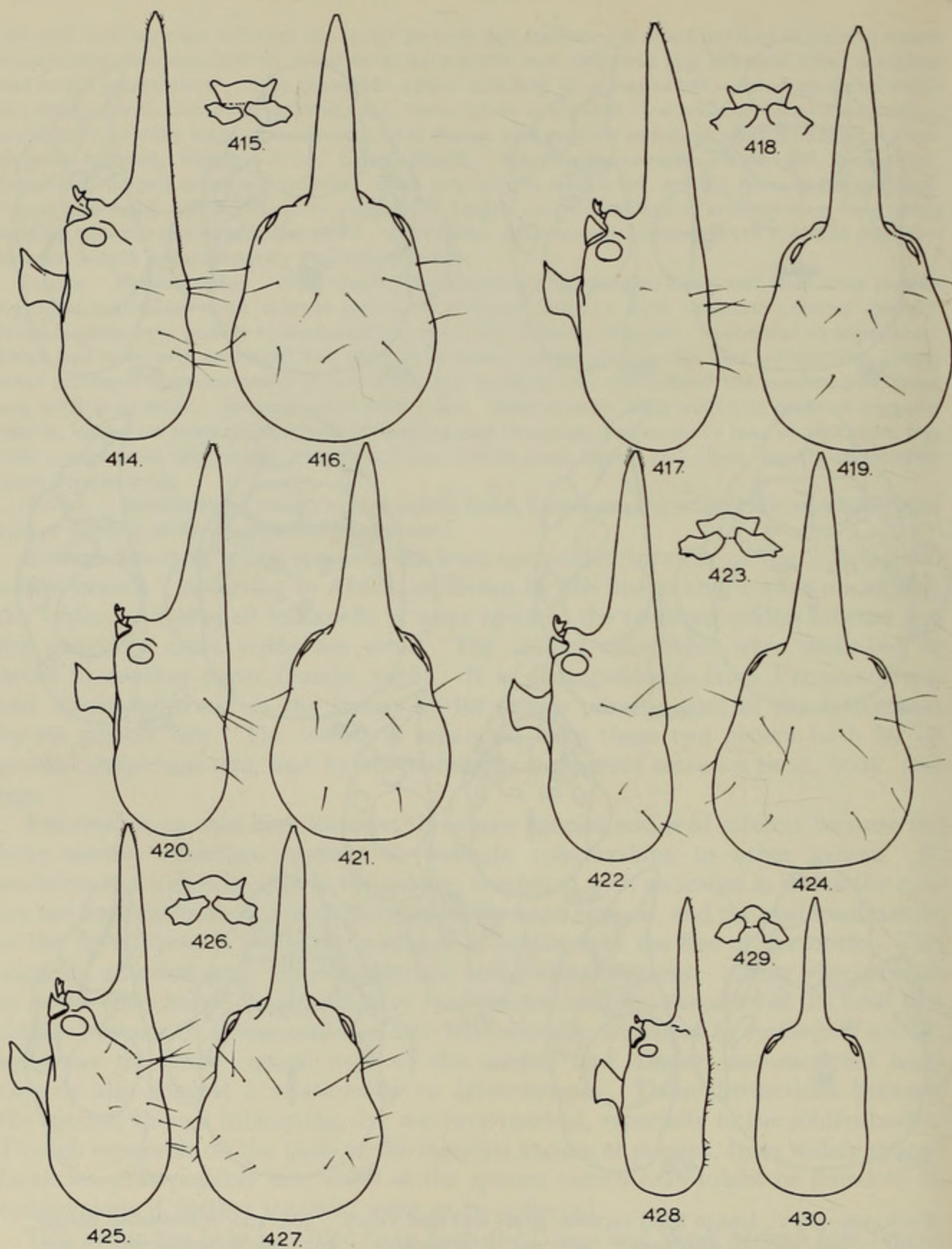
Eutermellus is in many respects the least specialized member of the "*Paracornitermes*-branch" occurring in Africa, as shown by the imago and worker mandibles, the typically Y-shaped fontanelle of some species, the tri-lobed soldier labrum and the generally more numerous setae. The soldier mandibles were described in detail in another paper (Sands, 1956). It is distinguishable from *Verrucositermes* and *Afrosubulitermes* in the imago by its denser pilosity, and in the latter case by its greater size. The soldier is separated from these two genera both by its general shape and size, and by the numerous prominent setae on head, body, and legs.

Eutermellus as used here includes three new species and is of interest because the inter-specific variation appears to indicate relationships to other genera. *E. undulans* has a slender nose in the soldier, combined with an imago in which the eyes are not noticeably set out from the sides of the head capsule, and the posterior margin of the postclypeus is indistinct, merging in profile with the line of the frons. This suggests affinities with *Afrosubulitermes* and *Postsubulitermes*. Other species such as *E. abruptus* and *E. bipartitus* have the eyes set out from the sides of the head in a similar manner to *Verrucositermes* and *Mimeutermes*, whilst in *E. convergens* and *E. aquilinus* the more conical nose of the soldier and almost unconstricted head capsule also suggest a relationship to *Mimeutermes*. These distinctions between the species, though interesting, are not very marked, especially in the soldier castes. Though separable on the basis of the material known at present, from widely spaced localities, it is possible that some of the species named here might be found to be synonymous if further material were to be collected.

This genus has been recorded from both the Congo and West African rain forests and from the adjacent savannah zones, but not from the savannah south of the Congo nor from East or South Africa. It is found in the mounds of other genera of termites and builds none of its own.



FIGS. 399-413 : Imago head capsule, front and side views. 399, 400, *Eutermellus abruptus* ; 401, 402, *E. aquilinus* ; 403, 404, *E. bipartitus* ; 405, 406, *E. convergens* ; 407, 408, *E. undulans* ; 409-411, *Afrosubulitermes congoensis* (411, pronotum, plan view) ; 412, 413, *Postsubulitermes parviconstrictus*.



FIGS. 414-430 : Soldier head capsule, side and plan views, labrum, and mandibles. 414-416, *Eutermellus abruptus* ; 417-419, *E. aquilinus* ; 420, 421, *E. bipartitus* ; 422-424, *E. convergens* ; 425-427, *E. undulans* ; 428-430, *Afrosubulitermes congoensis*.

KEYS TO SPECIES

IMAGOS

- 1 Ocelli smaller, $0.07-0.09 \times 0.10-0.13$, separated from eyes by half own least diameter or more 2
- Ocelli larger, $0.09-0.11 \times 0.13-0.16$, separated from eyes by less than half own least diameter 3
- 2 Fontanelle a pale streak, slightly to distinctly bifurcate in front. Postclypeus less inflated, width 2.5 times length **convergens** (p. 149)
- Fontanelle minute, triangular or 3 spots arranged in triangle, slightly paler than head capsule. Postclypeus more inflated, width 2.0-2.1 times length **abruptus** (p. 145)
- 3 Larger; W, $0.93-0.99$; E, $0.34-0.38$. Fontanelle irregularly bilobed, sometimes divided into 3 spots, distinctly paler than head. Postclypeus more inflated, width 1.8-1.9 times length, anterior margin straight, posterior arched in middle, sinuate towards outer corners **aquilinus** (p. 147)
- Smaller; W, $0.85-0.88$; E, $0.31-0.33$. Fontanelle an elongate rounded triangle, slightly paler than head, or almost obsolete. Postclypeus less inflated, width 2.1 times length, anterior margin very slightly convex or sinuate, posterior regularly rounded indistinct. 4
- 4 Eyes, 0.31 ; Ocelli, 0.09×0.13 ; T_3 , 1.20 . Fontanelle an elongate rounded triangle (S. Congo) **bipartitus** (p. 148)
- Eyes, 0.33 ; Ocelli, 0.10×0.14 ; T_3 , $1.00-1.09$. Fontanelle almost obsolete (Guinean savannah, W. Africa) **undulans** (p. 150)

SOLDIERS

- 1 Posterior lobe of head capsule behind constriction with 1-2 pairs of long conspicuous setae, nose thicker, conical, profile nearly straight **aquilinus** (W. Africa, p. 147) and **bipartitus** (S. Congo, p. 148)
- Posterior lobe of head capsule with 3-5 pairs of long conspicuous setae. In two of three species, nose cylindrical or thinner conical, profile undulating; remaining species, nose conical, profile nearly straight 2
- 2 Nose thicker conical, profile nearly straight. T_3 shorter, $0.57-0.72$ (one only over 0.70). Antennal socket almost without ridge on dorsal side **convergens** (p. 149)
- Nose thinner, cylindrical or conical, profile undulating. T_3 longer, $0.70-0.82$. Antennal socket usually with ridge on dorsal side 3
- 3 Highest point of "hump" at nose base vertically above middle of postmentum in profile, and abruptly depressed behind (Congo forest species) **abruptus** (p. 145)
- Highest point of "hump" in front of middle of postmentum, profile more evenly undulating. (Guinean savannah species, W. Africa) **undulans** (p. 150)

***Eutermellus abruptus* sp. n.**

(Text-figs. 399, 400, 414-416, 431-433, 479-481; Map 30)

Imago. Head capsule sepia brown with paler markings on frons, postclypeus and antennae yellow-brown, labrum yellow. Pronotum, meso- and metanota brown, other thoracic sclerites and legs yellow. Abdominal tergites brown, sternites yellow-brown.

Posterior margin of head capsule behind eyes evenly rounded, slightly less than semi-circular, turned slightly outwards at eye rim; fontanelle, paler than head capsule, minute triangular or three spots arranged in triangle; eyes oval, slightly set out from sides of head, prominent in proportion to own diameter and large relative to head width, W/E index 2.6-2.9; ocelli small

oval, separated from eyes by about half own least diameter or slightly more ; postclypeus moderately inflated, width about twice length, anterior margin sinuate, posterior convex, evenly rounded ; antennae 15 segmented, II, IV and V subequal, III shorter.

Pilosity of head rather even and dense, but not sufficiently so to form a "pelt" or "mat", pronotum and abdominal pilosity similar, longer towards margins of sclerites.

Measurements (3 specimens from 2 localities) in millimetres.

	Range
Head width across eyes	0.88-0.94
Greatest diameter of eye	0.33-0.35
Ocellus	0.08-0.09 × 0.11-0.13
Ocellus to eye	0.04-0.05
Width of pronotum	0.73-0.79
Length of pronotum	0.49-0.54
Length of hind tibia	1.10-1.23

Soldier. Head capsule pale yellow to yellow, nose orange-yellow to orange, rest of body cuticle pale yellow.

Head capsule in plan view weakly constricted behind antennae, posterior margin evenly or slightly angularly rounded ; nose thin, weakly conical. In profile undulating with distinct hump at base of nose, to nearly straight with depression in front of evenly rounded posterior lobe, highest point of hump vertically above middle of postmentum, and somewhat abruptly depressed behind ; antennae, II, III and V subequal, IV shorter, antennal socket usually with small ridge over dorsal rim.

Conspicuous setae of head consist of six in three pairs in line across base of nose in front of constriction, and six in three pairs similarly arranged on posterior lobe behind constriction.

Measurements (7 specimens from 3 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.25-1.40	1.34
Head width	0.61-0.73	0.67
Depth of head capsule	0.38-0.46	0.42
Width of pronotum	0.34-0.38	0.36
Length of pronotum	0.13-0.14	0.13
Length of hind tibia	0.71-0.83	0.74

E. abruptus differs from *E. bipartitus* in the imago in having the ocelli slightly more distant from the eyes, and a differently shaped fontanelle ; the head capsule has a slightly more broadly rounded posterior margin. The soldier of *E. abruptus* has a thinner nose and more numerous head setae. Differences from *E. aquilinus*, *E. convergens* and *E. undulans* are discussed under those species.

Holotype ♀ imago, CONGO : Njili, 18km. from Leopoldville, 11.vi.1948 (*A. E. Emerson*), in American Museum of Natural History.

Morphotype soldier, same data, A.M.N.H.

Paratype soldiers from type colony, same data, in A.M.N.H. and British Museum (Nat. Hist.).

Other paratype material. CONGO : Sona Mpangu, 10.iv.1948, soldiers and workers, A.M.N.H. and B.M.(N.H.), and Camp Putnam, 1° 24' N., 28° 36' E., 18.v.1948, 2 vials, one containing soldiers and workers, and the other, two imagos that flew to light (*A. E. Emerson*), allotype ♂ imago in A.M.N.H.

Eutermellus aquilinus sp. n.

(Text-figs. 401, 402, 417-419, 482, 483 ; Map 30)

Imago. Head capsule sepia brown with paler markings on frons, postclypeus and antennae yellow-brown, labrum yellow. Pronotum brown, meso- and metanota and femora yellow-brown, tibiae and tarsi yellow. Abdominal tergites brown, sternites yellow-brown. Wing membrane translucent very pale brown, venation brown.

Posterior margin of head capsule behind eyes rounded, more strongly curved towards sides, and turned slightly outwards at eye rim ; fontanelle pale, irregularly bilobed with triangular middle section, lateral arms variable in length and shape, sometimes separated from middle section ; eyes scarcely set out from sides of head, oval, prominent in proportion to own diameter and large relative to head width, W/E index 2.5-2.8 ; ocelli large, oval, separated from eyes by less than one-third own least diameter ; postclypeus strongly inflated, width 1.8-1.9 times length, anterior margin straight, posterior, convex, arched in middle, sinuate towards outer corners ; antennae 15 segmented, II, IV, and V subequal, III very small.

Pilosity of head rather even and dense but not sufficiently so to form a "pelt" or "mat", pronotum and abdominal pilosity similar, longer setae towards margins of sclerites.

Measurements (8 specimens from 2 localities) in millimetres.

	Range	Mean
Head width across eyes	0.93-0.99	0.94
Greatest diameter of eye	0.34-0.38	0.36
Ocellus	0.10-0.11 × 0.14-0.16	0.10 × 0.15
Ocellus to eye	0.02-0.03	0.02
Width of pronotum	0.71-0.78	0.74
Length of pronotum	0.50-0.56	0.53
Length of hind tibia	1.08-1.20	1.12
Length of fore wing	7.60-8.60	8.12

Soldier. Head capsule pale yellow to yellow, nose orange-yellow to orange, rest of body cuticle pale yellow.

Head capsule in plan view scarcely constricted behind antennae, posterior margin somewhat angularly rounded, nose rather thick, weakly conical. In profile almost straight or slightly convex, sometimes weakly humped at base of nose ; antennae, II, III, and V subequal, IV shorter. Conspicuous setae of head consist of six in three pairs arranged approximately in line across base of nose in front of "constriction" and one or two pairs on vertex behind constriction.

Measurements (8 specimens from 2 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.28-1.38	1.32
Head width	0.60-0.65	0.62
Depth of head capsule	0.39-0.45	0.41
Width of pronotum	0.35	
Length of pronotum	0.13	
Length of hind tibia	0.68-0.70	0.70

E. aquilinus is separable from *E. bipartitus* in the imago by the larger size, differently shaped fontanelle, more inflated postclypeus, and by the eyes being less distinctly set out from the sides of the head. The soldiers have, however, been found indistinguishable, and in this case the distribution is the only criterion. In the imago caste of the other species, *E. convergens* has the ocelli more distant from the eyes, a less inflated postclypeus, and a differently shaped fontanelle, *E. undulans* is smaller, with almost obsolete fontanelle and a differently shaped head capsule, and *E. abruptus* has smaller ocelli, more distant from the eyes, and a different fontanelle. The soldiers are all very much alike, but the remaining species all have

3-5 pairs of long setae on the vertex behind the constriction, and *E. abruptus* and *E. undulans* have thinner noses with different profile.

Holotype ♀ imago, allotype ♂, morphotype soldier, and paratypes from type colony. GHANA : 20m. from Bolgatanga on Tamale Road, 9.iii.1959 (*W. A. Sands*, Coll. No. S.2364), in British Museum (Natural History).

Other paratype material. GHANA : Awura, 4m. from Ejura on Kintampo Road, 28.iii.1959 (*W. A. Sands*), soldiers and workers.

NIGERIA : Northern Region ; Samaru, 7m. from Zaria on Funtua Road, 17.v. 1959 (*W. A. Sands*), imagos. Both in B.M.(N.H.).

This species has been recorded from the edge of the forest-zone to the Northern Guinean savannah (*Keay et al.*, 1959, vegetation types 8, 16, and 17).

Eutermellus bipartitus (Sjöstedt)

(Text-figs. 403, 404, 420, 421, 484 ; Map 30)

Eutermes bipartitus Sjöstedt, 1911 : 168. Type locality : CONGO, Mukimbungu.

Eutermes (*Coarctotermes*) *bipartitus* Sjöstedt ; Holmgren, 1912 : 65.

Eutermellus bipartitus (Sjöstedt) Sjöstedt, 1926 : 358.

Imago. Colour probably faded in old specimen. Described by Sjöstedt as having head capsule chestnut brown, dorsal sclerites pale red-brown.

Posterior margin of head capsule evenly rounded, less than semi-circular, turned slightly outwards at eye rim ; fontanelle pale, elongate triangular, somewhat rounded, with indistinct oval mark in front ; eyes oval, slightly but distinctly set out from sides of head, prominent in proportion to own diameter and fairly large relative to head width, W/E index 2.9 ; ocelli medium-sized, oval, separated from eyes by slightly more than one-third own least diameter ; postclypeus moderately inflated, width 2.1 times length, anterior margin nearly straight, posterior convex, evenly rounded ; antennae probably 15 segmented, II, IV, and V subequal, III shorter.

Pilosity of head dense, not sufficiently even to form a "pelt" or "mat", pronotum and abdominal pilosity similar, longer towards margins of sclerites.

Measurements (1 specimen) in millimetres.

Head width across eyes	. . . . .	0.89
Greatest diameter of eye	. . . . .	0.31
Ocellus	. . . . .	0.09 × 0.13
Ocellus to eye	. . . . .	0.03
Width of pronotum	. . . . .	0.68
Length of pronotum	. . . . .	0.46
Length of hind tibia	. . . . .	1.20

Soldier. Head capsule pale yellow to yellow, nose orange-yellow to orange, rest of body cuticle pale yellow.

Head capsule in plan view weakly constricted behind antennae, posterior margin evenly rounded ; nose rather thick, conical. In profile almost straight or slightly convex, with slight depression behind base of nose and in front of evenly rounded posterior lobe ; antennae 13 segmented, II, III and V subequal, IV shorter.

Conspicuous setae of head consist of four to six in two or three pairs in line across base of nose in front of constriction, and one or two pairs similarly arranged on posterior lobe behind constriction.

Measurements (4 specimens from 1 locality) in millimetres.

	Range	Mean
Head length to tip of nose	1.25-1.40	1.31
Head width	0.59-0.66	0.62
Depth of head capsule	0.33-0.41	0.38
Width of pronotum	0.29-0.35	0.32
Length of pronotum	0.11-0.14	0.12
Length of hind tibia	0.61-0.74	0.68

E. bipartitus differs from its earliest congener *E. convergens* in the imago in having the ocelli closer to the eyes, and the eyes more distinctly set out from the sides of the head ; the postclypeus is more inflated. The soldier of *E. bipartitus*, whilst similar in shape, appears to have fewer head setae. Differences from the new members of the genus, *E. abruptus*, *E. aquilinus*, and *E. undulans*, are discussed under those species.

Material. CONGO : Mukimbungu, 5° S., 14° E., 9.x.1904, Coll. No. 1158 (*K. E. Laman*), syntype male imago and soldiers from type colony, *E. bipartitus* (Sjöstedt) ; same locality, 19.x.1904, and 22.x.1904, 2 vials (*K. E. Laman*), the first of these containing further syntypes. All in A.M.N.H.

This species is only known from the original material, but it appears possible that it may be a savannah species south of the Congo forest, equivalent in its ecology to *E. aquilinus* in the north.

Eutermellus convergens Silvestri

(Text-figs. 405, 406, 422-424, 485 ; Map 30)

Eutermellus convergens Silvestri, 1912 : 245. Type locality : ISLAND OF FERNANDO POO, Basile.

Eutermes (*Eutermellus*) *convergens* (Silvestri) Holmgren, 1912 : 64.

Eutermellus convergens Silvestri ; Sjöstedt, 1926 : 358. [States *convergens* syn. of *bipartitus* (Sjöstedt)].

Eutermellus convergens Silvestri ; Snyder, 1949 : 344. [States *convergens* not. syn. of *bipartitus* (Sjöstedt)].

Imago. Head capsule dark sepia brown, with paler markings on frons, postclypeus sepia brown, labrum and antennae brown. Pronotum sepia brown, meso- and metanota brown, other thoracic sclerites and legs yellow-brown to brown. Abdominal tergites sepia brown, sternites brown. Wing membrane translucent very pale brown, venation brown.

Posterior margin of head capsule behind eyes evenly rounded, less than semi-circular, turned slightly outwards at eye rim ; fontanelle pale, slit-like and slightly bifurcate in front to Y-shaped with lateral arms dilated or branching terminally ; eyes slightly set out from sides of head, oval, moderately prominent in proportion to own diameter and large or medium-sized relative to head width, W/E index 2.6-3.0 ; ocelli small, separated from eyes by three-quarters own least diameter ; postclypeus moderately inflated, width 2.5 times length, anterior margin slightly convex or sinuate, posterior convex rounded, somewhat indistinct ; antennae 15 segmented, II, IV and V subequal, III shorter.

Pilosity of head uneven, and dense not forming a "pelt" or "mat". Pronotum and abdominal pilosity similar, longer setae towards margins of tergites.

Measurements (3 specimens from 2 localities) in millimetres.

	Range
Head width across eyes	0.88
Greatest diameter of eye	0.29-0.33
Ocellus	0.07-0.08 × 0.10-0.11
Ocellus to eye	0.05-0.06
Width of pronotum	0.69-0.70
Length of pronotum	0.44-0.48
Length of hind tibia	1.03-1.10

Soldier. Head capsule pale yellow to yellow, nose orange-yellow to orange, rest of body cuticle pale yellow.

Head capsule in plan view constricted behind antennae, posterior margin evenly rounded ; nose rather thick, conical. In profile nearly straight, sometimes with slight depression in front of rounded posterior lobe ; antennae, II, III and V subequal, IV shorter. Conspicuous setae of head consist of six to eight in three or four pairs approximately in line across base of nose in front of constriction, and a similar number on posterior lobe behind constriction.

Measurements (13 specimens from 5 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.23-1.39	1.30
Head width	0.55-0.68	0.61
Depth of head capsule	0.38-0.40	0.39
Width of pronotum	0.30-0.36	0.34
Length of pronotum	0.11-0.15	0.13
Length of hind tibia	0.57-0.72	0.66

E. convergens differs in the imago from *E. bipartitus* by the smaller ocelli, more distant from the eyes, slightly less inflated postclypeus, and shorter hind tibia. *E. abruptus* has a different fontanelle and more inflated postclypeus. The differences from *E. aquilinus* and *E. undulans* are discussed under those species. In the soldier, *E. aquilinus* and *E. bipartitus* have fewer head setae, and *E. abruptus* and *E. undulans* thinner noses.

Material. ISLAND OF FERNANDO POO : Basilè, date unknown (*L. Fea*), syntype imago and soldiers, type colony, *E. convergens* Silvestri, A.M.N.H.

GHANA : Aburi, 1912-13 (*F. Silvestri*), Silvestri Coll., Lab. Zool. Sc. Agr., Portici.

NIGERIA : Western Region ; 63m. S. of Ilorin on Oyo Road, 4.xii.1957, and Ibadan, Agodi, 10.xii.1957 (*W. A. Sands*) ; Benin Province, Obanokoro, Sobo Plain, 7.i.1957 (*W. Wilkinson*).

CAMEROUN : Kumba, 19.x.1949 (*H. Oldroyd*).

Material in British Museum (Natural History) unless otherwise stated.

E. convergens appears to be a forest species, with only one record in riverain forest outside the main rain forest block of West Africa.

Eutermellus undulans sp. n.

(Text-figs. 407, 408, 425-427, 486, 487 ; Map 30)

Imago. Head capsule sepia brown with paler markings on frons, postclypeus and antennae yellow-brown, labrum yellow. Pronotum, meso- and metanota brown, other thoracic sclerites and legs yellow. Abdominal tergites brown, sternites brown laterally, paler in mid-line. Wing membrane translucent very pale brown, venation brown, radius-sector outlined brown.

Posterior margin of head capsule behind eyes rounded, less than semi-circular, turned slightly outwards at eye rim ; fontanelle almost obsolete, very indistinct, shape uncertain ; eyes oval, scarcely set out from sides of head, moderately prominent in proportion to own diameter, large relative to head width, W/E index 2.6–2.7 ; ocelli medium-sized, oval, separated from eye by less than one-fifth own least diameter ; postclypeus moderately inflated, width about twice length, anterior margin slightly convex, posterior convex, rounded, very indistinct ; antennae 15 segmented, II, IV and V subequal, III shorter.

Pilosity of head rather even and dense, but not sufficiently so to form a "pelt" or "mat", pronotum and abdominal pilosity similar, longer towards margins of sclerites.

Measurements (2 specimens from 1 locality) in millimetres.

	Range
Head width across eyes	0.85–0.88
Greatest diameter of eye	0.33
Ocellus	0.10 × 0.14
Ocellus to eye	0.02
Width of pronotum	0.69–0.71
Length of pronotum	0.50
Length of hind tibia	1.00–1.09
Length of fore wing	6.80–7.20

Soldier. Head capsule pale yellow to yellow, nose orange-yellow to orange, rest of body cuticle pale yellow.

Head capsule in plan view distinctly constricted behind antennae, posterior margin evenly rounded ; nose thin and cylindrical or slightly tapering. In profile undulating with distinct hump at base of nose, to nearly straight, with weak depression in front of evenly rounded posterior lobe ; antennae, II, III and V subequal, IV shorter, antennal socket usually with small ridge over dorsal rim. Conspicuous setae of head consist of six to ten in three to five pairs approximately in line across base of nose in front of constriction, and three to five pairs similarly arranged on posterior lobe behind constriction, the latter being less regular in position.

Measurements (16 specimens from 4 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.20–1.35	1.29
Head width	0.58–0.64	0.62
Depth of head capsule	0.38–0.43	0.41
Width of pronotum	0.31–0.35	0.34
Length of pronotum	0.11–0.13	0.12
Length of hind tibia	0.68–0.75	0.69

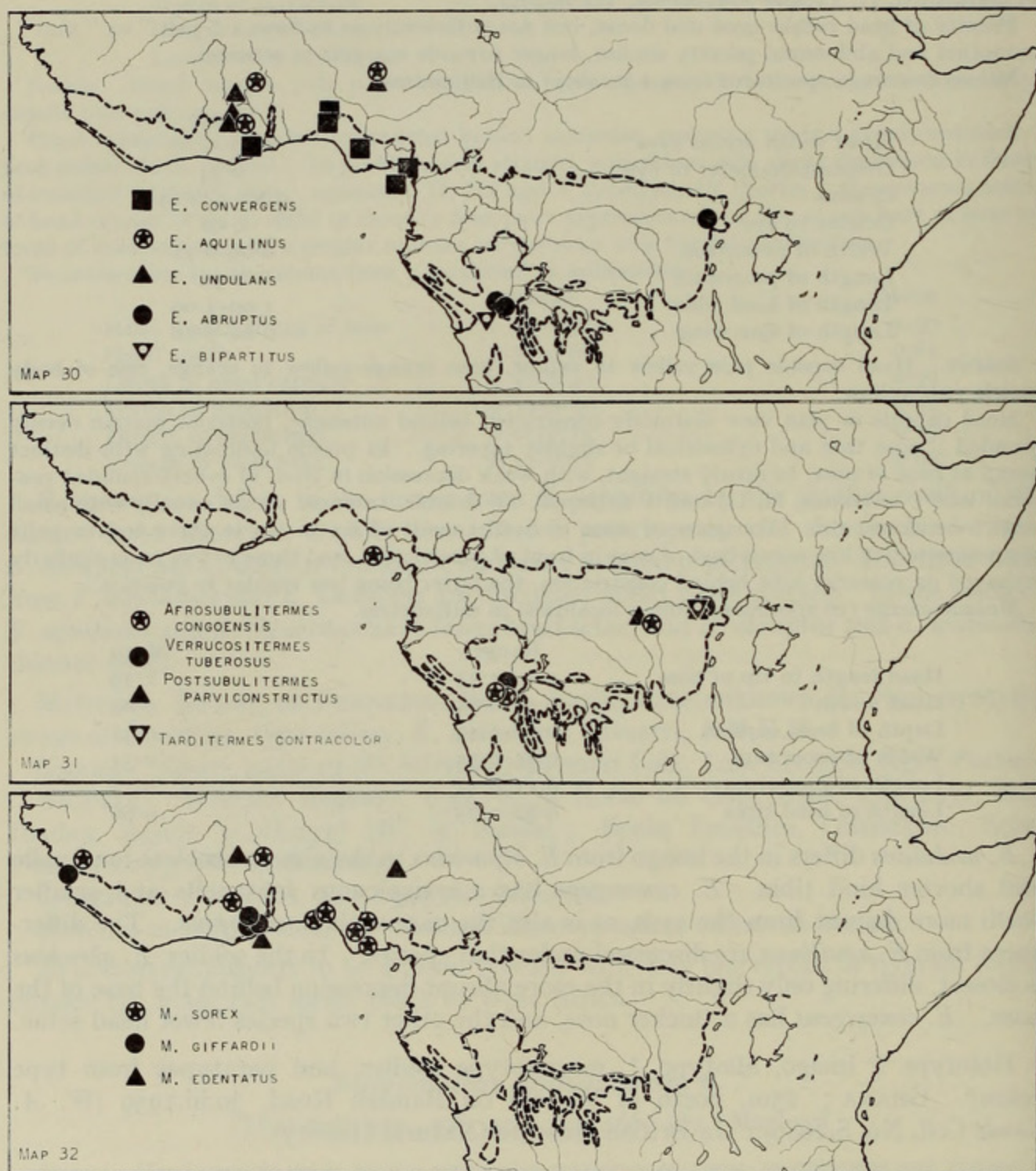
E. undulans differs in the imago from *E. bipartitus* in the almost obsolete fontanelle and shorter hind tibia. *E. convergens* has a conspicuous fontanelle and smaller ocelli more distant from the eyes, as is also the case with *E. abruptus*. The differences from *E. aquilinus* are discussed under that species. In the soldier, *E. abruptus* is closest, differing only slightly in the more abrupt depression behind the base of the nose. *E. convergens* has a thicker nose, and the other two species fewer head setae.

Holotype ♀ imago, allotype ♂, morphotype soldier, and paratypes from type colony. GHANA : 25m. north of Wenchi on Bamboi Road, 30.iii.1959 (*W. A. Sands* Coll. No. S.2680). In British Museum (Natural History).

Other paratype material. GHANA : 3m. from Larabanga on Bole Road, 22.iii.1959, and 12m. N. of Techiman on Wenchi Road, 29.iii.1959 (*W. A. Sands*), soldiers and workers.

NIGERIA : Northern Region ; 18m. from Kaduna on Zaria Road, 31.x.1957 (W. A. Sands), soldiers and workers. All in B.M.(N.H.).

This species has been recorded from the same vegetation zones as *E. aquilinus*, namely the Guinean savannah woodlands.



MAPS 30-32. (30), The genus *Eutermellus* ; (31), " *Paracornitermes* branch ", monotypic genera ; (32), The genus *Mimeutermes*.

***AFROSUBULITERMES* Emerson**

Afrosubulitermes Emerson, 1960 : 7. Type-species by original designation, *Afrosubulitermes congoensis* Emerson, 1960.

Imago. Left mandible with apical tooth distinctly longer than first marginal, but distance between them slightly shorter than that from first to third marginals (left mandible index .89-.94), cutting edge between the latter deeply indented in front of third marginal and slightly or not sinuate, anterior edge of third marginal longer than posterior, gap between this and molar prominence very narrow ; right mandible, apical and first marginal as left, second marginal small but distinct, molar plate in surface view without basal indentation, asymmetrical, with large posterior rounded flange and smaller anterior, weakly ridged. Postclypeus scarcely inflated, following line of profile, width 2.3 times length. Fontanelle represented by elongate narrow ridge, visible only by side lighting on the highly polished head capsule, with pale oval spot in front. Eyes not set out from sides of head. Pilosity virtually absent from head, only prominent setae paired, on vertex, between ocelli, in middle of postclypeus and on its anterior margin. Pronotum, sides weakly convergent posteriorly, length three-quarters or more of width.

Soldier. Monomorphic. Nose thin, cylindrical, tapering to fine point. Vestigial mandibles without points, labrum with sinuate anterior margin. Head capsule weakly constricted behind antennae. Antennae 12 segmented. Head and nose with numerous fine short setae, and six longer setae, one pair on vertex and two pairs at base of nose. Abdominal tergites with scattered short setae and longer on posterior margins, sternites similar but all setae longer, in both cases, marginal setae approximately twice length of rest.

Worker. Mandibles as imago except apical tooth longer in proportion (left mandible index 1.36-1.39), cutting edge behind left first marginal more sinuate, and right molar plate with more pronounced flanges.

The discovery of the imago of *Afrosubulitermes* has clarified its relationships to a considerable extent. Its closest connection among Ethiopian genera is *Eutermellus*, and the generic separation of the two is not as distinct as would appear from the original description of *Afrosubulitermes*. New material of *Eutermellus* has shown a greater range of variation than was previously known, and the main distinctive features of *Afrosubulitermes* are its extremely small size and much reduced pilosity in the imago, and its proportionately shorter nose in the soldier. It also has features of resemblance to *Postsubulitermes* and appears to be intermediate between this genus and *Eutermellus*. *Afrosubulitermes* was considered by Emerson (1960) to be closely related to *Verrucositermes*, but I believe that the latter was more probably separately derived from an ancestral form close to *Eutermellus*.

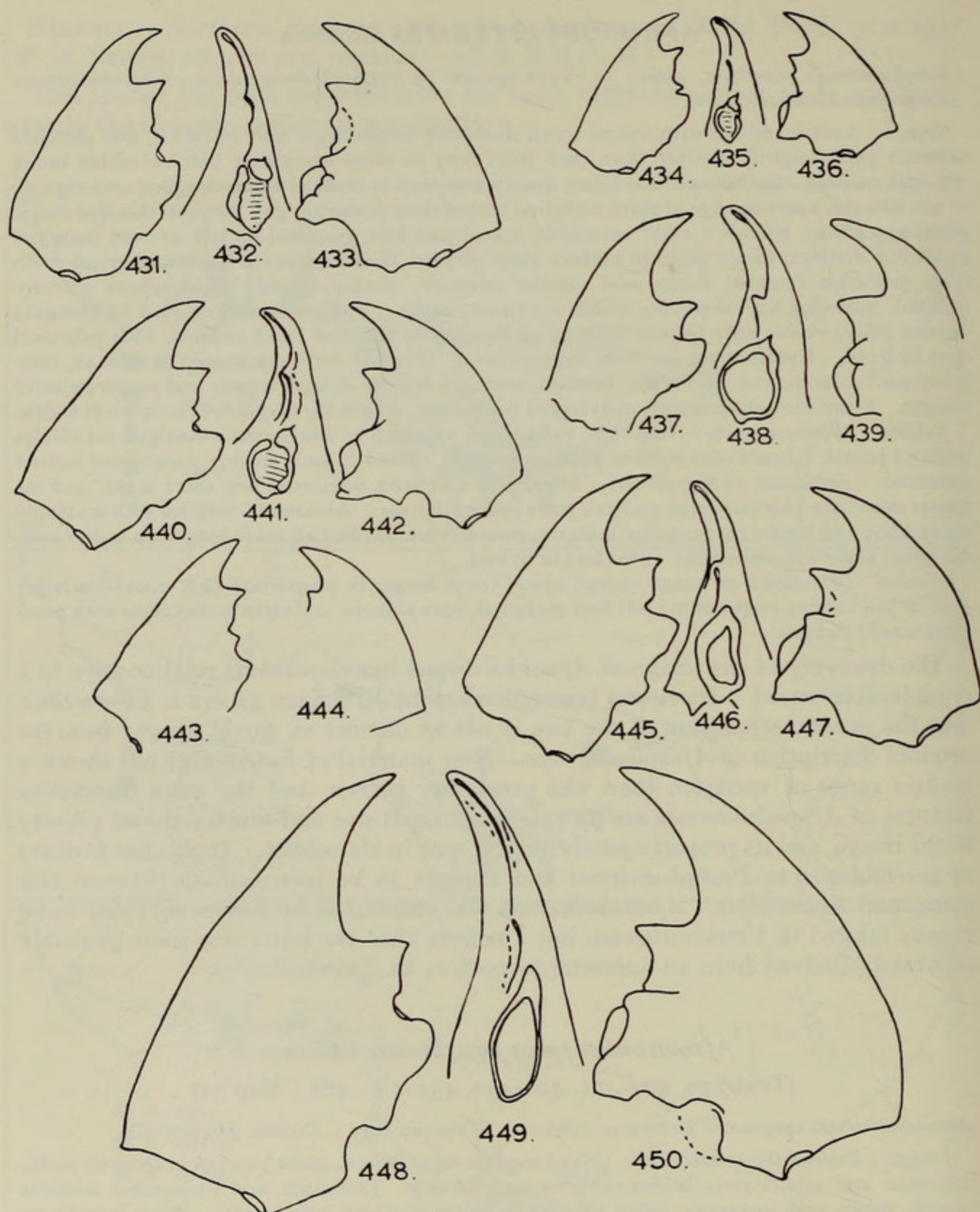
***Afrosubulitermes congoensis* Emerson**

(Text-figs. 409-411, 428-430, 434-436, 488 ; Map 31)

Afrosubulitermes congoensis Emerson, 1960 : 9. Type locality : CONGO, Stanleyville.

Imago. Previously undescribed. Head capsule sepia brown, paler patches in front of ocelli, antennae and postclypeus brown, labrum pale brown. Pronotum and abdominal sclerites brown, meso- and metanota, other thoracic sclerites and legs pale brown. Wing membrane translucent pale brown, radius sector sepia brown, rest of venation brown, only subcosta and radius sector distinct.

Posterior margin of head capsule behind eyes less than semi-circular, slightly sinuate immediately behind eyes ; eyes large relative to head width W/E index 2.3-2.4, but not prominent in proportion to own diameter, slightly angular oval ; ocelli medium-sized, oval, separated from



FIGS. 431-450 : Imago mandibles of " *Paracornitermes* branch ", showing details of right molar plate. 431-433, *Eutermellus abruptus* ; 434-436, *Afrosubulitermes congoensis* ; 437-439, *Postsubulitermes parviconstrictus* (late nymph) ; 440-444, *Verrucositermes tuberosus* (440-442, worker, 443, 444, unique morphotype king) ; 445-447, *Mimeutermes edentatus* ; 448-450, *Tarditermes contricolor*.

eyes by about one-fifth own least diameter ; anterior margin of postclypeus straight, posterior convex, evenly rounded ; antennae 13 segmented, II and V subequal, IV slightly shorter, III shorter still and narrower.

Other characteristics given in generic diagnosis.

Measurements (10 specimens from 1 locality) in millimetres.

	Range	Mean
Head width across eyes	0.54-0.56	0.55
Greatest diameter of eye	0.23-0.24	0.24
Ocellus	0.06 × 0.08-0.09	0.06 × 0.08
Ocellus to eye	0.006-0.013	0.011
Width of pronotum	0.39-0.43	0.41
Length of pronotum	0.29-0.31	0.31
Length of hind tibia	0.68-0.71	0.70
Length of fore wing	4.40-4.60	4.48

Morphotype ♀ imago, NIGERIA : Eastern Region, 12m. from Aba on Ikot Ekpene Road, 12.ix.1957 (*W. Wilkinson* Coll. No. WW 830). In British Museum (Natural History).

Soldier. The additional material has slightly increased the range of variation in size.

Measurements (14 specimens from 4 localities) in millimetres.

	Range	Mean
Head length to tip of nose	0.98-1.07	1.02
Head width	0.37-0.41	0.38
Depth of head capsule	0.28-0.29	0.28
Width of pronotum	0.24-0.32	0.26
Length of pronotum	0.09	
Length of hind tibia	0.47-0.53	0.50

Variation. In the soldier caste the lack of any noticeable variation is significant, since the species has been recorded over a range of nearly 1,500 miles.

The relationships of this species are discussed under the generic heading.

Material (additional to morphotype colony). NIGERIA : Western Region, Ibadan, Agodi, 10.xii.1957 (*W. A. Sands*), one queen, B.M.(N.H.).

CONGO : Stanleyville, 26.v.1948, 1.vi.1948, paratype soldiers and workers, type and other colonies, Leopoldville, 5.vi.1948, paratype soldiers and workers (*A. E. Emerson*) ; Stanleyville, 19.iii.1948, paratype soldier (*N. A. Weber*), A.M.N.H.

REPUBLIC OF CONGO : 13km. W. of Brazzaville, 8.vi.1948, paratype soldiers and workers (*A. E. Emerson*), A.M.N.H. and B.M.(N.H.).

This species appears widely distributed throughout the Congo and lower Guinean forest block, where it has been recorded from galleries within the mounds of other species. It has not been found west of the Dahomey-Togoland gap in the Guinean forests.

POSTSUBULITERMES Emerson

Postsubulitermes Emerson, 1960 : 10. Type-species by original designation, *Postsubulitermes parviconstrictus* Emerson, 1960.

Imago. The morphotype queen is unique and the mandibles have not been dissected. The worker mandibles are described below. Postclypeus moderately inflated, width twice length, anterior margin sinuate, convex in middle. Fontanelle elongate, Y-shaped. Eyes not set out

from sides of head. Pilosity very fine and sparse with very few more prominent setae, three over each eye, two pairs on vertex and one pair on postclypeus. Pronotum, sides converging posteriorly, length less than two-thirds width.

Soldier. Monomorphic. Nose thin, cylindrical, tapering to fine point. Vestigial mandibles without points, labrum with regular rounded anterior margin. Head capsule scarcely constricted behind antennae, weakly humped at base of nose. Antennae 12 segmented. Head setae confined to bilaterally placed pair on vertex, one or two pairs near base of nose, and few at nose tip. Abdominal tergites with scattered short setae one-third length of longer setae on posterior margins, sternites with scattered short setae longer than on tergites and half length of longer setae on posterior margins.

Worker. Left mandible with apical tooth much longer than first marginal, distance between them, nearly three times that from first to third marginals (left mandible index 2.63), cutting edge between the latter entire, concave, gap between third marginal and molar prominence very narrow; right mandible, apical and first marginal as left, second marginal absent, molar plate with weak basal indentation of outline, weak anterior and strong posterior rounded flanges, and no ridges.

Emerson (1960) considered this genus to have been derived from close to *Afrosubulitermes* and I agree with this, particularly since the recently discovered imago of the latter shows close similarities of shape and appearance to *Postsubulitermes*. The imago and worker mandibles of *Postsubulitermes* are more specialized, and the soldier has an evenly rounded labrum, which is a further reduction of the tri-lobed shape seen in the more primitive members of the group, such as *Eutermellus*. The other genera are distinguishable by many characters, and are unlikely to be confused with *Postsubulitermes*.

Postsubulitermes parviconstrictus Emerson

(Text-figs. 412, 413, 437-439, 464-466, 489; Map 31)

Postsubulitermes parviconstrictus Emerson, 1960: 13. Type locality: CONGO, Yangambi.

Material. CONGO: Yangambi, 0° 47' N., 24° 23' E., 20.v.1948 (A. E. Emerson), holotype and paratype soldiers and morphotype queen; Camp Putnam, 1° 24' N., 28° 36' E., 13.v.1948, 4km. N. of Camp Putnam 19 and 20.v.1948 (A. E. Emerson), paratype soldiers, A.M.N.H. and B.M.(N.H.).

VERRUCOSITERMES Emerson

Verrucositermes Emerson, 1960: 3. Type-species by original designation, *Verrucositermes tuberosus* Emerson, 1960.

Imago. The morphotype king of *V. tuberosus* is unique and the mandibles have not been dissected. The worker mandibles in this group are particularly closely similar to the imago and are described below. Postclypeus moderately inflated, width 2.5 times length, anterior margin concave, sinuate. Fontanelle a pale streak, tapering and slightly depressed posteriorly. Eyes set slightly out from sides of head and undercut at rims. Pilosity of head fine and uniform with a few more prominent setae. Pronotum, sides converging posteriorly, length less than two-thirds width.

Soldier. Monomorphic. Nose thin, cylindrical, tapering to fine point. Vestigial mandibles without points but angular in outline, labrum with sinuate anterior margin. Head capsule

strongly inflated at base of nose and sharply constricted in middle, with numerous irregular small tubercle-like outgrowths of cuticle, denser on base of nose and anterior lobe of head. Antennae 12–13 segmented, III to IX or X with 3 tubercles each on inner side. Head and nose with numerous scattered small setae. Abdominal tergites with scattered short setae, longer on posterior margins, sternites with short setae more dense and longer than tergites, and longer on posterior margins.

Worker. Left mandible with apical tooth longer than first marginal, distance between them longer than that from first to third marginals (left mandible index 1.36), notch present in cutting edge in front of third marginal, gap between third marginal and molar prominence little wider than this notch, subsidiary tooth between them just visible; right mandible, apical and first marginal as left, second marginal almost absorbed in posterior edge of first, molar plate with weak basal indentation of outline, strong rounded posterior flange, "ridges" vestigial and embedded in smooth shining surface.

The curious eyes of the imago of *Verrucositermes* are a feature occurring to a less marked degree in some *Eutermellus* species and in *Mimeutermes*. The worker mandible illustrated by Emerson (1960) appears to be that of *Orthotermes depressifrons* (Termitinae), a common forest species frequently occurring in the nests of other genera. The paratype material deposited at the British Museum (Natural History) includes a worker of this species, and there is a notable resemblance in general appearance between this and the true paratype *Verrucositermes* worker in the same vial. The *Orthotermes* worker has a prominent comb of diverging bristle-like setae on the anterior coxae, and slight differences in the mandibles. Emerson notes in parenthesis that some workers of the type colony have the right second marginal tooth less conspicuous than that figured. This is characteristic of the true *Verrucositermes* worker, which also has a much narrower gap between left third marginal and molar prominence, and a more elongate right molar plate.

The very characteristic soldier caste is the chief distinctive feature of the genus, though the rugosity of the nose and its base in some *Eutermellus* and *Mimeutermes* indicates a similar tendency in these genera; indeed, the vertex and nose-base cuticle of *Mimeutermes giffardii* magnified $\times 500$ shows very numerous outgrowths which are closely similar in appearance and may be homologous in spite of their much smaller size.

The phylogenetic position of *Verrucositermes* must remain in some doubt, but the most likely would appear to be derived from an ancestor of less specialized soldier caste, but otherwise similar, intermediate between the genera *Eutermellus* and *Mimeutermes*.

Verrucositermes tuberosus Emerson

(Text-figs. 440–444, 451, 452, 467–469, 490; Map 31)

Verrucositermes tuberosus Emerson, 1960: 6. Type locality: CONGO, Leopoldville.

Material. CONGO: Leopoldville, Kalina Point, $4^{\circ} 18' \text{ S.}$, $15^{\circ} 18' \text{ E.}$, 5.vi.1948 (A. E. Emerson), holotype soldier, paratypes, and morphotype king, A.M.N.H.; Camp Putnam ($1^{\circ} 24' \text{ N.}$, $28^{\circ} 36' \text{ E.}$), 22.v.1948 (A. E. Emerson), paratype soldiers, A.M.N.H. and B.M.(N.H.).

MIMEUTERMES Silvestri

Mimeutermes Silvestri, 1914 : 47. Type-species by original designation, *Mimeutermes giffardii* Silvestri, 1914.

Imago. Left mandible with long apical tooth, cutting edge from first to third marginals short, slightly concave (left mandible index 2.00–2.23), gap between third marginal and molar plate less than half as wide as this cutting edge ; right mandible, apical and first marginal as left, second marginal obsolete, posterior cutting edge of first marginal concave, molar plate with pronounced anterior and posterior rounded flanges, and tapering distally, ridges absent. Post-clypeus weakly inflated, width twice length or slightly less. Fontanelle pale, slit-like, slightly bifurcate with pale patch in front, to almost obsolete, little paler than head. Eyes slightly set out from sides of head. Pilosity of head variable. Pronotum, rounded posteriorly, anterior margin concave.

Soldier. Monomorphic. Nose thickly conical, merging with taper of head capsule at base, fontanelle rather large. Vestigial mandibles with and without points, labrum with sinuate anterior margin. Head capsule in plan view not constricted, top-shaped including nose, with sides parallel or rounded towards back. Antennae 12 segmented. Head and nose with few conspicuous setae. Abdominal tergites with sparse scattered minute setae, longer on posterior margins and posterior 2–3 tergites ; sternites with sparse short setae and longer on posterior margins, approximately twice length of short.

Worker. Mandibles as imago except apical tooth longer in proportion (left mandible index 3.32–3.59), and right molar plate larger with more pronounced flanges.

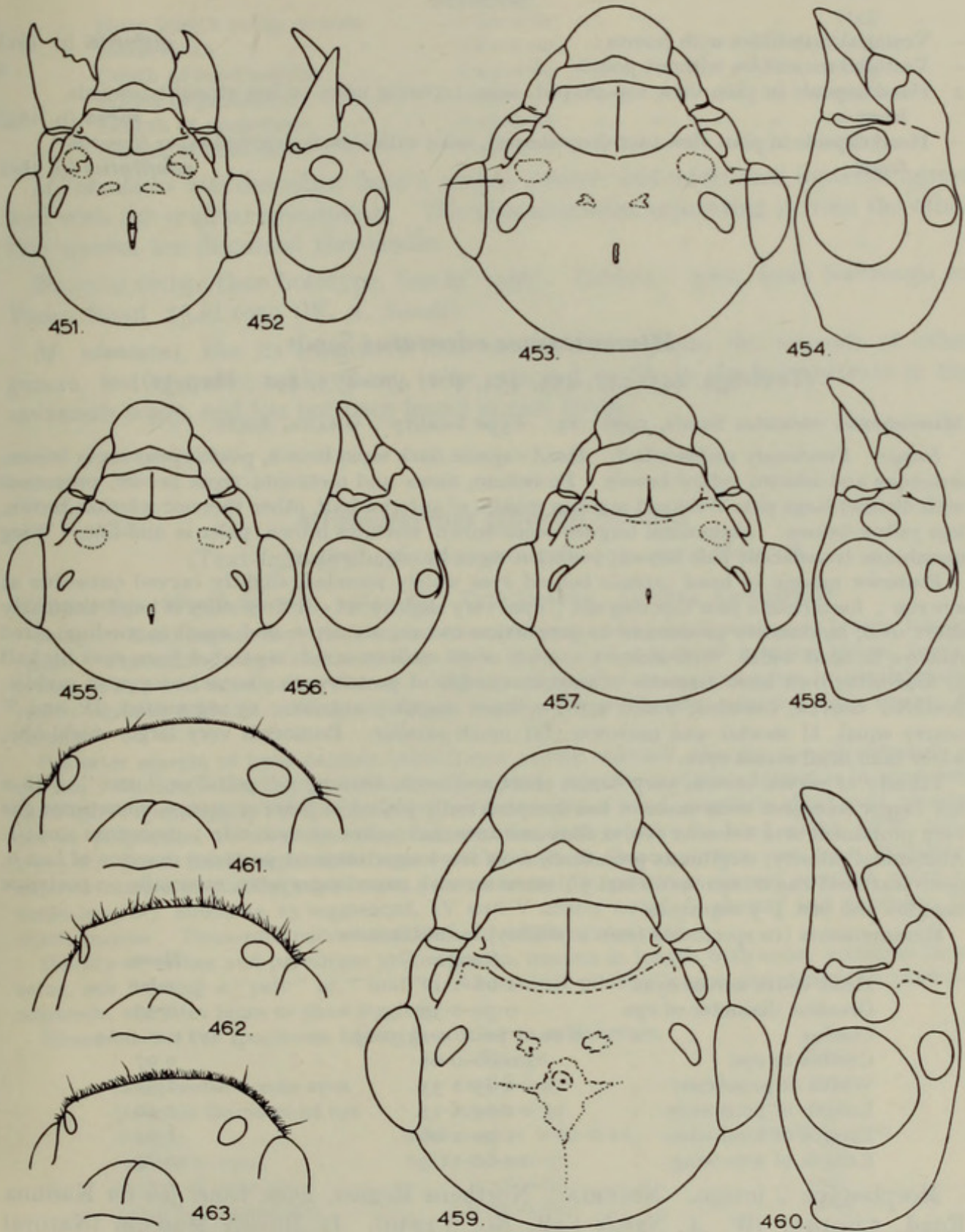
The genus *Mimeutermes*, like the other Ethiopian members of the “*Paracornitermes*-branch”, is very distinctive in form, and detailed discussion is not required. Its relationships to *Tarditermes* and *Verrucositermes* are discussed under those genera. It is unlikely to be confused with any other genus except in the worker caste.

This is an unusual genus in that it appears to have evolved in the rain forest to the west of the Dahomey–Togoland gap. This forest limits the distribution of *M. giffardii*, the most primitive species, but the other two appear progressively more adapted to savannah conditions, and have spread back to Nigeria, though unknown further eastwards. It seems probable that this reflects the genuine distribution, rather than the failure of collectors, in view of the frequent records of related genera from similar habitats in other localities.

KEYS TO SPECIES

IMAGO

- 1 Larger, W, 1.08–1.12 ; pronotum very large, wider than head width across eyes, 1.25–1.35 **edentatus** (p. 160)
- Smaller, W, 0.89–0.97 ; pronotum narrower than head width across eyes, 0.78–0.89 2
- 2 Eyes smaller, 0.29 ; T₃ longer, 1.02. Pilosity of head capsule and pronotum very even, forming a “pelt” with a few scattered longer setae (Text-fig. 463) **sorex** (p. 163)
- Eyes larger, 0.31–0.33 ; T₃ shorter, 0.81–0.87. Pilosity of head capsule and pronotum uneven, not forming a “pelt”, with many scattered longer setae, (Text-fig. 462) **giffardii** (p. 161)



FIGS. 451-460 : Imago head capsule, front and side views. 461-463 : Vertex pilosity.
 451, 452, *Verrucositermes tuberosus* ; 453, 454, 461, *Mimeuterms edentatus* ; 455, 456,
 462, *M. giffardii* ; 457, 458, 463, *M. sorex* ; 459, 460, *Tarditermes contricolor*.

SOLDIERS

- Vestigial mandibles with points *giffardii* (p. 161)
- Vestigial mandibles without points 2
- 2 Head capsule in plan view top-shaped, sides tapering more or less straight towards front *sorex* (p. 163)
- Head capsule in plan view tear-drop-shaped, sides with concave curved taper towards front *edentatus* (p. 160)

Mimeuterme edentatus Sands

(Text-figs. 445-447, 453, 454, 461, 470-473, 491; Map 32)

Mimeuterme edentatus Sands, 1956 : 83. Type locality : GHANA, Accra.

Imago. Previously undescribed. Head capsule dark sepia brown, postclypeus sepia brown, antennae and labrum yellow-brown. Pronotum, meso- and metanota sepia brown, pronotum with distinct large pale T-shaped mark in middle of anterior half, other thoracic sclerites brown, legs yellow-brown. Abdominal tergites sepia-brown, sternites brown, paler in mid-line. Wing membrane translucent pale brown, venation sepia brown, distinct.

Posterior margin of head capsule behind eyes widely rounded, slightly curved outwards at eye rim; fontanelle a pale tapering slit; eyes very slightly set out from sides of head, angularly short oval, moderately prominent in proportion to own diameter, and small to medium-sized relative to head width, W/E index 3.1-3.6; ocelli medium-sized, separated from eyes by half to four-fifths own least diameter; anterior margin of postclypeus sinuate, convex in middle, posterior convex, rounded, width 1.8-1.9 times length; antennae 15 segmented, IV and V nearly equal, II shorter and narrower, III much smaller. Pronotum very large, shield-like, wider than head across eyes.

Pilosity of vertex brown, very dense, short and even, forming a "pelt" or "mat", with a few longer emergent setae more or less symmetrically placed in pairs or groups, sometimes one very prominent seta between eye, ocellus and antennal socket on each side; pronotum similar. Abdominal pilosity, tergites as pronotum, with few longer setae on posterior margins of last 6, more scattered and numerous on last 3; sternites with more longer setae, especially on posterior margins and last 4-5 segments.

Measurements (10 specimens from 1 locality) in millimetres.

	Range	Mean
Head width across eyes	1.08-1.12	1.10
Greatest diameter of eye	0.30-0.35	0.33
Ocellus	0.10-0.12 × 0.13-0.15	0.11 × 0.14
Ocellus to eye	0.06-0.08	0.07
Width of pronotum	1.25-1.35	1.32
Length of pronotum	1.04-1.15	1.10
Length of hind tibia	1.00-1.06	1.04
Length of fore wing	10.60-11.30	10.87

Morphotype ♀ imago. NIGERIA : Northern Region, 25m. from Jos on Kaduna Road, 5.iii.1957 (W. A. Sands Coll. No. S.1256). In British Museum (Natural History).

Soldier. The additional material has increased the known range of variation in size.

Measurements (15 specimens from 3 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.22-1.61	1.43
Head width	0.82-1.02	0.94
Depth of head capsule	0.49-0.64	0.58
Width of pronotum	0.43-0.51	0.47
Length of pronotum	0.18-0.25	0.21
Length of hind tibia	0.59-0.77	0.67

M. edentatus was described from a unique soldier, and additional material agrees well with the original description. The characteristics separating it from the other two species are discussed thereunder.

Material (other than holotype, Sands, 1956). GHANA : 30m. from Navrongo on Tumu Road, 13.iii.1959 (W. A. Sands).

M. edentatus, like its congeners, has been recorded from the mounds of other genera, but appears, unlike them, to be adapted to life in shaded habitats in the savannah zones, and has not been found in rain forest.

Mimeutermes giffardii Silvestri

(Text-figs. 455, 456, 462, 476-478, 493, 494 ; Map 32)

Mimeutermes giffardii Silvestri, 1914 : 48. Type locality : GUINEA, Camayenne.

Imago. Head capsule very dark sepia brown, antennae and postclypeus sepia brown, labrum yellow. Pronotum, meso- and metanota sepia brown, other thoracic sclerites brown, femora yellow, tibiae and tarsi yellow-brown. Abdominal tergites brown, sternites brown laterally, yellow-white in mid-line. Wing membrane translucent pale brown, venation sepia brown, all distinct.

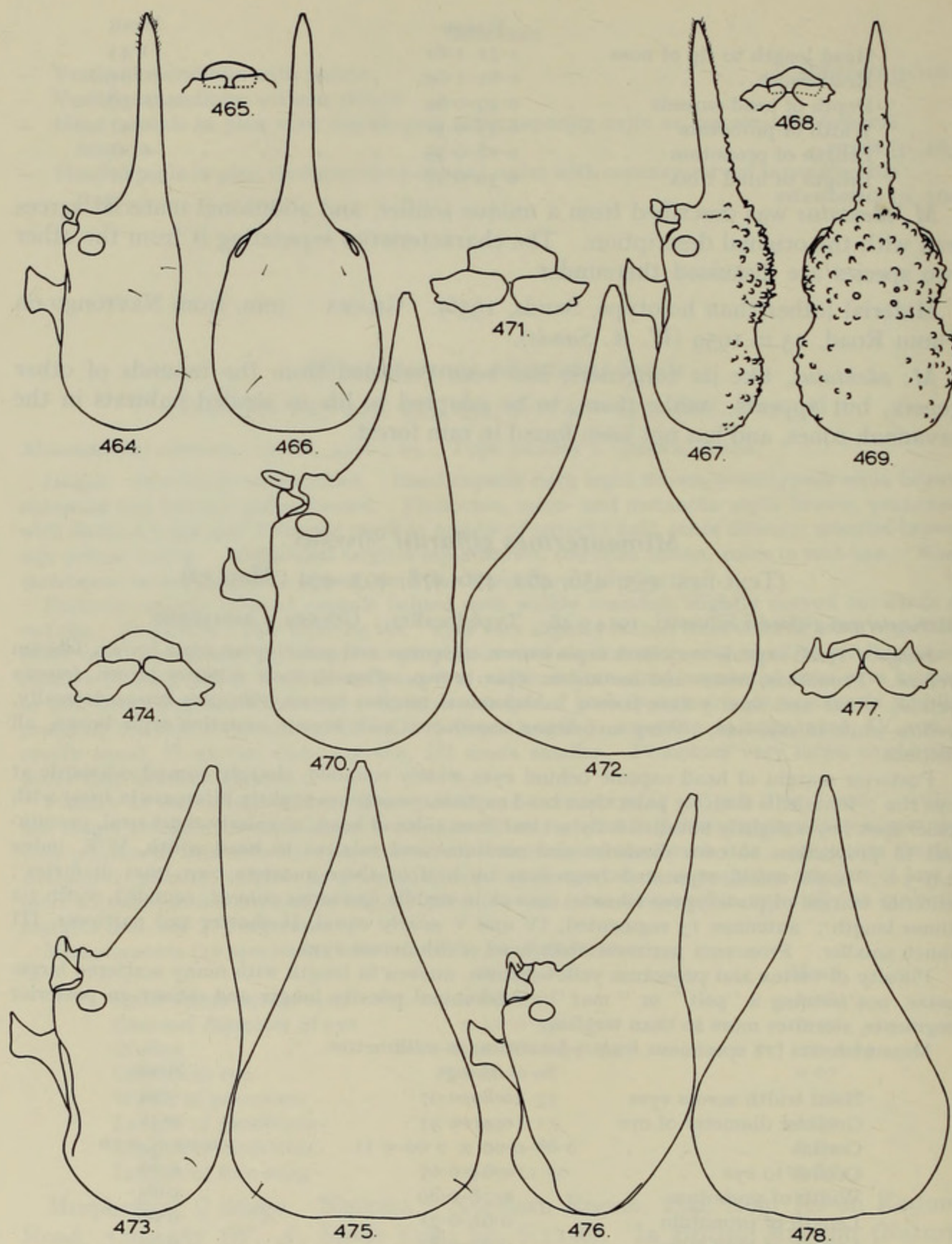
Posterior margin of head capsule behind eyes widely rounded, sharply curved outwards at eye rim ; fontanelle scarcely paler than head capsule, sometimes slightly bifurcate in front with paler spot ; eyes slightly but distinctly set out from sides of head, angularly short oval, prominent in proportion to own diameter and medium-sized relative to head width, W/E index 2.9-3.0 ; ocelli small, separated from eyes by half to three-quarters own least diameter ; anterior margin of postclypeus sinuate, convex in middle, posterior convex, rounded, width 2.2 times length ; antennae 15 segmented, IV and V nearly equal, II shorter and narrower, III much smaller. Pronotum narrower than head width across eyes.

Pilosity of vertex and pronotum yellow-brown, uneven in length with many scattered larger setae, not forming a "pelt" or "mat". Abdominal pilosity longer and denser on posterior segments, sternites more so than tergites.

Measurements (12 specimens from 3 localities) in millimetres.

	Range	Mean
Head width across eyes	0.89-0.97	0.94
Greatest diameter of eye	0.31-0.33	0.31
Ocellus	0.08-0.09 × 0.09-0.11	0.09 × 0.10
Ocellus to eye	0.04-0.07	0.06
Width of pronotum	0.78-0.89	0.85
Length of pronotum	0.61-0.71	0.66
Length of hind tibia	0.82-0.87	0.84
Length of fore wing	8.20-8.60	8.38

Soldier. Head capsule yellow to ferruginous orange, nose orange to ferruginous orange, rest of body cuticle yellow.



FIGS. 464-478 : Soldier head capsule, side and plan views, labrum, and mandibles. 464-466, *Postsubulitermes parviconstrictus* ; 467-469, *Verrucositermes tuberosus* ; 470-472, *Mimeuterms edentatus* ; 473-475, *M. sorex* ; 476-478, *M. giffardii*.

Head capsule in plan view top-shaped, sides parallel at back then sharply converging continuously with nose to about half nose length, rest of nose tapering less sharply. In profile strongly humped above antennal socket, which is distinctly behind middle of head, nose slightly upturned; vestigial mandibles with points; antennae, proportions of basal segments somewhat variable, usually II, IV and V subequal, longer up to twice III. Conspicuous head setae few, one bilaterally placed pair near back of head, and one pair near base of nose. Cuticle of vertex distinctly rastrate, at high magnifications ($\times 500$) small papillae visible.

Measurements (14 specimens from 4 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.25-1.48	1.39
Head width	0.72-0.87	0.83
Depth of head capsule	0.61-0.71	0.66
Width of pronotum	0.43-0.46	0.44
Length of pronotum	0.18-0.26	0.23
Length of hind tibia	0.54-0.64	0.59

M. giffardii is easily distinguished from the other two species by the points on the soldier mandibles. Other features are the distinctly rastrate vertex and the differing profile in the soldier. In the imago, the coarser irregular vertex pilosity is distinctive; in addition the larger eyes and shorter hind tibia separate it from *M. sorex* and the generally smaller size from *M. edentatus*. *M. giffardii* is probably the most primitive of the three species in possessing these characteristics.

Material. GUINEA: Camayenne, $9^{\circ} 25' N.$, $13^{\circ} 40' W.$, 1912-13 (*F. Silvestri*), holotype ♀ imago, paratype soldiers and workers, *M. giffardii* Silvestri, Silvestri Coll., Lab. Zool. Sc. Agr., Portici.

GHANA: Aburi, 1912-13 (*F. Silvestri*), further paratype imago, soldiers, and workers, Silvestri Coll., as above; Kumasi, Kwadaso, 19.ii.1959, and $5\frac{1}{2}$ m. from Dunkwa on Obuasi Road, 4.iv.1959 (*W. A. Sands*), B.M.(N.H.).

This species appears to be one of the very few which are confined to the rain forest areas to the west of the Dahomey-Togoland gap, presumably having evolved in isolation from the main Congo forest block. It has been recorded from the mounds of other genera of termites.

Mimeutermes sorex Silvestri

(Text-figs. 457, 458, 463, 473-475, 495; Map 32)

Mimeutermes sorex Silvestri, 1914: 50. Type locality: GUINEA, Mamou.

Imago. Previously undescribed. Head capsule dark sepia brown, antennae and postclypeus brown, labrum yellow. Pronotum, meso- and metanota brown, other thoracic sclerites and legs yellow-brown. Anterior abdominal tergites yellow-brown, posterior brown; sternites yellow-brown, brown around stigmata. Wings absent.

Posterior margin of head capsule behind eyes widely rounded, sharply curved outwards at eye rim; fontanelle a minute, pale, tapering slit with oval pale spot in front; eyes slightly set out from sides of head, angularly short oval, prominent in proportion to own diameter and medium-sized relative to head width, W/E index 3.4; ocelli small, separated from eyes by approximately three-quarters own least diameter; anterior margin of postclypeus sinuate, convex in middle, posterior convex, rounded, width 2.0 times length; antennae 15 segmented,

IV slightly larger than V, II smaller than these, III much smaller. Pronotum narrower than head width across eyes.

Pilosity of vertex and pronotum brown, of medium length, very dense and even, forming a "pelt" or "mat", with a few longer emergent setae more or less symmetrically placed in pairs or groups. Abdominal pilosity, first 3-4 tergites as pronotum, posterior tergites and sternites with longer setae of uneven length.

Measurements (Unique morphotype ♀) in millimetres.

Head width across eyes	0.97
Greatest diameter of eye	0.29
Ocellus	0.09 × 0.10
Ocellus to eye	0.06
Width of pronotum	0.89
Length of pronotum	0.66
Length of hind tibia	1.02

Unique morphotype ♀ imago. NIGERIA: Eastern Region: Port Harcourt, 1.iv.1957 (*W. Wilkinson*, Coll. No. WW.607). In British Museum (Natural History).

Soldier. Head capsule yellow to ferruginous, nose orange to chestnut brown, rest of body cuticle pale yellow to yellow.

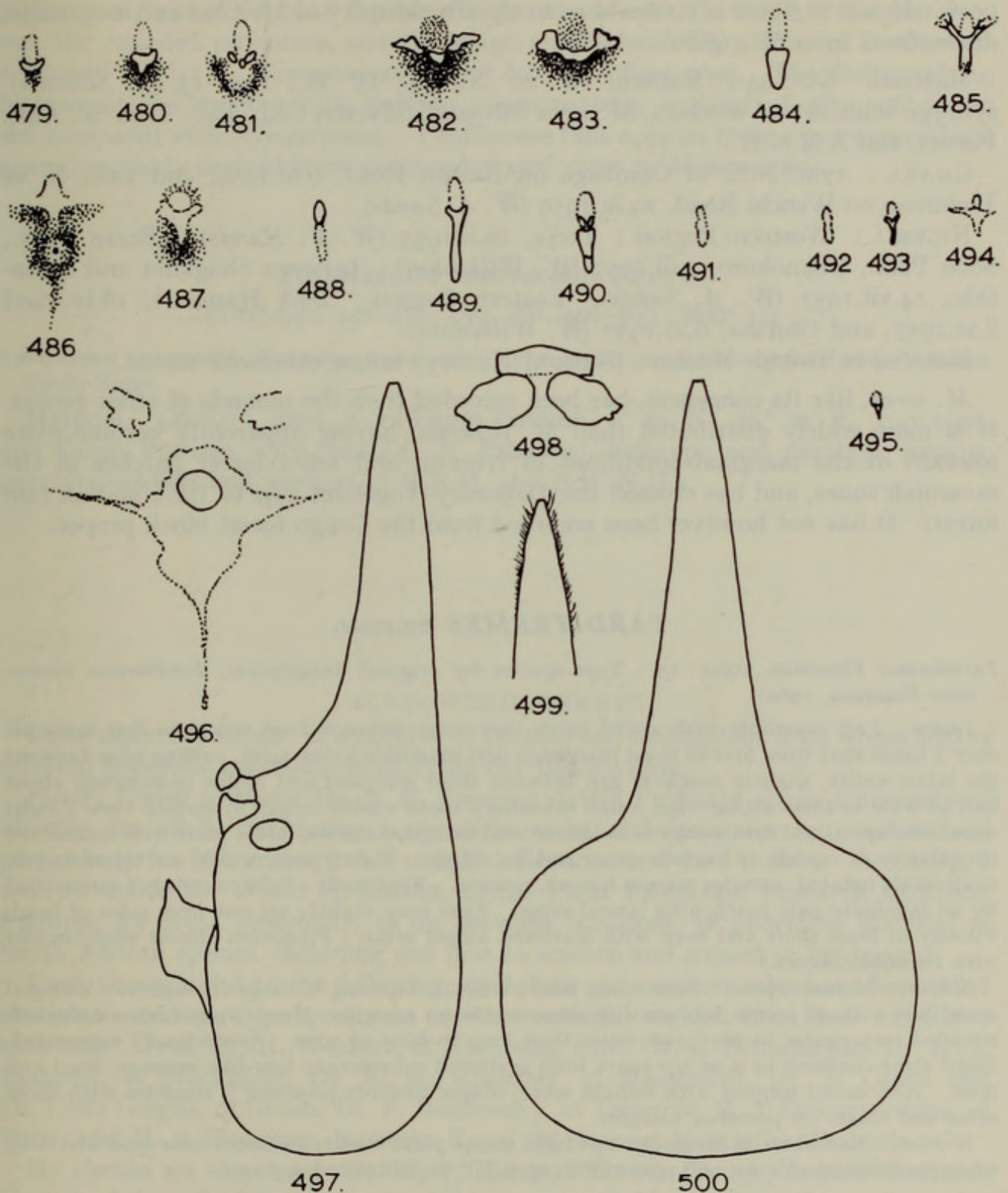
Head capsule in plan view top-shaped, posterior corners rounded, sides sharply converging to near tip of nose in continuous line. In profile strongly humped above antennal socket, which is behind middle of head, nose more or less parallel to long axis of head; vestigial mandibles without points; antennae, proportions of basal segments somewhat variable, usually II and V subequal, IV subequal or slightly larger, III smaller and narrower than these. Conspicuous head setae few, usually one bilaterally placed pair towards back of head. Cuticle of vertex not markedly rastrate.

Measurements (25 specimens from 8 localities) in millimetres.

	Range	Mean
Head length to tip of nose	1.35-1.51	1.43
Head width	0.75-0.89	0.82
Depth of head capsule	0.61-0.69	0.63
Width of pronotum	0.41-0.46	0.44
Length of pronotum	0.18-0.22	0.19
Length of hind tibia	0.64-0.71	0.66

M. sorex differs from *M. giffardii* in the shape of the soldier head capsule, particularly in profile, and the lack of points on the mandibles. *M. edentatus* is also different in shape. In the imago, the smaller eyes and very even dense head and pronotum pilosity separate *M. sorex* from *M. giffardii*. *M. edentatus* is larger, with a wider pronotum, and shorter but still dense and even pilosity.

The description above differs from that given by Silvestri in several respects, of which the most important is the lack of points on the soldier mandibles. The reason for this is that the syntypes of *M. sorex* include specimens of *M. giffardii*, presumably having been collected from a mound containing both species. This fact was not recognized by Silvestri, who described the general shape of *M. sorex*, clearly distinguishing it from the paratype soldiers of *M. giffardii*. The soldier mandibles he must have illustrated and described from a specimen of *M. giffardii* in which the points were slightly smaller than usual. The true *M. sorex* syntypes are without points, and no other specimen with points has been found. When the syntypes were examined in Portici in 1958, a lectotype was not selected, and this designation must await a further personal visit since the Silvestri collection is not accessible by



FIGS. 479-496 : Imago fontanelle. 497-500 : Soldier head capsule, nose tip, labrum and mandibles. 479, ♂, 480, 481, ♀, *Eutermellus abruptus* ; 482, ♂, 483, ♀, *E. aquilinus* ; 484, ♂, *E. bipartitus* ; 485, ♂, *E. convergens* ; 486, ♂, 487, ♀, *E. undulans* ; 488, ♂, ♀, *Afrosubulitermes congoensis* ; 489, ♀, *Postsubulitermes parviconstrictus* ; 490, ♂, *Verrucositermes tuberosus* ; 491, ♂, ♀, *Mimeutermes edentatus* ; 492, ♂, 493, 494, ♀, *M. giffardii* ; 495, ♀, *M. sorex* ; 496-500, *Tarditermes contricolor*.

post. However, there is no doubt as to the true identity of *M. sorex* and its genuine distinctness from *M. giffardii*.

Material. GUINEA : Mamou, 10° 20' N., 12° 15' W., 1912-13 (F. Silvestri), syntype soldiers and workers, *M. sorex* Silvestri, Silvestri Coll., Lab. Zool. Sc. Agr., Portici, and A.M.N.H.

GHANA : 17m. N.E. of Gambaga on Bawku Road, 6.iii.1959, and 12m. N. of Techiman on Wenchi Road, 29.iii.1959 (W. A. Sands).

NIGERIA : Western Region ; Ikeja, 10.ii.1955 (W. V. Harris) ; Benin Prov., Sobo Plain, Obanokoro, 7.iii.1957 (W. Wilkinson) ; between Shagamu and Ijebu-Ode, 14.xii.1957 (W. A. Sands). Eastern Region ; Port Harcourt, 18.iv. and 8.xi.1957, and Onitsha, 6.xi.1957 (W. Wilkinson).

Material in British Museum (Natural History) unless otherwise stated.

M. sorex, like its congeners, has been recorded from the mounds of other genera. It is more widely distributed than *M. giffardii*, having apparently become more tolerant of the marginal conditions of riverain and relict forest patches in the savannah zones, and has crossed the Dahomey-Togoland gap to the Nigerian rain forest. It has not however been recorded from the Congo forest block proper.

TARDITERMES Emerson

Tarditermes Emerson, 1960 : 15. Type-species by original designation, *Tarditermes contricolor* Emerson, 1960.

Imago. Left mandible with apical tooth very long, distance from apical to first marginal over 3 times that from first to third marginals (left mandible index 3.17), cutting edge between the latter entire, slightly concave, gap between third marginal and molar prominence about half as wide as this cutting edge, small subsidiary tooth visible in gap in surface view ; right mandible, apical and first marginal as left, second marginal absent, molar plate with no marked irregularity of outline in surface view, and no ridges. Postclypeus, width 2.1 times length, moderately inflated, anterior margin convex, sinuate. Fontanelle a light round spot surrounded by an indefinite pale patch with lateral arms. Eyes very slightly set out from sides of head. Pilosity of head short and even with scattered longer setae. Pronotum almost semi-circular with rounded corners.

Soldier. Monomorphic. Nose long, thick, conical, tapering to large fontanelle. Vestigial mandibles without points, labrum with sinuate anterior margin. Head capsule not constricted, rounded rectangular in plan and wider than long to base of nose. Antennae 13 segmented. Head setae confined to nose tip apart from scattered microscopic hair-like setae on head and nose. Abdominal tergites with minute setae, longer towards posterior ; sternites with short setae and longer on posterior margins.

Worker. Mandibles as imago, except right molar plate weakly indented near base and with more pronounced anterior and posterior flanges (left mandible index 3.23).

According to Emerson (1960), the imago of *Tarditermes* is larger than all its nasute relatives except the neotropical *Angularitermes*. This is true but the recently discovered imago of *Mimeuterme edentatus* Sands to a large extent bridges the gap. Other features of the latter species appear to indicate a relationship with *Tarditermes*, including the characteristic slow movement of the neuter castes in life. The imago of *Tarditermes* most closely resembles *Mimeuterme* in the widely curved

posterior margin of the head capsule, the prominent eyes, the shape of the postclypeus, the rounded pronotum, and the imago mandibles. The soldier of *Tarditermes* is closely similar to *Mimeuterme*s except for the longer nose. The distinguishing features of the imago are its striking colour pattern, reduced pilosity, and larger size compared with *Mimeuterme*s. *Tarditermes* thus appears to be a more specialized genus, probably derived from an ancestor very close to *Mimeuterme*s.

***Tarditermes contricolor* Emerson**

(Text-figs. 448–450, 459, 460, 496–500 ; Map 31)

Tarditermes contricolor Emerson, 1960 : 18. Type locality : CONGO, near Camp Putnam, Epulu River.

Material, CONGO : 4km. N. of Camp Putnam, 1° 24' N., 28° 36' E., 19.v.1948, and Camp Putnam, 17.v.1948 (*A. E. Emerson*), holotype and paratype imagos, paratype soldiers and workers, A.M.N.H. and B.M.(N.H.).

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