Cimbebasia

MEMOIR NO. 2

PRELIMINARY REPORT ON A SURVEY OF THE TERMITES (ISOPTERA) OF SOUTH WEST AFRICA

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precipitation or sap drawn from the living tissues of the tree to which the infested wood is attached. Flourishing colonies are found in driftwood deposited in dry riverbeds in the coastal belt of the Namib desert where rain rarely falls. Apparently sea fogs, which regularly sweep inland from the Atlantic by night, provide sufficient moisture in the wood to enable survival of the termites.

There are no records of Kalotermitinae infesting timber composing man-made structures in South West Africa, nor have they been found to be responsible for serious attack on indigenous or exotic timber, shade or fruit tree species. In this territory they are thus classified as being of minor economic importance.

1. *NEOTERMES* Holmgren

(Fig. 6: A-B, soldier. Fig. 26: distribution).

Species

Only one species, as yet undetermined, is represented.

DISTRIBUTION

The six colony samples were obtained from five collecting stations situated in the districts Grootfontein (1) and Okavango (4).

The genus has been recorded hitherto only from vegetation Type 11.

Feeding and nesting habits

In all cases the colonies inhabited dead branches and branch stubs on living indigenous tree species. One host tree involved was *Guibourtia coleosperma*, known localy as the ushivi, in the remainder the host tree species were not recorded.

2. *BIFIDITERMES* Krishna

(Fig. 7: A-B, soldier. Fig. 27: distribution)

Species

B. sibayiensis (Coaton) is the only species represented, determinations by R. M. C. Williams.

Distribution

The two colony samples were obtained from two collecting stations, both situated in the Okavango. The genus has been recorded hitherto only from vegetation Type 11.

Feeding and nesting habits

One colony was recorded as nesting in a dead branch on a living Mangetti tree *Ricinodendron rautanenii*, the other in a section of dead wood in the trunk of a living *Guibourtia coleosperma*.

3. *EPICALOTERMES* Silvestri

(Fig. 6: C-D, soldier. Fig. 28: distribution)

Species

The material assembled is as yet identified. There may be more than one species represented, or one species with a highly variable soldier caste.

Distribution

The 325 colony samples were obtained from 205 collecting stations situated in the districts Bethanie (3), Gibeon (1), Gobabis (1), Grootfontein (24), Kaokoveld (37), Karibib (11), Keetmanshoop (8), Lüderitz (3), Maltahöhe (5), Okahandja (14), Okavango (12), Omaruru (9), Otjiwarongo (7), Outjo (15), Ovamboland (21), Rehoboth (2), Swakopmund (8), Tsumeb (10), Walvis Bay (4), Warmbad (9), and Windhoek (1).

The genus has been recorded from all vegetation types except 3.

Feeding and nesting habits

Colony samples were taken from nests in dead branches and branch stubs on living trees of the following species:- *Acacia* spp., amongst others including *A. hereroensis* (Bergthorn), *A. karroo* (Soetdoring), *A. albida* (Ana), *A. mellifera detinens* (Swarthaak) and *A. tortilis heteracantha* (Haak-en-steek) — 33 samples; *Aloe ramosissima*, and *A. dichotoma* (Kokerboom) — two samples; *Boscia albitrunca* (Witgat) — two samples; *Combretum* sp., amongst others including *C. apiculatum* (Rooibos), *C. zeyheri*, and *C. imberbe* (Hardekool) — 17 samples; *Commiphora* spp., amongst others including *C. glaucescens*, *C. multijuga*, and *C. wildii* — 67 samples; *Ficus* spp. — two samples; *Lonchocarpus nelsii* (Appelblaar) — 19 samples; *Albizia anthelmintica* — 13 samples; *Tamarix austro-africana* — 5 samples; *Sclerocarya caffra* (Marula) — ten samples; *Peltophorum africanum* (Huilboom) — six samples; *Ricinodendron rautanenii* (Mangetti) — two samples; *Parkinsonia africana* (Lemoendoring) — 77 samples. In 39 cases the colonies were similarly situated on host trees of unrecorded species. Two samples were drawn from colonies nesting in the stems of dead *Nicotiana glauca* (Wilde Tabak). In two cases the colonies sampled nested within driftwood in the beds of the Kuiseb and Omaruru Rivers, both situations lying in the mist belt of the Namib desert.

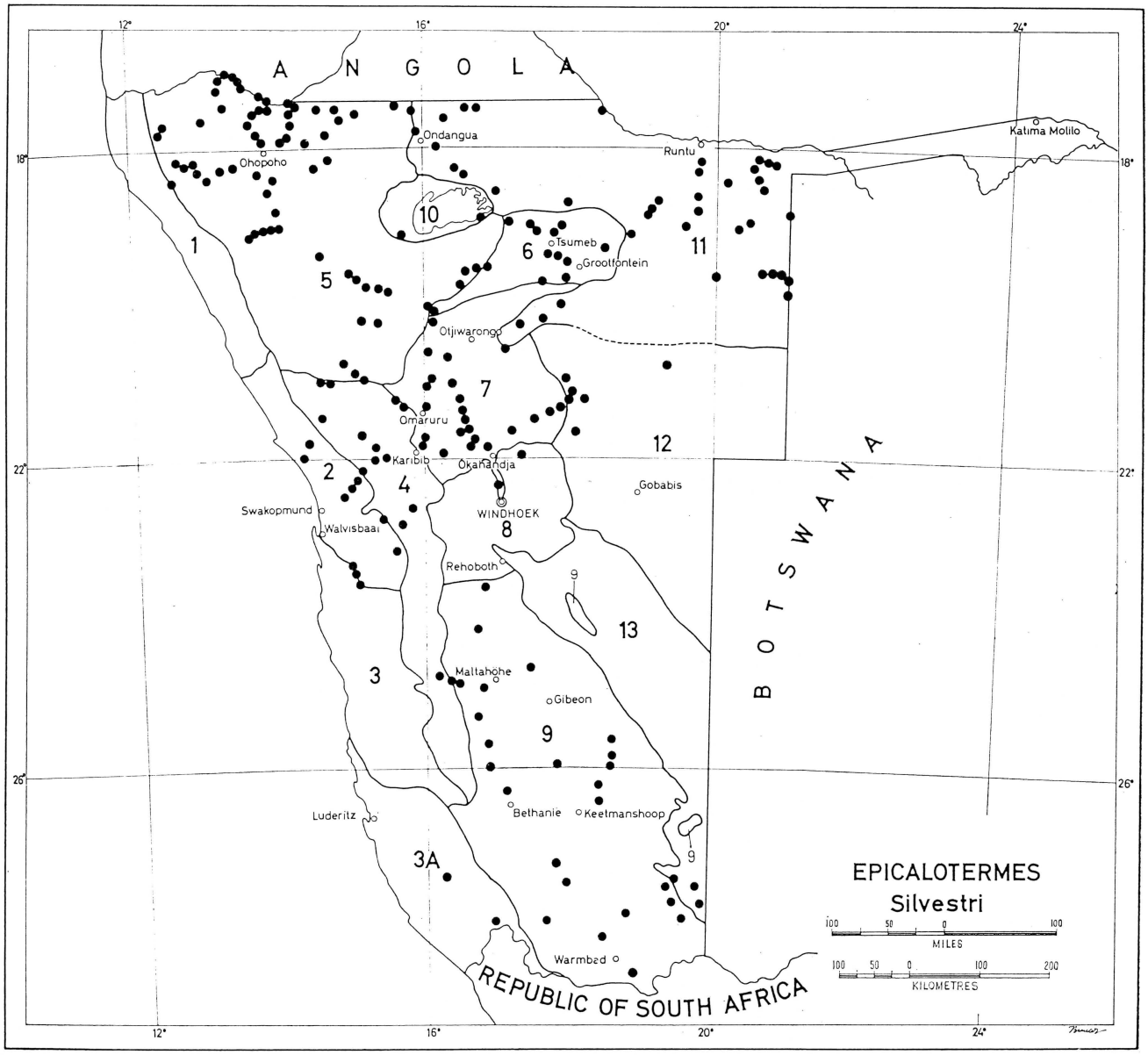

Figure 28. Distribution in South West Africa of the genus *Epicalotermes* Silvestri.

The unexpected distribution of *Epicalotermes* through the arid western coastal belt occurs in the Upper Namib mainly via *Commiphora* spp., and *Parkinsonia africana* (a favoured host species) which occurs along the dry stream beds. From there it extends right down to the coast via the major rivers in hosts such as *Acacia albida, Tamarix austro-africana,* and *Nicotiana glauca* as well as in drift-wood. In the arid southern and south-western vegetation types its major host species are *Parkinsonia africana* and the two tree *Aloe* species *A. dichotoma* and *A. ramosissima.*

4. *CRYPTOTERMES* Banks

(Fig. 7: C-D, soldier. Fig. 29: distribution)

Species

C. havilandi (Sjöstedt) is the only species represented, determinations by W. G. H. Coaton.

Distribution

The 13 colony samples were obtained from nine collecting stations situated in the districts Kaokoveld (4), Okavango (2), and Ovamboland (3).

The genus has been recorded hitherto only from vegetation Types 5 and 11.

Feeding and nesting habits

In ten cases the samples were drawn from colonies nesting in dead wood in the trunks of living *Ficus* sp. Three of the colony samples were taken from nests in dead branches and branch stubs on living trees, the host species in one case being a *Commiphora* sp. and in the rest not recorded.

SUBFAMILY HODOTERMITINAE

Popularly known in South Africa as harvester termites, the species referred to this subfamily are notorious in the more arid zones of Africa south of the Sahara for their heavy destruction of grazing. The nests are spherical to subspherical cavities, situated at varying depths in the soil, which are filled with closely set shelving composed of paper-thick, brittle, brownish black carton. Stocks of grass and other food materials are stored in the hives. The nest sites are never subtended by surface mounds in South West Africa, the presence of the termites in the soil being betrayed only by numerous soil dumps and foraging ports which are distributed on the surface at irregular intervals over the area occupied by each colony.

The soil dumps (plate 15) vary in height from less than 2 cm to over 20 cm and may range in shape from regularly conical to compounded multi-peaked specimens. Each dump is composed of loose soil particles, on occasions mixed with dark organic waste materials which have been eliminated from the nest system. Within the dumps brittle access passages, the walls of which are composed of soil particles stuck together with saliva, lead from surface level to the summits where waste materials are ejected.

The foraging ports are most readily seen while surface foraging is in progress; workers may then be observed dragging lengths of grass and other non-woody food materials through the open ports into the subterranean ramifications of the nest system. When foraging ceases the open ports are sealed off at surface level with plugs of cemented soil and become well-nigh invisible. Foraging may take place by day or by night, the timing being controlled mainly by temperature on the soil surface.

5. *HODOTERMES* Hagen

(Fig. 8: soldiers. Plate 15: soil dumps. Fig. 30: distribution)

Species

The only species represented is *H. mossambicus* (Hagen), determinations by W. G. H. Coaton. The soldier caste is highly variable, nanitic forms being encountered in all newly established colonies, and even in old colonies at situations where food supplies are scarce, for example, in the coastal dune sectors.

Distribution

H. mossambicus is widely and densely distributed over most parts of South West Africa. Many more samples could have been taken by the survey expeditions had the objective not been set to obtain only one vial of the species from each collecting station — this procedure was adopted to allow more time for the search for rarer taxa. Even with such deliberate limitation of collecting, *Hodotermes* colony samples were taken with such regularity that traverse legs throughout the territory are more or less delineated by localities proved positive for the genus (compare figures 5 and 30).

The 721 colony samples were obtained from 634 collecting stations situated in the districts Bethanie (10), Caprivi strip (1), Gibeon (49), Gobabis (45), Grootfontein (53), Kaokoveld (66), Karibib (19), Keetmanshoop (46), Lüderitz (7), Maltahöhe (14), Okahandja (19), Okavango (41), Omaruru (19), Otjiwarongo (26), Outjo (40), Ovamboland (42), Rehoboth (44), Swakopmund (16), Tsumeb (18), Walvis Bay (6), Warmbad (24), and Windhoek (29).

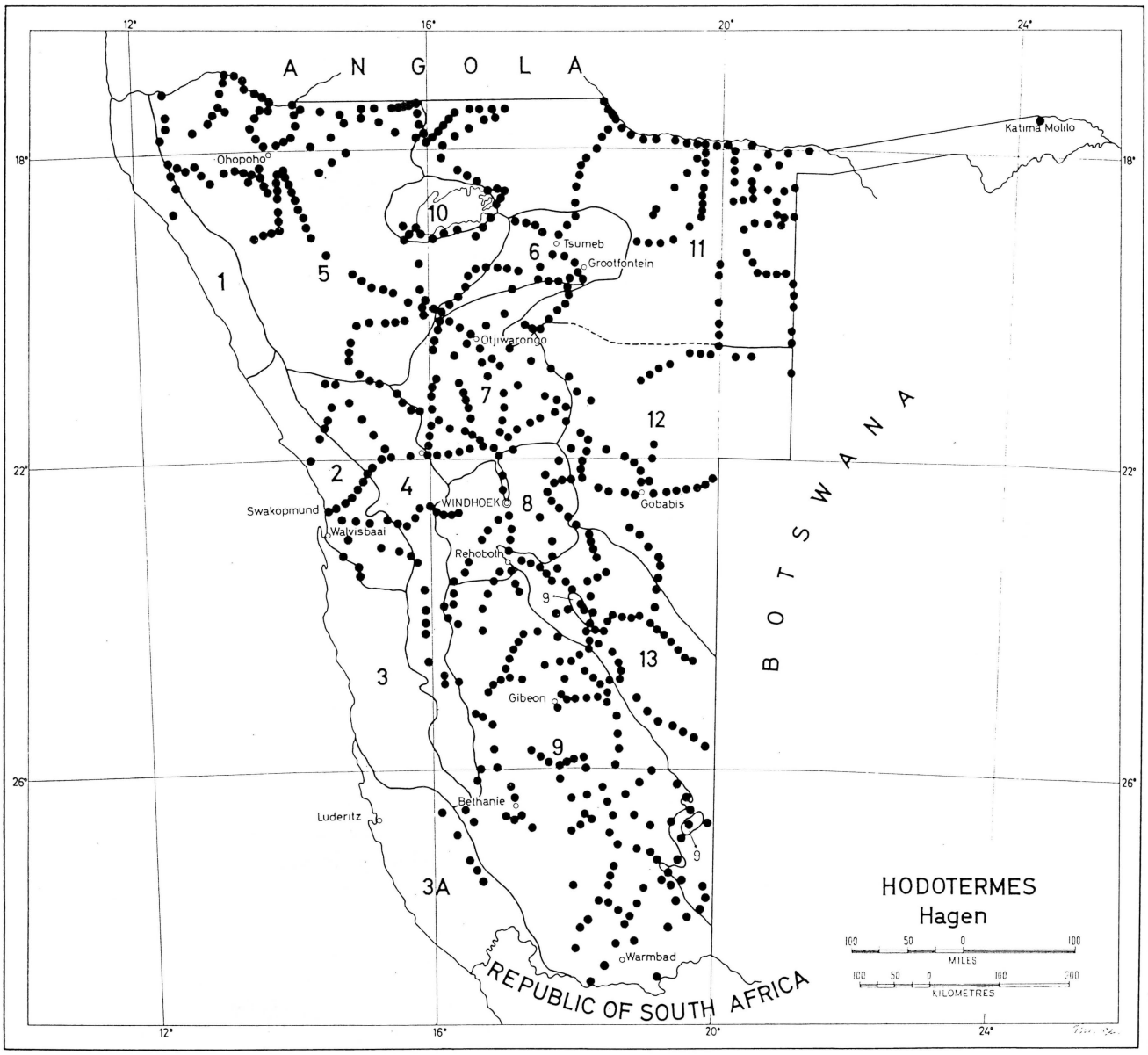

Figure 30. Distribution in South West Africa of the genus *Hodotermes* Hagen.

All the vegetation types except Type 3 are known to be positive for the genus.

Feeding and nesting habits

Colony samples were normally taken by sweeping aside fresh soil dumps to expose workers, the soldiers then being collected by inserting a length of pliable grass stem down into the subterranean galleries — in withdrawal thereof soldiers could usually be brought to the surface with their jaws clamped around the stem. Less frequently *Hodotermes* samples were taken while surface foraging was in progress, or from cells constructed either in mounds of other termite species or in the soil under stones.

The nest system consists of from one to three nursery hives, which serve as the reproductive centre of the colony, linked to a large and variable number of supplementary hives which hold only the sterile castes together with reserve stocks of food material which are conveyed to the breeding centre as required.

The area occupied by a colony varies seasonally and from year to year. During a season of abundant rainfall, when there is heavy regeneration of grass on the surface, the colony occupies a restricted area around its breeding centre during the summer months; from the end of the growing season onwards surface vegetation is progressively removed by termites and grazing animals, thus forcing the harvesters to extend the nest system further and further afield in search of food supplies. Should the following summer happen to be a period of drought, with little or no regeneration of surface vegetation, competition for available food supplies between grazing animals and the full complement of termite colonies reaches its peak, the areas occupied by individual harvester colonies reach their maxima and overlap considerably. Complete denudation of surface grass cover is then the inevitable outcome. Should summer rainfall be normal, however, each harvester colony falls back on the breeding centre and once more forages over a restricted area around it.

Coaton (1958) pointed out that there is evidence indicating that new colonies of *H. mossambicus* are established most successfully on areas which have been heavily denuded of grass cover during the summer months when swarming flights take place. Such barren conditions could be created by overstocking in sheep- and cattle-farming areas, especially in South West Africa where summer droughts occur frequently.

During the summer months of 1964-1965 drought prevailed over most parts of the districts Gibeon, Gobabis, Keetmanshoop, Rehoboth, Warmbad, and the eastern sectors of the Windhoek district. Although sufficient rain had fallen over this region to permit *H. mossambicus* colonies to send out swarming flights, the showers were in general too widely spaced in time, with spells of intense heat between them, to permit adequate regeneration of the grass cover. Optimum conditions for establishment of new colonies apparently prevailed.

These regions were traversed by the authors during April-May 1965, at a time when new colonies established through swarming some three to four months previously could have been expected to have commenced foraging activity on the surface. Such juvenile colonies can be recognised by the minute size of their soil dumps, which are usually much less than 2,5 cm in height, and by the extremely nanitic soldiers and workers which are characteristic of the first generation offspring of young queens. A close watch was kept for the presence of such incipient colonies along the routes traversed.

The picture which emerged was most alarming. Juvenile colonies were found abundantly at practically every collecting station throughout the area traversed. In many sectors it was possible to walk at random for hundreds of metres through the veld and find the typical minute soil dumps containing dwarfed workers fairly evenly spaced at intervals of from 8-12 inches (20-30 cm); between collecting stations these diminutive dumps were seen to be as frequently distributed along the barren road verges, almost without interruption, for hundreds of kilometres at a stretch. When it is borne in mind that each juvenile colony would probably not have established more than three or four surface dumps at this early stage of development it becomes clear that colony density must have increased tremendously throughout the south-eastern sectors of South West Africa during the summer of 1964-1965. While it could be assumed that many of these juvenile colonies would have succumbed subsequently as a result of starvation and predation, the nett increase in colony density that year would still have been alarmingly high.

Under conditions of bad grazing practice combined with periodic droughts saturated or near-saturated populations of *H. mossambicus* have developed over extensive areas in South West Africa. A saturated population is defined as one capable of consuming practically the whole hay yield of the veld, in the absence of grazing animals, during any year of average rainfall. One of many such cases seen in the territory may be mentioned. During October 1965 the authors were collecting in a large fenced camp along the road linking Gobabis with Steinhausen when the owner of the farm arrived. It was ascertained from him that this particular camp had been rested completely since spring 1964 to provide grazing for livestock in spring 1965. Reasonably

good rains had been registered during the previous summer and regeneration of grass cover had been adequate, yet by October 1965 all grass had been reduced to stubble despite the complete absence of grazing livestock. The barren surface of the camp involved was then evenly and very heavily pocked over its entire area with dumps of *H. mossambicus*, and no doubt existed that harvester termites alone were responsible for removal of the entire hay yield. Figure 30 provides clear evidence of the extent to which *H. mossambicus* possesses the earth of South West Africa. Including the vast Northern Kalahari region, which is rather lightly infested by harvester termites except on the more consolidated soils of river flood-plains, omurambas, vleis and dune valleys, it is very conservatively estimated that *H. mossambicus* consumes approximately 25% of the aggregate hay yield of South West Africa during every year of average rainfall. In years of drought, when grass regeneration is poor, this figure would be doubled or even trebled. Apart from lowering the stock-carrying capacity of the territory by at least one-quarter these termites are facilitating soil erosion and desert encroachment through their removal of the protective grass cover.

A large range of vertebrate and invertebrate predators plays a part in keeping harvester termites in check. Some of the more important vertebrate predators are the antbear, the bat-eared fox and numerous smaller insectivorous mammal, bird and reptile species.

The antbear is progressively being eliminated in sheep-farming sectors owing to its habit of occasionally burrowing under jackal-proof fencing and thus providing ingress into protected camps for carnivorous vermin. This is an extremely short-sighted policy since the antbear is the only predator able to find, reach and destroy hives of mature colonies of *H. mossambicus* and thus plays a major role in controlling the species. Analyses made of the stomach contents of the bat-eared fox have revealed that termites in general, and harvester termites in particular, form the major constituent of its diet. This innocuous animal is rapidly being exterminated in pastoral areas since farmers erroneously tar it with the same brush as true jackals.

Amongst the birds seen feeding on *H. mossambicus* in South West Africa are starlings, hornbills, plovers and a wide range of game-birds such as francolins, bustards, guineafowl and the Namaqua sand grouse (kelkiewyn). The surface soil dumps of the harvesters are scattered daily to expose the workers contained within them; in the sandveld sectors game birds were observed scrabbling downwards to a depth of 15 cm or more into the sand beneath dumps while following up subterranean passages in search of more insects. Juvenile colonies of *H. mossambicus* are especially vulnerable to such predation — the production rate of first generation workers is low and if these are destroyed regularly the young queens must eventually die of starvation. Any farmer who shoots or traps termite predators should realise that he does so at high cost when expressed in terms of decreased stock-carrying capacity and veld deterioration.

6. *MICROHODOTERMES* Sjöstedt

(Fig. 9. A-B, soldier. Fig. 31: distribution)

Species

The only species represented is *M. viator* (Latreille), determinations by W. G. H. Coaton.

Distribution

The 27 colony samples were obtained from 26 collecting stations situated in the districts Keetmanshoop (2), Lüderitz (7), and Warmbad (17).

The genus has been recorded in South West Africa only from vegetation Types 3A and 9.

Feeding and nesting habits

Most of the colony samples of *M. viator* were obtained from cells and galleries present in the soil under stones or set in the matrix of nests of other termite species. Other samples were obtained from cells and galleries in the soil immediately beneath surface soil dumps.

M. viator differs from *H. mossambicus* in that there is only one hive per colony, and in that the area foraged remains fairly constant and rarely exceeds a radius of 50 yards (45 m) from the nest. It is a species ideally suited to survival in arid areas permanently covered with scrub and succulents. In the more grassy savanna regions it is ousted by *H. mossambicus*, which has a nest system far better adapted to coping with alternating periods of extreme scarcity and abundance of grass supplies on the surface.

The dumps on the surface in the immediate vicinity of the subterranean hives of *M. viator* invariably have a high proportion of waste organic material extruded from the nest system and consequently are of a typically greyish black colour; those situated further afield are composed of soil particles and have the same colour and composition as the subsoil.

In view of the fact that this termite is but sparsely present only in the extreme southern and south-western sectors of the territory it is classified as a pasture pest of relatively minor economic importance in South West Africa.

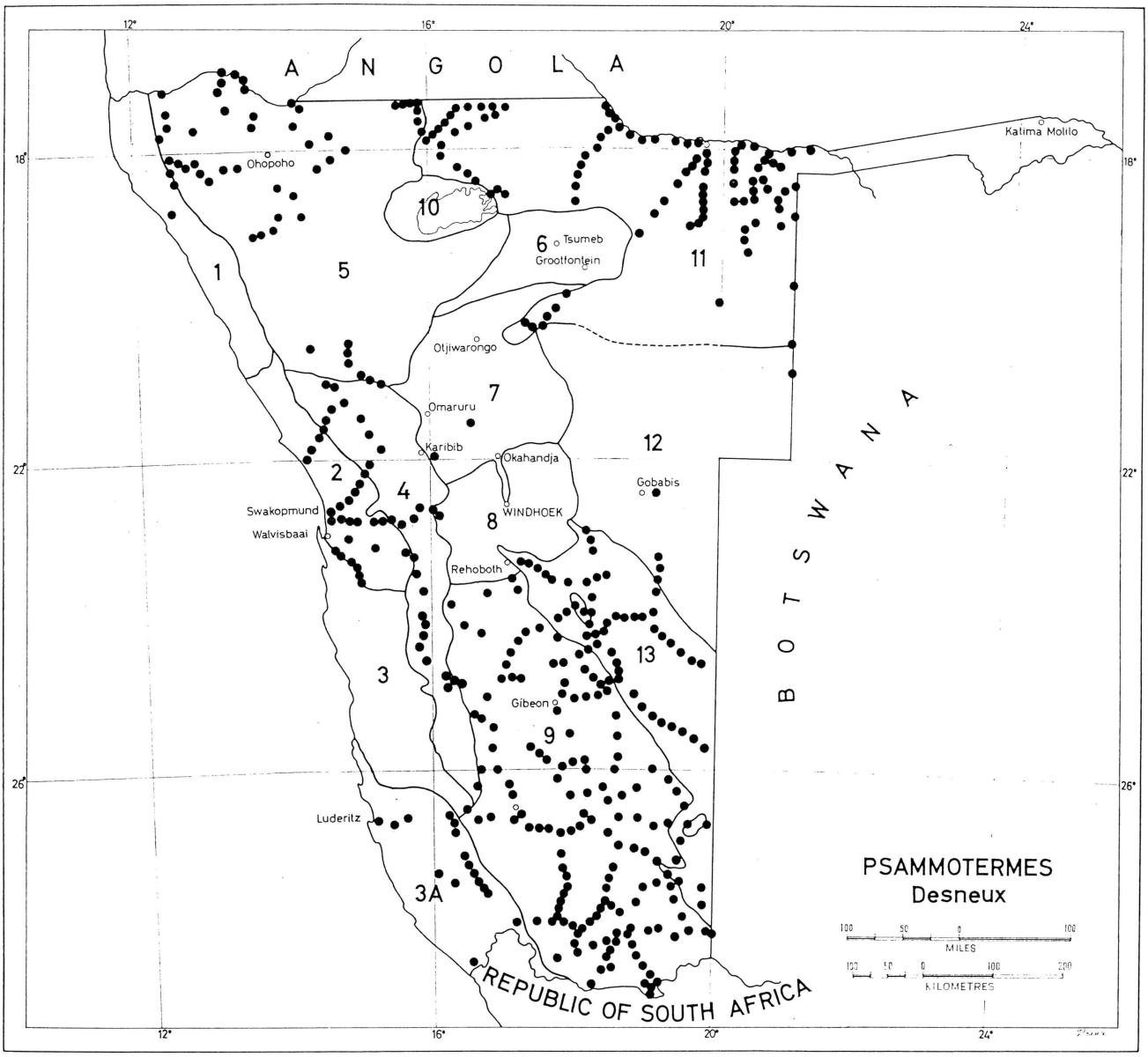

Figure 32. Distribution in South West Africa of the genus *Psammotermes* Desneux.

SUBFAMILY PSAMMOTERMITINAE
7. *PSAMMOTERMES* Desneux

(Fig. 10: soldiers. Fig. 32: distribution)

Species

The only species represented is *P. allocerus* Silvestri, determinations by W. G. H. Coaton.

There is an amazingly large variation in soldier size, individuals collected ranging from minute, nanitic forms to very large specimens which dwarf the alates, workers and smaller soldiers. Giant soldiers appear to develop most frequently in well-established colonies nesting in or near abundant food supplies.

Distribution

The 938 colony samples were obtained from 436 collecting stations situated in the districts Bethanie (13), Gibeon (46), Gobabis (8), Grootfontein (27), Kaokoveld (33), Karibib (9), Keetmanshoop (49), Lüderitz (19), Maltahöhe (15), Okahandja (1), Okavango (47), Omaruru (6), Otjiwarongo (2), Outjo (4), Ovamboland (35), Rehoboth (29), Swakopmund (18), Tsumeb (4), Walvis Bay (10), Warmbad (55), and Windhoek (6).

The genus has not yet been collected from vegetation Types 3, 6 and 10; it is marginally present along the western boundary of Type 8 and has been recorded from Type 7 only in the south-western corner. It is widely represented in all other vegetation types.

Feeding and nesting habits

Colony samples of *P. allocerus* were taken at the following foraging situations: In the dung of herbivora including cattle (135), horses and donkeys (4), sheep and goats (4), camel (1), springbok (1), black rhinoceros (1), zebras (8) and elephants (4); on roadside debris such as carton boxes, jute bags, etc. (4); on dead grass stools and surface leaf litter (23); on the dead ends of the leaves of *Welwitschia mirabilis* (2); on organic material contained in and under dumps of *H. mossambicus* and *M. viator* (16); on and in prone dead bushes, sticks, branches, and logs on the soil surface (477); on and in stems and trunks of standing dead millet, bushes and trees as well as tree stumps (133); in fence posts and droppers (5); in the posts and poles comprising the walls and roof of a rest hut in the Kaokoveld (1). Other samples were taken from nest cells and galleries placed in the soil under stones (95) or situated in the matrix of nests of species of *Amitermes* (1), *Baucaliotermes* (2) and *Trinervitermes* (3). In ten cases the samples were taken from nests of their own construction which were independently placed in the soil.

This termite consumes any material containing cellulose from dung and humus to sound, dead wood. Materials lying on the surface are normally entered from the side in contact with the soil and then hollowed out from within, but earthen canopies are on occasions constructed over the exposed surfaces under cover of which the material is attacked. Food sources removed from contact with the soil may be reached by means of covered runways constructed over the surface or galleries in the interior of intervening structures. As the food sources are hollowed out a core of cemented soil is introduced to maintain the solidity of the structure, this matrix being pierced by a series of superimposed, very flat cells linked by extremely narrow passages.

Its nests are most frequently found in the interior of wood embedded in the soil such as fence posts and tree stumps. Independent nests in the soil were abundant on the sandy plateau about 10 miles (16 km) south of Aus on the road to Witpütz. These took the form of subspherical aggregations of superimposed flattened cells linked by galleries no thicker than a matchstick. The dark faecal lining of cells and passages contrasted strongly with the red colour of the sand in which they were set. Each such nest was placed with its upper end set in the base of a grass stool, and extended downwards into the sand to depths of 15-23 cm with the grass roots serving to bind together a rather brittle structure. Similar nests, which had been partly exposed by wind erosion of the dunes in which they were set, were observed near the south-eastern border of the territory on the banks of the Nakop River.

In view of its wide distribution in South West Africa and the fact that it readily and severely attacks seasoned timber in and away from buildings, *P. allocerus* should be rated as a pest of major economic importance in the territory.

SUBFAMILY COPTOTERMITINAE

8. *COPTOTERMES* Wasmann

(Fig. 9: C-D, soldier. Fig. 33: distribution)

Species

The only species represented is *C. amanii* (Sjöstedt), determination by W. V. Harris.

Harris (1966) lists the distribution area of this species as including Somalia, Kenya, Tanganyika, Zanzibar, Malawi, and Rhodesia. The most westerly record hitherto known has been Victoria Falls, at longitude 25°52'E. The two records given below extend its distribution westward to approximately longitude 16°E.

This is the first recording of an indigenous *Coptotermes* species from South and South West Africa.

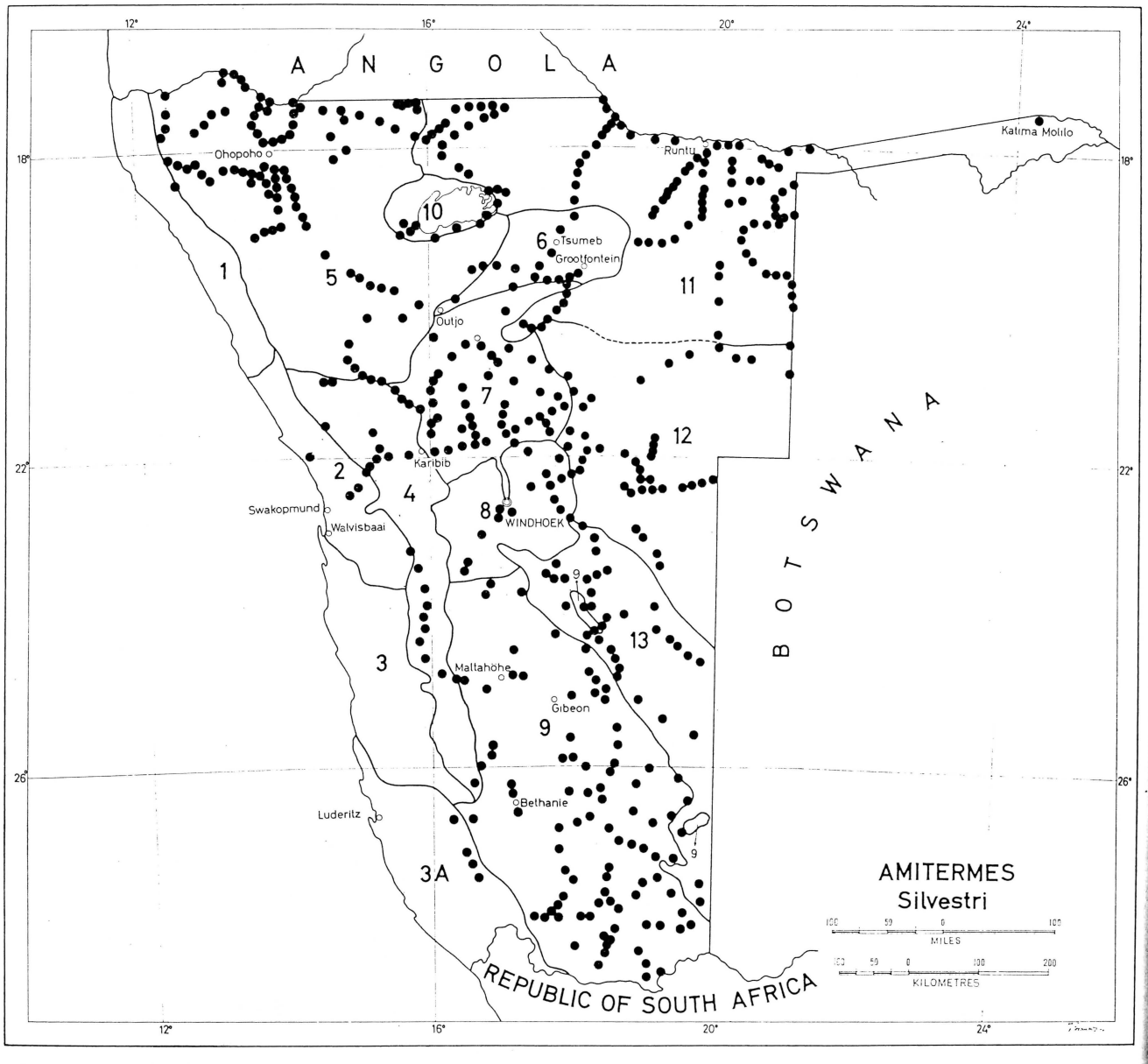

Figure 37. Distribution in South West Africa of the genus *Amitermes* Silvestri.

Distribution

The 15 samples were obtained from an aggregate of 14 collecting stations situated in the districts Gobabis (2), Okavango (11), and Windhoek (1).

These termites have up to the present only been recorded from vegetation Types 8, 11 and 12. They will eventually undoubtedly be found to be far more widely distributed in South West Africa when it is possible to search for them during seasons when alates are present in their nests.

Feeding and nesting habits

Colony samples were taken in the following situations:- From flight ports while swarming was in progress (2), from nest cells taken over from *Ovambotermes sylvaticus* placed in the sand 25 cm below soil surface (1), from cells of their own construction under a stone (1), in the nest matrix of *Trinervitermes* spp. (3), against the exterior of decaying tree stumps (4) and on the lower surfaces of prone, rotting logs (4).

On a few occasions *"Anoplotermes"* species were seen feeding on fairly sound moist dead wood, but most frequently the material being attacked took the form of bark and wood at an advanced stage of decay. The grey to greyish black gut contents of the workers would suggest that humus and other decaying plant materials constitute their basic diet.
The nests consist of small aggregations of interconnected cells, the walls of which are composed of soil particles glued together with faecal fluid and which are lined internally with dark faecal deposits. Their positions are not subtended by mounds or other surface structures.

How the *"Anoplotermes"* species protect their nests from invasion without a soldier caste to keep predators at bay is not known. The workers certainly do not use faecal fluid as a means of waging chemical warfare.

In view of their tendency to feed mainly on decaying plant material these termites are not classified as being of economic importance in South West Africa.

SUBFAMILY AMITERMITINAE

12. *AMITERMES* Silvestri

(Fig. 12: A-B, soldier, Fig. 37: distribution)

Species

The large collection of this genus awaits determination; several species are represented in South West Africa.

Distribution

The 885 colony samples were obtained from an aggregate of 485 collecting stations situated in the districts Bethanie (7), Caprivi strip (1), Gibeon (28), Gobabis (35), Grootfontein (52), Kaokoveld (56), Karibib (12), Keetmanshoop (36), Lüderitz (5), Maltahöhe (9), Okahandja (23), Okavango (38), Omaruru (15), Otjiwarongo (19), Outjo (21), Ovamboland (36), Rehoboth (21), Swakopmund (7), Tsumeb (9), Warmbad (32), and Windhoek (23).

The genus is ubiquitous and has been recorded from all vegetation types except Type 3.

Feeding and nesting habits

Colony samples of *Amitermes* spp. were taken from the following situations:- From cells constructed in the nest matrix of species of *Cubitermes* (1), *Macrotermes* (6), *Baucaliotermes* (1), and *Trinervitermes* (40) or situated in the soil under stones (75); from foraging and nesting sites in prone dead wood on the soil surface (406); from nests placed independently in the soil (137); from foraging sites in the dung of herbivora including cattle (68), sheep and goats (2), horses and donkeys (5), zebras (8), black rhinoceros (2) and elephant (14), on and in tree stumps, fence posts and droppers, standing dead bushes and trees (108), on debris such as jute bags and in dead grass stools and surface leaf litter (11). In one case a sample was taken from poles comprising a derelict Bushman shelter which had been very severely attacked.

Soil canopies are not normally constructed over the exposed surfaces of food supplies lying on the soil; attack usually commences from the side in contact with the soil and the material is hollowed out from within. Wood embedded in the soil such as tree stumps, standing dead trees, bushes and fence posts is entered beneath the soil surface and the workings are then extended upwards beneath an unbroken outer shell of wood. As the cavities in the food source are enlarged they are filled in with a cellular matrix, the interior surfaces of which are lined with dark brown to greyish black faecal deposits.

The nests consist of moderate to large aggregations of darkwalled interconnected cells. These may be situated on the lower surfaces of prone logs or in the interiors of tree stumps, fence posts, etc. Other nests are situated independently in the soil, with or without surface mounds to subtend them. In South West Africa the grey mounds of *Amitermes* species are never prominent — the largest one seen had a basal diameter of 35 cm and was about 25 cm high. Mounding seems to occur most frequently in areas with surface outcrops of limestone. In the unconsolidated sandveld of the Kalahari sectors mounds are insignificant, never more than 2,5-5 cm high but the subterranean cellular structures are deeply fanged and penetrate into the sand to depths 35 cm or more below the surface. Due to the sturdy, thick walls of the individual cells the nests are nor-

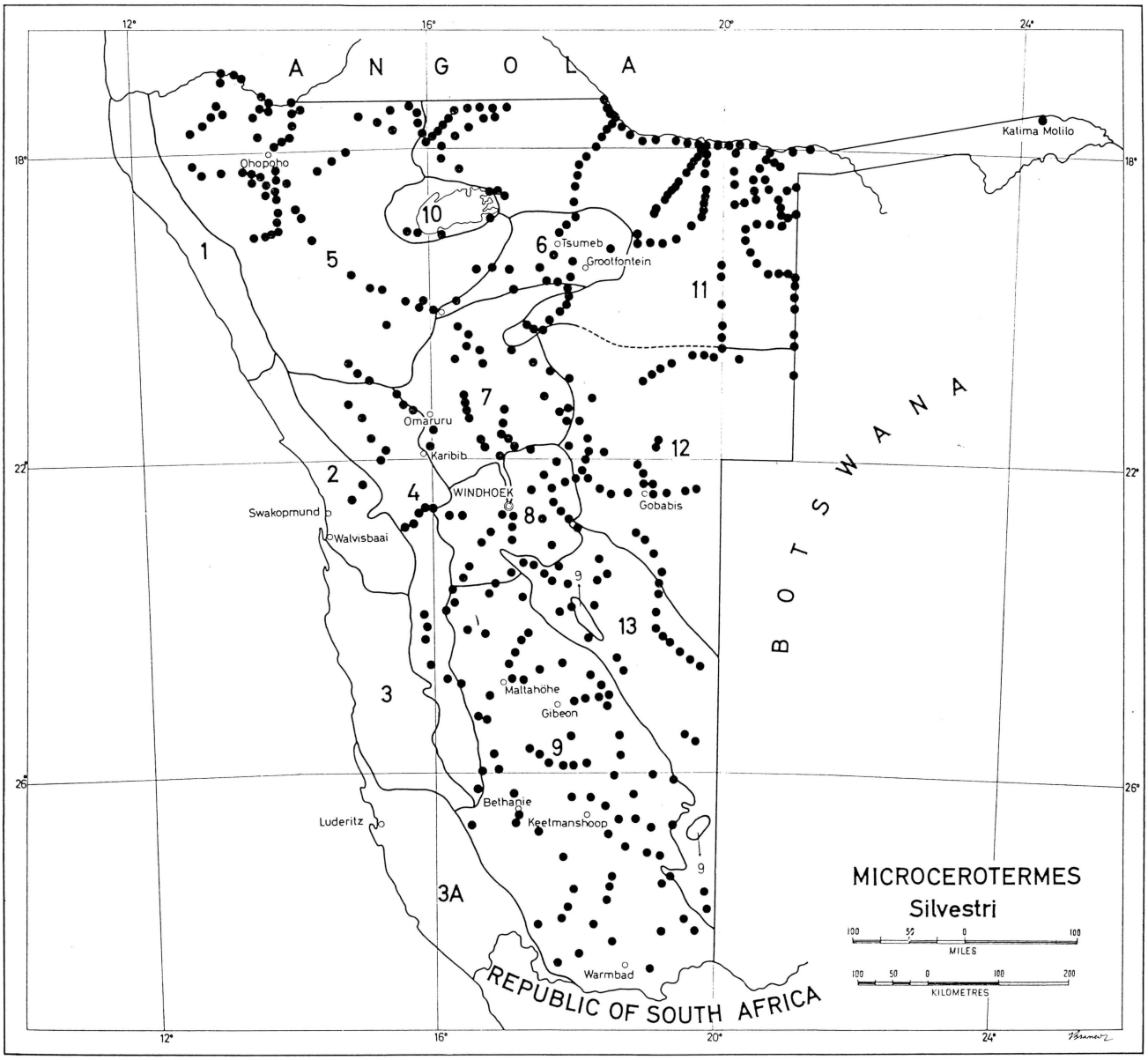

Figure 38. Distribution in South West Africa of the genus *Microcerotermes* Silvestri.

mally well consolidated, extremely hard and not easily fragmented.

Owing to their wide distribution through all vegetation types and known potential as destroyers of sound, dead wood the *Amitermes* species are classified as being of considerable economic importance in South West Africa. The damage done by them can be expected to occur mainly in extra-mural situations since the species are not well adapted to survival in buildings of modern construction.

13. *MICROCEROTERMES* Silvestri

(Fig. 12: C-D, soldier. Fig. 38: distribution)

Species

The large collection assembled awaits determination; several species are known to be represented.

Distribution

The 808 colony samples were obtained from 440 collecting stations situated in the districts Bethanie (8), Caprivi strip (1), Gibeon (24), Gobabis (40), Grootfontein (55), Kaokoveld (42), Karibib (10), Keetmanshoop (29), Lüderitz (3), Maltahöhe (10), Okahandja (14), Okavango (55), Omaruru (10), Otjiwarongo (15), Outjo (14), Ovamboland (32), Rehoboth (27), Swakopmund (2), Tsumeb (11), Warmbad (18) and Windhoek (20).

The genus has been recorded from all vegetation types excepting 1, 3, and 3A.

Feeding and nesting habits

Colony samples were collected from the following situations:- From nests placed independently in the soil (14), under stones (34) or contained within the nest matrix of species of *Amitermes* (26), *Macrotermes* (1), *Baucaliotermes* (2), and *Trinervitermes* (37); from foraging sites in dead wood on living trees or runways on the trunks giving access to it (18), in dead wood lying on the soil surface (488), in surface leaf litter and dead grass stools (6), in the interior of standing dead bushes, trees, tree stumps and fence posts (135), and in the dung of herbivora including cattle (36), horses and donkeys (3), hyrax (1), zebras (3) and elephants (3). One sample was taken while swarming flights were taking place.

These termites attack any material containing cellulose from humus to sound dead wood. Food sources lying on the soil surface are invariably entered from the side in contact with the ground; timber embedded in the soil such as fence posts and standing dead trees is initially attacked below surface level, the workings then being extended upwards beneath an intact outer shell of wood; dead wood present on living trees is reached via brownish black covered runways built on the exterior of the trunks. As the material being attacked is hollowed out a dark cellular filling composed of brownish black carton is introduced into the cavities.

Microcerotermes nests encountered in the nest matrix of other termite species took the form of spherical aggregations of cells with hard carton walls and ranged in diameter from 2,5-13 cm. Those situated independently in the soil were never subtended by surface mounds; in rocky soils the nests were amorphous, the cells being constructed in interstices available between the stones; in the deep Kalahari sands the nests seen were deeply fanged and large, specimens up to 15 cm in diameter by 35 cm deep having been recorded on numerous occasions. The carton nests are well consolidated, extremely hard and can be fragmented only through using chopping implements.

Owing to their wide distribution and heavy potential as destroyers of sound, seasoned timber the *Microcerotermes* species should be classified as being pests of major economic importance in South West Africa. Although they have on numerous occasions been recorded as severely damaging suspended flooring, block floors, skirting boards, door and window frames and even rafters in houses, most of their attack can be expected to take place in situations removed from buildings.

SUBFAMILY TERMITINAE

None of the termites assigned to this subfamily is able to digest sound wood. Food materials consist of humus, the dung of herbivora, decaying leaf litter, bark and wood. Although of great scientific interest these termites are of no economic importance.

In South West Africa their nests may be found on the lower decaying surfaces of prone branches and logs, in and against rotting tree stumps and the boles of standing dead trees, in the nest matrix of other termite species or situated independently in the soil. In some cases small surface mounds may subtend the nests but most frequently they are entirely concealed. The nests consist of grey to greyish black aggregations of interconnected cells lined with dark faecal deposits, the walls of which are strongly made of soil particles stuck together with faecal fluid.

14. *CUBITERMES* Wasmann

(Fig. 13: A-B, soldier. Fig. 39: distribution)

Species

Several species are represented in the large collection, which awaits identification.

rical chambers, each about 2,5—5,0 cm in diameter, which are dispersed through the soil and connected to each other by a maze of extremely narrow galleries. Each chamber contains one rather spongy fungus comb. There are no surface structures to subtend the nest sites.

Microtermes species are known destroyers of sound wood in and away from buildings, block floors, skirtings and doorframes of houses being especially vulnerable to attack. With its wide and dense distribution in that territory the genus is classified as being of major economic importance in South West Africa.

SUBFAMILY NASUTITERMITINAE

In all except the most primitive termite genera referred to this subfamily the soldier mandibles are reduced to microscopic membranous relics and have no defensive function; the frontal gland in the head capsule secretes a sticky, caustic fluid which is ejected when required with a high degree of accuracy through a syringe-like proboscis to tangle up the legs of and immobilise predators.

Food material may very rarely consist of sound dead wood. Normally these taxa are either harvesters which forage for grass and other non-woody plant material on the surface or they are humivores feeding on decaying wood and other organic debris. The nests consist of aggregations of interconnected cells, usually lined internally with dark faecal deposits. Food stocks may or may not be accumulated in the nests. Nest sites may be subtended on the surface by low to prominent mounds, but some taxa have them entirely concealed in the soil or on the lower surface of prone dead wood.

29. *BAUCALIOTERMES* Sands

(Fig. 24: A—B, soldier, Fig. 55: distribution)

Species

The only species represented in South West Africa is *B. hainesi* (Fuller), determinations by W. G. H. Coaton.

Distribution

The 268 colony samples of the genus were obtained from 144 collecting stations situated in the districts Bethanie (7), Gibeon (19), Karibib (2), Keetmanshoop (37), Lüderitz (7), Maltahöhe (12), Rehoboth (17), and Warmbad (43).

B. hainesi has been recorded in South West Africa from vegetation Types 3A, 4, 9, and 13, with a few localities in Type 8 confined to its south-western extremity. The species does not occur in areas of unconsolidated sand — all records from Type 13 are on outliers of hard soil, usually patches with limestone outcrops.

When figures 55 and 56 are compared it is quite clear that the genus *Baucaliotermes* occupies the niche in the arid southern and south-western sectors of South West Africa that is held by the genus *Trinervitermes* in the more grassy areas of higher rainfall in the central and northern sectors.

Feeding and nesting habits

Colony samples of the genus were obtained at the following situations: From foraging sites in surface leaf litter and grass stools (4), under dungpats (3), in a dump of *Hodotermes mossambicus* (1), under bushes (5) and prone, decaying wood (4); from subterranean galleries in the soil under surface foraging ports (30); from moundlets of their own construction (33); from nest cells under stones (186) or placed in the nest matrix of species of *Macrotermes* (1) and *Trinervitermes* (1).

The moundlets are grey in colour and rarely higher than 15 cm, the bulk of the nest system being underground. In the more rocky areas nests are most frequently found under rocks without mounds to indicate their situations. The nest consists of an aggregation of thick-walled cells forming a well-consolidated structure which is not easily fragmented. The inner surfaces of cells are lined with dark faecal deposits. Nests normally contain limited stocks of food material in the form of leaf confetti, fragments of bark, dung, and grass.

B. hainesi is a forager which emerges by night from open ports on to the surface where food materials are gleaned without concealment. Foraging was observed during daylight on only one occasion — at 09.30 hours on an overcast morning after rain had fallen the previous night. When not in use the foraging ports are hidden beneath minute heaps of loose soil particles which are observed most readily in the early morning while they are yet moist.

This termite, which is restricted to the more arid southern sectors of South West Africa, has small colonies with limited food requirements and is not classified as a pasture pest of economic importance.

30. *TRINERVITERMES* Holmgren

(Fig. 23: soldiers. Plates 19, and 20: mounds. Fig. 56: distribution)

Species

Three species have been recorded from South West Africa by earlier workers. The large collection of the genus taken from this territory is in the hands of

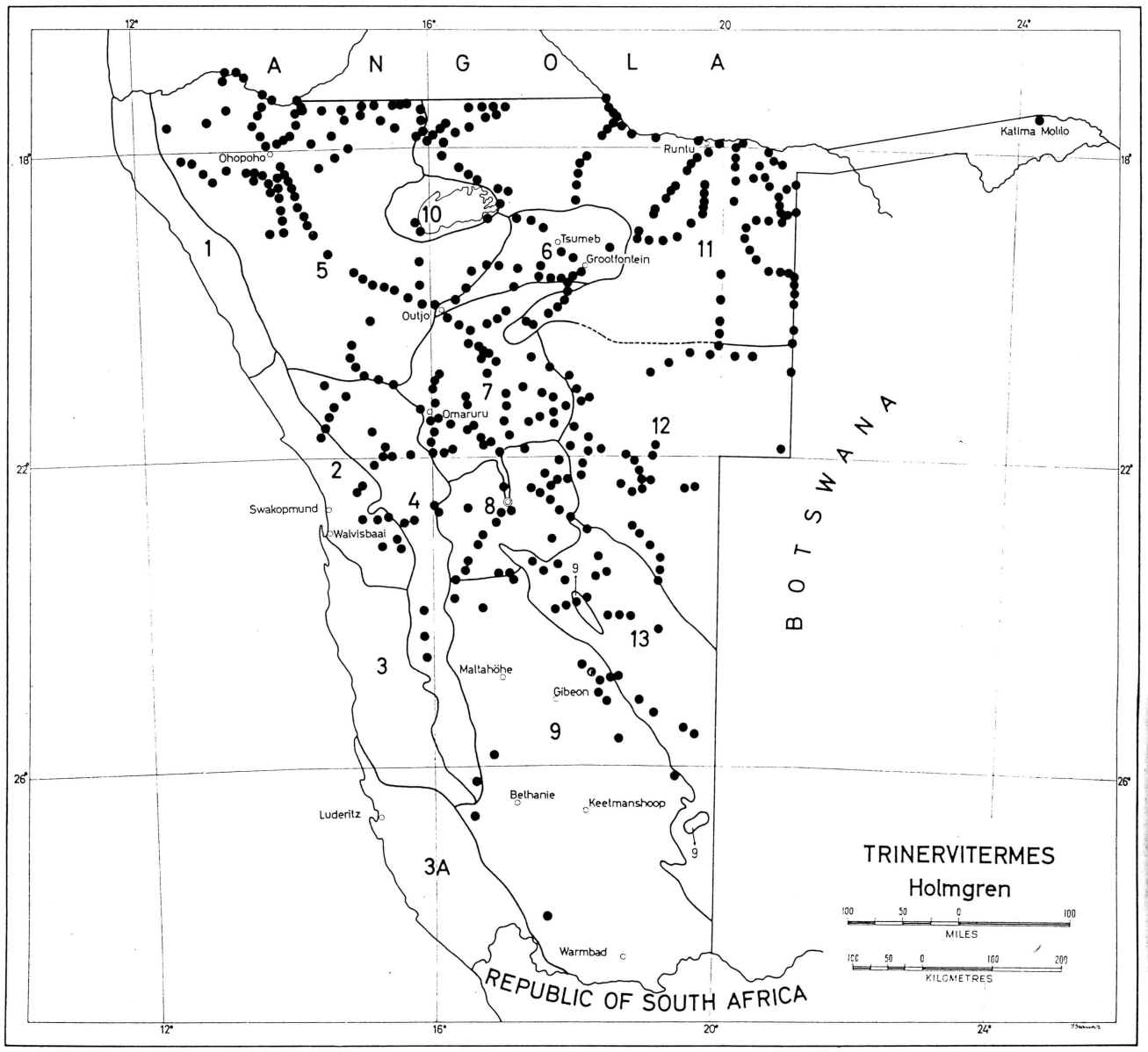

Figure 56. Distribution in South West Africa of the genus *Trinervitermes* Holmgren.

W. A. Sands but has not yet been identified. Up to the present he has named only the *Trinervitermes* species which were hosts of termitophiles being studied by D. H. Kistner. Four species are represented: *T. dispar* (Sjöstedt), *T. rapulum* (Sjöstedt), *T. rhodesiensis* (Sjöstedt), and *T. trinervoides* (Sjöstedt).

Distribution

The 756 colony samples of the genus were obtained from 393 collecting stations situated in the districts Bethanie (2), Caprivi Strip (1), Gibeon (15), Gobabis (38), Grootfontein (55), Kaokoveld (43), Karibib (13), Keetmanshoop (2), Lüderitz (1), Maltahöhe (2), Okahandja (21), Okavango (34), Omaruru (15), O'jiwarongo (23), Outjo (22), Ovamboland (42), Rehoboth (18), Swakopmund (8), Tsumeb (9), Walvis Bay (4), Warmbad (1), and Windhoek (24).

The genus has been recorded from all vegetation types except 1, 3, and 3A, but is very sparsely present over Type 9 in which *Baucaliotermes* predominates.

Feeding and nesting habits

Colony samples were taken at the following situations:— From soil dumps of *Hodotermes mossambicus* (1), surface deposits of humus and leaf litter (15), dung of herbivora including cattle, horses, and elephants (12), on prone branches and logs (196) and standing dead trees and stumps (6); from galleries in the soil under sealed foraging ports (14) or on the soil surface while foraging was in progress (3); from galleries and cells placed under stones (112) or contained within the nest matrix of species of *Amitermes* (2), *Cubitermes* (2), *Macrotermes* (3) and *Odontotermes* (1); from nests of their own construction independently situated in the soil, with or without surface mounds to subtend them (389).

With one exception the *Trinervitermes* species represented in South West Africa are harvesters which emerge from foraging ports on to the surface, where food supplies in the form of grass, leaf litter, and other non-woody plant materials are gleaned and taken underground. Such foraging activity normally takes place by night, but on two occasions active harvesting was seen on overcast days at 10.00 hours and 16.00 hours respectively. When not in active use the foraging ports are concealed beneath minute heaps of loose soil particles which are most readily seen in the early morning while they are still moist. *Trinervitermes rapulum,* a species which is distributed in South West Africa mainly over the more heavily timbered north-eastern sectors, is able to consume sound dead wood in the form of prone branches, logs, tree stumps, and standing dead trees and bushes. Such food sources are normally entered and attacked from the surfaces in contact with the soil and then hollowed out from within, but on numerous occasions these termites were observed to be feeding on the exposed upper surfaces of logs and dead trees under cover of sheetlike soil canopies such as constructed by the fungus-grower Macrotermitinae. This species, which subsists mainly on a diet of wood, is unique in a genus comprised of grass-eating harvester species.

The nests are honeycombed aggregations of thick-walled cells forming well consolidated structures which are very hard and not easily fragmented. The inner surfaces of cells and galleries are lined with greyish or greyish black faecal deposits. All species except *T. rapulum* store in their nests food material in the form of lengths of grass and leaf fragments.

Normally nests are subtended on the surface by mounds, which vary in size and shape according to species and soil type. *Trinervitermes trinervoides* is the only species of the genus known to construct massive mounds in South West Africa; these may be regularly domed and up to 0,9 m high (Plate 19) or columnar and up to 1,7 m tall (Plate 20), the most massive types being encountered mainly in the dune valleys of the Southern Kalahari. The other species have insignificant moundlets ranging in height from 2,5 cm to a maximum of about 30,5 cm. Mound colour may vary from brownish red through grey to greyish black. In areas of unconsolidated sand the nest structure under the moundlet penetrates downwards to observed depths of up to 46 cm. The *Trinervitermes* species, which are widely spread over most of South West Africa excepting the more arid southern and western zones, should be classified as important pasture pests in that territory. In the northern sectors *T. rapulum* could be classified as a fairly important destroyer of timber but is unlikely to attack wood in buildings.

31. *FULLERITERMES* Coaton

(Fig. 24: C—D, soldier. Plate 21: runways. Fig. 57: distribution)

Species

The only species represented in South West Africa is *Fulleritermes contractus* (Sjöstedt), determinations by W. G. H. Coaton.

Distribution

The 265 colony samples of the genus were obtained from 102 collecting stations situated in the districts Gobabis (9), Grootfontein (36), Okavango (41), Otjiwarongo (2), Ovamboland (12), and Tsumeb (2). The genus has been recorded only from vegetation Type 11 and the northern half of Type 12.