SURVEY OF THE TERMITES (ISOPTERA) OF THE KALAHARI THORNVELD AND SHRUB BUSHVELD OF THE R.S.A.

By W. G. H. COATON,

Plant Protection Research Institute, Pretoria.

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1. INTRODUCTION.

The main objectives of the National Survey of the Isoptera, and the method of plotting existing data so as to enable expeditions to be carried out to maximum advantage, have been touched upon briefly in a previous article in Koedoe (Coaton, 1962).

Up to 1962 no N.S.I. expedition had ever sampled the termite fauna of the vast block of Kalahari Thornveld and Shrub Bushveld of the districts Mafeking, Vryburg, Kuruman, Gordonia and Postmasburg to the North of the road linking Kakamas in the South-West via Upington, Olifantshoek, Kuruman and Vryburg to Mafeking in the North-East, bounded to the West by the South-Eastern border of S.W. Africa, and to the North by the Southern border of Bechuanaland Protectorate, formed by the courses of the Nossob and Molopo Rivers from Union's End to Mafeking. This terrain, some 350 miles at greatest width from West to East and 270 miles at maximum depth from North to South, has hitherto remained a blank in respect of the distribution of termite genera such as *Neotermes, Epicalotermes* and *Bifiditermes* (Kalotermitidae), *Hodotermes* and *Microhodotermes* (Hodotermitidae), *Psammotermes* (Rhinotermitidae), and *Anoplotermes, Microcerotermes, Amitermes, Lepidotermes, Cubitermes, Promirotermes, Angulitermes, Allodontermes, Macrotermes, Odontotermes, Microtermes, Trinervitermes* and *Fulleritermes* (Termitidae) which could possibly be expected to occur there.

The objective of the expedition carried out during the period 1-31 May, 1962 was thus to fill in the distribution of the genera listed above within this vast block of unsurveyed territory, and to bring back material for incorporation into the National Collection of Isoptera and subsequent taxonomic study.

The route followed by the expedition while actively engaged in collecting Isoptera (Fig. 1) was as follows :-

Leg 1 : Mafeking — Tshidilamolomolo — Paddon — Vryburg — Ganyesa — Tosca — Terra Firma — Vorstershoop — Heuningvlei — Severn — Kuruman — Tsineng — Van Zylsrust — Askham — Witdraai — Koopan-Noord — Twee Rivieren.

Leg 2 : A complete circuit along the boundaries of the Kalahari National Gemsbok Park, via the Nossob River from Twee Rivieren to Union's End, the dunes along the S.W.A. border from Union's End to Mata Mata, and the Auob River from Mata Mata to Twee Rivieren.

Leg 3 : Twee Rivieren — Koopan-Noord — Noenieputs — Swartmodder — Lutzputs — Kakamas — Upington — Olifantshoek — Postmasburg — Lohatlha — Olifantshoek — Winton — Sutton — Kuruman — Vryburg.

Of the 30 days spent in the field 3 were used in travelling to and from the area surveyed, leaving 27 days for active collecting. During the month 2,752 miles were travelled, of which 2,231 were effective and 521 were dead miles. Of the effective miles 487 were travelled in the Kalahari National Gemsbok Park over a period of 9 days.

Apart from the writer, the following members of the staff of the Plant Protection Research Institute participated in the expedition :- J. L. Sheasby (Technician : National Collection of Insects); G. F. Pretorius (Junior Technical Officer : Economic Zoology), who was seconded to the writer by his section for the duration of the expedition; P. le S. Milstein (Technician : Economic Zoology), who was engaged chiefly in furihering another project, but who gave part-time assistance in the collection of termites as well as keeping a photographic record of field activities; W. Mohale (Bantu Labourer : National Collection of Insects). During the round-trip of the Kalahari National Gemsbok Park the expedition was accompanied by J. Burger (Technical Officer of the National Parks Board, stationed at Twee Rivieren).

The members of the expedition, with equipment and supplies, travelled in a Ford L.D.V. and a Ford Panel Van, neither of the vehicles being equipped with four-wheel drive. In view of the long distances between refuelling points and the salinity of the water in many of the bore-holes, a 40-gallon drum of petrol and one of water were carried in the vehicles.

The preliminary results of the expedition are reviewed below. Before dealing with the survey of the Kalahari Thornveld and Shrub Bushveld as a whole, a short review will be given of collecting conditions prevailing in and the accessions obtained from the Kalahari National Gemsbok Park, which occupies the wedge of the district Gordonia intruding to the North-West between South West Africa and Bechuanaland Protectorate.

2. DETAIL OF SURVEY IN THE KALAHARI NATIONAL GEMSBOK PARK.

(1) *Collecting Procedure and Conditions.*

While conducting the survey within the Gemsbok Park the objective, which was adhered to as far as possible, was to sample the fauna at an approximate distance of ten miles between collecting stations. Any localities between the main collecting stations which seemed to show promise as suitable termite habitats were, however, sampled as well.

At each collecting site the surveyors would fan out in diverging directions, each taking as complete a sample as possible of the various types of termites encountered by him. Where the halting points were situated in riverbeds, such as the Nossob between Twee Rivieren and Union's End, or the Auob between Mata Mata and Twee Rivieren, care was taken to sample the fauna in the riverbeds, as well as on the banks (limestone ridges and/or sand dunes) and in the dunes above and beyond the riverbanks. In the dune country along the S.W. African border, between Union's End and Mata Mata, collecting stations were usually sited in the "duinstrate" or troughs between the dunes, the collectors sampling the fauna in the depressions and unwards to the crests of the dunes on either side. Typical examples of collecting sites are shown in Figs. 2-5.

The only termite mounds encountered in the Gemsbok Park were constructed by species of the genus *Trinervitermes*. Massive domed, sub-conical or columnar mounds inhabited by these grass-consuming Isoptera were patchily encountered throughout the length of the beds of the Nossob and Auob Rivers (Fig. 6), and these extended in parts up the sandy banks into the dunes above and beyond them. The *Trinervitermes* species which inhabited the duneveld along the S.W. African border between Union's End and Mata Mata constructed mounds which were not nearly as prominent. Here they took the form of slight greyish elevations, at most projecting a few inches above the surface, the cellular nest structure being extended deeply into the dune sand beneath the surface (Fig. 7).

The only other termite which could be sought for and collected directly from readily visible surface structures of its own making was *Hodotermes mossambicus* Hag. The relatively small conical or multi-peaked dumps on which loose waste soil, removed when extending the subterranean nest system, is eliminated, literally pocked the greatest part of the beds of the Nossob and Auob Rivers throughout their courses in the Gemsbok Park. It has been shown that over-grazing creates conditions which favour the successful establishment of new colonies of *H. mossambicus,* and that saturated population densities of these insects tend to develop wherever such punishment of the veld is continued over a period of many years (Coaton, 1958). The heavy concentration of game in the riverbeds of the Gemsbok Park and the resulting overgrazing (Eloff, 1962) has undoubtedly caused the development there of saturated or near-saturated infestations of *H. mossambicus,* and these insects

must play an important role in bringing about the state of almost complete denudation such as existed in the riverbeds during May 1962 (Fig. 3). At 4 p.m. on 15.V.1962 in Kwang Pan and again at 2 p.m. on 16.V.1962 at Groot Kolk on the Nossob River, the writer was privileged to observe surface foraging of these insects. On both occasions, as far as one walked across these two denuded pans, the surface seethed with hundreds of thousands of workers of *H. mossambicus* busily engaged in cutting off and carrying underground the sparse remnants of the luxuriant stand of grass which must have developed there during the rains of the previous summer. Infestation in the dunes away from the rivers was discernible everywhere but was relatively light — in general the depressions and troughs between the dunes carried heavier populations of *H. mossambicus* than did the dunes themselves.

In other parts of the R.S.A., where the soils are heavier, the soldier caste of *H. mossambicus* can be taken readily by sweeping aside a fresh soil dump and inserting a grass stem into the passage beneath it leading down to the subterranean nest system — when the grass is withdrawn the soldiers are frequently brought to the surface with their jaws clamped around it. This method of taking the soldier caste yielded meagre results in the Gemsbok Park, for two reasons. Firstly, the soldiers appeared to be plentiful in the subterranean passages only at depths of from two to three feet below the surface, and it was difficult to get the grass to penetrate to the optimum depth. Secondly, by about 9 a.m. each day most of the fresh dumps deposited overnight had been swept aside by bird and animal predators which feed on the workers present in the dumps. For most of the day it was thus difficult to find fresh soil dumps for sampling. Since no termite sample is retained which does not contain the soldier caste, the survey of the Gemsbok Park yielded far fewer accessions of *H. mossambicus* than its abundance at the various collecting stations would have justified.

All termites in the Gemsbok Park other than the *Trinervitermes* and *Hodotermes* spp. nested in complete concealment in the soil and had to be sampled indirectly in a laborious hit-or-miss fashion. Many were taken by overturning the rocks and boulders composing and present above the limestone ridges, which alternated with dunes to form the river banks (Figs. 2, 3). Although concealed nesting sites of many species were exposed in this way the well-drained ridges, with their poor soil capillary action, had dried out considerably by May 1962 and proved to be far less fruitful in accessions than the moister dunes. Judging by the large numbers of abandoned workings present beneath the boulders, the ridges would prove to be much more productive shortly after rains have fallen.

Prone, dead trees, mainly *Acacia giraffae* (Kameeldoring), *Acacia haematoxylon* (Vaalkameel) and *Acacia detinens* (Swarthaak), were abundantly present in the beds of and dunes adjacent to the Auob and Nossob Rivers, and these proved to be one of the main sources of accessions of wood- and humus-consuming species, especially in those cases where they had become

partly buried in driftsand. On overturning any such log, one or more species of termite would normally be found feeding upon the previously concealed or buried surfaces — a maximum of four species was taken from one such dead tree. In the dunes proper prone, dead *Acacia haematoxylon* (Vaalkameel) and *Boscia albitrunca* (Witgat) were the main tree sources of accessions. In addition to those termites feeding on prone dead trees, many accessions were taken while attacking dead wood and bark present on standing, living specimens of the tree species mentioned above, as well as of shrubs such as *Grewia flava* (Roesyntjiebos) and *Rhigozum obovata* (Driedoring). Other sources of cellulose, such as tree stumps, prone dead branches of trees and shrubs, whether lying on the surface or buried in the soil or sand, dead vines of *Colocynthis sitrullus* (Tsamma) and *Cucumis hookeri* (Gemsbokkomkommer), dry grass stools, surface aggregations of leaves and twigs, and the dung of herbivorous animals, all yielded their quota of accessions.

Abandoned, derelict mounds of *Trinervitermes* species proved to be one of the most important sources of accessions of all termite species present in the Gemsbok Park. All *Trinervitermes* colonies store in their mounds large quantities of grass, which the workers glean by night on the surface. Where heavy infestations exist there are invariably numbers of derelict mounds, the colonies which had previously inhabited these having died off for one reason or another. Such deserted dilapidated mounds, crammed as they are with attractive food supplies in the form of grass in various stages of decomposition, draw to them all termite species in the vicinity. The ubiquitous, derelict *Trinervitermes* mounds could be relied upon to produce a high quota of accessions of invading species of all genera, and especially of the rarer forms. For example, every one of the 5 accessions of *Lepidotermes* gained in the Gemsbok Park, and well over half the total accessions taken of *Angulitermes* and *Promirotermes* (Fig. 8), were collected from dilapidated mounds of *Trinervitermes* species.

The soil in the Gemsbok Park was reasonably damp during May 1962 following the rains which had fallen there during the previous summer. In addition, diurnal temperatures during that month were mild. As a result, termites were feeding actively upon the abundant supplies of food material present on or near the soil surface, yielding conditions as near to the ideal for collecting Isoptera as could be hoped for in the arid West. Conditions in the Gordonia district outside the Kalahari National Gemsbok Park, as well as in the other four districts traversed during May, were not nearly as satisfactory. In consequence the rate at which accessions were gained in the Gemsbok Park was proportionately far higher and more constant than elsewhere.

(2) *Analysis of Accessions Gained.*

An analysis of accessions gained in the Kalahari National Gemsbok Park, arranged in order of locality and genus, is given in Table 1. The fol-

TABLE 1

Analysis of accessions gained in the Kalahari National Gemsbok Park.

	Hodotermes.	*Psammotermes.*	*Microcerotermes.*	*Amitermes.*	*Lepidotermes.*	*Promirotermes.*	*Angulitermes.*	*Allodontermes.*	*Odontotermes.*	*Trinervitermes.*	Total accessions.
TWEE RIVIEREN TO UNION'S END (NOSSOB RIVER) :											
Miles 0-10	1	1	—	2	—	—	1	—	—	2	7
11-20	1	2	1	1	—	4	—	—	—	2	4
21-30	—	1	1	1	—	1	—	1	—	1	13
31-40	—	1	2	2	—	2	1	—	—	1	8
41-50	—	2	4	1	—	1	4	2	—	1	10
51-60	—	2	—	1	—	1	1	1	—	1	7
61-70	1	—	—	1	—	—	1	1	—	—	11
71-80	—	2	3	2	—	2	2	1	—	1	11
81-90	1	1	2	2	—	1	—	1	—	—	5
91-110	2	—	1	1	—	—	3	3	—	—	6
111-120	1	—	1	2	—	—	—	2	—	1	5
121-130	1	3	1	1	1	—	2	2	—	—	7
131-140	—	2	3	3	—	2	1	—	—	—	11
141-150	1	—	—	—	1	1	—	1	—	1	6
151-160	1	1	—	1	—	1	—	2	—	—	9
161-176	1	—	1	1	—	1	—	1	—	—	15
UNION'S END TO MATA MATA (S.W.A. BORDER).											
Miles 0-10	—	2	2	2	—	3	—	1	—	1	11
11-20	—	2	—	3	—	2	—	—	2	2	11
21-40	1	3	—	2	—	—	—	—	1	2	9
41-50	—	1	2	—	—	—	—	—	1	—	4
51-60	1	5	1	2	—	—	—	—	1	1	11
61-76	1	5	1	2	—	3	—	—	1	3	16
MATA MATA TO TWEE RIVIEREN (AUOB RIVER).											
Miles 0-10	1	2	1	—	—	—	—	—	—	—	4
11-20	1	1	1	1	1	—	2	—	—	2	9
21-30	—	2	—	—	1	2	—	—	—	—	5
31-40	1	3	2	—	—	—	3	1	—	—	10
41-50	1	1	2	—	—	1	—	2	—	—	5
51-60	1	2	2	2	—	—	2	—	1	—	12
61-70	3	5	4	2	—	—	1	1	2	1	19
71-80	—	2	2	—	1	1	2	1	—	—	9
TOTAL ACCESSIONS.	22	54	40	38	5	29	26	24	9	23	270

lowing families, subfamilies and genera of Isoptera are represented in the bag :-

Hodotermitidae	:	Hodotermitinae	:	1. *Hodotermes* (22 acc.)
Rhinotermitidae	:	Psammotermitinae	:	2. *Psammotermes* (54 acc.)
Termitidae	:	Amitermitinae	:	3. *Microcerotermes* (40 acc.)
				4. *Amitermes* (38 acc.)
		Termitinae	:	5. *Lepidotermes* (5 acc.)
				6. *Promirotermes* (29 acc.)
				7. *Angulitermes* (26 acc.)
		Macrotermitinae	:	8. *Allodontermes* (24 acc.)
				9. *Odontotermes* (9 acc.)
		Nasutitermitinae	:	10. *Trinervitermes* (23 acc.)

The relative frequency of occurrence of the 10 genera recorded from the Gemsbok Park, determined by expressing the number of accessions gained in respect of each of them as a percentage of the total bag of 270 accessions, was as follows: 1. *Psammotermes* (20.0%); 2. *Microcerotermes* (14.8%); 3. *Amitermes* (14.2%); 4. *Promirotermes* (10.7%); 5. *Angulitermes* (9.6%); 6. *Allodontermes* (8.9%); 7. *Trinervitermes* (8.5%); 8. *Hodotermes* (8.1%); 9. *Odontotermes* (3.3%); 10. *Lepidotermes* (1.9%). It is quite clear that *Psammotermes allocerus* Silv. is the predominant termite of this region.

It is of interest to note (Table 1) that all the accessions gained in respect of *Lepidotermes* and *Angulitermes* species were taken along the courses of the Nossob and Auob Rivers, both these genera fading out completely in the duneveld along the S.W. African border between Union's End and Mata Mata. Also, that while *Allodontermes* was relatively common and *Odontotermes* very scarce in the beds of the Nossob and Auob Rivers, in the duneveld along the S.W. African border *Allodontermes* was scarce and *Odontotermes* relatively common.

3. RESULTS OF SURVEY OF KALAHARI THORNVELD AND SHRUB BUSHVELD.

The preliminary results of the termite survey of the Kalahari Thornveld and Shrub Bushveld as a whole are reviewed below, the data already dealt with in respect of the Kalahari National Gemsbok Park being incorporated into those of the district Gordonia, of which it forms an integral part.

(1) *Analysis of Accessions Gained.*

A genus-district analysis of the material gained during the course of the N.S.I. expedition of May 1962 is given in Table 2. It will be noted that 747 accessions, representative of 3 families, 6 subfamilies and 14 genera of Isoptera, were taken.

TABLE 2

Analysis of accessions gained according to district.

Family, Subfamily and Genus.	No. accessions from district					
	Mafeking.	*Vryburg.*	*Kuruman.*	*Gordonia.*	*Postmasburg.*	*Total no. of accessions.*
A. HODOTERMITIDAE.						
(1) HODOTERMITINAE.						
1. *Hodotermes* Hag.	5	10	5	27	2	49
B. RHINOTERMITIDAE.						
(2) PSAMMOTERMITINAE.						
2. *Psammotermes* Desn.	1*	9*	12*	98	5*	125
C. TERMITIDAE.						
(3) AMITERMITINAE.						
3. *Microcerotermes* Silv.	4	17	11	46*	7	85
4. *Amitermes* Silv.	3	16	11	58	12	100
(4) TERMITINAE.						
5. *Lepidotermes* Sjöst.	—	3	2	5*	—	10
6. *Cubitermes* Wasm.	2	—	—	—	—	2
7. *Promirotermes* Silv.	—	18	6	37	16	77
8. *Angulitermes* Sjöst.	—	6*	14*	44	5*	69
(5) MACROTERMITINAE.						
9. *Allodontermes* Silv.	12	22	7	32*	13	86
10. *Macrotermes* Hagrn.	4	3	—	—	1	8
11. *Odontotermes* Hagrn.	5	15	5*	9*	2*	36
12. *Microtermes* Wasm.	6	8	3	5*	7	29
(6) NASUTITERMITINAE.						
13. *Trinervitermes* Hagrn.	5	14	3	38	6	66
14. *Fulleritermes* Coat.	—	5	—	—	—	5
TOTAL	47	146	79	399	76	747

(: New district record for genus).*

Due mainly to the 270 accessions gained from the Kalahari National Gemsbok Park the district Gordonia, with a grand total of 399 accessions, was by far the most productive, to be followed in descending order by the districts Vryburg (146), Kuruman (79), Postmasburg (76) and Mafeking (47).

During May 1962 the genera listed below were recorded for the first time from the districts given in parenthesis :- *Psammotermes* (Mafeking, Vry-

burg, Kuruman, Postmasburg); *Microcerotermes* (Gordonia); *Lepidotermes* (Gordonia); *Angulitermes* (Vryburg, Kuruman, Postmasburg); *Allodontermes* (Gordonia); *Odontotermes* (Kuruman, Gordonia, Postmasburg); *Microtermes* (Gordonia). All told, 14 new genus-district records were thus established for the area surveyed.

The relative frequency of occurrence of the 14 genera recorded from the Kalahari Thornveld and Shrub Bushveld as a whole, determined by expressing the number of accessions gained in respect of each of them as a percentage of the total bag of 747 accessions, is as follows :- *Psammotermes* (16.7%); *Amitermes* (13.4%); *Allodontermes* (11.5%); *Microcerotermes* (11.4%); *Promirotermes* (10.6%); *Angulitermes* (9.2%); *Trinervitermes* (8.8%); *Hodotermes* (6.6%); *Odontotermes* (4.8%); *Microtermes* (3.9%); *Lepidotermes* (1.3%); *Macrotermes* (1.1%); *Fulleritermes* (0.7%); *Cubitermes* (0.3%). As has been pointed out previously, *Hodotermes mossambicus* Hag. should have been ranked far higher than reflected above, but great difficulty was experienced in obtaining accessions complete with the soldier caste, even in areas which carried extremely heavy infestations.

Of the genera which might have been expected to have been represented within the area surveyed, notable absentees during May 1962 were (a) wood-inhabiting Kalotermitidae such as *Neotermes, Epicalotermes* and *Bifiditermes* spp., and (b) *Microhodotermes viator* Latr., which had already been recorded from the Kenhardt district not very far South of the Orange River, and could thus have been expected to occur in the Gordonia district as well.

Although nymphs of the reproductive caste, in a fairly advanced stage of development, were present during May 1962 in the nests of species of most of the genera recorded from the Kalahari sector of the R.S.A., only one accession of the 747 taken contained fully fledged alates — an *Amitermes* series gained in the Vryburg district. If the soldierless genus *Anoplotermes* Fr. Müll. is present in the area surveyed, it would not have been collected unless the alate caste had been available. At some time in the future the Kalahari sectors of the R.S.A. will have to be re-surveyed, probably during the months October and November, to prove the presence or absence there of the genus *Anoplotermes*, as well as to take the alate caste of species of the genera already taken during the expedition of May, 1962.

(2) *Distribution to the North-West of the Genera recorded.*

Figs. 9-22 show the known distribution through the R.S.A. of the 14 genera of Isoptera recorded from the Kalahari Thornveld and Shrub Bushveld of the districts Mafeking, Vryburg, Kuruman, Gordonia and Postmasburg by the expedition of May 1962. Each symbol on a map represents one or more accessions of that genus obtained from that particular locality and incorporated into the National Collection of Isoptera, Pretoria. Those circles which have been blacked in represent accessions gained during the course of earlier N.S.I. expeditions, while those which have not been blacked in reflect acces-

sions gained by the expedition of May 1962. From these maps it can be seen at a glance in how far the most recent expedition has succeeded in filling in distribution blanks to the North-West of the R.S.A. of the various genera present there.

(a) *Hodotermes* (Fig. 9).

The previously existing blanks in the known distribution to the North-West of *H. mossambicus* have been filled in fairly adequately, and it has been shown that this species is present nearly everywhere throughout the 5 districts traversed. Had it not been for the difficulty experienced in taking accessions complete with the soldier caste, localities positive for the species would have been much more evenly distributed on the map.

(b) *Psammotermes* (Fig. 10).

The previously existing blanks to the North-West in the known distribution of *P. allocerus* Silv. have been filled in fairly adequately. This species is generally distributed in the five districts traversed throughout the unconsolidated Kalahari beds and Karoo geological system, but appears to fade out completely in the Southern sectors of the Postmasburg, Kuruman and Vryburg districts where the Transvaal and Ventersdorp geological systems predominate.

(c) *Microcerotermes* (Fig. 11).

Species of *Microcerotermes* were collected patchily throughout the five districts traversed, and the previously existing blanks in our knowledge of the distribution of this genus to the North-West have been fairly adequately filled in.

(d) *Amitermes* (Fig. 12).

As in the case of the genus *Microcerotermes*, species of *Amitermes* were found to be widely present throughout the five districts traversed, and the previously existing blanks in the distribution of this genus to the North-West have been filled in fairly adequately.

(e) *Lepidotermes* (Fig. 13).

Accessions of the humus-eating *Lepidotermes* species are taken with extreme difficulty owing to their relative scarcity and highly cryptic methods of nesting and feeding, hence the 10 accessions gained from the unconsolidated Kalahari beds of the districts Vryburg, Kuruman and Gordonia represent a distinct achievement. With the presence of the genus to the North-West of the R.S.A. established, the way is now open to plan future surveys in such a way that the existing distribution blank, stretching from Calvinia in the South to Postmasburg and Southern Gordonia in the North, can be filled in.

(f) *Cubitermes* (Fig. 14).

During May 1962 only two accessions of *Cubitermes* were taken by 3 full-time collectors over the 2,231 miles travelled through the Kalahari Thornveld

and Shrub Bushveld, and both of these were gained near Mafeking close to the North-Eastern boundary of this vegetation-soil type. It would thus appear to be fairly definite that this tropical genus is not at home there, and does not extend Westwards through the North-West of the R.S.A. beyond Longitude 24° East.

(g) *Promirotermes* (Fig. 15).

(h) *Angulitermes* (Fig. 16).

The bag taken of *Promirotermes* (77 accessions) and *Angulitermes* (69 accessions) in the Kalahari Thornveld and Shrub Bushveld during May 1962 represents a fantastic achievement when it is borne in mind that species of these genera, as is the case with *Lepidotermes*, are normally collected with extreme difficulty owing to their markedly cryptic nesting and feeding habits. The previously existing blanks in the distribution of both genera towards the North-West of the R.S.A. have now been filled in fairly adequately, and it has been established that both are present practically in all parts of the region traversed. The distribution of *Angulitermes* in the Western half of the R.S.A. has now been fairly well delimited, but a vast blank in respect of *Promirotermes*, stretching from the district Ceres in the South-West to Kenhardt in the North-West, clearly demands further attention in future.

(i) *Allodontermes* (Fig. 17).

The tropical genus *Allodontermes* has been proved to be fairly uniformly distributed throughout the Kalahari Thornveld and Shrub Bushveld of all 5 districts traversed, and the previously existing distribution blanks in respect of this genus in the North-Western sectors of the R.S.A. have been filled in adequately by the expedition of May 1962. *Allodontermes schultzei* Silv. appears to be particularly well adapted to existence in the unconsolidated Kalahari beds of this region. As a result of this most recent expedition the known distribution of this genus to the North-West of the R.S.A. has been extended from Longitude 22°E. to Longitude 20°E.

(j) *Macrotermes* (Fig. 18).

The known distribution of the genus *Macrotermes* to the North-West of the R.S.A. was not extended to any significant extent by the survey of May 1962. The striking, massive clay mounds of *M. natalensis* Hav. were patchily encountered along the course of the Molopo River from Mafeking to Longitude 24°E., and then Southwards as far as Vryburg vicinity. The most Westerly extension in its distribution area could be seen along the Southern sectors of the Vryburg and Kuruman districts to the Olifantshoek area in the Postmasburg district, to the immediate East of the Langeberge mountains. No trace of the genus could be found in the more arid sectors of the North-Western Vryburg and Kuruman districts, and the whole of the Gordonia district proved to be blank.

(k) *Odontotermes* (Fig. 19).

In the light of data then available Coaton (1962) wrote that the more arid areas of the Cape Province West of Longitude 22°E were apparently not inhabited by species of the genus *Odontotermes*. The survey conducted in May 1962 has proved the genus to be fairly widely spread through the unconsolidated Kalahari beds of the districts Vryburg, Gordonia, Kuruman and Postmasburg, to as far West as Longitude 20°E. A considerable blank in the known distribution of the genus in the North-Western sectors of the R.S.A. has thus been filled in. It is worthy of mention that the *Odontotermes* species inhabiting the sectors of deep, unconsolidated Kalahari sand lived in complete concealment in the soil since surface structures, such as clay chimneys or mounds which normally sub-tend the nesting sites of species of this genus, were conspicuous by their entire absence.

(l) *Microtermes* (Fig. 20).

The known distribution area of the genus *Microtermes* has been extended as far West as Longitude 20°E. by the survey conducted in May 1962, and distribution blanks to the North-West of the R.S.A. have been filled in considerably by the 29 accessions obtained from all 5 districts traversed. In general accessions of this genus were collected more readily in the eroded karroid sectors and in the heavier soil types than in the areas of deep, unconsolidated Kalahari sand — not a single accession was obtained from the Kalahari National Gemsbok Park, while the North-Western sector of deep sand of the Vryburg district also proved to be blank for the genus.

(m) *Trinervitermes* (Fig. 21).

This genus was proved to be present throughout the 5 districts traversed during May 1962, and the vast existing blank in the known distribution of the genus through the North-Western sectors of the R.S.A. has now been filled in fairly adequately.

It is of interest to note that all 5 new localities for the genus now placed on the map in the South-Western corner of the district Gordonia reflect accessions gained of *T. hainesi* Full., a species readily recognised by the chocolate colour of the head of the nasute. In all cases this species was taken nesting below stones and rocks in sectors classified geologically as belonging to the Nama and Karoo systems. *T. hainesi* had previously been recorded from rocky localities in the districts Namaqualand, Kenhardt and Prieska, and the new locality records mentioned above for the district Gordonia are the furthest North yet in its known distribution area. This species apparently does not extend Northwards in the Gordonia district into the unconsolidated Kalahari beds.

(n) *Fulleritermes* (Fig. 22).

Five accessions of the genus *Fulleritermes*, all representative of the Northern species *F. contractus* Sjöst., were obtained during May 1962 from

the Vryburg district at two separate localities, both placed roughly on Latitude 26° 20'S. Since no further accessions were gained West of Longitude 24°E., despite intensive collecting by three specialists, it would seem that this Longitude would bound the distribution area to the West of *F. contractus.*

In passing, it should be mentioned that the whole picture with regard to the distribution to the North-East of the R.S.A. of *F. contractus,* as outlined by Coaton ((1962), has changed as a result of two accessions of the species gained by J. L. Sheasby in the district Entonjaneni, Natal, during January 1962 (Fig. 22). It now seems quite clear that, contrary to the previous assumption, the North-Eastern Lowveld of the Transvaal and Swaziland will in future be proved positive for the species, thus linking existing records from the Sibasa district of the North-Eastern Transvaal to those recently established in the Entonjaneni district of Natal.

4. ACKNOWLEDGEMENTS.

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An especial word of thanks are due to Messrs. J. L. Sheasby, G. F. Pretorius and P. le S. Milstein, as well as to W. Mohale, for their untiring efforts in the field under most exacting physical and climatic conditions — without their whole-hearted co-operation and unflagging interest the survey would not have been nearly as productive and rewarding.

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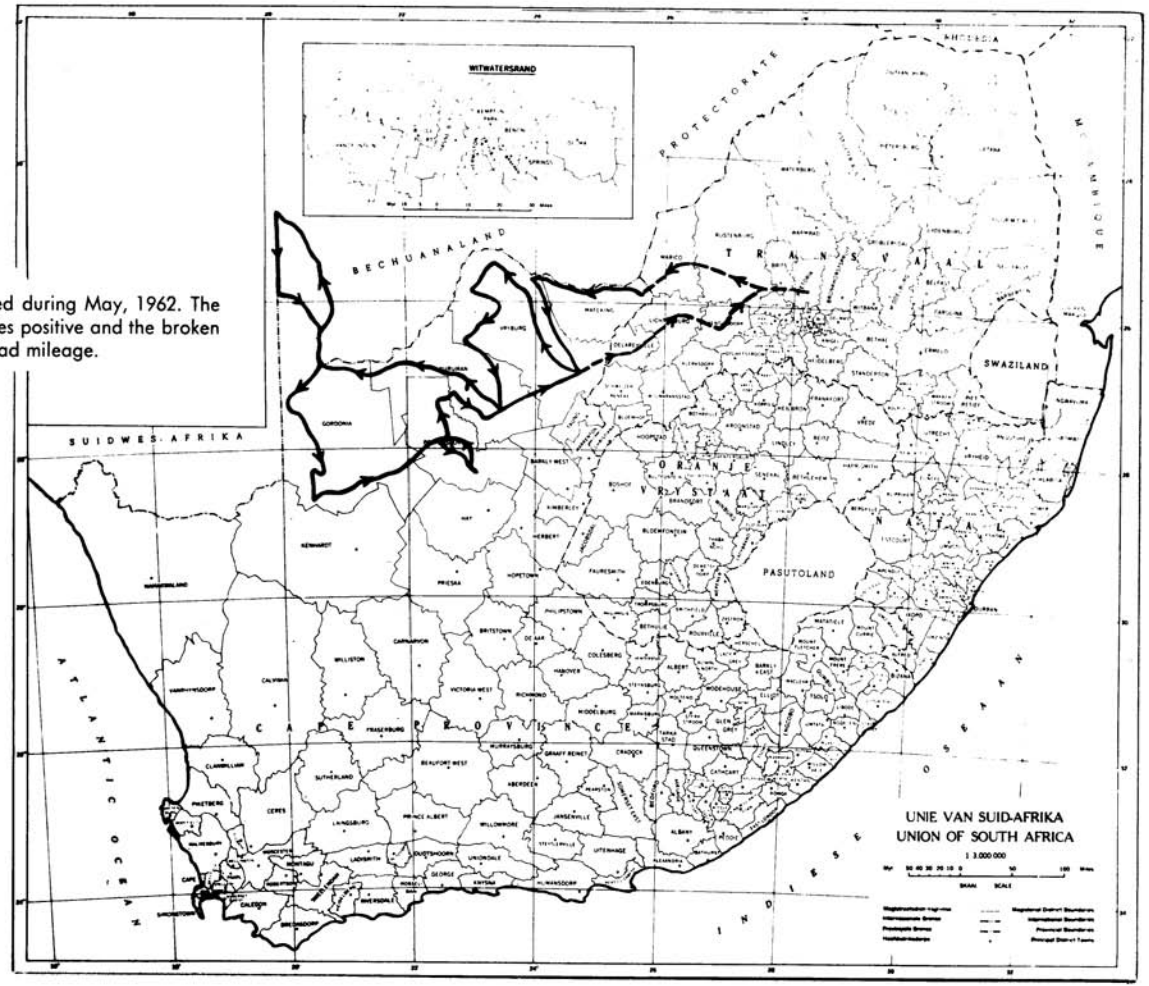

FIG. 1. Route travelled during May, 1962. The unbroken line indicates positive and the broken line dead mileage.

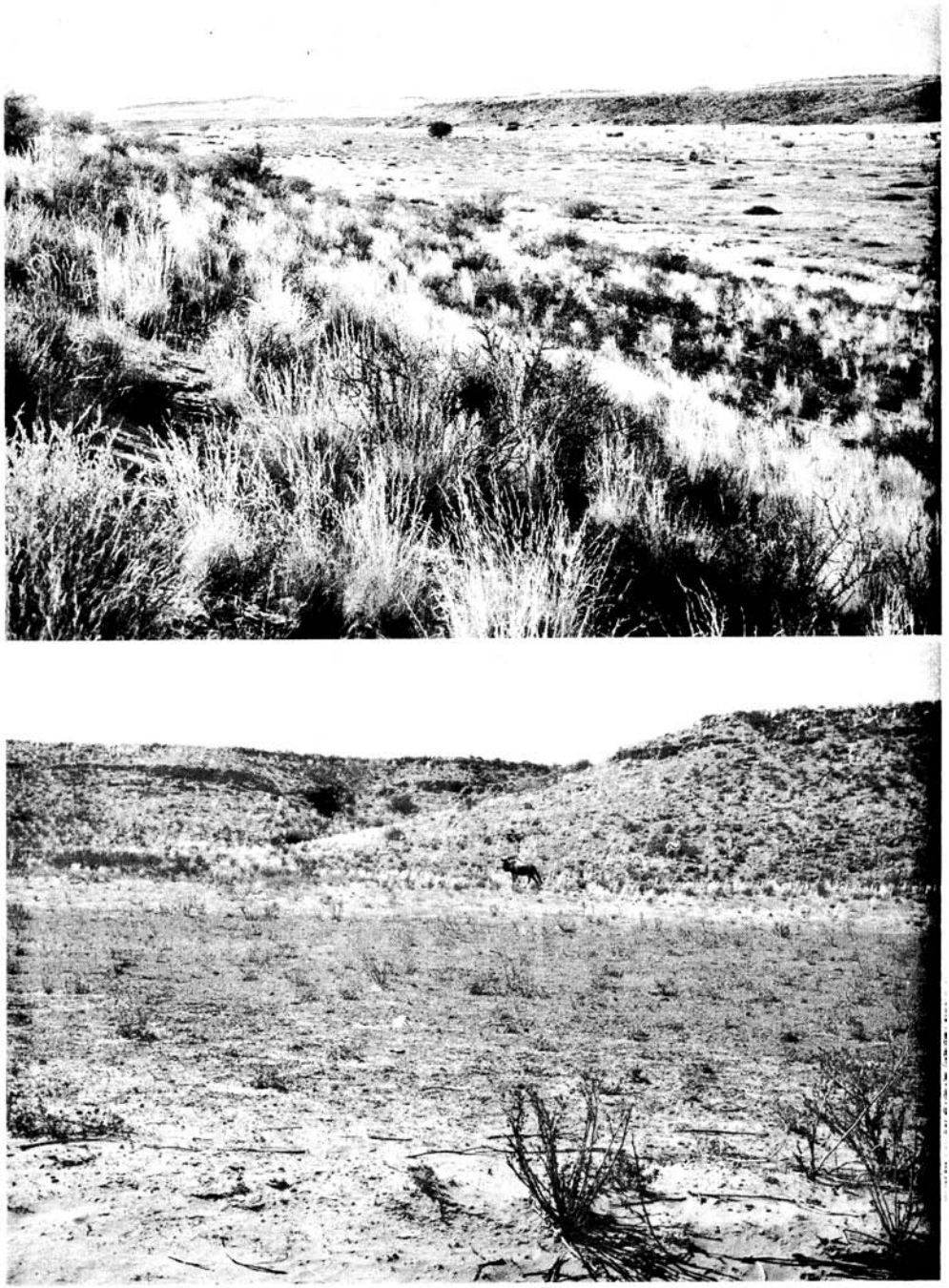

FIG. 2.

Top : Collecting station in the Nossob River near Twee Rivieren, from the dune forming one bank across the river bed to the limestone ridge forming the opposite bank.

FIG. 3.

Below : Collecting station in the Auob River near Twee Rivieren, from the denuded river bed to the limestone ridge forming one bank.

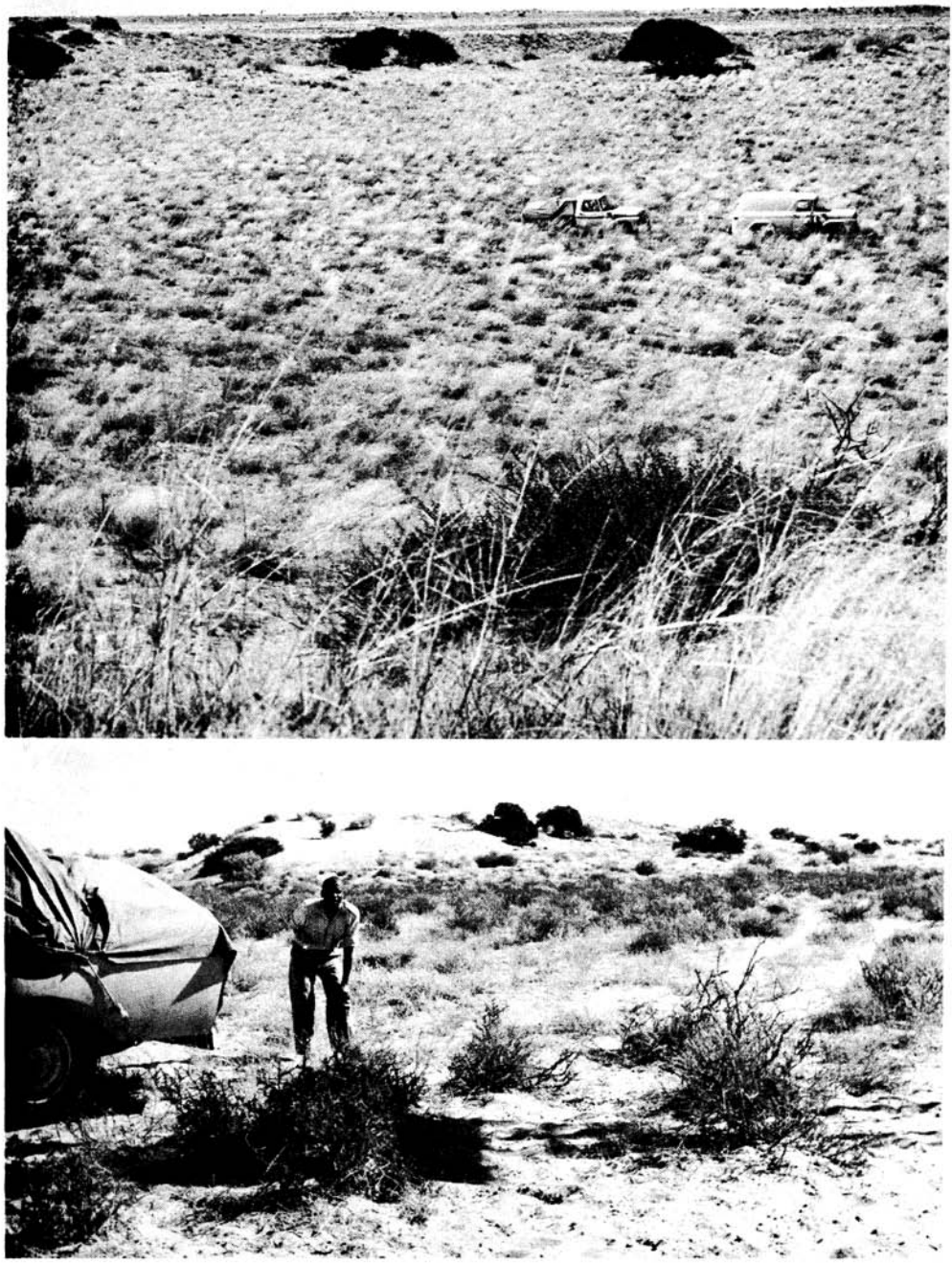

FIG. 4.
Top : Collecting station in the vegetated dunes along the S.W.A. border, viewed from the crest of a dune above a trough.

FIG. 5.
Below : Collecting station in the open dunes along the S.W.A. border from a Rhigozum depression between the dunes.

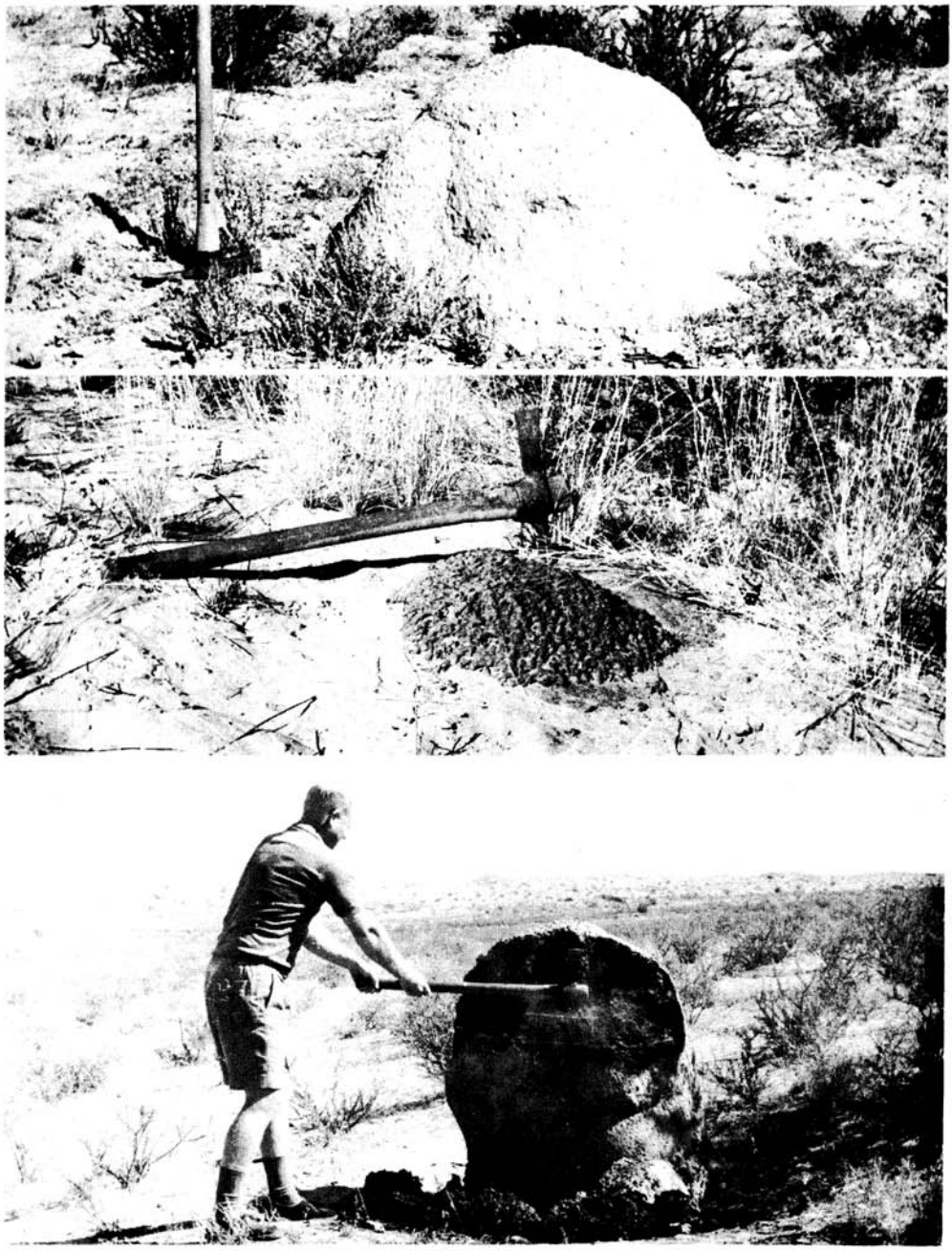

FIG. 6.

Top : Massive domed mound of Trinervitermes sp. *as seen in the bed of the Auob River near Mata Mata.*

FIG. 7.

Centre: Low mound of Trinervitermes sp. *as seen in the dunes along the S.W.A. border.*

FIG. 8.

Below : Mammoth, derelict Trinervitermes *mound invaded by* Promirotermes sp. *(Acc. TM. 10, 381), in bed of Auob River near Mata Mata.*

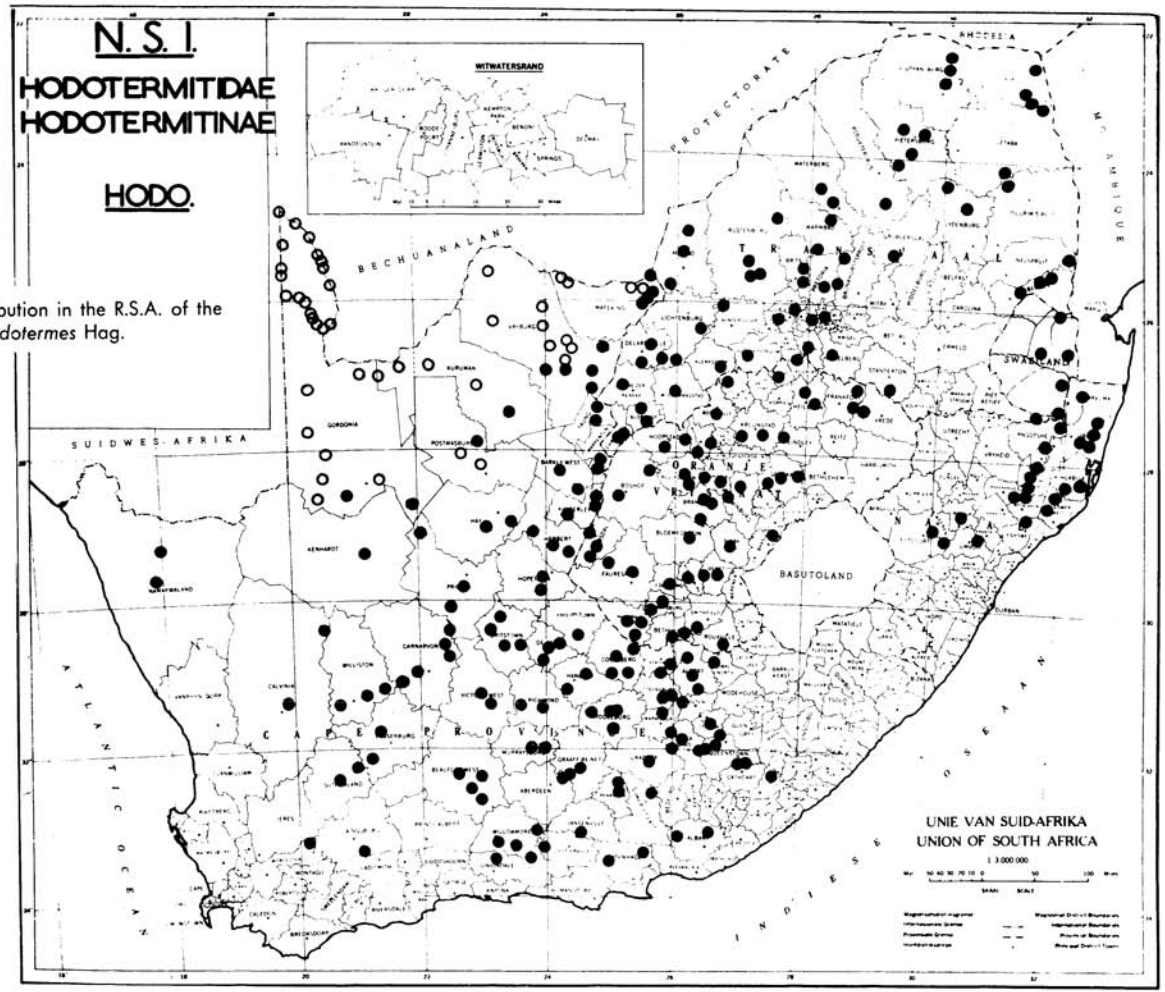

FIG. 9. Known distribution in the R.S.A. of the genus *Hodotermes* Hag.

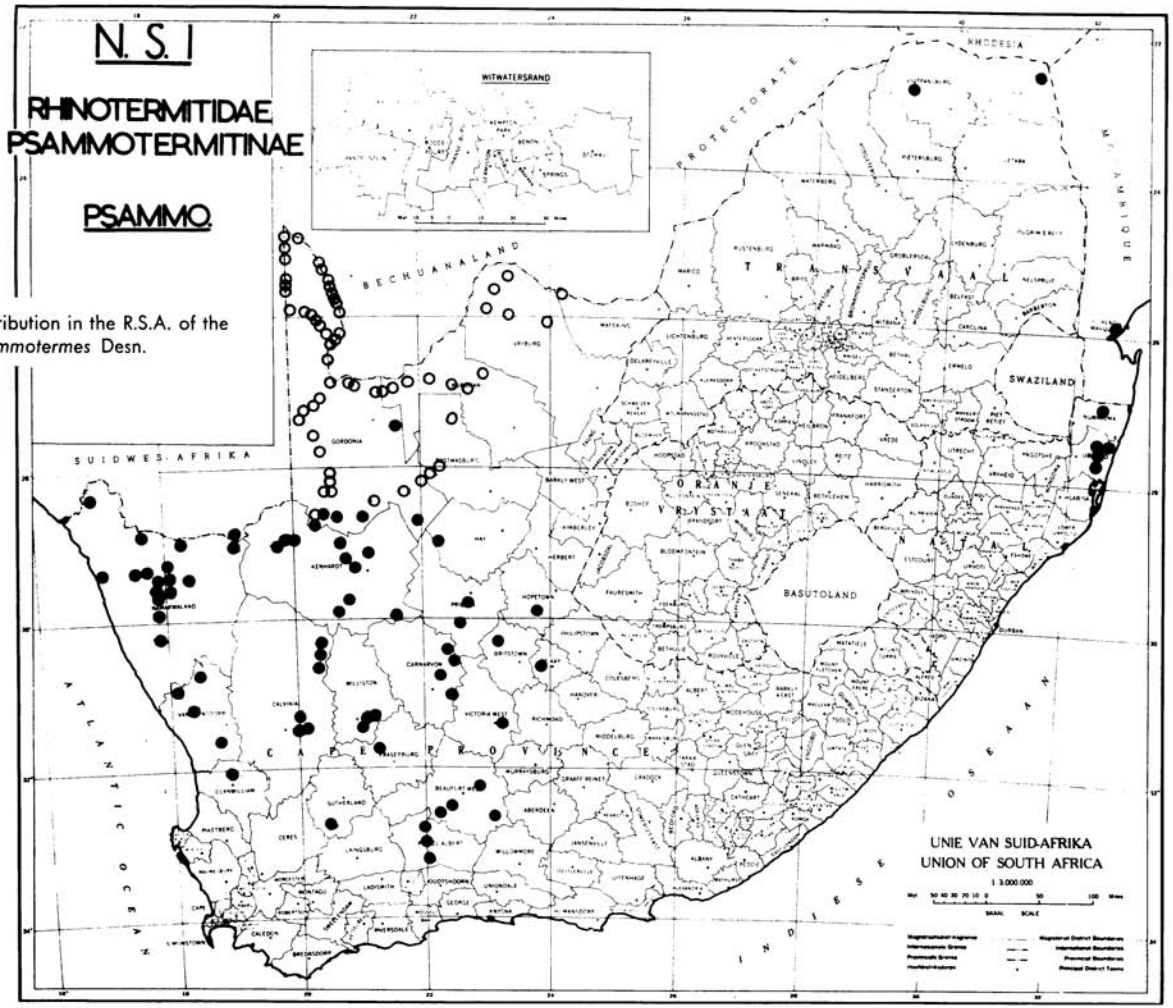

FIG. 10. Known distribution in the R.S.A. of the genus *Psammotermes* Desn.

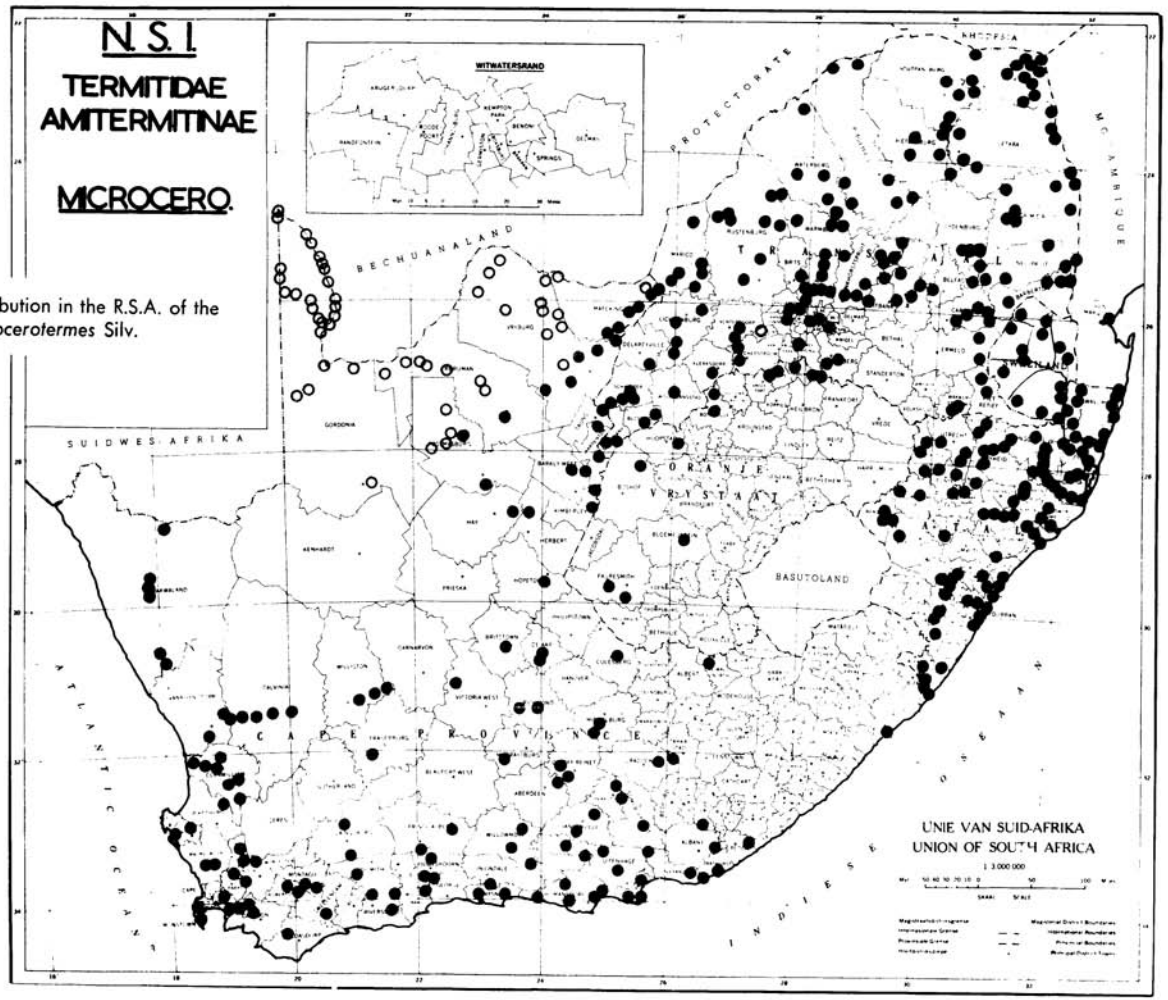

FIG. 11. Known distribution in the R.S.A. of the genus *Microcerotermes* Silv.

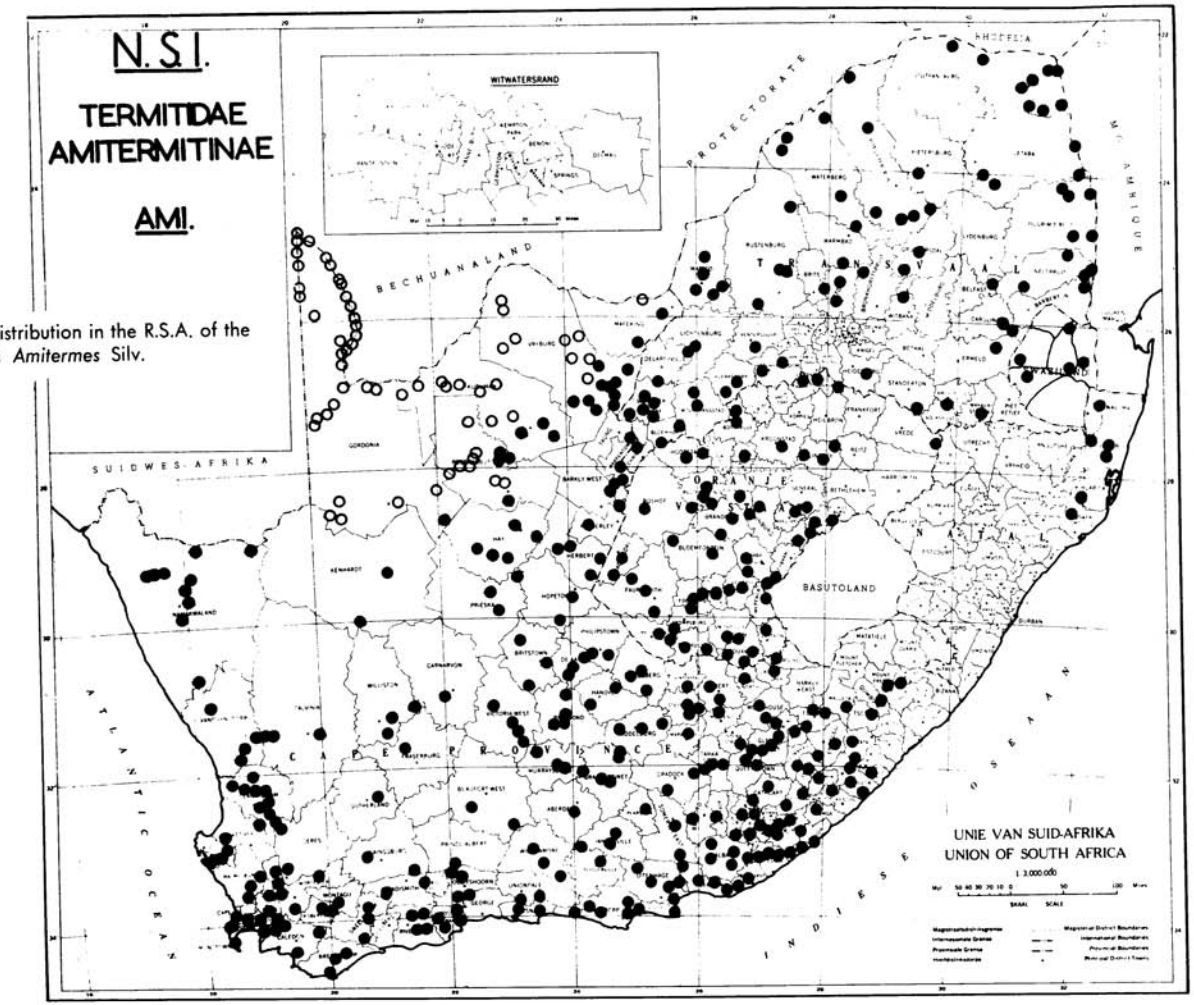

FIG. 12. Known distribution in the R.S.A. of the genus *Amitermes* Silv.

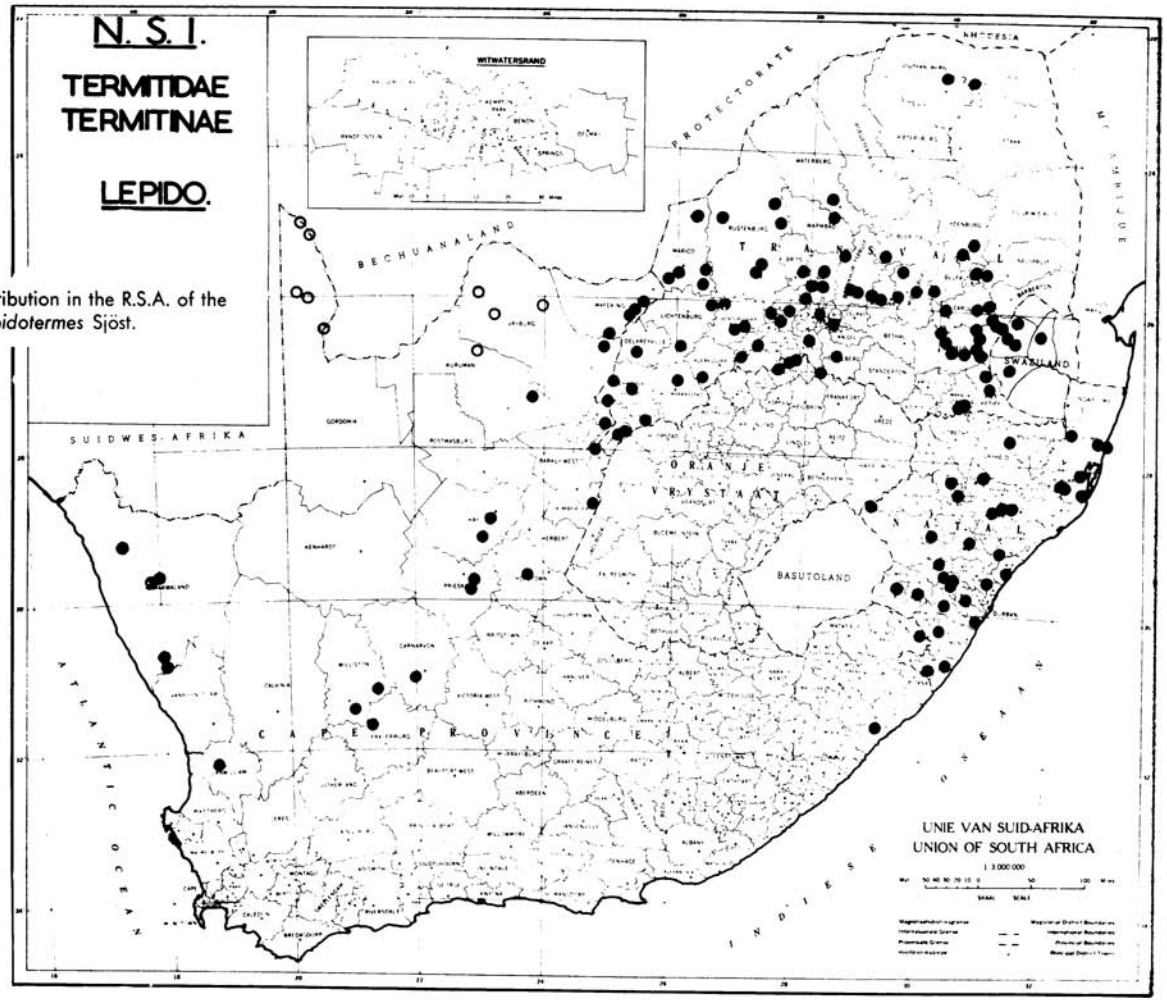

FIG. 13. Known distribution in the R.S.A. of the genus *Lepidotermes* Sjöst.

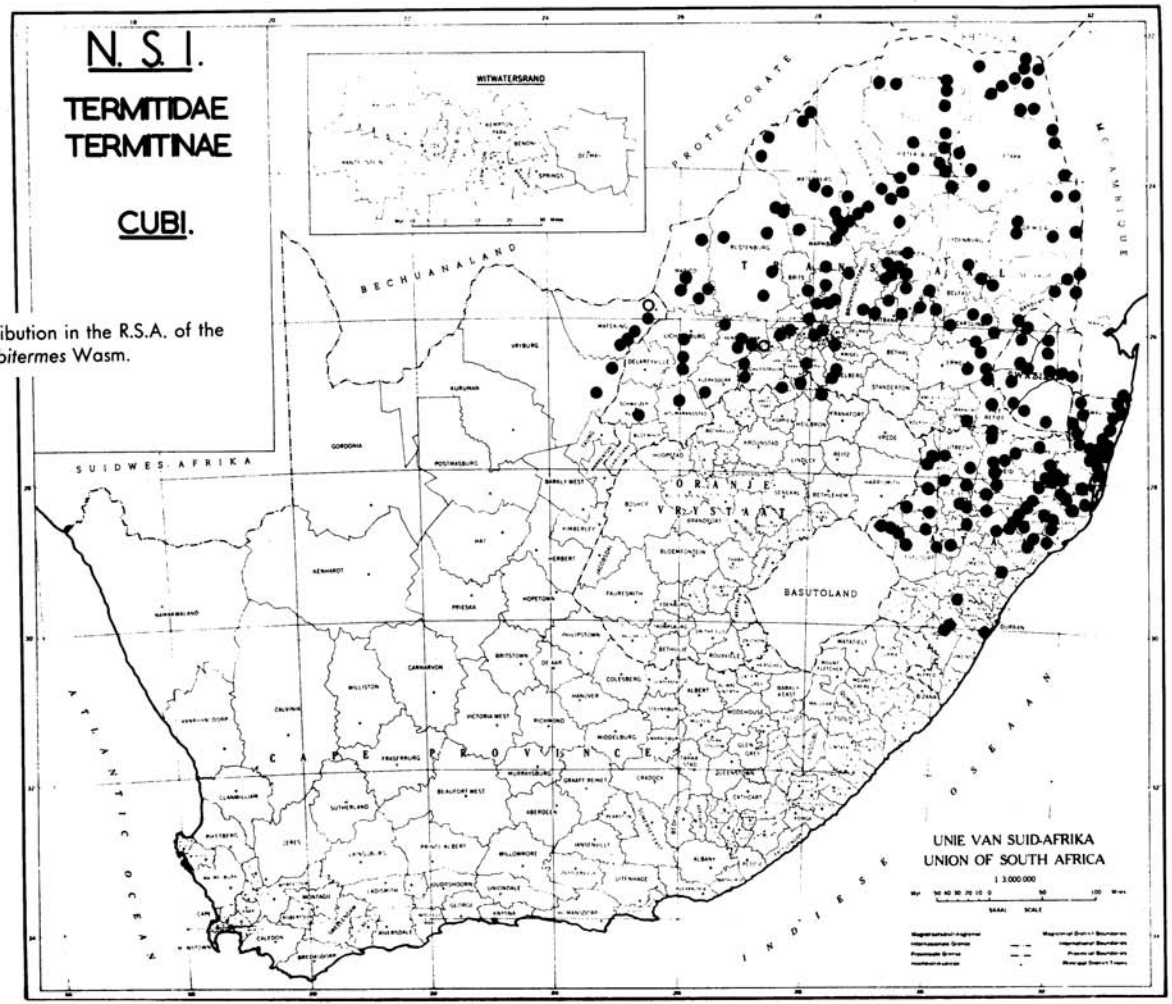

FIG. 14. Known distribution in the R.S.A. of the genus *Cubitermes* Wasm.

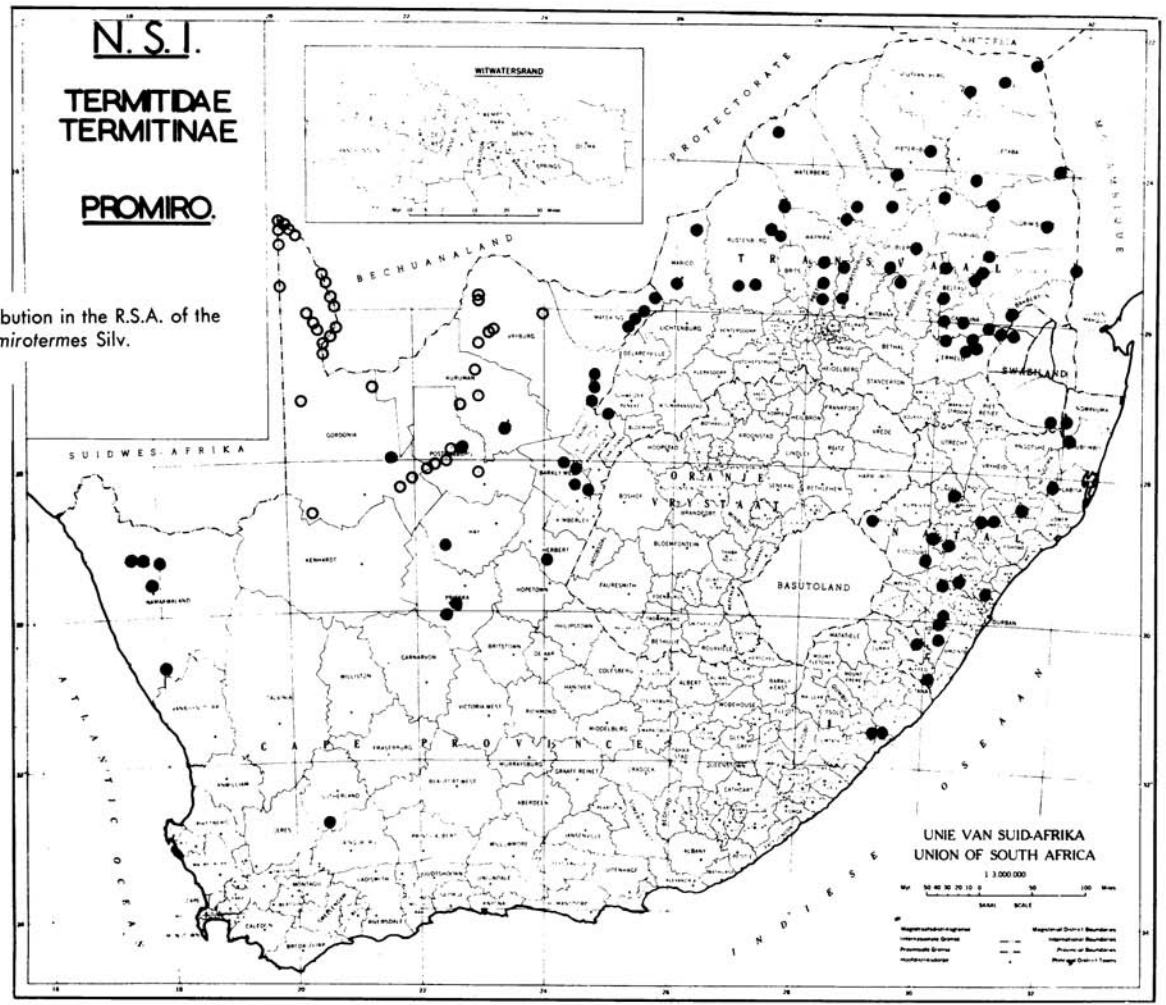

FIG. 15. Known distribution in the R.S.A. of the genus *Promirotermes* Silv.

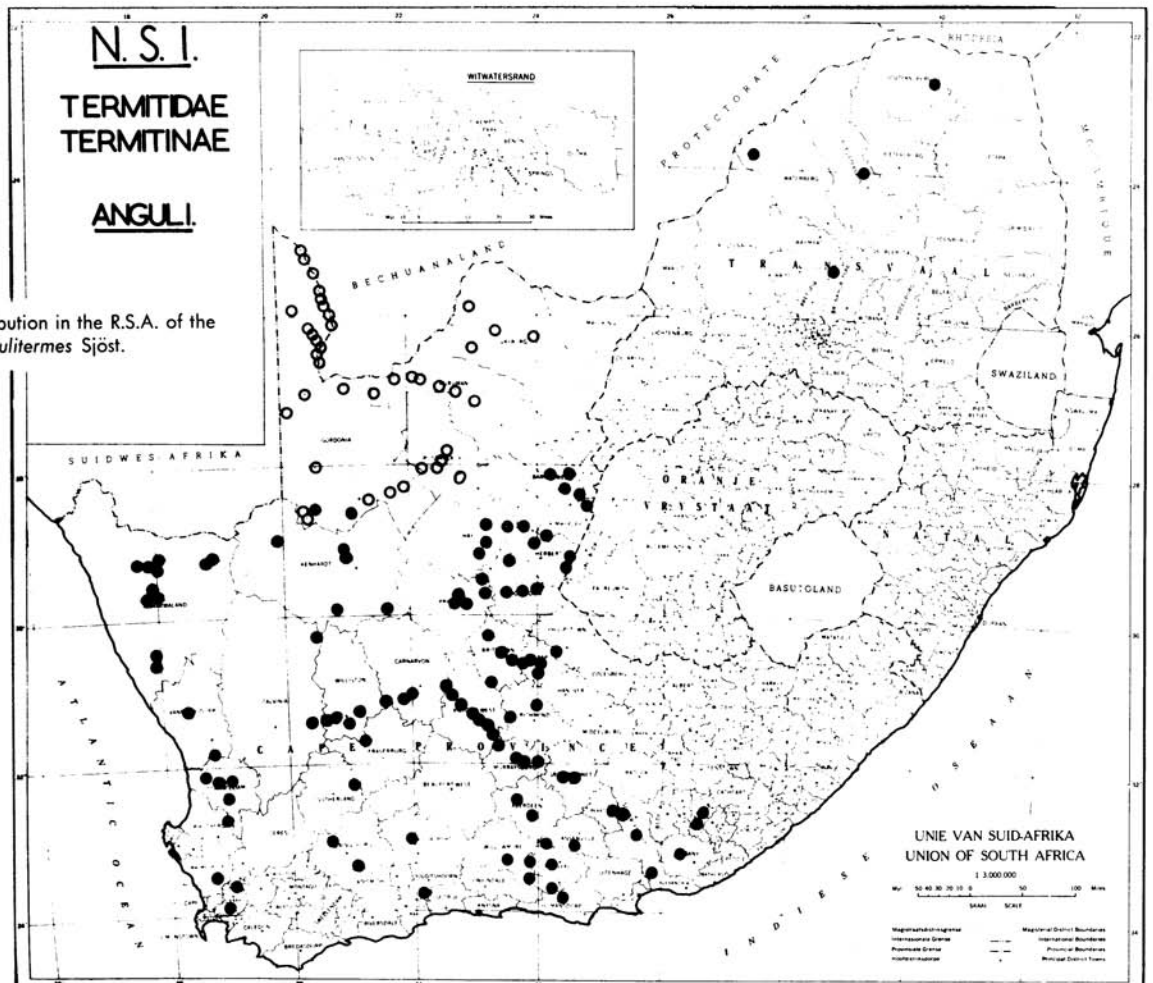

FIG. 16. Known distribution in the R.S.A. of the genus *Angulitermes* Sjöst.

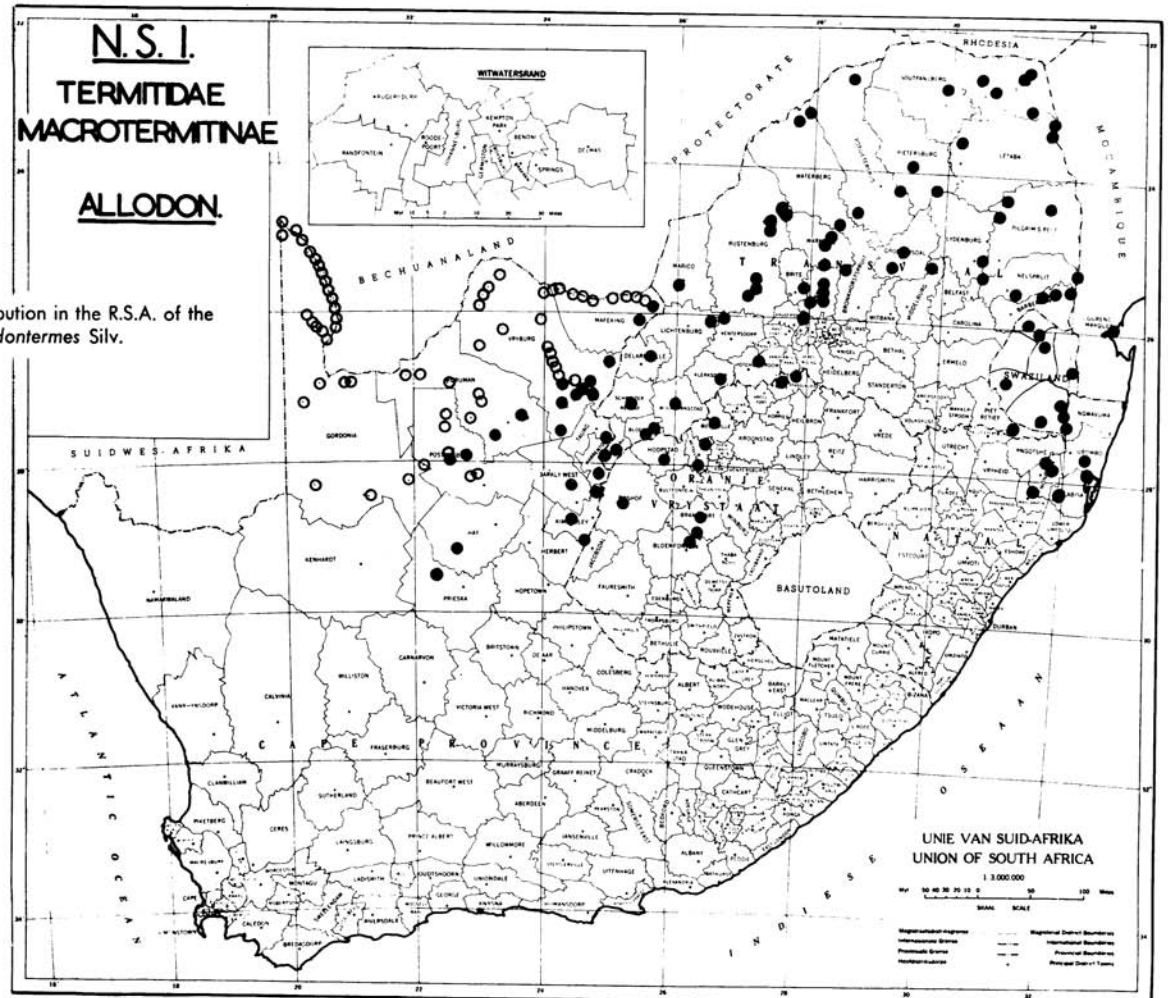

FIG. 17. Known distribution in the R.S.A. of the genus *Allodontermes* Silv.

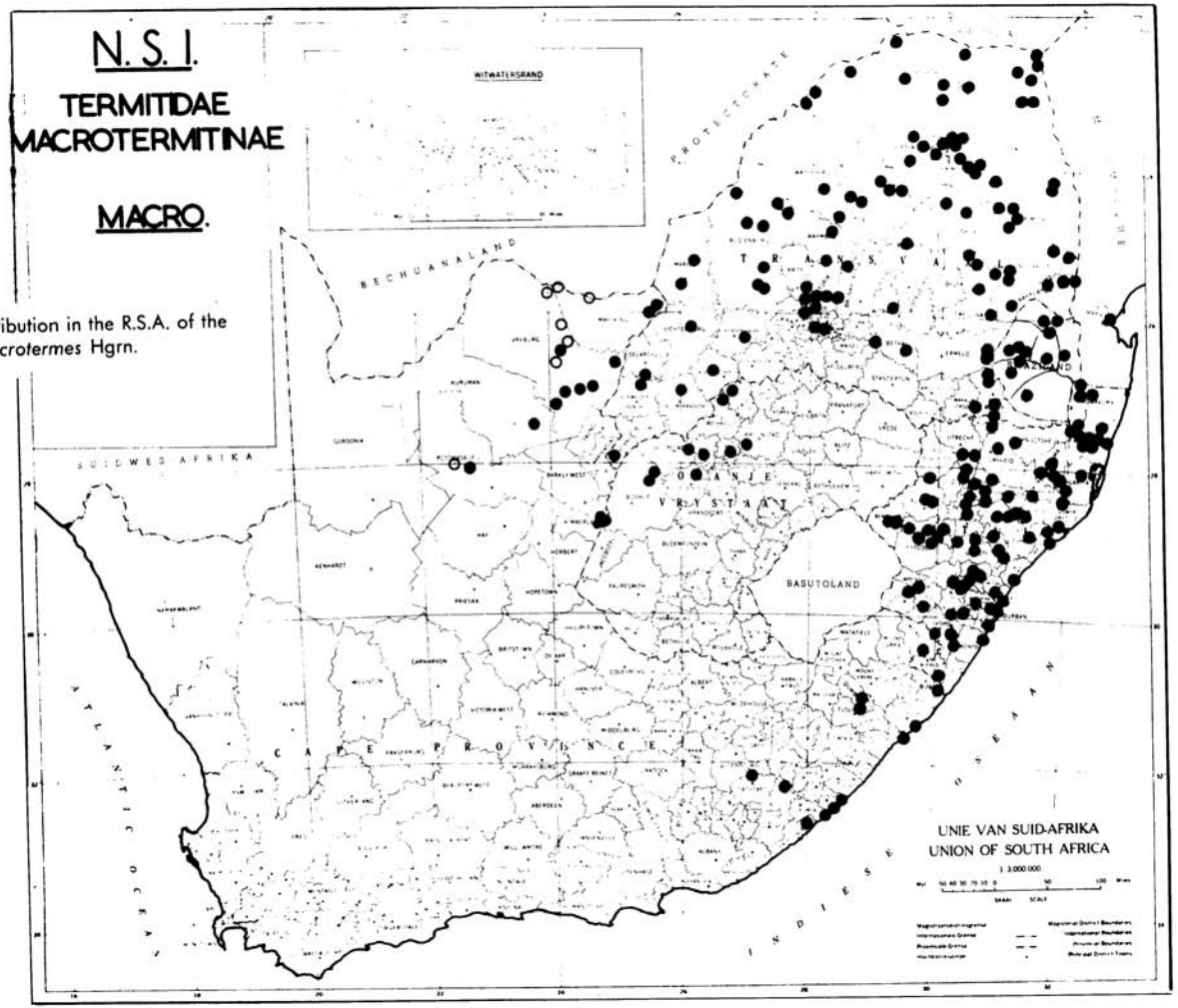

FIG. 18. Known distribution in the R.S.A. of the genus *Macrotermes* Hgrn.

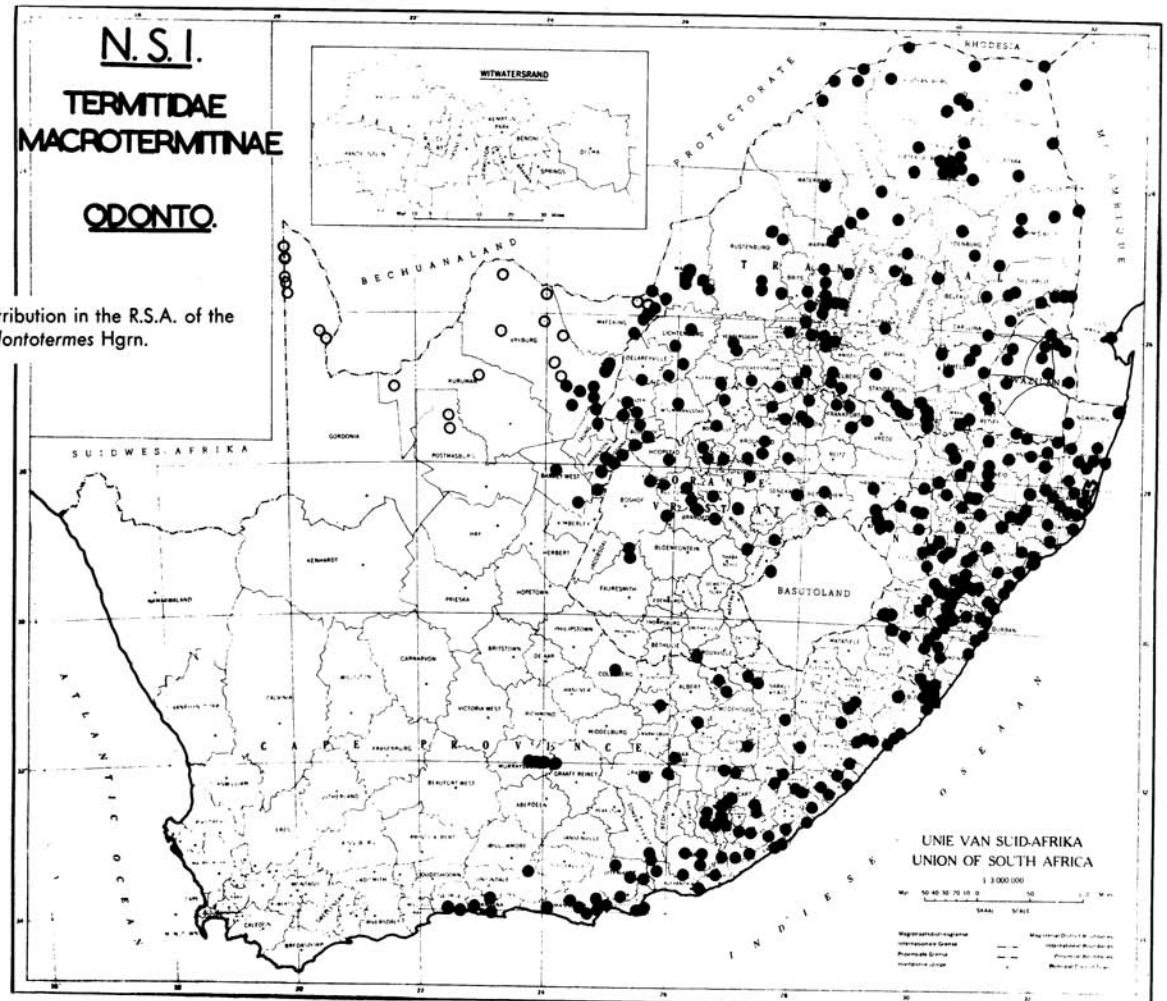

FIG. 19. Known distribution in the R.S.A. of the genus *Odontotermes* Hgrn.

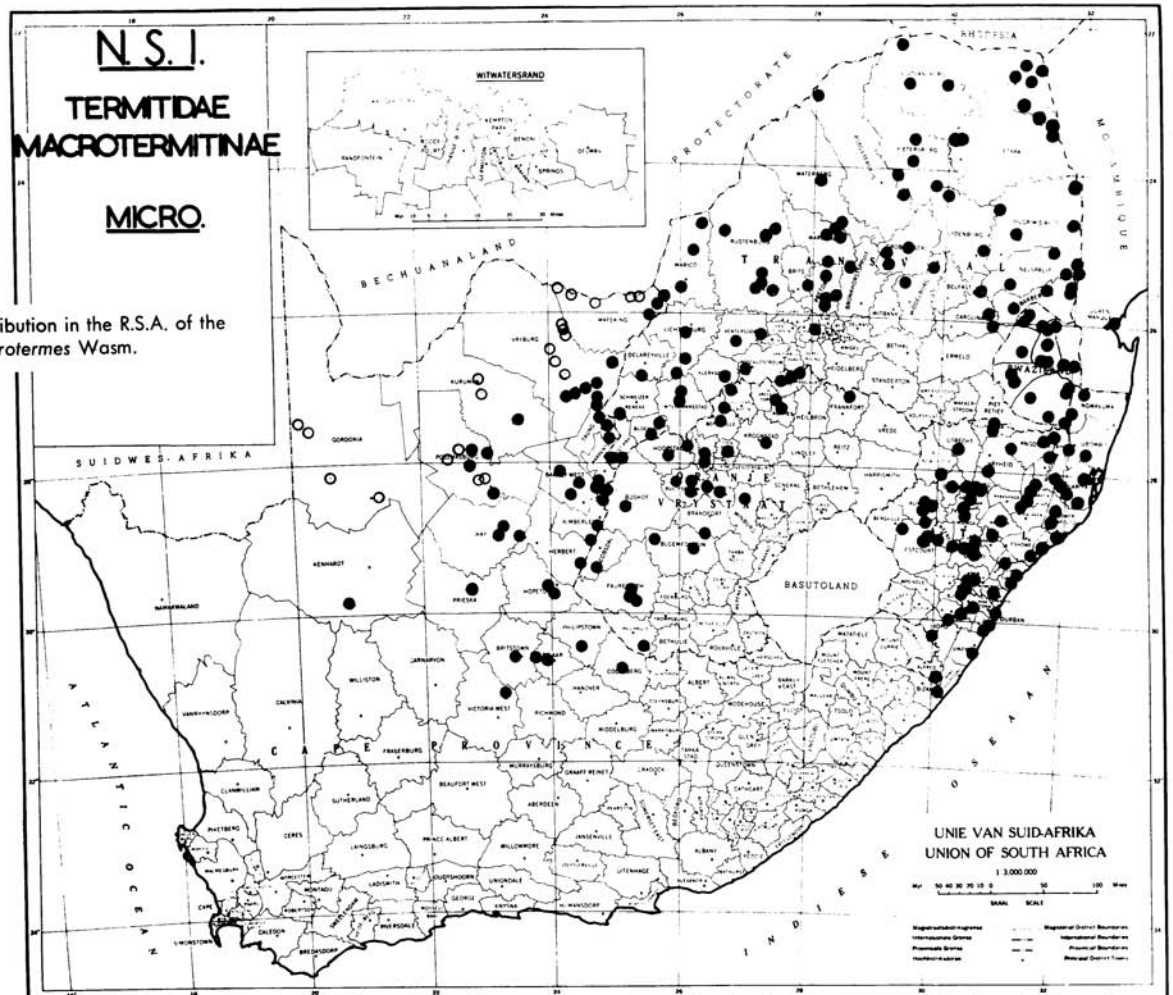

FIG. 20. Known distribution in the R.S.A. of the genus *Microtermes* Wasm.

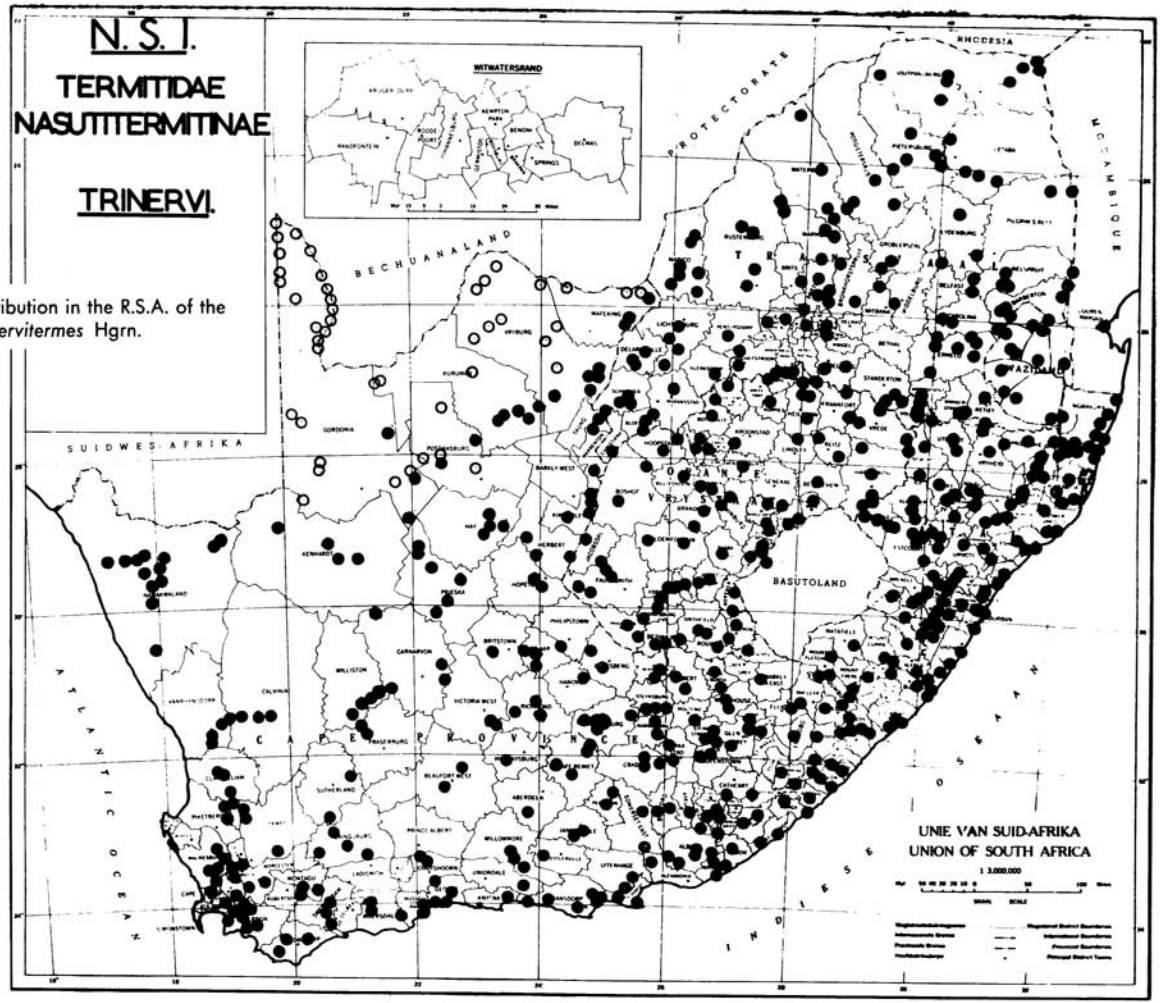

FIG. 21. Known distribution in the R.S.A. of the genus *Trinervitermes* Hgrn.

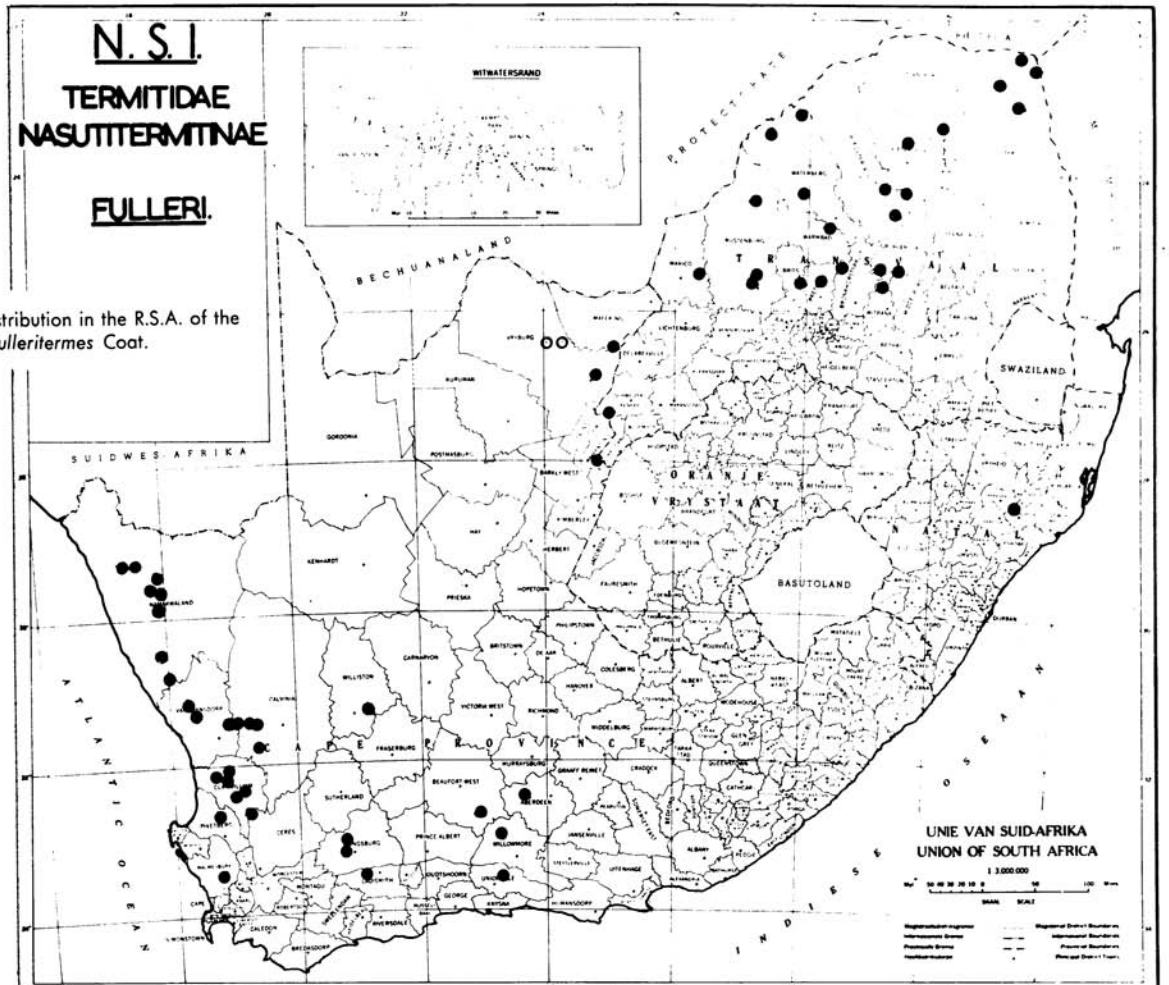

FIG. 22. Known distribution in the R.S.A. of the genus *Fulleritermes* Coat.