

Further contributions to a knowledge of Termite Fungi in East Africa: The Genus *Termitomyces* Heim

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With plates I—VI.

Introduction

Since the first paper was published on Termite fungi in East Africa (Otieno: 1964), further collecting has been carried out in other parts of the east african area with the help of students and teachers of the University. This work has produced another new species of *Termitomyces* as well as some species which had been previously reported from the Congo (Heim: 1942, 1958). Keys which had already been provided for the identification of species (Otieno: loc. cit.) including the synopsis of all the known species are omitted from this paper. The writer is grateful for the enthusiasm in collecting fungi which has resulted from his first paper. It is for this reason alone that two species of *Termitomyces* have been collected from Tanzania and one species from Uganda in addition to the ones already reported from Kenya.

The genus *Termitomyces* Heim. Arch. Mus. Nat. Hist. Nat., ser. 6, 18: 147. 1942.

Carpophores of small to large *pileus* with prominent umbo (perforatorium); gills free to sub-adnate. Spores pink in mass, non-amyloid, hyaline, ellipsoid and smooth. Basidia cylindrical, four-spored. Stipe usually continued into a long pseudorrhiza which arises from termitaria.

Termitomyces magoyensis Otieno. Proceedings East African Academy II: 108—120, 1964. 5 Plates.

Carpophores of white, glabrous, *pileus* when young, which gets covered by large dark pustules at maturity; 150 mm. or more in width, with a broad dark umbo in the centre; and of robust stipe which tapers into a long pseudorrhiza 400 mm. or more long. Gills cream to white. All the carpophores found growing scattered on a large termitarium. Basidia clavate, 20—25 $\mu \times 7.0$ —7.5 μ , spored, with relatively short sterigmata. Spores ovoid, pink in mass, hyaline under the microscope, 7.0—7.5 $\mu \times 5.5$ —7.0 μ . Cystidia present but not as prominent as those of the type species.

Distribution: Kenya (Rift Valley, 72 miles on Kajiado Road).

Tanzania: On the road side before Mt. Meru towards Arusha, found growing on large termite mound.

This report on *T. magoyensis* brings the number of localities in Eastern Africa where the species has been found to two. As was stated in our earlier paper (loc. cit.), it is probable that the distribution is much greater than what is presently known — and further work in drier areas of East Africa with large termite mounds during the rains is likely to increase our knowledge about the range of *T. magoyensis*.

Termitomyces microcarpus (Berk. & Br.) Heim. (Pl. I, Fig. 3).

1941. Mem. Acad. Sci. Inst. France, 64: p. 72.

1942. Arch. Mus. Nat. Hist. Nat. Paris, 18: p. 128.

1952. Mem. Soc. Helvet. Sc. Nat. 43: p. 21.

Syn.: *Entoloma microcarpum* Berk. et Br. Journ. Lin. Soc. 14: p. 119, 1897.

Entoloma microcarpum Petch. Ann. Roy. Bot. Garden Peradeniya 5: 6, p. 389, 1913.

Mycena microcarpa (Berk. et Br.) Pat. Bull. Soc. Myc. France, 29: p. 2110, 1913.

Mycena termitum Beeli. Rev. Zool. Bot. Africa, 21: 4, p. 327, 1932.

Carpophores growing superficially, densely grouped together on soil mounds brought to the surface by termites. Pileus small, glabrous, 4—15 mm. in diameter, with a prominent, sharply pointed umbo; cream to whitish when fresh, turning brown and sandy on drying. Gills creamy white, close together. Stipe 20—50 mm. long, glabrous, cream coloured, with a slightly bulbous base. Basidia small, 20.0—25.0 μ \times 7.0 μ , four spored, with short sterigmata. Spores pink in mass, ovoid, 5.0—6.0 μ \times 3.0—3.5 μ . Few cystidia in the hymenium.

Distribution: Uganda — Makerere College, collected by Kye y u n e Nov. 1959.

Tanzania — Tanga Road near Moshi, collected by Miss. S. M o o r - j a n i on a termite mound, 14/4/67.

The two collections of *T. microcarpus* in our herbarium are very close in all respects to the species described by Heim (loc. cit.). But they differ slightly from *T. narobiensis* in having smaller carpophores and spores. The Tanzanian collections are small, usually with more sharply pointed umbo than the Ugandan material. Besides these minor observations, we believe the two East African collections are *T. microcarpus*.

***Termitomyces badius* sp. nov. sp. nov. (Pl. I, Fig. 3).**

Carpophores growing crowded together from soil brought to the

surface by termites. *Pileus* 12—15 mm. in diameter, with a sharply pointed umbo; striated from the apex to the edge, buffy brown in colour, with pinkish gills. Stipe 42—60 mm. long, thin and twisted, with a slightly bulbous base, cream coloured. Basidia 20—22 $\mu \times 5.0$ —6.0 μ , four spored, with short sterigmata. Spores pink in mass, ovoid, 4.0—5.0 $\mu \times 3.0$ —4.0 μ . Cystidia rare.

Carpophoris acervatim e termitariis subterraneis erumpentibus; pileo 12—15 mm diam., umbonato, ex apice ad marginem striato, alutaceo; lamellis pallide roseis; stipite 42—60 mm longo, tenui, postice parum sed distincte bulboso-incrassato, cremeo; basidiis 4-sporis, 20—22/5—6 μ , sterigmatibus brevibus praeditis; sporis acervatim roseolis, ovoideis, 4—5/3—4 μ .

Locality: Choromo campus, Nairobi, collected by N. C. Otieno 15/5/67, and 14/5/66.

This small species superficially resembles both *T. microcarpus* and *T. narobiensis*. But the striated texture of the carpophore radiating from the prominent umbo; the twisted stipe and the very decidedly buffy brown colour throughout the life of the carpophore — make it a different species from the above. In addition, it has much smaller spores than those of *T. microcarpus* and *T. narobiensis* so that we believe we have a new species of *Termitomyces* which has been deposited in the herbarium, Botany Dept., University College, Nairobi, Kenya.

Termitomyces clypeatus Heim. Bull. Jard. Bot. Etat. Brux.

Carpophores growing in clusters from underground termitaria. Pileus 30—50 mm. wide, radially striate and with concentric zonation. Umbo sharply pointed, conical, darker than the pileus and with a broad base merging gradually into the pileus. Stipe 45—70 mm. long and tapering into a long pseudorrhiza which is slightly swollen at point of transition from the stipe. Basidia cylindric, 4-spored, 20—25 $\mu \times 5.0$ —7.0 μ , with short sterigmata. Spores pink in mass, hyaline under the microscope, ovoid, 6.0—7.0 $\mu \times 4.0$ —5.0 μ .

Distribution: Kenya — collected on a farm near Kikuyu by N. C. Otieno, May 1964.

Choromo Campus, University College, Nairobi. Collected by N. C. Otieno, June 1967.

This species was found growing crowded together from termitaria some 120 mm. below the ground (Fig. 1 & 2). These were carefully dug out while the carpophore was attached to the termitaria. Some of the termitaria were later incubated in moist chambers and *Xylaria* species were found developing from them after a few days (P. I, Fig. 4). This appears to be the first record of *T. clypeatus* from the East African area and a search in farms in our area should reveal a wider distribution of *T. clypeatus* than we have at present.

Termitomyces rabuorii Otieno. (Pl. VI, Fig. 1—3).

Proc. E. Afr. Acad. II: 108—120, 1964.

Carpophores growing crowded together from an underground termitarium. Pileus 70—80 mm. wide, radially striated, with a sharply pointed obtuse conical umbo with a broad base and distinctly darker than the rest of the pileus. Gills cream coloured. Stipe (above ground) 70 mm. long with a bulbous base, tapering into a pseudorrhiza 30—50 mm. long. Basidia cylindric, 4-spored, with short sterigmata, $20-25 \mu \times 6.5-7.5 \mu$. Spores pink in mass, hyaline under the microscope, ovoid, $7.0-7.5 \mu \times 4.5-5.5 \mu$. Cystidia present.

Distribution: Kenya, Choromo Campus, Nairobi growing clustered from an underground termitarium.

This is the second collection of *T. rabuorii* to come from the Nairobi area. It is likely that its range which appears limited at present is due again, to small amount of collecting that has been done.

Termitomyces robustus (Beeli) Heim. Bull. Jard. Bot. Etat Brux., p. 210, 1951.

Syn.: *Schulzeria robusta* Beeli, Bull. Soc. Roy. Bot. Belg. LX: p. 75, 1927.

Carpophore with a moderately sized, radially striate, pileus 110 mm. wide, with a robust umbo not distinct from the pileus. Gills lemon yellow and free. Stipe long, same colour as pileus, and both stipe and pseudorrhiza concolorous. Stipe 50—60 mm. long and pseudorrhiza 420 mm. long. Basidia 4-spored, cylindric, with short sterigmata, $20-25 \mu \times 7.0-8.0 \mu$. Spores pink in mass, hyaline and smooth under the microscope, ovoid, $7.0-8.0 \mu \times 5.0-5.5 \mu$.

Distribution: Nairobi on a farm growing from an underground termitarium; collected by N. C. Otieno, June 1967.

T. robustus has been reported from the Congo by Heim. Since our collecting began in Eastern Africa, this is the first species of *Termitomyces* whose both macroscopic and microscopic characters are distinctly those of the Congolese specimens. Here again we have only one collection which we attribute to scanty collecting that has been done in our area.

Discussion

In our previous paper (Otieno: 1964), a key was constructed for the identification of *Termitomyces* species based on the size of the pileus, prominence and colour of the umbo, length of the stipe and the pseudorrhiza, possession of veil and/or annulus as well as the size of spores and types of cystidia. The above key, not reproduced in here, has proved to be extremely useful in identifying species of *Termitomyces* that have been collected from our area over the past three years.

The range of *Termitomyces* in eastern Africa has been extend by

the discovery of *T. microcarpus* in both Uganda and Tanzania. *T. magoyensis* is now reported from Tanzania growing on termite mounds very similar to those found in Kenya in 1964. A new species of *Termitomyces*, viz. *T. badius* is herein reported from the Nairobi area. This brings to three the number of *Termitomyces* with a pileus whose diameter ≥ 30 mm., having no pseudorrhiza, and classified by Heim as *Praetermitomyces*.

The association between *Termitomyces* and *Xylaria* species is further demonstrated in this paper (Plate I, Fig. 4) as evidenced by incubation of a whole termitarium of *Termitomyces clypeatus* which was collected from Kikuyu near Nairobi. Otieno (1964) stressed the importance of work on species of termites with which *Termitomyces* species are associated if we are to understand more clearly the basic principles of species within the genus. Present work further confirms this view and it is our hope that future investigation by other scholars will endeavour to throw light on this interesting biological association.

Otieno (1964) stated that much work would be required in collecting and typifying the many species of *Termitomyces* which he believed could be found in many parts of the tropics especially in East Africa. Our discovery of *T. microcarpus*, *T. robustus* and *T. clypeatus* in East Africa during the last three years tends to bear this out and it is our further hope that this paper will stimulate more work which should enable us to know more of the distribution of *Termitomyces* in our area.

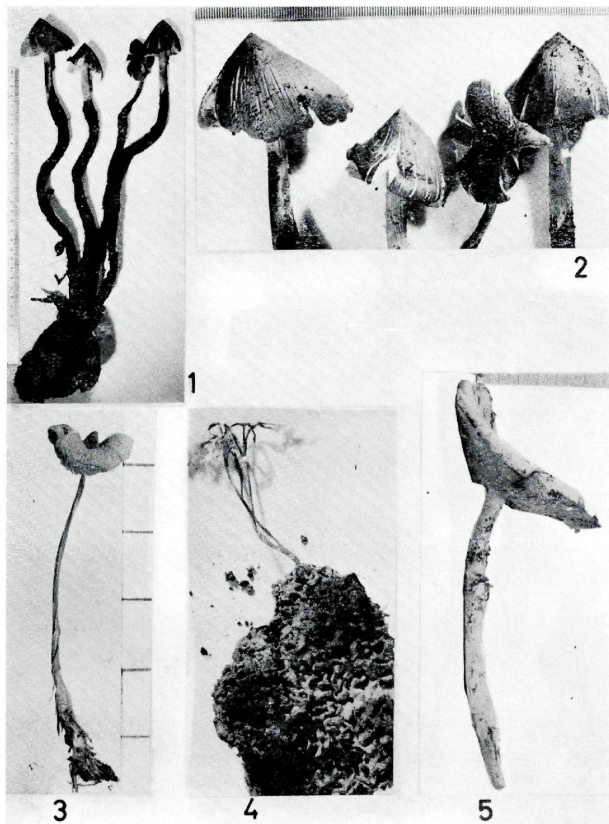
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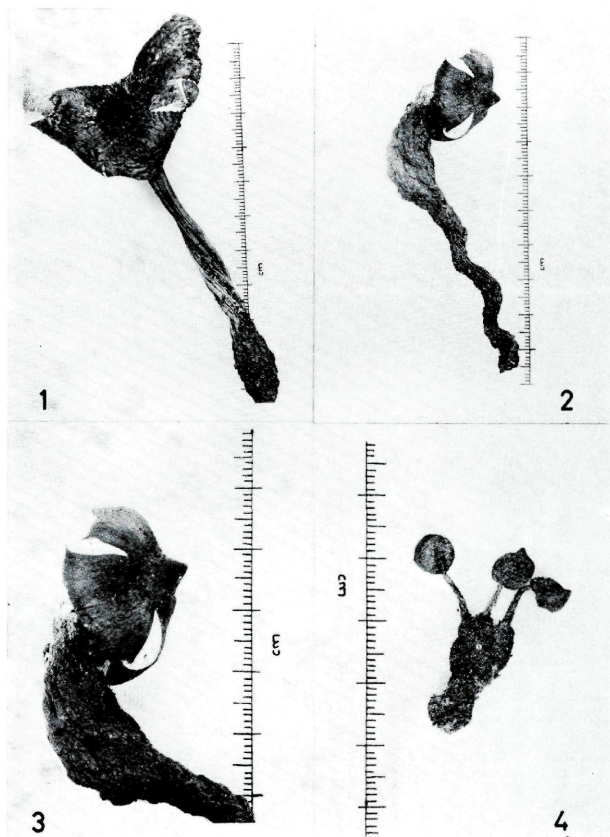
One new species of *Termitomyces* viz. *T. badius* is reported in this paper. *T. microcarpus*, *T. clypeatus* and *T. robustus* which have been reported from the Congo are now reported from Eastern Africa. The range of *T. magoyensis* now includes Tanzania whereas *T. microcarpus* is reported from both Uganda and Tanzania.

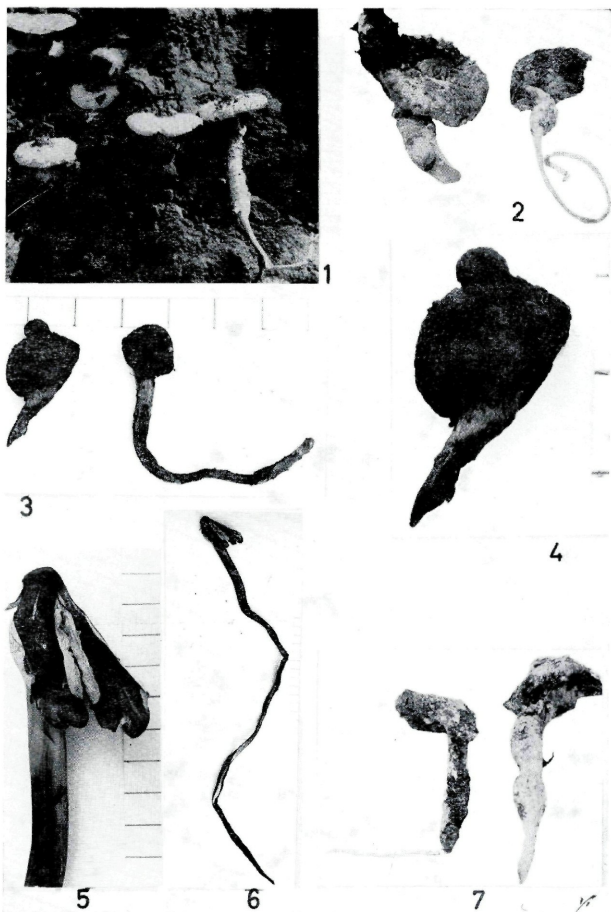
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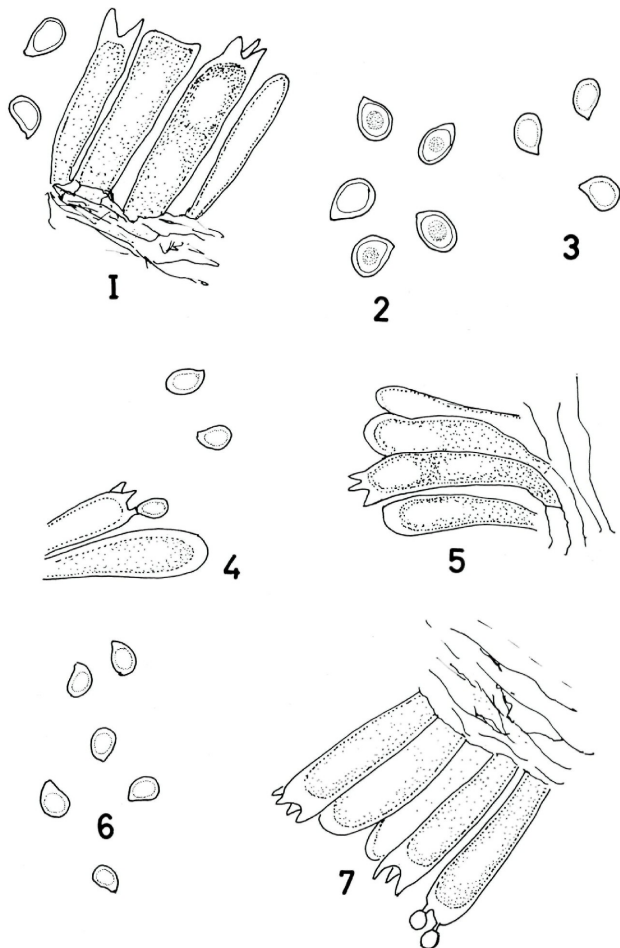
1. Heim, R. 1942. Les Agarics Termitophiles d'Afrique Tropicale. Arch. Mus. Nat. Hist., ser. 6, 18: 108—166
2. — 1958. Flore Iconographique des Champignons du Congo. Fasc. 7: Termitomyces. Brussels.
3. Otieno, N. C. 1964. Contributions to a knowledge of Termite Fungi in East Africa: The genus *Termitomyces* Heim. Proc. E. Afr. Acad. Vol. II: 108—120.
4. Singer, R. 1951. The genus *Termitomyces*. Lilloa 22: 397.
5. — 1962. The Agaricales in Modern Taxonomy. Hafner Publishing Co., m N. Y., 915 pp.

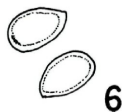
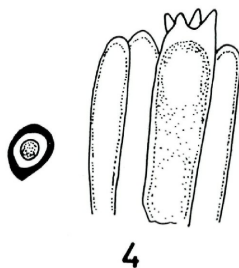
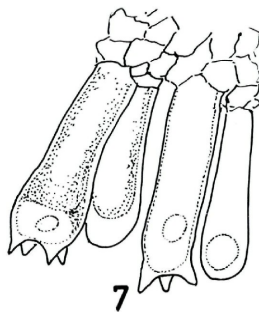
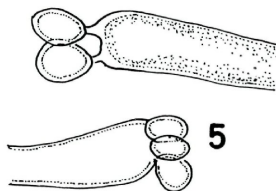
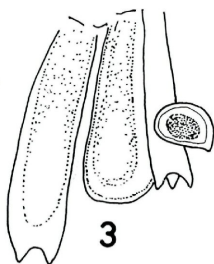
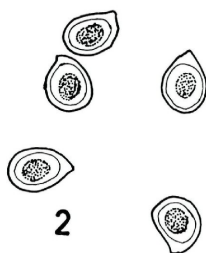
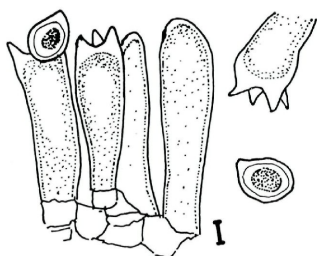
Plate I: Carpophores of *Termitomyces* showing: 1. *Termitomyces clypeatus* with the pseudorrhiza still attached to the subterranean termitarium. — 2. Further aspects of *T. clypeatus* showing perforatoria of the pileus. —

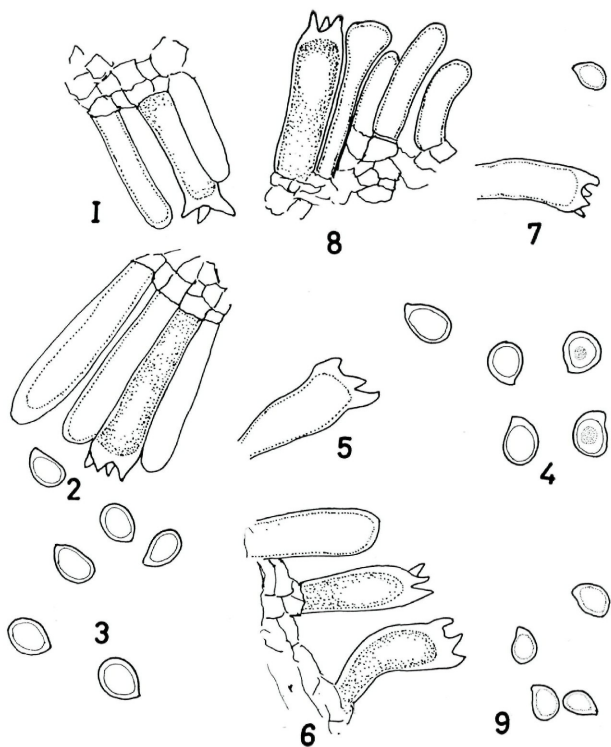












3. *Termitomyces badius* with prominent perforatorium, twisted stipe. —
4. *Xylaria* fruitbodies growing from termitarum from (1) above. — 5. *Termitomyces magoyensis* from Tanzania.

Plate II: Carpophores of *Termitomyces* showing: 1. *Termitomyces robustus* —
2. & 3. *Termitomyces clypeatus* — 4. *Termitomyces microcarpus* from Tanzania.

Plate III: Carpophores of *Termitomyces* showing: 1. *Termitomyces magoyensis* from Tanzania as they are found growing on the termite mound. One carpophore has been dug out to show the long pseudorrhiza. — 2 & 7. Dried carpophores of *T. magoyensis*. — 3 & 4. An unidentified species of *Termitomyces*. — 5 & 6. *Termitomyces robustus* showing the robust perforatorium (5) and the long pseudorrhiza (6).

Plate IV: Basidia and basidiospores of *Termitomyces*: 1 & 2. *Termitomyces clypeatus*. — 3, 4 & 5. *Termitomyces microcarpus*. — 6 & 7: *Termitomyces badius*.

Plate V: Basidia and basidiospores of *Termitomyces*: 1 & 2. *Termitomyces robustus*. — 3 & 4. *Termitomyces magoyensis*. — 5, 6 & 7. *Termitomyces robustus*.

Plate VI: Basidia and basidiospores of *Termitomyces*: 1, 2 & 3. *Termitomyces rabuorii*. — 4, 5 & 6. *Termitomyces clypeatus*. — 7, 8 & 9. *Termitomyces microcarpus*

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Autor(en)/Author(s): Otieno Nickson E.

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