

Tanzanian mushrooms and their uses 5. Some notes on the Gasteromycetes

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Ten species of Gasteromycetes (Basidiomycotina) collected in Tanzania are described or mentioned in this article. *Phallus tenuis* (E. Fisch.) Kuntze seems to represent the first record for Africa.

Key words: Africa, Gasteromycetes, mycology, Tanzania, taxonomy

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Introduction

Within the framework of the research project on Tanzanian mushrooms (see Härkönen 1992, Härkönen et al. 1993a,b,c, 1994a,b, 1995 and Saarimäki et al. 1994) Härkönen, Saarimäki and Mwasumbi have carried out intensive forays to collect wild mushrooms in Tanzania. Among the collected fungi there are ten species of Gasteromycetes, which were sent for identification to Madrid, to our first author, Calonge, who is a specialist in this group of fungi. The material is preserved at the herbaria of the Botanical Museum of the University of Helsinki (H) and Real Jardín Botánico of Madrid (MA-Fungi).

Cyathus montagnei Tul.

Monograph. Nidulariées, in *Ann. Sc. Natur. sér. 3*, 1:70. 1844

Basidioma cyathiform, 5–8 mm in height and 4–5 mm in diam, on the top, sulcate, smooth inside

and hirsute-strigose outside. Hairs cinnamon reddish disappearing partially from the upper part. Peridioles lenticular, 1–2 mm in diam, greyish brilliant with funiculus and tunica. Spores oval to elliptical, 16–18 × 9–11 µm, with walls 2–3 µm thick.

Cyathus montagnei is close to *C. striatus* Pers., which has different coloured peridioles, hairs of outer surface being greyish and the inner surface only slightly striate (Bottomley 1948). Regarding spore dimensions, we find notorious differences among authors. Thus, they are 20 × 12 µm for Brodie (1975), 20 × 13.2 µm for Saccardo (1888), 7.5–14.4 × 5.2–7.2 µm for Bottomley (1948). *Cyathus montagnei* has been reported from South Africa (Bottomley 1948), Central Africa (Dissing & Lange 1962), South and Central America, West Indies, Philippines, Thailand, and Sri Lanka (Wolf 1949, Brodie 1975).

Specimens examined

Tanzania. Tanga Prov.: Lushoto Distr., W Usambara Mts, Mazumbai, on the outskirts of the village, on wood, 1400–1500 m, 18.IV.1991 *Saarimäki & al.* 910.

Cyathus rudis Pat.

Champ. de Madagascar, Mém. Acad. Malagache, fasc. 6:35. 1927 — Fig. 1

Basidioma obconical, 5–6 mm in height and 3–5 mm in diam, on the top. Inner surface striate, greyish, glabrous. Outer surface hirsute with reddish hairs. Peridioles lenticular, 1–2 mm in diam, greyish, with funiculus and tunica. Spores oval to elliptical, 8–10 × 4–5 μm , with walls 1 μm thick.

Cyathus rudis is close to *C. chevalieri* Harriot & Pat., which has larger basidiomata, up to 20 mm height, and shorter spores, 8 × 5 μm . Patouillard's description gives spores 9–12 × 5 μm (Brodie 1975). *C. rudis* is also related to *C. novae-zeelandiae* Tul., but the latter has smaller

peridioles and spores (Brodie 1975). *C. rudis* has been reported from Madagascar, New Caledonia and Amboina (Brodie 1975).

Specimens examined

Tanzania. Eastern Prov.: Morogoro Distr., Kimboza Forest Reserve, caespitose on rich soil, 440 m, 31.III.1991 *Saarimäki & al.* 788.

Geastrum corollinum (Batsch) Hollós
Magy. Gast.: 57–58. 1903 — Fig.2

Geastrum recolligens (With.) Desvaux, J. Bot. Paris 2:102. 1809

Geastrum mammosum Chevalier, Fl. Paris 1:359. 1826

Basidioma saccate, 15 mm in height before ripeness, then opens, as much as 30 mm in diam, strongly hygroscopic. Endoperidium sessile with fibrillose peristome distinctly delimited. Spores 3–4 μm in diam, including ornamentation, with warts 0.5 μm long. Capillitium 1–6 μm in diam.



Fig. 1. *Cyathus rudis*.



Fig. 2. *Geastrum corollinum*.

The specimen is very similar to the European material (Sunhede 1989, Calonge 1990), but in this case spores are slightly larger, 4–5.5 μm in diam. This species has also been reported from Asia (Eckblad 1976, Kreisel 1975, 1976), South Africa and North America (Staněk 1958).

Specimens examined

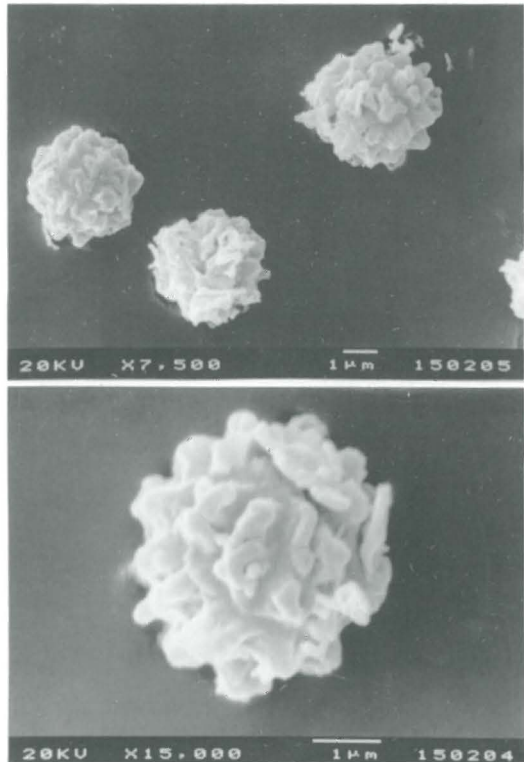
Tanzania. Southern Highlands Prov.: Rungwe Distr., Mwakaleli, Old Missionary House, on soil under a tree, 1650 m, 27.III.1991 Saarimäki & al. 729.

***Geastrum drummondii* Berk.**

Hooker's Lond. J. Bot. 4:63. 1845 — Figs. 3–4

Basidioma hygroscopic, with exoperidium splitting into 7–10 subequal rays, which are expanded when wet, reaching 15 mm diam. Fleshy layer

Figs. 3–4. *Geastrum drummondii*. Spores with warts flattened or truncate, sometimes joined into conical structures.



chocolate brown in exsiccata. Fibrous layer whitish. Mycelial layer thin, membranous, covered with debris, easily detached. Endoperidium globose, 7–10 mm in diam, sessile, whitish to greyish brown. Peristome sulcate, distinct or indistinctly delimited. Spores globose, 4–5 μm in diam, including flattened warts (Figs. 3–4). Capillitium solid, 1–5 μm thick, without septa or branches.

Our specimen fits well the description of this taxon given by Dissing & Lange (1962) and Dring (1964) for material collected in tropical West Africa. However, the type material has slightly larger spores (5.5–7.5 μm in diam) according to Sunhede (1989:121). *Geastrum drummondii* has also been reported from Australia and Tasmania (Dring 1964). Regarding the possible affinities of *G. drummondii*, Sunhede (1989:120–121) considers that it could well be

identical with *G. ambiguum* Mont., and *G. campestre* Morgan. And if this is so, *G. ambiguum* has priority.

Specimens examined

Tanzania. Western Prov.: Tabora Distr., Kipalapala, woodland, on soil, 1200 m, 12.XII.1991 *Saarimäki & al.* 1073.

***Geastrum hariotii* (Lloyd) E. Fisch.**
Myc. Notes: 311. 1907 — Figs. 5–6

Basidioma not hygroscopic, splitting into 6 equal pointed rays, 40 mm in diam, and 30 mm in height. Fleshy layer pale brownish. Fibrous layer whitish. Mycelial layer covered with debris. Endoperidium globose, 10–15 mm in diam, sessile, pale cream. Peristome sulcate, indistinctly delimited. Spores spherical, 3–4 μm in diam, including ornamentation (Figs. 5–6) consisting of warts 0.3–0.5 μm long. Capillitium solid, 2–5 μm diam, with abundant crystals on the surface, without branches.

Geastrum hariotii looks very similar to *G. elegans* Vittad., but that species has larger spores (5–6 μm in diam). *G. hariotii* has been found in Central Africa (Dissing & Lange 1962) and reported from the Americas, Europe, Sri Lanka, East and West Indies and Australia (Dissing & Lange 1962, Cunningham 1979).

Specimens examined

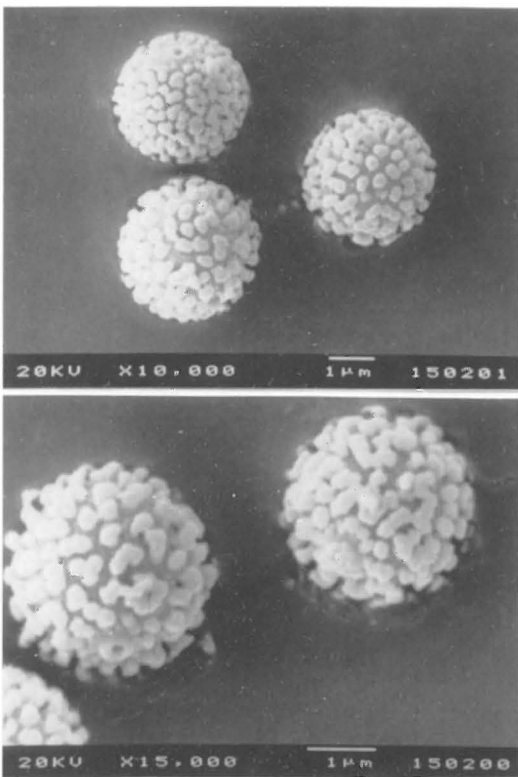
Tanzania. Tanga Prov.: Lushoto Distr., W Usambara Mts, Mazumbai Forest Reserve, on soil, 1500 m, 9.XII.1989 *T. Saarimäki* 440.

***Geastrum saccatum* Fr.**
Syst. Mycol. 3:16–17. 1829

We have examined only one basidioma, not very well preserved, but showing the same features as the European specimens (Sunhede 1989). We presume it is spread all over Africa (Bottomley 1948, Dring 1964).

Specimens examined

Tanzania. Southern Highlands Prov.: Iringa Distr., Sao Hill, Sawmills, on soil, 1900 m, 29.III.1991 *Saarimäki & al.* 777.



Figs. 5–6. *Geastrum hariotii*. Spores with flattened hemispherical warts, normally isolated, showing a uniform distribution.

Phallus impudicus L.: Pers.
Syn. Meth. Fung.: 242. 1801 — Fig. 7

The basidiomata show the typical features of this cosmopolitan species.

Specimens examined

Tanzania. Tanga Prov.: Lushoto Distr., W Usambara Mts, Mazumbai Forest Reserve, on rich soil, 1400 m, 19.IV.1991 Saarimäki & al. 921.

Phallus tenuis (E. Fisch.) Kuntze
Rev. Gen. Pl. 2:865. 1891 — Fig. 8

Phallus amurensis (Jacz.) Pilát, in Fl. ČSR,
Gast.: 710. 1958

Basidioma made up of a basal volva, pseudostipe and receptacle (Fig. 8). Volva conical, 8–12 × 4–8 mm, dirty white, covered with debris, carrying a rhizomorph. Pseudostipe cylindrical, attenuate towards the top, 25–33 × 1–3 mm, spongy, yellowish orange when dry. Receptacle conical, 8–10 × 2–5 mm, reticulate, perforate on the top and partially covered with the olive brown gleba. Spores elliptical, 2–3 × 1–1.5 μm, smooth, hyaline.

This is a very interesting species, apparently unknown in the Western hemisphere, but reported from China, Japan, Java and Sri Lanka (Liu 1984). Its tiny size, both of basidioma and spores, its yellowish pseudostipe and its habitat on rotten wood give it an almost unique taxo-



Fig. 7. *Phallus impudicus*.

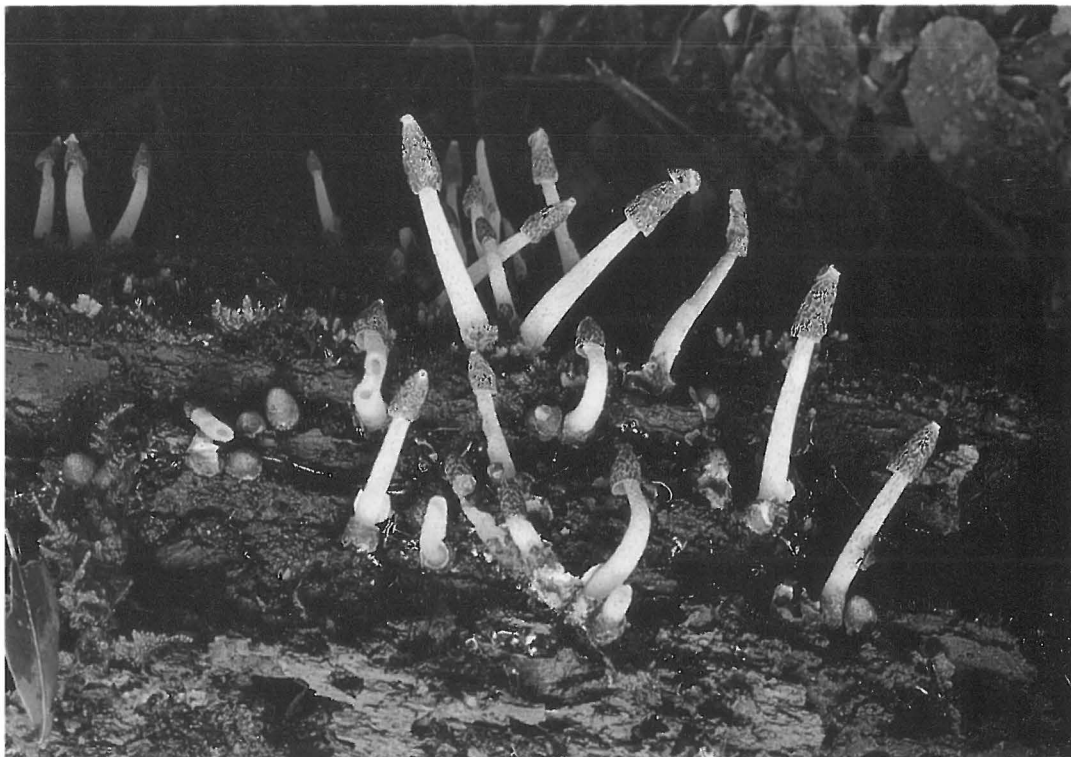


Fig. 8. *Phallus tenuis*.

nomical identity. However, it could be mistaken for *P. costatus* (Penz.) Lloyd, which also grows on decaying wood and shows some similar features, but with the following differences: pseudostipe pale yellow, 50–70 × 15–20 mm, receptacle campanulate 25–40 × 20–30 mm and spores 3.5–4 × 1.5–2 μm (Liu 1984).

Specimens examined

Tanzania. Tanga Prov.: Lushoto Distr., W Usambara Mts, Mazumbai Forest Reserve, on decaying wood, 1860 m, 8.XII.1989 Saarimäki & al. 438.

Scleroderma cepa Pers.

Syn. Meth. Fung.: 155. 1801 — Fig. 9

This species is widespread in the world (Guzmán 1970), and easy to identify by its tough yellowish peridium, strongly echinulate, non-reticulate spores and the absence of a distinct pseudostipe (Calonge 1983).

Specimens examined

Tanzania. Southern Highlands Prov.: Rungwe Distr., Tukuyu, Ipondelo-Ikama village, under *Cupressus* sp., on soil, 1600 m, 27.III.1991 Saarimäki & al. 739.
Malawi. Zomba Distr., Makwawa village, 850 m, 10.IV.1991 Saarimäki & al. 813.

Scleroderma verrucosum Bull.: Pers.

Syn. Meth. Fung.: 154. 1801

This is also widespread in the world (Guzmán 1970), close to *Scleroderma areolatum* Ehrenb., but with a longer pseudostipe and a dark brown peridium (Calonge 1983). *S. areolatum* is common in Sweden (Jeppson 1979) and Poland (Calonge & Lawrynowicz 1986), but it seems to be replaced by *S. verrucosum* in the Mediterranean area (Calonge & Demoulin 1975).

Specimens examined

Tanzania. Southern Highlands Prov.: Iringa Distr., Mufindi, Kibao, on soil, 1900 m, 20.III.1991 Saarimäki &



Fig. 9. *Scleroderma cepa*.

al. 676. Rungwe Distr., Tukuyu, Ipondelo-Ikama vil-
lage, under *Cupressus* sp., 1600 m, 27.III.1991 Saari-
mäki & al. 737.

Dietary and other uses

During our collecting trips in Tanzania, no tribe informed us that they use members of the class Gasteromycetes as food (Härkönen et al. 1995). Instead, in several places in Tanzania this group of fungi, especially puffballs, are used to sedate bees. The fungus is attached to a stick, set on fire and then pushed into a beehive. The smoke evidently stuns the bees and the hive can be emptied of the honeycombs.

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References

- Bottomley, A.M. 1948: Gasteromycetes of South Africa. – *Bothalia* 4:473–810.
- Brodie, H.J. 1975: The bird's nest fungi. – 199 pp. Univ. Toronto Press, Toronto.
- Calonge, F.D. 1983: El género *Scleroderma* Pers., (Gasteromycetes) en España. – *Rev. Biologia* 12:49–60.
- Calonge, F.D. 1990: Check-list of the Spanish Gasteromycetes (Fungi, Basidiomycotina). – *Crypt. Bot.* 2:33–55.
- Calonge, F.D. & Demoulin, V. 1975: Les Gasteromycetes d'Espagne. – *Bull. Soc. Mycol. France* 91:247–292.
- Calonge, F.D. & Lawrynowicz, M. 1986: A contribution to the chorology of some Gasteromycetes in Poland. – *Acta Mycol.* 18:161–170.
- Cunningham, G.H. 1979: The Gasteromycetes of Australia and New Zealand. – *Bibliotheca Mycol.* 67:1–236.
- Dissing, H. & Lange, M. 1962: Gasteromycetes of Congo. – *Bull. Jard. Bot. Bruxelles* 32:325–416.
- Dring, D.M. 1964: Gasteromycetes of West Tropical Africa. – *Mycol. Papers* 98:1–60.
- Eckblad, F.-E. 1976: Contributions to the gasteromycetoflora of Iran. – *Iranian J. Bot.* 1:65–69.

- Guzmán, G. 1970: Monografía del género *Scleroderma* Pers. em. Fr. (Fungi, Basidiomycetes). – *Darwiniana* 16:233–407.
- Härkönen, M. 1992: Wild mushrooms, a delicacy in Tanzania. – *Univ. Helsinkiensis* 12:29–31.
- Härkönen, M., Buyck, B., Saarimäki, T. & Mwasumbi, L. 1993a: Tanzanian mushrooms and their uses 1. *Russula*. – *Karstenia* 33:11–50.
- Härkönen, M., Saarimäki, T. & Mwasumbi, L. 1993b: Tanzanian mushrooms and their uses 2. An edible species of *Coprinus* section *Lanatuli*. – *Karstenia* 33:51–59.
- Härkönen, M., Saarimäki, T., Mwasumbi, L. & Niemelä, T. 1993c: Collection of the Tanzanian mushrooms heritage as a form of developmental cooperation between the Universities of Helsinki and Dar es Salaam. – *Aquilo Ser. Bot.* 31:99–105.
- Härkönen, M., Saarimäki, T. & Mwasumbi, L. 1994a: Setting up a research project on Tanzanian mushrooms and their uses. In: Seyani, J.H. & Chikuni, A.C. (eds.), *Proceedings of the 13th Plenary Meeting of AETFAT Zomba, Malawi, 2–11 April 1991*, 1:729–734. *Nat. Herbarium & Botanic Gardens of Malawi, Zomba*.
- Härkönen, M., Saarimäki, T. & Mwasumbi, L. 1994b: Tanzanian mushrooms and their uses 4. Some reddish edible and poisonous *Amanita* species. – *Karstenia* 34:47–60.
- Härkönen, M., Saarimäki, T. & Mwasumbi, L. 1995: Edible mushrooms of Tanzania. – *Karstenia* 35 suppl.:1–92.
- Jeppson, M. 1979: Notes on the occurrence of *Scleroderma areolatum* and *Scleroderma verrucosum* in Sweden. – *Göteborgs Svampklubbs Årsskrift* 1979:39–44.
- Kreisel, H. 1975: *Gasteromyceten aus der Mongolischen Volksrepublik*. – *Feddes Rep.* 86:321–327.
- Kreisel, H. 1976: *Gasteromyceten aus Nepal II*. – *Feddes Rep.* 87:83–107.
- Liu, B. 1984: *The Gasteromycetes of China*. – *Beih. Nova Hedwigia* 76:1–235.
- Saarimäki, T., Härkönen, M. & Mwasumbi, L. 1994: Tanzanian mushrooms and their uses 3. *Termitomyces singidensis*, sp. nov. – *Karstenia* 34:13–20.
- Saccardo, P.A. 1888: *Gasteromycetaceae*. – *Sylloge Fungorum* 7:34.
- Staněk, V. I. 1958: *Geastrum*. In: Pilát, A. (ed.), *Flora ČSR B–I. Gasteromycetes: 494, 792*. – Praha.
- Sunhede, S. 1989: *Geastraceae (Basidiomycotina). Morphology, ecology, and systematics with special emphasis on the North European species*. – *Synopsis Fungorum* 1:1–534.
- Wolf, F.A. 1949: Notes on Venezuelan fungi. – *Lloydia* 12:208–219.

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