



MycoAfrica

Newsletter of the African Mycological Association (AMA)

Volume 3
Issue 2
June 2009

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Review of knowledge of macrofungi in miombo in Zimbabwe

By Cathy Sharp

The term 'miombo' is derived from a Swahili word, used in Tanzania and Zambia (Wild and Barbosa 1967) to describe a type of woodland dominated by tree genera within the Caesalpinioideae, namely *Brachystegia*, *Julbernardia*, and *Isoberlinia*. This term was accepted by the international community in 1959 at a meeting on 'Open Forest' by the Scientific Council of Africa South of the Sahara. White (1983) divided Africa into simplified vegetation zones, many of which support Caesalpinoid trees, but true 'miombo' is characteristic of his 'Zambeian Regional Centre of Endemism' (White 1983).

The earliest known mycological records for Zimbabwe date back to 1905 when W. N. Cheesman from Britain, visited this country and made collections at Victoria Falls and the Matobo Hills (Cheesman 1907-1909). Neither of these



Fig. 1 *Amanita loosii* (= *A. zambiana*)

localities is classified as miombo woodland and the collections were mainly of hardy polypores rather than agarics, and not comparable to what are known today as 'miombo fungi' (Boletales, Russulales, *Cantharellus* and *Amanita*).

Frederick Eyles was the 'father of Rhodesian botany' and that 'title' could be extended to include mycology. He started collecting in 1909 and there are many records of fungi included in his 8900 specimens (Kimberley 1984). These cover all vegetation types and not miombo in particular, although examination of his data could determine localities in miombo areas.

Ove Arbo Høeg from Norway visited the country between 1929 and 1930. He collected lichens and fungi from the Victoria Falls area and along the Zambezi River, again not in miombo vegetation, but still a valuable contribution to the list of fungi for the region (Wakefield 1936).

The first significant work on miombo fungi was a 'book' of watercolour illustrations (but not specimens), produced by Lionel Cripps from 1936 to 1947. This work consists of 666 well-illustrated macrofungi from both montane forest and miombo in the Eastern Districts of Zimbabwe. The detailed notes with these paintings have been digitized and documented and await analysis (Sharp in prep.). Other Zimbabwean artists who have contributed to knowledge of the miombo mycobiota are Margaret Tredgold and Mary Davy, both of whom covered the Marondera district. Robbie Mackintosh compiled a comprehensive photographic record of miombo fungi from the Midlands area of Zimbabwe, and it was to him that the Zimbabwean 'truffle' was dedicated, *Mackintoshia persica* (Pacioni and Sharp 2000).

Many foresters contributed to the National Mycological Collection, part of which is housed at the Forest Research Centre in Harare. Although much of their collecting was done in teak or mukwa forests or *Pinus* and *Eucalyptus* plantations, it was usually for pathological reasons that specimens were collected. Many of these were polypores that caused wood-rot of their timber trees but could also be found on miombo tree species. E.J. Kelly Edwards was one of Zimbabwe's first forestry officers to start collecting fungi from 1935 to the 1950's and since then the National Collection has benefited from the work of Blake Goldsmith, John Roberts, Geoff Calvert, Tim English, Anxious Masuka and Graham Pearce. Staff from National Parks around the country have provided many collections in their efforts to compile checklists of the flora and fauna in their areas. Mycologists from the University of Zimbabwe have contributed their

knowledge over the years (Desiree Cole, Mike Swift and Allen Mswaka) and with the expansion of university education in Zimbabwe, mycological studies of our indigenous woodlands will improve.

Visiting international researchers in their particular fields have contributed much to the knowledge of macrofungi in the country. While collecting wood-rotting fungi, Leif Ryvar den (Norway), suggested that miombo 'mycoflora' must be one of the richest in the world (pers.comm.) and this observation is currently being examined; Jan Rammeloo (Belgium) has collected many Boletales and 'Myxomycetes' among other fungi; Gunter R.W. Arnold (Germany) studied Mucorales and coprophilic fungi (35 species from an assortment of animal dung collected around Zimbabwe, unpublished data); Annemieke Verbeke n (Belgium) studied *Lactarius* in particular but together with Ruben Walley n (Belgium) made great progress in overall determination of numerous species; André De Kesel (Belgium) made a good contribution to the mycobiota of the country and deposited half of his collection in the Forestry Research Centre Herbarium; David Arora (USA) collected widely in Zimbabwe and was particularly interested in Amanitaceae and Boletales from the miombo areas.

Several individuals perhaps never visited Zimbabwe but have contributed to the current status of Zimbabwe's macrofungi by way of determinations of specimens and publication of their findings. Ethel M. Doidge included much data from this country in her mammoth work on fungi published in South Africa (Doidge 1950); P.A. van der Bijl studied the Eyles' collections from Zimbabwe as did D.A. Reid (Reid 1974); from Kew in Britain, David N. Pegler, Derek A. Reid, Peter Roberts, Brian Spooner and E.M. Wakefield worked on many Zimbabwean collections; Bart Buyck and Guillaume Eyssartier (both from France)



Fig. 2 *Boletus spectabilissimus*

studied collections of *Russula* (Buyck and Sharp 2007) and *Cantharellus* respectively; Vladimir Antonin (Czech Republic) worked on marasmioid fungi (Antonin and Sharp 2006; Antonin 2007), and in 2002, the first molecular studies on Zimbabwean *Termitomyces* were done in Denmark (Aanen et al. 2002).

The author's work on field mycology in Zimbabwe started in 1976 under the guidance of Dr. Desiree Cole, and is still in progress. One of the priorities being addressed is the compilation of a checklist of macrofungi for the country. Preliminary estimates of all described fungi (including microfungi but excluding lichens) recorded in the literature, number about 1 100 which is very low. Much more work is needed before any reasonable figure can be given (e.g. from computerization of data and extraction of archival records). If one uses the ratio of 6 fungi : 1 plant (Hawksworth 1991), then with Zimbabwe's +/- 6 000 vascular plants (Mapaura and Timberlake 2004), the estimate of fungal species should be at least 36 000. At most there could be 60 000 fungi using the larger ratio of 10 fungi : 1 plant that has been suggested for the tropics (Hawksworth 2001). It was suggested in that same work that macromycetes make up 19% of the total estimate of fungi and using this to calculate an approximate number of macrofungi for Zimbabwe, there could be between 6 800 and 11 400 species.

Of that initial estimate above of 1 100 fungal species for Zimbabwe, about 200 are putative ectomycorrhizal species but many more boletes, *Amanita* and *Russula* species await determination. There are 200 known species from the 'Aphyllphorales' group of which two are mycorrhizal, 32 are parasitic and 186 saprotrophic (Masuka 1994). Using a rounded figure of 500 macrofungi recorded to date and the macromycete values quoted above, this equates to only 4.4% - 7.4% of the potential number. Clearly, there is a very long way to go before a more realistic picture of the diversity of macrofungi in Zimbabwe can be established.

Further research work is planned to determine the ectomycorrhizal status of Zimbabwe's miombo flora along with their associated macrofungi. Access to molecular techniques will greatly enhance this work. Meanwhile, accumulation of basic field data continues with particular notice being taken of which fungi most often are found in particular miombo ecotypes. A mapping programme has been incorporated into the newly formed database and this will be compatible with the vegetation maps.

A 7-year study on the seasonality of macrofungi in miombo woodland has been completed and provided an insight to the influence of soil moisture of fungal fruiting (Sharp 2008). As with any research programme, the more one attempts to answer a question, the more questions arise and this is certainly the case in Zimbabwe's mycological research. It is hoped that with increasing stability in the 'New Zimbabwe', students will be tempted to come to our country and focus on some important issues that arose from the thesis work above:

- What is the below-ground status of the mycelial community in miombo woodland in relation to the above-ground appearance of sporocarps?
- How does the macromycete community vary between the different miombo-subtypes on different soils?
- Field confirmation of the mycorrhizal status (below-ground) of all miombo trees in Zimbabwe is essential.
- How does fungal fruiting vary in relation to the morphological state of the host's root tips and associated ectomycorrhizal sheath throughout the rainfall season?
- How do the ectomycorrhizas survive the long cool/dry season?
- How does the phenology of miombo woodland influence the ectomycorrhizal status below-ground?
- What is the relationship between the emergence of 'early' and 'late season' fungi and decomposition processes?
- How does soil moisture and organic matter influence the species composition in a miombo habitat?
- What are the effects of fire on the macromycete community in miombo?
- How important are mycophagic animals in the structure of the macromycete community in Zimbabwe? (e.g. vertebrates: antelope, rodents, tortoises; invertebrates: millipedes, gastropods, termites, Phorid flies, coleopterans, earthworms, woodlice etc.).

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Key to the genus *Tulostoma* in southern Africa

Extracted and adapted from Wright (1987)

By J.C. Coetzee

Tulostoma Pers. : Pers. (Tulostomataceae, Agaricales) is a large cosmopolitan gasteromycetous genus of lollipop-like stalked puffballs. This most interesting and easily recognisable genus is characterized by basidiocarps consisting of a more or less globose spore-sac borne apically on a distinct and well-developed stem or stipe which may vary in length from species to species. The spore-sac contains the gleba which, upon ripening, differentiates into a powdery mass of spores and very distinctive, and taxonomically important, sterile threads called capillitium. The wall of the spore-sac (the peridium) is typically two-layered, consisting of an outer exoperidium and an inner endoperidium. When ripe, the spores are released through an apical opening (the stoma) in

the peridial wall. Basidiocarp development occurs mainly subterranean, but upon maturity the stipe expands to carry the spore-sac above the soil surface.

Bottomley (1948) in her catalogue of 'South African Gasteromycetes', listed fourteen *Tulostoma* species (and one doubtful species) as occurring in southern Africa, but, as indicated also elsewhere, Bottomley's classic work is now rather outdated and not a reliable yardstick of the biodiversity status of the region's gasteroid fungi anymore (Coetzee *et al.* 1997). In his authoritative world monograph of the genus *Tulostoma*, Wright (1987) recognized 138 species and varieties in the genus (48 of which were, however, regarded as doubtful or critical),

with no fewer than 26 cited as occurring in southern Africa.

Wright provided a most useful dichotomous key to the species and varieties of *Tulostoma* but, being a document spanning sixteen pages, it is not an altogether easy tool to use, especially for someone not well acquainted with the genus. A condensed key, concerning only those taxa occurring in southern Africa, extracted from Wright's world key (1987) but incorporating also information published elsewhere, and compiled for the current author's personal use, has proven useful as a first-step tool for local identification purposes. Since this slightly more user-friendly condensed key may be useful to other mycophiles in the region as well, it is presented here with a brief glossary of some of the terms used. This is done, however, with full recognition and in respectful memory of the brilliant work by the late Jorge Eduardo Wright, 1922–2005, as summarised in Lopez *et al.* (2006).

Key:

- 1a** Mouth indefinite2
- 1b** Mouth definite3

- 2a** Spores perfectly smooth under both LM and SEM, 4.6–5.4–(6.8) μm diam., guttulate; stem 40 x 4 mm, tapering towards the base, with a volvoid structure and rhizomorphs; capillitium 3.3–7.4–(8.5) μm diam., aseptate, coloured, thick-walled, lumen visible, with occasional pegs*T. vulgare*
- 2b** Spores ornamented, minutely asperate to almost smooth under LM, globose, 3.3–4.7 μm diam.; spore-sac up to 18 mm diam.; exoperidium membranous, covered partially by a layer of soil, persistent; capillitium 3.3–7.4 μm diam., hyaline, lumen visible to almost solid, septate, somewhat widened at septa.....*T. australianum*

- 3a** Mouth circular or elliptic, plane or tubular.....4
- 3b** Mouth fibrillose, sometimes distinctly fimbriate or denticulate, simple or nipple-shaped20

- 4a** Spores perfectly smooth under a good oil-immersion lens, may be slightly asperulate under SEM; stem noticeably tapering towards the base; mouth well-formed, circular, plane, without rim; capillitium coloured, disjointable in short segments but septa absent to rare.....*T. obesum* (vide Altés *et al.* 1999) (= *T. volvulatum* var. *elatum* sensu Wright 1987)
- 4b** Spores not entirely smooth.....5

- 5a** Mouth tubular, small; spores brown, reticulate-crested under LM, without 'wings' under SEM, 5.2–6.8 μm diam., capillitium hyaline, septate, slightly to fairly swollen at colourless septa.....*T. exasperatosporum*
- 5b** Spores not reticulate.....6

- 6a** Spores almost smooth to asperulate under oil-immersion lens7
- 6b** Spores with a coarser ornamentation.....10

- 7a** Small, slender species; spore-sac not exceeding 10 mm diam8
- 7b** Robust species; spore-sac usually exceeding 10 mm diam.....9

- 8a** Spores very small, 3.4–4.7 μm diam., minutely verrucose; capillitium hyaline, septate, somewhat swollen at septa; in sandy soil; mouth tubular*T. lesliei*
- 8b** Spores larger, 4.3–5.5–(8) μm diam., asperulate under LM, under SEM with short blunt, wide, low verrucae, smaller towards the apiculus; capillitium 2.6–6.7 μm diam., thick-walled, swollen at septa, lumen visible; in sandy soil in arid regions; mouth short tubular.....*T. nanum*

- 9a** Spore-sac large, up to 20 mm diam.; exoperidium indistinct but probably membranous; endoperidium dirty greyish brown; socket deep, separated from stem; stem usually around 20 x 4 mm, often distorted, caespitose; spores 4.2–5.9 μm diam., minutely asperulate, guttulate under LM, with low, sparse verrucae under SEM; capillitium subhyaline to yellowish, much branched, septa infrequent; in xerophytic regions; mouth circular, hardly projecting to plane*T. caespitosum*
- 9b** Spore sac up to 18 mm diam.; socket inconspicuous, hardly at all separated from stem; stem up to 60 x 6 mm, woody; spores rugose, appearing almost smooth under LM, 4.6–6.1 μm diam.; capillitium 4–9.4 μm diam., hyaline, septa few or absent, thick-walled, even; in sandy soil; mouth as above*T. jourdanii*

- 10a** Exoperidium verrucose; spores 6.4–7.1 μm diam., spiny under LM, under SEM ornamentation appears formed by conic or pyramidal spines composed of several columns; capillitium 2.5–11 μm diam., hyaline, not swollen at brown septa; mouth tubular*T. squamosum* (vide Moreno *et al.* 1992a) (= *T. verrucosum* sensu Wright 1987)
- 10b** Exoperidium not verrucose11

11a Exoperidium membranous12
11b Exoperidium hyphal or indistinct16

12a Robust species; spore-sac usually exceeding 10 mm diam.; endoperidium light-coloured (whitish, cream-coloured, greyish or light ochraceous)13
12b Robust species; spore-sac usually exceeding 10 mm diam.; endoperidium dark-coloured (dark yellowish, with orange hues, brown, ferruginous)14

13a Exoperidium a thick membranous layer covered by sand grains, caducous; endoperidium whitish; socket conspicuous; spores apiculate, globose, 3.8–5.1 µm diam., irregularly verrucose under LM, under SEM ornamentation formed by large conic spines, slightly blunt, coalescent and covering the whole spore surface; capillitium 2.1–6.1 µm diam., hyaline, thick-walled with visible to solid lumen; mouth tubular, projecting ± 1 mm*T. lacticeps*
13b Exoperidium membranous, white within, dark on the outside; endoperidium cream-coloured to ochraceous; spores 4.6–5.7 µm diam., echinulate under LM, under SEM with small, blunt, crowded verrucae; capillitium 3.3–6.1 µm diam., slightly swollen at infrequent septa; in sandy soil; mouth tubular, large, up to 3 mm diam*T. involucreatum*

14a Stem usually with reddish brown scales; spores 5.4–6.5 x 4.7–5.8 µm diam., echinulate; endoperidium usually cupreous; capillitium 1.8–7.2 µm diam., not swollen at the coloured septa; mouth tubular*T. squamosum*
14b Characters not as above15

15a Spore-sac subglobose, up to 10 x 15 mm; mouth with a dark peristome; endoperidium avellaneous; spores verrucose, 4–5.4 µm diam.; stem usually long and relatively thin; capillitium hyaline to subhyaline, 2.6–4.1 µm diam., septa not dark; mouth circular, more or less projecting*T. beccarianum* (vide Altés & Moreno 1993) (= *T. simulans* sensu Wright 1987)
15b Spore-sac large, up to 23 mm; mouth large, up to 2 mm diam., slightly projecting to tubular; endoperidium yellowish-cream, darker towards mouth; spores 5.6–6–(8) µm diam., with appressed verrucae forming crests, crests much anastomosed under SEM, forming dense subreticulum; capillitium hyaline to yellowish, 2.5–9 µm diam.,

septa more or less swollen and pigmented.....*T. purpusii*

16a Small slender species; spore-sac seldom exceeding 10 mm diam.17

16b Robust species; spore sac usually exceeding 10 mm diam.19

17a Endoperidium tan to isabelline; stem short, 30 x 3 mm, reddish brown; spores 6.4–8.5 µm diam., echinulate; capillitium coloured, septate, not much swollen at uncoloured septa; mouth tubular, small*T. rufum*
17b Endoperidium light- or not coloured (vide 12a)18

18a Stem up to 40 x 3.5 mm; spore-sac up to 11 mm diam.; spores large, 5.9–8–(13.6) µm diam., averaging 9–10 µm diam., with spines and verrucae under LM, under SEM appearing as digitiform verrucae anastomosed all along; capillitium 3–7.8 µm diam., thick-walled, walls wavy inside, profusely septate, swollen at the septa; mouth small tubular*T. macrosporum*
18b Basidiocarps very small; spore-sac under 8 mm diam.; stem up to 20 x 1.5 mm, straw-coloured; spores 4–5.9 µm diam., with conic spines formed by segments when viewed under SEM; capillitium hyaline to slightly yellowish, 2–6.8 µm diam., not swollen at the inconspicuous septa; mouth tubular*T. pygmaeum*

19a Spore-sac up to 20 mm diam.; mouth round, plane; endoperidium smooth, pinkish grey; socket inconspicuous, deep, quite separated from peridium; stem 25–30 x 3.5–5 mm; spores 4.3–6.7 µm diam., brown, echinulate, some appearing almost reticulate under LM, under SEM ornamentation appear as blunt conic spines formed by 4–6 elements fused at apex; capillitium slightly coloured to fuliginous, 3–7.4 µm diam., swollen at uncoloured to slightly coloured septa*T. adhaerens*

19b Spore-sac up to 15 mm diam.; mouth circular, slightly projecting; endoperidium smooth, with copper hues; socket conspicuous, not separated from stem; spores 4.6–6.7 µm diam., spiny under LM, under SEM spines appear to be formed by 3–5 columns fused at apex; capillitium 2.6–6.1 µm diam., hyaline, slightly swollen at uncoloured septa *T. chevalieri*

20a Spores smooth or nearly so under LM21

20b Spores with some type of ornamentation visible under LM24

21a Slender species; basidiocarps minute; stem up to 25 x 1.5 mm; spore-sac usually less than 7 mm diam.; gleba yellowish ochre; spores 3.9–5.1 µm diam., smooth under LM, with numerous flat, densely-packed verrucae under SEM; capillitium hyaline, scantily septate; mouth fibrillose-fimbriate, becoming rigid with age***T. gracilipes***

21b Stoutier species; spore sac often exceeding 10 mm diam.....22

22a Spores averaging 5.2 µm diam., almost smooth under LM; stem short and obese***T. angolense***

22b Not the above combination of characters23

23a Spore-sac up to 15 mm diam.; mouth fimbriate, nipple-like at first, soon becoming lacerate and indefinite; stem up to 40 x 4 mm, tapering towards base; spores 4.6–5.4–(6.8) µm diam., guttulate, smooth both under LM and SEM; capillitium 3.3–7.4–(8.5) µm diam., aseptate, coloured, thick-walled, lumen visible, with pegs here and there***T. vulgare***

23b Spore-sac up to 10 mm diam.; mouth inconspicuously fibrillose, almost indefinite, not becoming lacerate; stem up to 25 x 4 mm; spores 4.2–5.9 µm diam., guttulate, smooth under LM and SEM; capillitium 4–5.5 µm diam., septate, thick-walled, lumen visible, septa scant***T. leiosporum***
(*vide* Moreno *et al.* 1997)
(=*T. puncticulosum* sensu Wright 1987)

24a Spores striate, easily visible under LM, 4.5–7.4 µm diam.***T. striatum***

24b Spores ornamented but not striate25

25a Spore-sac up to 22 mm diam.; mouth fibrillose, scutellate-mammose; spores conspicuously reticulated under LM, appearing 'cyttarioid' under SEM, 4.6–5.7 µm diam. without the ornamentation, up to 8 µm diam. with it; exoperidium verrucose; capillitium slightly coloured, 2.1–7.1 µm diam., swollen at slightly coloured septa***T. transvaalii***

25b Spores asperulate to spiny26

26a Spores asperulate or finely verrucose; exoperidium membranous27

26b Spores brown, with a coarser ornamentation, 5.4–8.6 µm diam., verrucose to

crested under LM, under SEM ornamentation appears formed by numerous blunt, even, appressed verrucae, some anastomosed; capillitium 1.8–3.6 µm diam., hyaline, swollen at the numerous dark septa up to 8.7 µm wide; mouth fibrillose-fimbriate.....***T. macowanii***

27a Stem 25–65 x 2–4 mm; spore-sac up to 20 mm diam., usually 12–15 mm; mouth large, fibrillose-fimbriate, scutellate, mammose; endoperidium usually velvety to furfuraceous due to the presence of conspicuous 'mycosclereids' when young, particularly under the thick exoperidium; spores 3.2–4.6 x 2.8–4 µm, with minute and closely distributed granules under LM, appearing with low verrucae anastomosed in a pseudoreticulum under SEM; capillitium subhyaline to slightly yellowish, profusely branched and septate, not distinctly swollen at the brown, frequent septa***T. cyclophorum***

27b Combination of characters not as above28

28a Mouth mammose; spores verrucose, 4–5.7 µm diam., with verrucae here and there arranged in striae under SEM; endoperidium smooth; capillitium hyaline to coloured, slightly swollen at the coloured septa***T. pulchellum***
var. *subfuscum* (*vide* Moreno *et al.* 1992b)
(=*T. subfuscum* sensu Wright 1987)

28b Spore-sac up to 18 mm diam., mouth not mammose, relatively large for the small size of the spore-sac; spores 3.3–4.7 µm diam., minutely asperulate to almost smooth under LM, with small and densely-packed verrucae under SEM; capillitium 3.3–7.4 µm diam., hyaline, somewhat widened at the colourless septa, average diameter of capillitium threads larger than that of spores (*vide* also 2b)***T. australianum***

Glossary of terms used in key:

Explanations of terms are mainly according to Bottomley (1948), but with input also from Hawksworth *et al.* (1983), Stearn (1983) and Wright (1987).

apiculate	with short projection at one end of spore
asperate	rough with small points or granules
asperulate	diminutive of asperate
avellaneous	hazel; nut brown
caducous	falling off early
caespitose	crowded in dense clusters
cupreous	coppery

cyttarioid	deeply foveate; resembling fruit-body of <i>Cyttaria</i>
denticulate	having small teeth
echinulate	with minute and finely pointed spines
fimbriate	fringed
foveate	having small holes or cavities; pitted
fuliginous	dirty brown, almost black, sooty
furfuraceous	scurfy; covered with bran-like particles
guttulate	with oil globule in spore
LM	light microscope
mouth definite	with margin clearly defined
mouth indefinite	not delimited by a definite tissue; appears merely as a lacerated aperture at apex of spore-sac
pegs	small branch-like outgrowths from capillitium
peristome	edging around an opening
SEM	scanning electron microscope
scutellate	shield-like
socket	where spore-sac is attached to stem
striate	marked with lines, grooves or ridges
verrucae	small rounded processes or warts
verrucose	with verrucae

Concluding remarks:

Much exploration and ‘Gasteromycete’ collecting still needs to be done in southern Africa in order to formulate a proper understanding of the biodiversity of these interesting fungi in the region. It would be much appreciated therefore if anyone out in the field (including the more arid regions of the subcontinent) could keep an eye open for the gasteroid fungi as well. They are easy to collect and the puffballs in particular dry very well. Specimens (packed in boxes or paper bags) forwarded to the author at the address below for identification and

deposition in appropriate herbaria are always most welcome.

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Opinion

Challenges and opportunities for African Mycology

I am a PhD Mycology student in the University of Buea, Cameroon, and a Graduate Teaching and Research Assistant in the aforementioned university. The University of Buea is popularly called “the place to be” because of its academic excellence. My research is on species of *Ganoderma* from South Western Cameroon. The work focus on systematics (morphology, molecular and chemistry), ecological diversity as well as genetic diversity studies. I will like to have some collaborators in this area of research and also in research on the mycobiota of Cameroon, a country blessed with abundant natural resources.

Problems faced by African mycologists

1. Need for Government financial support for mycological research in most African countries.
2. Lack of African-based mushroom biomedical research centre to elucidate clinical trials.
3. Lack of Africa-based mushroom biotechnology centres of excellence.
4. Lack of an African-based mushroom taxonomy centre.
5. Paucity of mushroom scientists: Africa lacks a critical mass of scientists to undertake serious research on the commercialization of the affluent mushroom biodiversity. The government must aggressively recruit, train, and retain a critical mass of scientists, to lead the process towards a vibrant mushroom farming and processing industry in the country. Laboratories are also without the necessary equipment to carry out good research work, hence many scientists cannot do research.
6. Brain Drain syndrome: the poor working conditions and low salaries for researchers and teachers in most African countries has caused a lot of our good scientists to leave for the diaspora of better living conditions. The governments of African countries should do something to improve on its researchers’ working and living conditions to prevent this exodus.
7. Lack of effective communication channels on the importance of mycological specialization: there

should be effective communication through the media, seminars, sensitization of the local population, workshops and conferences on mushroom and mushroom products, formation of mushroom groups and clubs in schools.

8. Outdated school curricula: mushroom science should be integrated in most African school curriculums.

9. Mycophobia: there is the need for mycotaxonomists to provide a check list of edible, medicinal and poisonous mushrooms in Africa and also to carry out toxicity tests on mushrooms to encourage the population to be more engaged in mushroom utilization.

11. Loss of mushroom biodiversity: there is a need to collect and maintain strains of African mushrooms in a culture collection center because with the increase of climate change, habitat change and destruction due to deforestation, etc., our mushrooms may become extinct.

12. There should be unity and cooperation between and amongst African mycologists in order to improve mycological research in Africa (Tonjock,R.K.,2009).

Great opportunities of African mycology

For Cameroon it has been aptly described as Africa in miniature because of its very rich flora and fauna diversity, but what about the mycobiota? Mushroom biodiversity in Cameroon is rich and remains poorly explored. This is a similar situation for most African countries.

I will like to quote Professor Leif Ryvardeen, I call him the father of polypores and look to him as a role model. He said “In tropical Africa *Ganoderma* diversity seems not yet totally discovered and the polypore mycobiota as a whole have been insufficiently probed (Ryvardeen 1992; Roberts and Ryvardeen 2006; Douanla-Meli and Langer 2009).

Most African countries have very rich fungal diversities but it remains poorly unexplored. There

is need for collaborative research with mycologists who are experts in mycological research to help explore the mycobiota of Africa.

Dedications to eminent mycologists related to Africa

I will consider this dedication to mycologists that I know have contributed to the knowledge of mycological research in Africa. There might be others I do not know. I wish to extend my sincere gratitude to:

Prof. Leif Ryvarden, Department of Biology, University of Oslo. Polypores Systematics.

Prof. Cony Decock, Universite Catholique de Louvain, Belgium, Polypores Systematics.

Prof. Edward Langer, Head of Department of Ecology, University of Kassel, Germany. Ecology, biodiversity, phylogeny and evolution of higher fungi, especially from central Africa.

Emeritus Prof. S.T Chang Australia/ China, Mushroom Science.

Prof. Keto Mshigeni, Vice Chancellor of Hubert Kairuki Memorial University in Tanzania Mushroom Science.

Prof. Dominique Claude Mossebo, Laboratoire de Nutrition, Biochimie et Technologie alimentaire, Yaoundé, Cameroon. Mushroom Nutrition and Systematics.

Dr. Omon Isikheumhen, Department of Natural Resources and Environment, North Carolina State University, USA. Mushroom Biologist.

Dr. Douanla-Meli Clovis, Department of Ecology, University of Kassel, Germany. Ecology, biodiversity, phylogeny and evolution of higher fungi especially from central Africa.

Dr. Oyetayo Victor Olosegun, Department of Microbiology, Federal University of Technology, Akure Nigeria. Mushroom Biologist.

We are grateful for your contributions towards the knowledge generated through research on the Mycobiota of Africa.

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Message from the committee

AMA GOALS 2009-2011

Dear AMA members

This is the first letter from me as the next President of the AMA, and from the new AMA council. I am looking forward to the next couple of years, where we as new council will serve the AMA. We are grateful for the work that the previous committee has done that provided a foundation to continue with the goals of the AMA. In this regard, the current committee are striving to achieve several goals. These are mainly focused on building mycology in Africa, to stimulate collaborations and networks, and to make our association stronger and better known in Africa as well as outside Africa.

The AMA is continuing to develop as an association. For this, we would need a revised and contemporary constitution moulded on the constitution put in place by those who started the AMA. We continuously need to expand our membership to include colleagues, friends and collaborators, both in Africa and other continents. The AMA should not only be a network, but should also be useful to its members by providing information, and a voice at any level for the needs and opportunities of African mycology. We should also continuously advertise ourselves among other societies as the AMA and proud African mycologists.

What is happening regarding mycology in Africa? Who are doing what and what resources are available on our continent? We need to hear from our members and learn what each is doing in the various regions of Africa. We also need to know where there are gaps in expertise, research and facilities. Here our newsletter, MycoAfrica, plays a crucial role, but without contributions from you, our members, it cannot fulfil its purpose.

No way of communication is a substitute for meeting fellow mycologists face to face. In such a way, information is shared, opportunities created, new ideas are born and collaborations forged. It is also the only way we as an association can grow and where general AMA issues can be discussed among members. We should thus be working towards meeting and talking more. This we can achieve by knowing about the various congresses, meetings and symposia happening in Africa,

possibly having joint AMA meetings with them, having closer ties with our fellow scientific societies in Africa, starting with a fixed system of regular regional meetings (northern, eastern, western and southern Africa) and having one AFRICAN meeting of the AMA every committee term. This will entail hard work and we would also rely on our members to feed us with news and information on possible opportunities.

Africa has unique opportunities and challenges, yet African mycology also share many opportunities and challenges with mycology on other continents. However, to become stronger, we first need to focus close to home. We would thus like to determine what are the challenges that African mycologists (and fellow scientists) face in order to do their work and research, and to live out their passions. We should also determine what are the opportunities that our wonderful continent offers, and how to put things in place to enable us to use these opportunities and to explore them. For this reason, we as the committee would like to hear from you, and started a series of opinion related features where you can share the challenges you face and the opportunities that you see. These will not amount to much without plans of action, and in this regard we are also looking forward to hear from you.

Best wishes,
Marieka Gryzenhout
President



Important Dates

36th Annual Conference of the South African Association of Botanists (SAAB)
Potchefstroom, South Africa
Congress: 11-13 January 2010

First International Conference of Basic and Applied Mycology - Society of Basic and Applied Mycology (SBAM)
Assiut, Egypt
Congress: 9-11 March 2010

International Mycological Congress (IMC9)
(hosted by the British Mycological Society)
Edinburgh, Scotland
Congress: 1-6 August 2010
www.imc9.info

VISIT THE FOLLOWING SITE FOR COMPREHENSIVE LISTS OF UPCOMING CONGRESSES

Horizon Press for lists of microbiology congresses

<http://www.horizonpress.com/conferences/>

Useful websites

(Updated every second issue, more websites in previous issues.)

Tom Volk's Fungi
http://botit.botany.wisc.edu/toms_fungi

Mushroom Observer
<http://mushroomobserver.org>

MykoWeb
<http://www.mykoweb.com/index.html>

Mushroom Expert
<http://www.mushroomexpert.com>
Rogers Mushrooms
<http://www.rogersmushrooms.com>

Fungi Perfecti
<http://www.fungiperfecti.com>

Mycology Online
<http://www.mycology.adelaide.edu.au>

The Mycology.Net
<http://www.mycology.net>

Index Fungorum/CABI Biosciences Database
<http://www.indexfungorum.org>

Tree of Life Web Project
<http://tolweb.org>

The Mycological Society of America
<http://www.msafungi.org>

The American Phytopathological Society
<http://www.apsnet.org>

The British Mycological Society
<http://www.britmycolsoc.org.uk>

African Library

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QUESTIONNAIRE OF AFRICAN MYCOLOGISTS FOR THE AMA

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Name:

Title:

Institution and Postal Address:

Country:

Country or origin:

Email:

Website:

Phone number:

Fax number:

Research interests (choose one or between cell biology, physiology, ecology, pathology, molecular biology, systematics, evolution, medical mycology):

Specific interests:

Details of other African mycologists who may want to join AMA:

Skills to offer AMA (committee member, conference organiser, fund raising etc.):
