

Tanzanian mushrooms and their uses 7. Two new and distinctive boletes

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Two very distinctive boletes from East Africa are described as new to science. *Boletus spectabilissimus* Watling has rich red pileus, stipe and pores; *Boletus pallidissimus* Watling has almost white pileus and contrasting olivaceous yellow pores and tubes. The two species were collected in the miombo area (*Brachystegia* woodlands) of southern Tanzania. Closely related taxa in North America and South East Asia are discussed.

Key words: *Boletus*, Africa, ethnomycology, Tanzania, taxonomy

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Introduction

The boletes described below were collected during the fieldwork for the project *Edible mushrooms of Tanzania*, 1990–1995 (see Härkönen *et al.* 1995). The project was led by Marja Härkönen, accompanied by Leonard Mwasumbi from the Dar es Salaam University, and some Finnish mycologists, among them Tiina Saarimäki and Tuomo Niemelä. The main purpose of the project was to document traditional uses of mushrooms amongst different Tanzanian ethnic groups, for instance, the edibility of mushrooms, their names in local languages, medicinal uses of fungi, and folklore linked to them.

Specimens of the present boletes were obtained from southern Tanzania, an area belonging to the vast biome of moist savanna woodlands, called the *miombo*. Miombo vegetation gets ample moisture during the long rainy season, but, in contrast, there is one annual, harsh and long dry season. Species of *Brachystegia* and *Julbernardia* (Caesalpiniaceae) characterise the woody vegetation in natural stands, but the miombo region has traditionally been extensively utilised with slash-and-burn cultivation, or

chitemene. Heavy grazing also alters the vegetation and hinders the regeneration of trees. Degraded woodlands are therefore mostly occupied by small-stature trees of the genus *Uapaca* (Euphorbiaceae), until the above-mentioned and other legumes reclaim the woodland. Almost all miombo trees are ectomycorrhizal, and the onset of rains results in a profusion of *Amanita*, *Cantharellus*, *Lactarius*, *Russula* and other mycorrhizal fungi, including many species of boletes.

Materials and methods

Fungi were collected in the field by Marja Härkönen and co-workers, often accompanied by local people familiar with picking mushrooms and other fungi for food. Basidiomes to be collected were usually photographed *in situ*. After each collecting trip fresh characters were documented, and specimens were dried in a mushroom dryer, on well-ventilated steel-mesh shelves, heated with three kerosene lamps, which raised the temperature to ca. 50 °C. Fleshy and thick basidiocarps were usually cut into slices so that they were completely dry the next morning. Most herbarium specimens are preserved in Helsinki (H), and duplicates in Dar es Salaam (DSM) and some other herbaria.



Fig. 1. *Boletus spectabilissimus* Watling, holotype, photograph 2.II.1993 TN. The bipinnate leaves (lower right) emerging from the ground belong to the suffrutescent woody plant *Cryptosepalum maraviense*.

Fig. 2. *Boletus spectabilissimus* Watling, holotype, photograph MH. Sections, seen instantly after cutting (left) and after exposure of a few minutes (right).



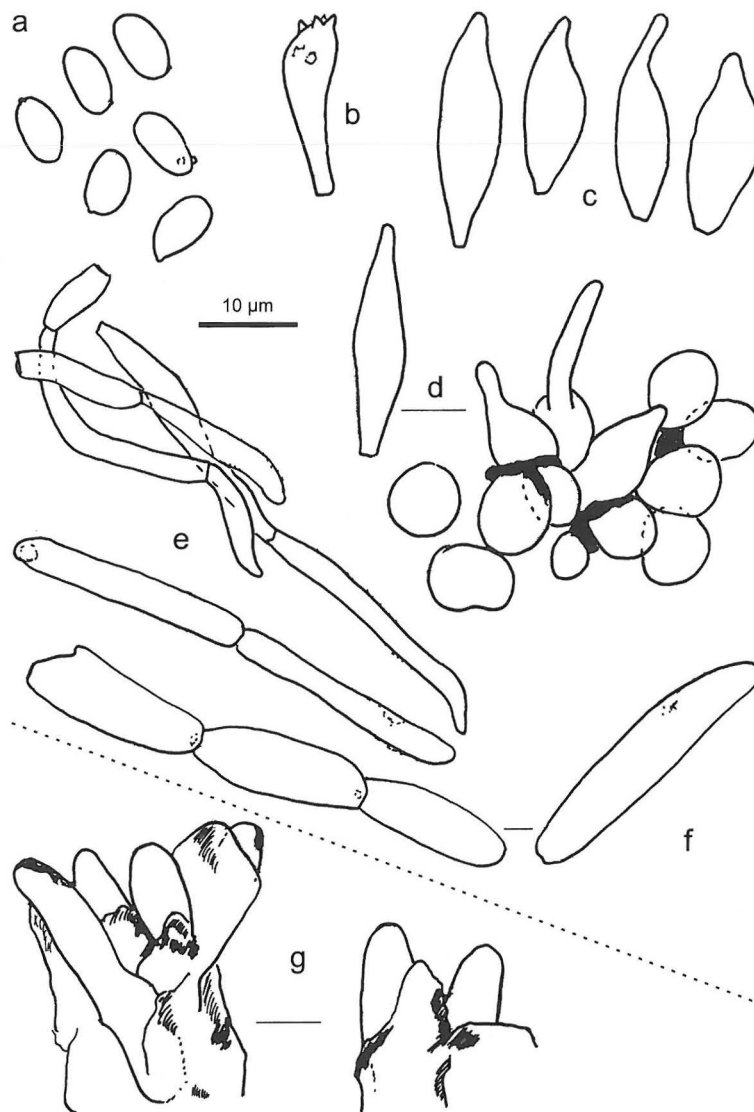


Fig. 3. *Boletus* species. *Boletus spectabilissimus* Watling, holotype: a – basidiospores, b – basidium, c – pleurocystidia, d – tube orifice and cheilocystidia, e – pileipellis, narrow elements, f – pileipellis, broad elements. *Boletus pallidissimus* Watling, holotype: g – tube orifice.

***Boletus spectabilissimus* Watling, species nova**
– Figs. 1–3

Pileus 70–90 mm, convexus, ruber vel aurantio-ruber. *Stipes* 70 × 20–40 mm, clavatus, aurantio-ruber, punctatus. *Tubi* albi, fracti nigrescentes; *poris* rubidis, parvuli, rotundis. *Carne*

alba, rubescente dein cyanescente, denique nigra. Sporae ellipsoideae, 8–9.5 × 4–4.5 µm.

Holotype: **Tanzania**. Iringa Reg., Njombe Dist., north of Kidugala, between Sengele and Masaulwa, alt. 1500 m, 2.II.1993 Tiina Saarimäki et al. 1532 (H, isotype E).

Pileus 70–90 mm across, convex, intense to-mato red, matted and minutely roughened especially towards disc; margin overhanging as regular lip with rich red and inner surface rich orange-yellow. *Stipe* 70 × 20–40 mm, strongly clavate, tapering towards the apex, orange ground-colour with red and yellow punctae giving an overall orange-red, velvety aspect. *Tubes* 1 mm long, at first white except at orifice, blackening on cutting; pores small with red margins giving a bright red aspect to underside. *Context* fairly firm in pileus and stipe, cream-colour then reddening, then cyanescent and finally black; negative Im-ler's reaction with Melzer's reagent. *Taste* mild; *smell* none.

Basidiospores 8–9.5 × 4–4.5 µm, ellipsoid only slightly inequilateral in side-view, very pale honey-colour, smooth. *Basidia* 4-spored, 20–25 × 8–12 µm, hyaline, clavate. *Hymenophoral trama* divergent, strongly bilateral with tightly packed, hyaline and highly gelatinized lateral zones composed of hyphae c. 9 µm broad; central zone of compacted, darker honey-brown to red-brown elements. *Pleurocystidia* scattered, projecting 18–25 µm above hymenium, hyaline ampulliform to lageniform with narrow venter. *Cheilocystidia* compacted into dark red-brown termination to trama with little or no clear differentiation into separate units amongst dark amorphous deposits; some cells swollen clavate and similar to those on face. *Pileipellis* producing golden yellow diffusate in alkalic mounts, a cutis of tangled, repent, hyaline to honey-coloured, filamentous, generally smooth hyphae, 4.5–6.5 µm broad with elements suberect or reflexed collapsing onto surface, some with very slightly granular-asperulate surface and some elements shortened and broader and 28.5–55 × 6.5–11 µm, downwards becoming more compacted and seated on hyaline, anastomosing, floccose hyphae of the context; end-cells rounded, obtuse, not distinctly differentiated. *Stipitipellis* of parallel, hyaline to slightly coloured, cylindric hyphae supporting numerous tight clusters of rounded cells, 9–18 µm diameter, intermixed with similar cells with coloured vacuolar sap and some cystidioid with apical papilla, <26 × 8.5–10 µm and tips 1.5–2 µm, some extremities with coloured contents. *Clamp connections* not seen.

Habitat: In heavily grazed and degraded *Brachystegia-Uapaca* woodland (miombo), occurring as single basidiomes. *Cryptosepalum*

maraviense (Caesalpiniaceae) was a common suffrutescent legume around this bolete.

Material examined: **Tanzania**. Iringa Reg., Njombe Dist., Kidugala, alt. 1500 m, 22.III.1991 *Saarimäki et al.* 687; 2.II.1993 *Saarimäki et al.* 1532 (see holotype).

Comestibility: Broken into pieces and dried; some people peel and parboil it before drying. Useful for food after drying, but not one of the most delicious species.

Vernacular names: WINDIMA, WITIMA (in Bena).

This very distinctive bolete is a member of *Boletus* subgenus *Luridellus* with its cyanescent and then blackening context and tubes, and pruinoso-punctiform stipe surface.

Boletus spectabilissimus is unique amongst African boletes so far known but comes close to a series of boletes described from South East Asia. Thus it approaches *B. craspedius* Massee (1914), a bolete considered by Corner (1972) to be a fairly common taxon in Singapore. Corner himself knew this species from three sites in Singapore, The Gardens Jungle, Reservoir Jungle and Bukit Timah; the original collection was made by Burkill also from The Gardens Jungle and paintings of this material are presently housed in the Royal Botanic Gardens Kew and Edinburgh. The type specimen is rather immature and is deposited in Kew. Although the red stipe and pores characterise *B. craspedius* the pileus is not a beautiful red but a more general sombre red-brown or deep bay brown or umber in older basidiomes. Corner (1972) considers Massee's species to be possibly the same as *B. magnificus* Chiu (1948), which, although the present author has not found anything approaching *B. craspedius* during his collecting trips to Malaysia does know Chiu's bolete from Doi Suthep, Chang Mai, Thailand. It differs from our present bolete in the more maroon red pileus, intense yellow aspect to the apex of the stipe and not red, and the widely spaced red punctae which give to the stipe an overall more orange colouration except the base which is infused with umber brown; the flesh is bright chrome yellow and not white, turns bluish green and is not blackening. From *B. craspedius* it possesses more red shades in the pileus, the context is much paler yellow and in the stipe is streaked with red and brown; the stipe is overall more dull in its colouration. Therefore both these

South East Asian boletes differ in the less uniformly orange red basidiomes found in the Tanzanian species.

Boletus manicus Heim (1963), described from New Guinea, although possessing the distinctive red pores differs in the pallid, greyish pileus; similarly *B. quercinus* Hongo (1967) described from Japan has a white pileus. Corner (1972) likens *B. craspedius* to *B. reayi* Heim (1963) from New Guinea but again this differs from *B. spectabilissimus* in the pileus colour not being a vibrant red.

A similarly coloured unnamed bolete has been found under *Brachystegia utilis* in Zambia (Copperbelt Prov., Misaka Forest Reserve, near Ndola, 3.IV.1991 Watling 28211, E). It differs, however, in the rather more magenta colour to the mature pileus and although blueing the flesh does not finally become black. The spores are more ovoid, $8.3-9.5(-10) \times (5.1-6.8-8 \mu\text{m})$, and under the microscope the walls are distinctly yellow in ammoniacal solutions.

There are several boletes with similar coloured pores in other parts of the world including South East Asia and North America and including our own European *Boletus satanas* Lenz but these all

possess distinctive hymenial reticulations on the stipe. Also there are some xerocomoid boletes with red pilei but in these species the basidiomes are slender, the pores never as intensely red and the hyphae of the central regions of the tube trama are arranged more erratically and are less clearly demarcated than those of the Tanzanian species described herein.

Although many of the red-pored cyanescent boletes are rejected as food in Europe and North America, because it is thought that they are poisonous, this is patently untrue; e.g., *Boletus luridiformis* Rostk. (*B. erythropus* auct.) and *B. luridus* Schaeff. : Fr. are quite good to eat after cooking (Chandra 1989) even though the context turns a vivid Prussian blue on exposure to the air.

***Boletus pallidissimus* Watling, species nova – Figs. 3–5**

Pileus 30–70 mm, *convexus vel plano-convexus, cremeus vel ochraceo-maculatus*. *Stipes* 50 × 18 mm, *aequalis, cylindricus, fusco-griseus, haud reticulatus, basin versus velutino-punctatus, umbrinus, tubi et pori sordido-grisei*. *Caro pilei cremea, fracta tarde cyanescens, in stipite cre-*



Fig. 4. *Boletus pallidissimus* Watling, holotype, photograph 29.I.1993 TN.

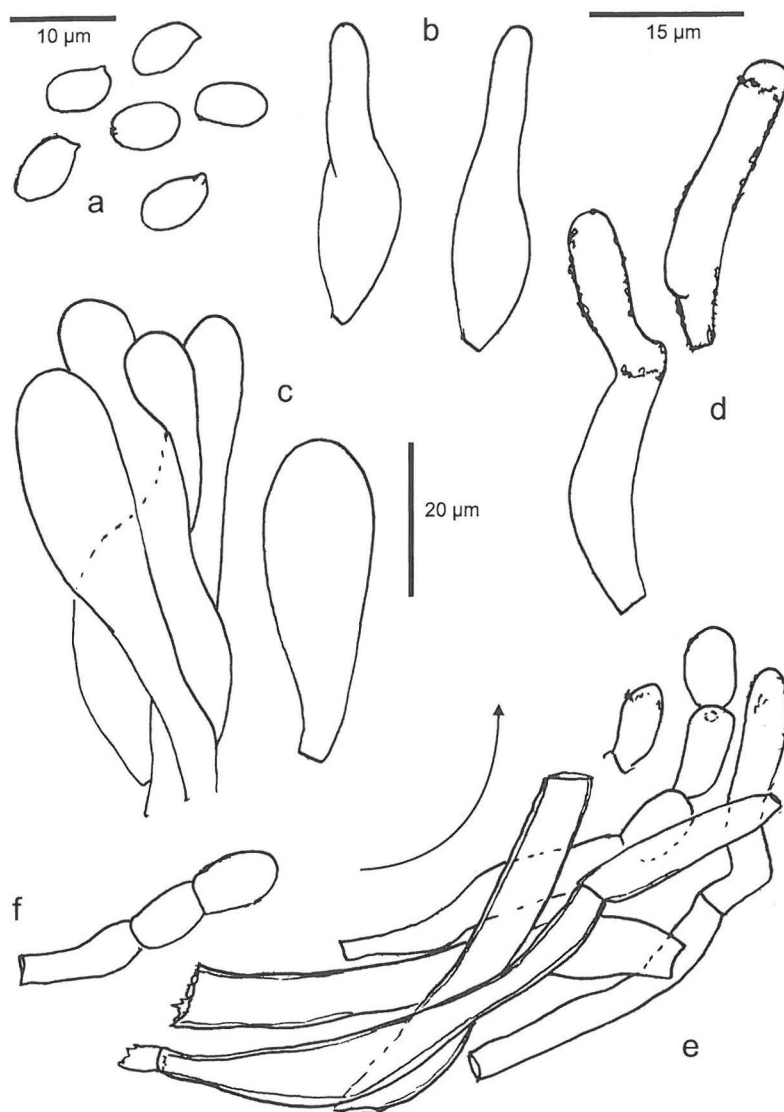


Fig. 5. *Boletus pallidissimus* Watling, holotype: a – basidiospores, b – pleurocystidia, c – caulocystidia, d – end-cells in pileipellis, e – part of scurfiness in pileipellis, f – rounded cells within scurfiness.

mea, fracta sordido-lutescens. Sporae ellipsoideae, 6.7–7.5 × 4–5.2 µm.

Holotype: Tanzania. Ruvuma Reg., Songea Dist., Songea 29 km W towards Mbinga, Matomondo, alt. 800 m, 29.I.1993 *Tiina Saarimäki et al. 1458* (H, isotype E).

Pileus 30–70 mm in diameter, convex then plano-convex with broad obtuse umbo, whitish

or ivory or in some basidiomes white especially towards margin and in others cream-colour especially towards the disc, smooth and leathery although minutely scurfy at disc or towards one side. *Stipe* 50 × 18 mm, equal except for very base which is slightly tapered into whitish, soil-mixed mycelial cone, equal, blackish grey, streaked with hints of purplish date but paler towards the base, reticulate at apex with scurfy dots below, fibril-

lose-streaky towards base. *Tubes* >10 mm long, dark olivaceous grey; pores similarly coloured but with hints in places of isabelline, 2 mm in diameter. *Context* cream-coloured in pileus, faintly cyanescent above the tubes on cutting, similarly coloured in stipe, turning yellowish on cutting; Imler's reaction with Melzer's reagent producing rich red-brown stain. *Taste* not distinct; *smell* unpleasant, slightly acidic.

Basidiospores 6.7–7.5 × 4–5.2 µm, ellipsoid, hardly flattened in side-view, pale honey-coloured, smooth. *Basidia* 4-spored, hyaline, clavate. *Hymenophoral trama* divergent from a poorly differentiated, irregularly coloured dark honey-coloured or dark yellow brown central zone; lateral zone of highly gelatinized hyphae c. 5.5 µm broad. *Pleurocystidia* scattered, 30–36 × 10–12 µm, hyaline, lageniform, elongated into tapered blunt apex, sometimes bluntly lanceolate; *cheilocystidia* coalescing into dark cluster at base of each tube, elongate-clavate cells with base >4.5 µm broad. *Pileipellis* a cutis of tangled, honey-coloured, little differentiated hyphae <8.5 µm, some with silvery walls, slightly thickened and fracturing easily, smooth or some elements with poorly developed, irregular almost crystalline ornamentation; in areas representing scurfiness on pileus hyphae adhering in yellow-brown clusters of more parallel hyphae some forming chains of shortened cells; end-cells rounded, obtuse. *Stipitipellis* of hyaline to darkened, parallel hyphae supporting very prominent clusters of well-differentiated umber-brown, elongate-clavate to lageniform caulocystidia <60 µm broad × 12–26 µm, tapering to foot c. 7 µm broad. *Clamp connections* not seen.

Habitat: In degraded miombo woodland with *Brachystegia*, *Julbernardia*, *Uapaca*, *Syzygium*, *Combretum*. Grows in tight clusters of 5–10 basidiocarps.

Material examined: See holotype.

Comestibility and vernacular name: Like most boletes, this species is inedible according to the local people. We have documented no vernacular name for it.

Boletus pallidissimus comes remarkably close in field characters to the edible North American *B. pallidus* Frost, originally described from Vermont, but which is widespread certainly in the eastern areas of the United States to the Lower

Peninsula of Michigan. The present bolete, however, differs in the much paler overall colouration and in mature specimens not becoming dark tan of dark buff at maturity. There is little doubt that the tubes and pores in the present species go through the same colour changes as is found in *B. pallidus*, that is from ivory or cream-colour to finally olivaceous yellow or brownish.

Boletus pallidus and the present species do not fall into any familiar natural grouping although Singer (1951 *et subsequ.*) places *B. pallidus* in *Boletus* sect. *Calopodes* with reservations. 'The latter species (*viz. B. pallidus*) is somewhat intermediate between sect. 3 (*viz. Appendiculati*) and 4 (*viz. Calopodes*) as these are defined at present' (Singer 1986). On the other hand Smith and Thiers (1971) place this same fungus with *Boletus badius* Fr., a common, widespread European bolete in sect. *Pseudoboleti* formerly proposed for a section of *Xerocomus*. Corner (1972) really had no taxon from Malaysia which resembled *B. pallidus* except that amongst his xerocomoid grouping he mentions the North American bolete under discussion on *B. rectus* Corner but this is not a cyanescent bolete. The present fungus poses the same problems as the placement of *B. pallidus* and more work is required. The structure of the hymenophoral trama certainly resembles members of sect. *Pseudoboleti* in being somewhat intermediate between the typical 'Boletus type' of trama demonstrable in *B. spectabilissimus* above and the xerocomoid boletes.

The well-developed clusters of dark caulocystidia in *Boletus pallidissimus* might suggest a relationship with members of the genus *Leccinum*. However, these clusters are not composed of gradually darkening pseudoparaphysoid and cystidioid elements intermixed with functional and non-functional basidia. The stature, the spore morphology and size, and structure of the hymenophoral trama do not favour a placement in this genus. There are indications that a relationship with members of the genus *Xanthoconium* cannot be ruled out. A fresh spore-deposit is therefore an essential requirement but the shape of the basidiospores superficially gives no great support for such a relationship. Binder (pers. comm.) has indicated that from his molecular studies there appears to be a relationship between *B. pallidus* and *B. variipes* Peck (1888) in addition to both *B. gertrudiae* Peck (1911) which has a similar stature to the present fungus and *B.*

separans Peck (= *Xanthoconium separans* (Peck) Halling & Both 1998). Unfortunately there has been some confusion as to the identity of all three taxa in the literature although this is now being resolved. There are no species in South East Asia or Africa which approaches any of these boletes.

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