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Lactifluus kigomaensis sp. nov. from Kigoma province,Tanzania

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Abstract – *Lactifluus kigomaensis* De Crop & Verbeken sp. nov. is described from primary miombo woodlands in the biologically underexplored Kigoma Province in North Western Tanzania. The species is consumed and offered for sale on local markets.

Ectomycorrhizal fungi / edible mushroom / *Lactarius* / miombo woodlands / taxonomy / tropical Africa

Résumé – *Lactifluus kigomaensis* De Crop & Verbeken sp. nov. est décrit de la forêt claire primaire de la province de Kigoma au nord-ouest de la Tanzanie, une province scientifiquement peu explorée. L'espèce est consommée et vendue sur les marchés locaux.

Champignons ectomycorrhiziques / champignons comestibles / *Lactarius* / forêt claire / taxinomie / Afrique tropicale

INTRODUCTION

The diversity of the ectomycorrhizal *Lactarius* Pers. and *Lactifluus* (Pers.) Roussel in tropical Africa is high, with 39 and 59 species respectively (Verbeken & Walleyn, 2010; Douanla-Meli & Langer, 2009; Van de Putte *et al.*, 2009). With the exception of two lactarioid species in *Multifurca* (Wang, 2010; Lebel *et al.*, 2012), the remaining species of the classic genus *Lactarius* have recently been divided between *Lactarius* sensu novo and *Lactifluus* (Buyck *et al.*, 2008). The genus *Lactarius* has its main distribution in the Northern hemisphere, while the genus *Lactifluus* occurs mainly in the Southern hemisphere with a major biodiversity in tropical Africa, although recent exploration shows other tropical areas to be increasingly diverse as well (Stubbe *et al.*, 2008, 2010, 2011; Van de Putte *et al.*, 2010, 2011; Wang, 2012). Whereas *Lactarius* is a large genus with a seemingly low genetic diversity, *Lactifluus* is much smaller but has a very high genetic diversity with subgroups in very different and genetically distant clades. This was again

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illustrated by the recent discovery of *Lactifluus cocosmus* (Van de Putte *et al.*, 2009), which turns out to occupy a phylogenetically very isolated position, representing a new subgroup in the genus.

One of the most important and richest ectomycorrhizal vegetations, where *Lactifluus* is one of the major genera, are the African miombo woodlands. Miombo woodland covers in sub-Saharan Africa an estimated area of 2.7 million km^2 on nutrient-poor soils that receives less than 700 mm of precipitation per year (Campbell *et al.*, 1996). It is also characterized by the local codominance of ectomycorrhizal trees of different genera of the Caesalpinaceae, especially *Julbernardia*, *Brachystegia* and *Isoberlinia*, as well as trees of the genus *Uapaca* (Phyllantaceae) and the genera Monotes and Marquesia (Dipterocarpaceae).

In Tanzania, studies focusing on edible mushrooms in miombo woodland have been rather well-explored compared to other countries in the region (Buyck, 2012; Buyck *et al.*, 2012; Calonge *et al.*, 1997; Härkönen *et al.*, 1993, 1994, 1995, 2003; Karhula *et al.*, 1998; Saarimäki *et al.*, 1994; Tibuhwa *et al.*, 2008, 2012). However, the Kigoma province in North-West Tanzania, situated at the border of Burundi and Lake Tanganyika, is rich in miombo forest, but has been poorly explored for the presence and use of edible fungi. This region contains the largest untouched miombo area in the country and was the focus region of our study. This paper describes a new *Lactifluus* species from the Kigoma province in Tanzania.

MATERIAL AND METHODS

Macroscopic characters are all based on fresh material. Microscopic features were studied from dried material mainly in Congo-red in L4. Spore ornamentation is described and illustrated as observed in Melzer's reagent. For details on terminology we refer to Verbeken (1998) and Verbeken & Walleyn (2010). Line-drawings were made by A. Verbeken, with the aid of a drawing tube at original magnifications: 6000 × for spores, 1000 × for individual elements and sections. Basidia length excludes sterigmata length. Spores were measured in side view in Melzer's reagent, excluding the ornamentation, and measurements are given as [AVa-2*SD] - *AVa* - [AVa + 2*SD], in which AVa = mean value for the measured collection and SD = standard deviation. Q stands for "quotient length/width" and is given as MINQ - *AvQ* – MAXQ, in which AvQ stands for the mean quotient for the measured spores. Colour codes refer to Kornerup & Wanscher (1978). A colour picture of the species is available at http://www.mtsn.tn.it/russulales-news.

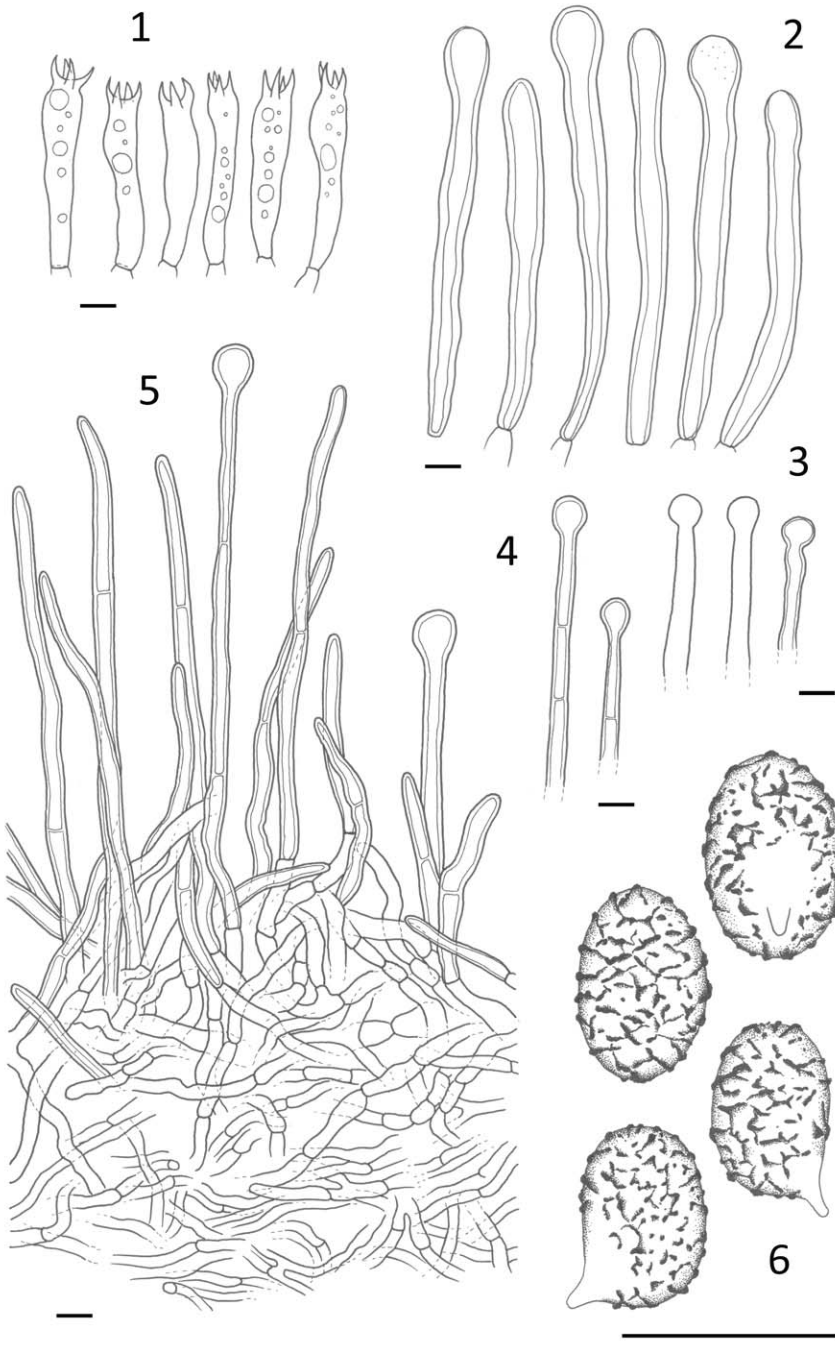
RESULTS

Lactifluus kigomaensis De Crop & Verbeken **sp. nov.** **Figs 1-6**

Mycobank: MB802400

Etymology: from the Kigoma region

Pileus 65 mm diam., firm, moderately thick, planoconvex, irregularly shaped, somewhat knotty; surface dry, somewhat felty or chamois-leather-like,



Figs 1-6. *Lactifluus kigomaensis*: **1.** basidia, **2.** pleuromacrocystidia, **3.** capitate elements of the stipitipellis, **4.** capitate elements of the pileipellis, **5.** section through the pileipellis, **6.** basidiospores (all from holotype AV 11-066, scale bar = 10 μm).

strongly and irregularly cracking, with concentrical wrinkles at the extreme margin, almost unicolorous, only paler in the cracks, pale brown, brownish orange or brown (7CD6-7, 7DE7), slightly paler towards margin. **Stipe** 45 × 17 mm, irregularly cylindric, with some folds and ridges, curved; surface smooth, dry, pale reddish orange, 6AB4-5. **Lamellae** decurrent with teeth, moderately distant, 9 L+l/cm, with abundant lamellulae of different lengths, pale yellow (4A4-5A4), staining purplish-brown by the latex (pale, not dark). **Context** white, very solid and firm in stipe and in pileus, slightly changing flesh-coloured to pale orange when cut, dirty salmon to greyish with Fe_2SO_4, unchanging with gaiac; smell very much like *Lactifluus volemus*, agreeable, lobster-like; taste agreeable, nut-like. **Latex** rather abundant, semitransparent, between watery and white, staining the lamellae pale purplish brown to greyish; taste mild.

Basidiospores broadly ellipsoid to ellipsoid, 7.5-*8.4*-9.3 × 5.2-*6.2*-7.0 µm (Q = 1.13-*1.37*-1.53); ornamentation amyloid, composed of low, up to 0.3 µm high, ridges forming an incomplete reticulum; many isolated warts and short ridges present; plage inamyloid. **Basidia** 45-50 × 8-11 µm, cylindric to narrowly clavate, 4-spored. **Pleurolamprocystidia** very abundant, very emergent and arising deep in the hymenium, 90-120 × 7-11 µm, cylindrical and typically capitate, distinctly swollen at the top; very thick-walled. **Pleuropseudocystidia** rare, usually not emergent, 3-5 µm diam., slightly tortuose. **Lamellae-edge** fertile, composed of basidia and occasionally a cheilocystidium. **Hymenophoral trama** cellular, with lactifers and sphaerocytes. **Pileipellis** a lamprotrichoderm, up to 220 µm thick; terminal elements cylindric to distinctly capitate, 50-170 × 4-6 µm, thick-walled; subpellis composed of intricate, hyaline hyphae. **Stipitipellis** a lamprotrichoderm, also with distinctly capitate terminal elements present.

Studied material: TANZANIA. Kigoma Province, Mboyogo Kigoma, Kitwe, alt. 780 m, S04°54.96' E29°36.51', purchased from Katonga market, sold in a mixture with *Cantharellus* spp., *Amanita loosii* Beeli, *Russula* spp., 15 March 2011, Verbeken, AV 11-006 (Holotypus, GENT); near Kigoma, Msitwa Katara, alt. 816 m, S04°54.52' E29°36.06', young and managed miombo forest with *Brachystegia* sp., 16 March 2011, De Crop, EDC 11-012 (GENT); near Kigoma, Zungu beach, alt. 781 m, S04°54.51' E29°33.08', young and managed miombo forest with *Brachystegia* sp., 16 March 2011, De Crop, EDC 11-013 (GENT).

DISCUSSION

L. kigomaensis can be recognized in the field by a strongly cracking pileus, lamellae that are staining purplish brown by the latex and by the smell of *Lactifluus volemus* (agreeably fishy, lobster-like). Microscopically, the capitate elements are very striking, both in the hymenium as pleurocystidia, as well as in the pilei- and stipitipellis as terminal elements in a trichoderm. In African species, such capitate elements are only observed in *Lactifluus nonpiscis* (Verbeken) Verbeken and *Lactifluus rubroviolascens* (R. Heim) Verbeken. In *L. nonpiscis*, they are very abundant as terminal elements in a lampropalisade (pileipellis) or lamprotrichoderm (stipitipellis), but lamprocystidia are absent. In *L. rubroviolascens* they only occur in the stipitipellis near the base of the stipe, while the lamprocystidia and the terminal elements in the pileipellis are never capitate.

Morphologically, the species seems at first sight to belong to *L.* sect. *Pseudogymnocarpi* because of the thick-walled hairs in the pileipellis and the lamprocystidia. However, the trichodermic structure of the pileipellis of this species is exceptional, as all other representatives have a palisadic structure. Preliminary phylogenetic results suggest that *L. kigomaensis* has an isolated phylogenetic position within *Lactifluus*.

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