

## TAXONOMY OF SOME FUNGI USED BY THE SONGOLA PEOPLE (ZAÏRE)

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**ABSTRACT** The author describes and illustrates some fungi used as food or as medicine by the Songola people of Zaïre. The taxa are: *Auricularia fuscusuccinea*, *Pycnoporus sanguineus*, *Schizophyllum commune*, *Lentinus sajor-caju*, *Armillaria camerunensis* (P. Henn.) R. Courtec. *comb. nov.*, *Cyptotrama songolarum* R. Courtec. *sp. nov.* and *Gymnopilus sp.*, the former four are common in tropical Africa, but the latter three are much rare.

**Key Words:** Fungi; *Auricularia*; *Pycnoporus*; *Schizophyllum*; *Lentinus*; *Armillaria*; *Cyptotrama*; *Gymnopilus*; Ethnomycology; Songola people; Zaïre; Africa.

### INTRODUCTION

Some specimens of fungi used by the Songola people (Zaïre) have been made available, thanks to the courtesy of Dr. Yuji Ankei and Dr. Takako Ankei (Yamaguchi University, Japan). The aim of this paper is a tentative determination of this material, as a first step in the taxonomical knowledge of the species used by this African people.

The material consists of dried samples, without macroscopic descriptions, so that identification has been somewhat difficult or remained impossible in some cases. The partial results presented below reveal some unusual or even new taxa.

This may also be an opportunity to emphasize to non-mycologists, the importance, of providing well-annotated material to taxonomists. Ethnobotanists and other scientists collecting material in tropical areas may refer to earlier recommendations by the author (Courtecuisse, 1991), a copy of which (in English or in French) may be obtained on request. See also Appendix.

The determined species are listed below, following a systematic order. (Courtecuisse & Duhem, 1994). The fungi all belong to the *Basidiomycotina*.

### DESCRIPTION OF THE SPECIMENS

#### 1. Phragmobasidiomycetes; Auriculariales

*Auricularia fuscusuccinea* (Montagne) Farlow

**Macroscopic description:** The specimen consists of a small cluster of three basidiocarps, corky tough, with finely velvety external surface, brownish with an

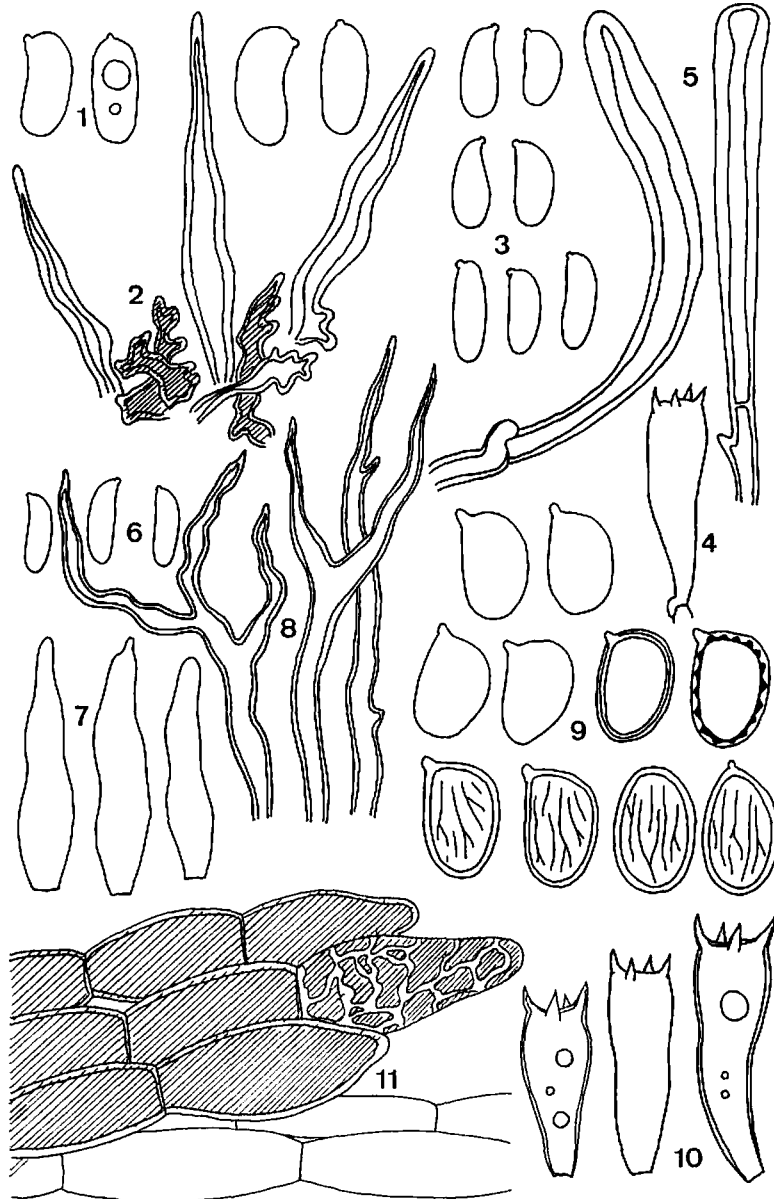


Fig. 1-2. *Auricularia fuscossuccinea* (Mont.) Farlow. 1: Spores. 2: Abhymental hairs.  
 Fig. 3-5. *Schizophyllum commune* Fr.: Fr. 3: Spores. 4: Basidia. 5: Terminal parts of skeletal hyphae.  
 Fig. 6-8. *Lentinus sajor-caju* (Rumph.: Fr.) Fr. 6: Spores. 7: Cheilocystidia. 8: Terminal part of skeletal hyphae.  
 Fig. 9-11. *Armillaria camerunensis* (P. Henn.) R. Courtec. 9: Spores. 10: Basidia. 11: Suprapellis

olivaceous hue and the hymenial surface venose crispate, dark reddish brown and glabrous. The flesh clearly demonstrates a stratification when cut, with a thin

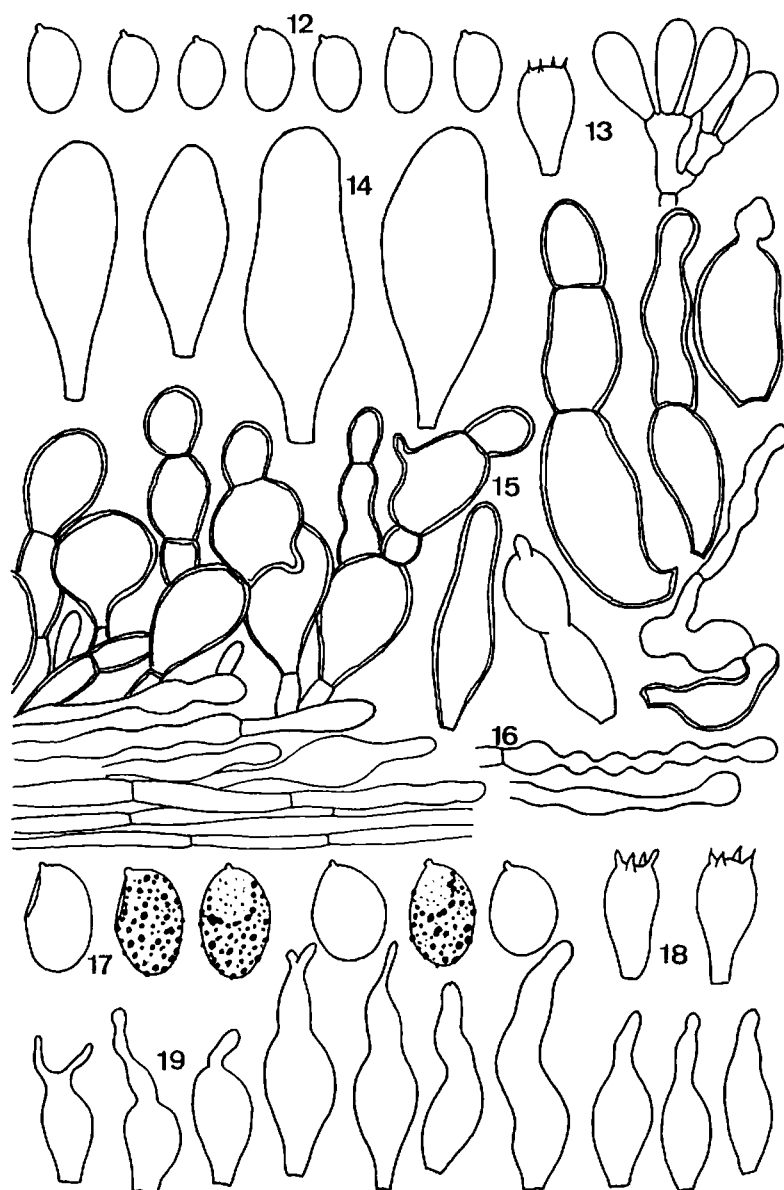


Fig. 12-15. *Cyptotrama songolarum* R. Courtec. 12: Spores. 13: Basidia. 14: Cystidia. 15: Suprapellis with details of terminal elements at right. 16: Elements of the mediopellis.

Fig. 17-19. *Gymnopilus* sp. 17: Spores. 18: Basidia. 19: Cheilocystidia.

whitish medulla.

Microscopic description: Spores (Fig. 1) very few, cylindrical allantoid,  $11-13 \times 4.5-5 \mu\text{m}$ , hyaline. Probasidia cylindrical, up to  $50 \times 6 \mu\text{m}$ , not seen mature.

Hyphae narrow,  $\times 2\text{--}3.5\ \mu\text{m}$ , strongly gelified, more or less branched and with prominent flattened clamps.

Abhymenial hairs (Fig. 2) short,  $25\text{--}60\text{--}(80) \times 3\text{--}7\ \mu\text{m}$ , thick-walled (wall up to  $2\ \mu\text{m}$ ), emerging from a covering made of tortuose lobate hyphae, hyaline to brownish.

Discussion: This collection is quite typical of *A. fuscossuccinea*, which is mainly neotropical in distribution, although it is noted from Australia, the Philippines and Africa as well (Wojewoda, 1981). From the latter continent, it is known from Sao Tome & Principe (Bresadola & Roumeguère, 1890). *Auricularia flava* Lloyd, regarded as a synonym by Lowy (1952) and described from South Africa, is doubtfully conspecific after Reid (1975).

Collection examined: Tongomacho village, toward Kindu, Maniema, Zaïre. 26 Sept. 1990. Coll. *Y. Ankei* A4. Songola name: i. tili (ma.). Used as food.

## 2. Homobasidiomycetes; *Aphyllorphoromycetidae*; Polyporales; *Coriolaceae*

### *Pycnoporus sanguineus* (L.: Fr.) Murrill

There is little to add to the macroscopy of this very common, pantropical fungus. It consists of two basidiocarps, quite typical of the species, in all respects.

Collection examined: Village Ngoli, Kindu, Maniema, Zaïre. 5 Sept. 1990. Coll. *Y. Ankei* A7. Songola name: ke.éléla (bi.). Used as medicine.

## 3. Homobasidiomycetes; *Aphyllorphoromycetidae*; Polyporales; *Schizophyllaceae*

### *Schizophyllum commune* Fr.: Fr.

Macroscopic description: The collection consists of a dense cluster of about 10 sporophores, 12–25 mm in diam., hemicircular to spatulate, the cluster measuring about 40 mm at the widest.

Surface of pilei is beige to pale ochraceous, velvety to finely tomentose or almost strigose with brown hyphae at the point of attachment. Margin is enrolled and more or less undulate or lobate.

Hymenophore is gilled, the gills very narrow, concolorous or slightly paler than the cap, splitting in two parts, converging to and more or less decurrent on a lateral collective stipe, the latter concolorous or darker, ochraceous to pale brown, tomentose to strigose.

Context of the exsiccatum is very tough. Flesh seems to be paler or perhaps white when fresh.

Microscopic description: Cells in a rather bad state, especially in the hymenium (specimen moulded with an *Aspergillus* sp.).

Spores (Fig. 3) cylindrical to slightly allantoid,  $(5)\text{--}6\text{--}7.5 \times 2\text{--}2.5\text{--}(3)\ \mu\text{m}$ , hyaline, smooth, inamyloid. Apiculus very small.

Basidia (Fig. 4) small,  $17\text{--}24 \times 3\text{--}4.5\ \mu\text{m}$ , narrowly clavate to subcylindrical, 4-spored.

Subhymenial layer about  $15\ \mu\text{m}$  thick, made of narrow, densely interwoven thin-

walled hyphae,  $\times 2-2.5 \mu\text{m}$ .

Gill-trama made of interwoven hyphae, tending to become more parallel-oriented, then divergent toward the edge, pseudodimitic. Thin-walled hyphae  $\times 4-7 \mu\text{m}$ , pale, walls slightly thickened, up to  $1 \mu\text{m}$ . Thick-walled hyphae  $\times 5-7 \mu\text{m}$ , the wall thickened up to  $2-(2.5)\mu\text{m}$ , very numerous, especially toward the deep layers where they tend to be curved or even enrolled and intimately interwoven, and toward the margin where they emerge through the hymenium like pseudocystidia (Fig. 5). Terminal elements up to  $100-(150)\mu\text{m}$ , sometimes secondarily septate.

Clamps present.

Covering of the cap made of a very thick and loose trichodermium. Hyphae of the "skeletal" type, interwoven, very long (very few septa seen),  $\times 3-5 \mu\text{m}$ , the walls thickened up to  $1 \mu\text{m}$ , refringent and slightly golden yellow s.l. lumen shows internal air droplets, especially toward the more superficial layers.

Discussion: The specimens are rather typical of the cosmopolitan *S. commune* Fr.: Fr., which is still at the moment, the only African representative of the genus. The colour of this collection may be somewhat surprising, with the brown hyphae at the point of attachment. But this colour may have arisen after the drying process by burning wood, judging from the smell of the dried material. Other features are satisfactory and fit very well with those observed on other collections compared on that occasion (from herb. RC. Specimens from France, French Guiana, Sri Lanka).

*S. commune* is already known to be used as food by several other people in Zaire (former Belgian Congo). Cooke (1961) reported that the peoples of Eala, Rungu-Wamba and Immu called the fungus, "tukunw" or "buangi."

Collection examined: Village Ngoli, Kindu, Maniema, Zaire. Sept. 1990. Coll. Y. *Ankei* A2. Songola name: alulu. Used as food.

#### 4. Homobasidiomycetes; *Agaricomycetideae*

Collection A1 consists of two connate and one isolated specimens, with a long stem ( $35-40 \times 2-3 \text{ mm}$ ) and a small ( $10-18 \text{ mm diam.}$ ) depressed cap. Hymenophore is gilled. It is apparently lignicolous. No further details can be obtained.

The specimens has been almost cooked during dessiccation and microscopic elements are collapsed.

Collection examined: Village Ngoli, Kindu, Maniema, Zaire. 10 Sept. 1990. Coll.: Y. *Ankei* A1. Songola name: alulu. Used as food.

#### 5. Homobasidiomycetes; *Agaricomycetideae*; Tricholomatales; *Pleurotaceae*

*Lentinus sajor-caju* (Rumpf.: Fr.) Fr.

Macroscopic description: One of the collections consists of three connate lignicolous basidiocarps, partially eaten by insects. The other of two intact specimens. The main characters are well visible: the pileus is deeply infundibuliform, smooth to fibrillose, ochraceous to reddish brown, gills are decurrent, narrow, not

furcate, concolorous or darker brown and the stipe is paler, fibrillose, furnished with remnants of an annulus just below the gill attachment. The specimens are lignicolous.

Microscopic description: Cells are in a rather poor state.

Spores (Fig. 6) narrowly cylindrical to slightly allantoid,  $5-7 \times 1.5-1.8 \mu\text{m}$ , hyaline, smooth, non amyloid, with a tiny apiculus.

Basidia very small,  $12-18 \times 3-5 \mu\text{m}$ , not seen mature (mostly collapsed on the examined material). Cheilocystidia (Fig. 7) have been found in the specimens numbered A5 and they are irregularly cylindro-lageniform,  $25-35 \times 4-7 \mu\text{m}$ .

Gill trama and structure are dimittical, very dense. The skeletal hyphae are densely interwoven, multifurcate, their terminal parts (Fig. 8) emerging in the subhymenial layer,  $\times 2.5-5 \mu\text{m}$  at this level, with thickened walls.

Suprapellis is a cutis of repent, thin-walled hyphae.

Discussion: Rather few microscopic details can be seen on this collection, but they are very typical of the common palaeotropical *L. sajor-caju*, as well as the macroscopic characters (Pegler, 1983). It is known to be eaten in Vietnam (Joly & Perreau, 1977) and Malaysia (Corner, 1981).

Collection examined: Village Ngoli, Kindu, Maniema, Zaïre. 5 Sept. 1990. Coll. *T. Ankei* A5. Songola name: ka. óbóbyá (to.). Used as food.—Village Ngoli, Kindu, Maniema, Zaïre. 5 Sept. 1990. Coll. *Y. Ankei* A9. Songola (=Swahili) name: saidia. Used as food.

#### *Lentinus* sp.

This collection, labelled A10, is a moulded and sterile *Lentinus* species. It is obviously not *L. sajor-caju* because of the squamulose pileus and the absence of veil. Unfortunately, no spores were observed and very little detail about the structure can be obtained from this weak material.

Collection examined: Kindu, Maniema, Zaïre. Sept. 1990. Coll. *Y. Ankei* A10. Songola (=Swahili) name: saidia. Used as food.

### 6. Homobasidiomycetes; *Agaricomycetidae*; Tricholomatales; *Tricholomataceae*

#### *Armillaria camerunensis* (P. Henn.) R. Courtecuisse comb. nov.

Basionym: *Armillaria mellea* var. *camerunensis* P. Hennings 1895 Bot. Jb. 22: 107

= *Armillariella camerunensis* (P. Henn.) Singer 1986 Ag. mod. tax., Ed. 4: 263

Macroscopic description: The collection consists of a single basidiome, demonstrating the following characters. Cap about 4 cm in diam., convex with a depressed disc and a thin, probably wavy or lobate, thin and striate margin. Colour brownish. It is difficult to decide whether the cap surface was squamulose or smooth because the densely crispate appearance of the exsiccatum. Microscopic structure (see below) suggests it was finely squamulose. Gills not very crowded, rather broad, ventricose and slightly decurrent to decurrent. Stipe central, very dark on the exsiccatum, about  $4 \times 0.4$  cm (measured dried), longitudinally striate.

Veil remnants almost absent; very few fibrils or patches of remnants may be seen in the upper part. Flesh rather thin.

Microscopic description: Cells in a rather bad state in the hymenium, and specimens contaminated with an *Aspergillus* species.

Spores (Fig. 9) pale or hyaline, inamyloid, elliptical to subamygdaliform,  $6-9 \times 4.5-6.5 \mu\text{m}$ , often rather stout or even subglobose. Apiculus very prominent, often excentric toward ventral face. Wall thick, up to  $1 \mu\text{m}$ , multi-layered and probably very complex in structure (examination has been exclusively made in light microscopy) and details very hard to be seen. In fact, the complete ornamentation pattern as described below is seen on some over-mature spores and paradoxically in spores found on the cap surface (these spores probably from the spore-print of another basidiome in the same cluster, what means naturally ejected and fully mature ones). Exosporium apparently smooth, sometimes loosening when spores become very old. Endosporium much more complex, decidedly cyanophilous, at first smooth, then developing small obuse lenses all around, giving a more or less echinulate pattern (very seldom seen like this) in optical section. The surface of the endosporium shows a striate pattern, very prominent and spectacular on some spores, especially when they are rotating in the fluent mouting medium. In polar view, some spores show a "*Clitopilus*-pattern," with very small (about 20) crests, corresponding to the end of the striations seen on the profile view.

Basidia (Fig. 10) 4-spored,  $30-35 \times 4-9 \mu\text{m}$ , cylindrical to clavate. Some sclerobasidia with the wall up to  $1 \mu\text{m}$  and slightly yellowish have been seen.

Cystidia not seen (although several mounts have been realized, I felt to find the cheilocystidia).

Sub-hymenial layer decidedly gelatinized,  $20-35-(4) \mu\text{m}$  thick, made of thin interwoven hyphae.

Gill-trama parallel to subparallel, made of thick hyphae,  $\times 15-30 \mu\text{m}$ , the wall up to  $1 \mu\text{m}$ , hyaline.

Clamp connections absent.

Suprapellis (Fig. 11) an interrupted trichodermium, with small clusters of semi-erected hyphae, the elements  $40-100-(130) \times 12-28-(32) \mu\text{m}$ , elongate elliptical, thick-walled, yellow-brownish by a smooth to cracked or encrusting parietal pigmentation, laying on the medio-and subpellis, made of hyaline repent hyphae, up to  $\times 15-35 \mu\text{m}$ .

Discussion: This collection has been quite puzzling because of the lack of an annulus (not leading easily to an *Armillaria*), and because of the obviously ornamented spores for which it is so difficult to get a good idea of the exact pattern of this ornamentation. The trichodermial elements of the suprapellis, probably building small squamules on the pileus, and the lack of clamps finally led to this genus. But the occurrence of striate spores in *Armillaria* is an often ignored character. Mention of this is only made, as far as I know, in Kile & Watling (1988), Singer (1986) and Watling (1992). These striate spores seem to be a discriminating character between *A. camerunensis* and *A. fuscipes* Petch, as described by Watling (1992).

Collection examined: Ngoli Village, Kindu, Maniema, Zaire. 5 Sept. 1990.

Coll. *Y. Ankei* A11. Songola name: selesélé. Used as food.

7. Homobasidiomycetes; *Agaricomycetidae*; Tricholomatales; *Dermolomataceae*

*Cyptotrama songolarum* R. Courtecuisse sp. nov.

Macroscopic description: The collection consists of a single dried basidiocarp in a rather good state, although the stipe is partially broken toward the basis.

The cap is 45 mm wide, apparently slightly convex with an enrolled margin when fresh, with a prominent blackish umbo and areolate or irregular surface. The original colour should be rather bright orange brown, probably darker toward the center. The cap surface is covered with adherent particles of sand or soil (unfortunately covering the probable flocci or little squamules), so that we can assess it is somewhat viscid when fresh. The gills are rather crowded, bright rusty brown, broadly adnate to slightly decurrent. The stipe is  $50 \times 8-13$  mm, more or less cylindrical, darker than the pileus, fibrillose. Flesh seems to be rather thin.

Microscopic description: Spores (Fig. 12) elliptical, hyaline, smooth  $4-5.5-(6) \times 2.8-3.5-(3.8) \mu\text{m}$ , non-amyloid, with a distinct apiculus.

Basidia (Fig. 13) clavate, small,  $15-18 \times 3-6 \mu\text{m}$ , bearing four sterigmata, very often organised in clusters.

Subhymenial layer made of thin, interwoven hyphae, the sub-basidial ones widened at apex and bearing 2 to 4 basidia. Hymenophoral trama regular, made of hyaline hyphae,  $\times 5-25 \mu\text{m}$ , wider in the mediostratum. Some lactifers are present, especially toward the subhymenium.

Clamps totally absent.

Pleurocystidia scattered, identical with the cheilocystidia (Fig. 14), the latter rather numerous (but gill-edge not sterile), cylindrical to clavate or broadly utriform,  $25-35-(45) \times 5-18 \mu\text{m}$ , hyaline, rather fragile but sometimes with more or less thickened wall.

Suprapellis (Fig. 15) trichodermial or tending to be epithelial by places, made of articulate elliptical to spherical elements, organized in small clusters (probably forming tiny squamules macroscopically); the elements of this suprapellis are very variable in shape and size,  $5-40 \times 5-20 \mu\text{m}$ , more or less thick-walled (wall up to  $1 \mu\text{m}$  and slightly rugose). Subpellis about  $150 \mu\text{m}$  thick, more or less gelified, made of repent, sometimes moniliform, often capitate hyphae (Fig. 16),  $\times 1.5-3.5 \mu\text{m}$ . Hyphae of the context more banal,  $\times 5-15 \mu\text{m}$ .

Discussion: The species belongs to sect. *Xerulina* (Sing.) Sing. of the genus *Cyptotrama*. None of the described species in the section (Redhead & Ginns, 1980) fit in the above combination of characters. The most closely related species seems to be the African *C. deseynesiana* Pegler, differing by the slightly narrower spores,  $3.5-5.8 \times 2-3.2 \mu\text{m}$ , the very slender cheilocystidia, and especially the presence of clamp connections (Pegler, 1966, 1977). The lack of macroscopic notes on fresh material is very unfortunate but the microscopic details described above could help to recognize this taxon in further collections and complete its description.

Collection examined: Tongomacho village, toward Kindu, Maniema, Zaïre. 19. Sept. 1990. Coll. *Y. Ankei* A3. Songola name: i. mbúliká (ma.). Used as food.



*Cyptotrama songolarum* R. Courtecuisse sp. nov.

*Pileus 4.5 cm latus, convexus, mammosus, brunneo-aurantiacus vel brunneus, viscidulus, subtiliter flocculosus. Lamellae confertae, ferrugineo-brunneae, adnexae vel subdecurrentes. Stipes circa 5 × 1.5 cm, cylindraceus, brunneus. Sporae 4-5.5-(6) × 2.8-3.5-(3.8) μm, ellipticae, hyalinae. Basidia clavata, 15-18 × 3-6 μm, 4-sporigera. Fibula nulla. Pleurocystidia remota, cheilocystidia numerosa, cylindracea, clavata vel utriformia, 25-35-(45) × 5-18 μm, hyalina. Suprapellis trichodermatis modo vel subepitheliaceus, ex elementis ellipticis vel sphaericis 5-40 × 5-20 μm, parietis crassus usque ad 1 μm. Subpellis ex elementis repentis, multistrangulatis, saepe capitatis, × 1.5-3.5 μm. Typus in Tongomacho, circa Kindu, Maniema, Zaire. 19 Sept. 1990. Y. Ankei A3 in herbario Lille Universitatis (Herb. RC) conservatur.*

8. Homobasidiomycetes; *Agaricomycetidae*; Amanitales; *Termitomycetaceae*cf. *Termitomyces* sp.

This collection is in a very bad state, at least microscopically, as the cells are all collapsed. It consists in a single basidiocarp with a very long, radicate stem, and a cap obviously furnished with a prominent umbo (pronotum). It has been partially eaten by insect larvae and almost cooked during dessiccation.

Macroscopy suggests a *Termitomyces* sp., but no further identification can be made.

9. Homobasidiomycetes; *Agaricomycetidae*; Cortinariales; *Crepidotaceae**Gymnopilus* sp.

Macroscopic description: The collection consists in two basidiocarps, one of them being partly destroyed by over-heating during the dessiccation. The pilei, about 4 cm in diam., seem to be smooth (not scaly), brown orange, with a probably striate margin. Gills are bright fulvous or even orange by place with spore deposit, apparently not crowded and adnate emarginate. The stipes, 25-45 × 2.5-4 mm, are central, brownish, without any prominent trace of a veil. Some remnants of earth at the base of one stipe probably indicates that the species is terricolous.

Microscopic description: Spores (Fig. 17) elliptical in average, but rather often shortly elliptical to subglobose, more rarely subamygdaliform, 7-8.5 × 4.5-5.2 μm, rusty brown s.l., regularly verruculose, the ornamentation very well delimited, up to 0.3-(0.4) μm high, made of isolated to somewhat confluent warts. There is a prominent supra-apicular zone where the warts are much lower or even absent, delimited by some bigger ones. Apiculus rather small.

Basidia (Fig. 18) 4-(2)-spored, rather small, 14-18 × 4-8 μm, with stout sterigmata.

Subhymenial layer pseudoparenchymatous. Hymenophoral trama bright yellow in alcali, made of parallel hyphae, × 5-15 μm, up to × 30 μm in the mediostratum,

with thickened, smooth walls.

Clamp connections very abundant.

Pleurocystidia probably absent (some cystidioid elements seen by places, but not everywhere in the preparation, so that they can be suspected to be only in submarginal positions. The rather bad state of the hymenium does not allow more precision about this). Cheilocystidia (Fig. 19) present, but gill edge fertile, 15–35  $\mu\text{m}$ , lageniform to cylindrical, sometimes with a more inflated base and a narrow neck, occasionally furcate at apex.

Suprapellis a cutis, badly preserved but showing a dominant smooth parietal pigmentation, very few hyphae having encrusting parietal pigmentation. Some hyphae appear to be uniformly bright yellow and could possess an intracellular pigment as well.

Discussion: The attribution of this collection to *Gymnopilus* is quite certain, but I feel reluctant to go further in the determination, not being familiar enough with rusty-spored African species of agaricoid fungi. On the other hand, macroscopic details are wanting, and it is necessary to get a full description indicating the veil characters, the aspect of cap surface when fresh, and ecological details before deciding its identity.

It is interesting that this species is eaten by the Songola people. *Gymnopilus* species are rarely reported to serve as food, as most of the taxa in that genus are scientifically or empirically known as bitter or even toxic.

Collection examined: Village Ngoli, Kindu, Maniema, Zaïre. 5 Sept. 1990. Coll. Y. Ankei A8. Songola name: kimbuyumbuyu (bi.). Used as food.

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**Appendix 1.** Protocol for the collection, description and conservation of fungi.

Collectors have to take a few elementary precautions, in order to provide taxonomists with valuable materials of fungi from various parts of the world. The goal of this note is to give some data about technical and practical aspects related to this problem.

**1. Collecting the Specimens**

- a. What to collect?: As a rule, it is useless to collect primordia alone, over-mature specimens, or even single basidiocarps (unless the involved species always seems to occur solitary). The best collections consist of several individuals, if possible at different stages of development. Nevertheless, it is preferable to leave some fruitbodies in the field for further sporulation.
- b. Collect carefully and avoid fiddling about the material: It is primordial to collect the whole basidiocarp (fruitbody) of the fungus. Special attention should be paid to the possible presence of some volva or some bulbous shape toward the base of the stem, to any root-like structure below the soil surface, and other things of the same kind. On the other hand, during and after the collection, it is necessary to handle the sample as little as possible. Some important characteristics are very fugacious and could disappear after careless handling (see below).
- c. Take a quick look to trace possible fugacious details: In order not to miss some of these soon disappearing features, it is possible to look carefully if some element (cap, margin of the cap, gill edge, stem) bears flocci, remnants of veil, pruina, detersile scales, fibrils or any other element. Note these on site. Tracing a peculiar smell should also be attempted when collecting the specimens.
- d. What about ecology?: It is important to pay special attention to the ecology of the samples. So, it is necessary to note as carefully as possible, in the field, on which substrate, under which tree or near which flowering plant, among which mosses, etc., the collected fungus occurs. It is sometimes difficult to ascertain all these elements, but some details about the environment of the fungus should be provided anyway, at least type of landscape, type of natural habitat, data on hygrometry of the substrate, and any other important parameter of the involved ecosystem.
- e. Use a field note-book: All these preliminary remarks must be written down. This step comprises the attribution of a collecting-number, which will be reported later on the description form and on the herbarium sheet.
- f. Carry the material back to the (field-) laboratory: The collections could also be injured during the transportation. It is recommended to carry them separately, if possible in small boxes (slide-boxes, film-boxes or larger containers for example) after making sure that they cannot move inside the box.

## 2. Describing the Collections

- a. Preliminary filling of the description form: The description of any collection must indicate at least some preliminary information, e.g.
  - (1) numbering of the collection (any system could be used, provided that each collection bears a serial number), (2) name of the collector(s), (3) location (city, village, place..., mentioning of the district, state, country...) where the fungus was growing, if necessary with the geographical coordinates or some details concerning the vicinity (river, mountain...) as reference marks, (4) date, (5) data about ecology, as accurate as possible. A provisional name can be added if the collector has an idea about the (generic or specific) identity of his or her samples.
- b. Sketch or paint the collections: A black and white sketch is highly needed to give an idea about the shape of each collection. Coloured drawings or paintings (aquarelle or other) are better but more time-consuming. A good range of coloured pencils gives very good results after some experience. It is necessary to show at least one adult specimen (preferably several basidiocarps, at different stages), with all details and also a cross-section of the fungus. It is also possible to photograph the collected fungus. Good slides are valuable, but this does not replace the description itself (see below). Both documents are complementary. In case you take a slide, make sure that it presents the whole characteristics of the fungus (view from above, from below, from aside and if possible of a cross-section).
- c. The description itself: The identification elements are numerous and should be noticed as carefully as possible, after the following scheme.

## 3. What about the Cap (Pileus)?

- a. Its shape: It is necessary to observe this shape at different stages of development (young, mature...), from above: circular, flabelliform, spathuliform, reniform..., from aside: even, applanate, convex, hemispherical, campanulate, (broadly or narrowly) conical, truncate, obtuse, acute, concave, (slightly or deeply) infundibuliform, depressed, umbilicate, papillate.... The description may combine several of these characters, for example cap truncately conical with a narrow central depression....
- b. Its margin: (Same remark as above) the shape (cross-section from aside): straight, deflexed, involute, reflexed, revolute, exceeding lamellae; the pattern (from above): even, lobate, flexuose, wrinkled, pectinate, corrugated, dentate, denticulate, fimbriate, striate (density, length of the striation), scrobiculate, granulose, pruinose, fibrillose...; other parameters: opaque, transparent....
- c. Its surface: Colour(s) (the description of colours is a true problem because each collector has his own references. The use of a code is recommended but unfor-

tunately sometimes impossible), is there any change of colour when the surface is bruised? Hygrophanicity (change of colour on drying; in this case, note both occurring colours and pay special attention to the striation toward margin), aspect of the surface: smooth, shiny, dull, mealy, scaly (size, shape, pattern, density and colour of these scales), granulose, wrinkled (pattern of the wrinkles: radiating, anastomosing...), fibrillose, downy, hairy, tomentose, strigose, rimose, scrobiculate..., presence of flocci, detersile elements originating in the general veil....

- d. Its size: In diameter (from youth to adult stage) and if necessary in height.
4. What about the Gills (or Pores)?
    - a. Their density: Close, medium distant, with or without intermediate smaller gills (not reaching the stem).
    - b. Their shape, from below: Simple, furcate, intervenose, anastomosing, with a collarium; from aside (cross-section): Transvenose, narrow, wide, horizontal, ventricose, arcuate, triangular, sinuate.
    - c. Their insertion (cross-section): Free, adnexed, adnate, emarginate, decurrent (sometimes a combination of several features is possible: Emarginate with a decurrent tooth...).
    - d. The gill-edge: Shape: Even, undate, undulate, crenate, crenulate, serrate, serrulate, eroded, fimbriate; colour: Is it the same colour as the gill itself?
    - e. Their colour: When young, when mature. Is the colour even or with darker patches or any other pattern? If possible, it is useful to make a spore-print.
  5. What about the Stipe?
    - a. Its consistence: Fragile, firm, flexible, horny,...: in cross-section: Solid, stuffed, fistulose, chambered.
    - b. Its insertion: Central, excentric, lateral.
    - c. Its size: It may be absent or rudimentary; otherwise: Length, diameter (at apex, at base if different).
    - d. Its shape: Cylindrical, tapering upwards or downwards, clavate, straight, flexuose; at base: With rhizomorphs, with pseudorhiza, subbulbous, bulbous, marginately bulbous....
    - e. Its colour: See above (cap).  
Its ornamentation: Very important; pay special attention to the presence or

absence of general veil (volva-like remnants; of which kind, and to the partial veil: Ring (of which kind, colour,...), cortina (thickness, colour...)). As to the stipe itself, is it smooth, pruinose, scally...? (see 'look of the surface' under the heading 'cap').

#### 6. What about the Flesh?

- a. Thickness in different parts of the fruitbody, colour(s), is there any change of colour when bruised, after cutting, etc., hygrophanicity, consistence....
- b. Smell: A very important characteristic. If several specimens are available, you may triturate one to get a stronger smell. The smell is also better expressed if several specimens are placed inside the hands, building a conch-like container, the nose being placed through the opening. Under cold conditions, gently blowing one's warm breath inside the conch-like hands can help to express the smell.
- c. Taste: Although there is some risk, it is sometimes important to notice this feature, at least for some genera. In any case, the taken piece might be rather small (near the margin of the cap), and it is safer to spit it after mastication. Especially under tropical conditions, collectors must be careful, and their own health always has to come first.... This operation might be restricted to the already determined genera (non-poisonous species, genera which taste is a discriminating parameter...).

#### 7. Chemistry?

In some cases, it could be useful to give some information on the macrochemical reactions of the fungus (especially on the flesh). If available,  $\text{FeSO}_4$  (crystal), phenol, acids, bases, etc. can be tried. Colour, intensity and rapidity of the reactions might be useful.

#### 8. Preserving the Specimens

After this descriptive operation, the collector must prepare the specimen for the herbarium.

The best solution is to dry up the samples. It is very easy as long as an ascending source of hot air can be used (place fungus on a radiator, on any drier or apparatus providing a good air circulation and heat). It is necessary to provide each collection with a small ticket mentioning at least the collecting-number (see above, preliminary data to report on the description form) before drying it up. Indeed, most specimens are hardly recognizable after dessication, and this will avoid mixing the collections.

If the specimens are small enough, they are simply placed on the drier, or they could even be dried up in some sunny and dry place. If they are rather thick or large, it is highly recommended to cut them into thin radial or longitudinal slices.

After dessication, it is important to avoid re-moisturing, which could lead to

the development of various moulds (especially in the Tropics). The dried specimens might be placed (each collection in an individual envelope or wrapper) in waterproof containers, along with some 'Silicagel' or any other drying material.

As a conclusion, it might be said that describing the fungi, intending to provide valuable material for further taxonomic research, is somewhat time-consuming. But this must not be discouraging; let's say that it is preferable to collect few specimens and provide them with a good description and preparation than to gather lots of unserviceable fungi.

#### NOTE

\*This is a slightly abridged edition of a paper which occurred in the *Flora of the Guianas*, *Newsletter* No. 8 (1991).