

The genus *Galerella*. A world-wide survey

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Abstract: A survey of the present state of knowledge of the genus *Galerella* is given. The true *Galerella plicatella* is reported for the first time in Europe, and *Galerella floriformis* is described as new. A world-wide key of species of *Bolbitiaceae* with irregularly undulate-plicate to strongly plicate-sulcate pileus is given, and colour plates of two species are presented.

Zusammenfassung: Ein Überblick über den derzeitigen Kenntnisstand in der Gattung *Galerella* wird gegeben. Die echte *Galerella plicatella* wird erstmals für Europa nachgewiesen, und *Galerella floriformis* wird als neue Art beschrieben. Ein weltweiter Schlüssel für *Bolbitiaceae* mit wellig-gefurchtem bis gefurcht-gekerbtem Hut wird gegeben, und zwei Arten werden farbig abgebildet.

The genus *Galerella* was erected by EARLE (1909) to accommodate *Agaricus plicatellus* PECK because of its deviating pileus surface reminding of species of the genus *Coprinus*. This new genus was accepted by SINGER (1951). KÜHNER (1935: 137) recognizes within the genus *Conocybe* a section *Plicatellae*, wherein he documents European and North African finds of *Conocybe plicatella* (PECK) KÜHNER. He mentions *Galera crocospora* (BERK. & CURT.) SACC., *Galera flava* PECK, *Galera pulchra* CLEMENTS and *Bolbitius conocephalus* ss. RICKEN as further species with plicate-sulcate pileus surface, but assumes that all these taxa probably belong to section *Conocybe* due to their lecythiform cheilocystidia. After examination of the type material HORAK (1968) accepts the genus and notes “Das Typusmaterial stimmt recht gut mit dem aus Europa unter dem Namen *Conocybe plicatella* (PECK) KÜHNER bekannten Pilz überein”. Despite some reservations (WATLING & GREGORY 1981: 127 “doubtful the same as European collections”) European collections were further listed as *Galerella plicatella*. Only recently ARNOLDS & HAUSKNECHT (2003) decided to describe European finds, which hitherto were determined as *Galerella plicatella*, as new under the name *Pholiotina sulcata* ARNOLDS & HAUSKNECHT, after comparing several European collections with the type from the USA and other non-European material (see discussion in ARNOLDS & HAUSKNECHT 2003).

The following comments have to be made on the above mentioned taxa as probable members of the genus *Galerella* listed by KÜHNER (1935) and later SINGER (1986: 547).

***Galera crocospora* (BERK. & CURT.) SACC.**

According to WATLING & GREGORY (1981) it is "undoubtedly a member of the genus *Conocybe*". The first author examined the type and noted the following microscopical characters: spores 11.5-14.5 x 8-10 μm , in average 13.0 x 8.5 μm , ellipsoidal with thick wall and wide germ-pore, dark brown in KOH. Basidia 4-spored, cheilocystidia not found (after HESLER 1974, in herb: cheilocystidia lecythiform, 15-23 x 5-8 μm , flask-shaped, with a short neck and abrupt capitellum). Stipe covering as in *Conocybe* sect. *Pilosellae*, pileipellis hymeniform. We are in accordance with WATLING & GREGORY (1981), that this species is a member of the genus *Conocybe* sect. *Pilosellae* and not a *Galerella*.

***Galera flava* PECK**

The species was combined by KÜHNER (1935) into the genus *Conocybe*, but without citing the basionym. Unfortunately, up to now we could not examine the type material, but in his unpublished notes to the type HESLER states "Pleurocystidia and cheilocystidia none. The type material is very sparse. I failed to find either squamules on the pileus or cystidia on the gills."

WATLING & GREGORY (1981) consider this species to be a real *Conocybe*, although the description of the pileus "surface breaking up into squamules" does not clearly speak for it. In view of all these facts it seems advisable to consider *Galera flava* as a nomen dubium.

***Galera pulchra* CLEMENTS**

Also here we could not examine the type material up to now. ATKINSON (1918) lists *Galerula pulchra* (CLEM.) MURR. under the species with "cystidia specialised, only on edge, lecythiform", thus indicating a member of the genus *Conocybe*, as has later been supposed by KÜHNER (1935).

***Bolbitius conocephalus* (BULL.: FR.) FR. ss. RICKEN**

[= *Galerella conocephala* (BULL.: FR.) BON]

Agaricus conocephalus BULL. was combined by MOSER (1951, inval.) into the genus *Galerella*. He adds a short description corresponding to the interpretation of RICKEN (1915) and also cites the colour illustration of RICKEN (1915: 23). MICHAEL & al. (1981) published a copy of this illustration. The viscid-glistening pileus apex as well as the lamellae blackening from the lamellar edge onwards are not in the least conform with the *Bolbitiaceae* genus *Galerella*. WATLING & GREGORY (1981) doubt if the interpretation of MOSER (1951) is in accordance with that of BULLIARD (1792) and if this taxon is more closely related to *Galerella plicatella* at all. As there are no recent finds which could be interpreted as belonging to this taxon, *Galerella conocephala* also has to be interpreted as unclear and doubtful species.

The maintaining of *Galerella* as a separate genus is under dispute, but in our opinion is strengthened by the discovery of an arachnoid veil which appears to be

completely different from that in *Pholiotina* and *Conocybe*. Unfortunately, as far as we know up to now no thorough molecular biological studies have been performed in the *Bolbitiaceae*. Consequently for evaluating the hierarchy within this family only conservative systematic approaches are available.

In the following we want to give a survey of all species belonging to the genus *Galerella* according to the present state of knowledge and we add a world-wide key of *Bolbitiaceae* with irregularly undulate-plicate to strongly plicate viz. *Coprinus*-like pileus:

- 1 Pileus distinctly viscid-mucous, even in dry weather conditions
species of *Bolbitius*
- 1* Pileus dry or slightly viscid only in very humid weather conditions, soon dry 2
- 2 Pileus completely dry, surface irregularly undulate to plicate, not *Coprinus*-like, reddish brown, without veil; Europe
Pholiotina sulcata
- 2* Pileus very young often slightly viscid, soon dry, strongly plicate-sulcate like some species of *Coprinus*; white, yellow or pale brown; veil present or not 3
- 3 Spores subcylindrical, thin-walled without germ-pore; without cheilocystidia; pileus soon strongly splitting radially and then becoming flower-like; Vanuatu
Galerella floriformis
- 3* Spores ellipsoidal, lentiform or not, with distinct germ-pore; cheilocystidia always present 4
- 4 Pileus purely white when young, up to 8 mm broad; Sri Lanka
Galerella microphues
- 4* Pileus yellow to pale brown when young, mostly broader than 10 mm 5
- 5 Spores ellipsoidal, never lentiform, thin-walled; cheilocystidia large, up to 80 µm long; Brazil
Galerella spec.
- 5* Spores always sublentiform to lentiform, sometimes subhexagonal; cheilocystidia shorter, up to 60 µm long 6
- 6 Spores with distinct double wall, sublentiform, yellow-brown in KOH; cheilocystidia 10-20 µm broad, vesiculose to lageniform with thick, broad neck, apex obtuse; Brazil, Mauritius
Galerella fibrillosa
- 6* Spores more thin-walled, lentiform, sometimes subhexagonal, orange yellow to pale yellowish-brown in KOH; cheilocystidia up to 12 µm broad, lageniform with thin neck, sometimes subcapitate; Asia, North- and South-America, South Europe
Galerella plicatella

Taxonomic survey

Galerella fibrillosa HAUSKNECHT in HORAK & HAUSKNECHT 2002, Österr. Z. Pilzk. 11: 236.

This new species, described only one year ago, is known from Mauritius (holotype) and from Brazil. A detailed macro- and microscopical description is given by HORAK & HAUSKNECHT (2002).

Galerella floriformis HAUSKNECHT, spec. nova (Colour fig. II, Fig. 1 a-f)

Descriptio latina:

Pileus 10-15 mm latus, 8-11 mm altus, glandiformis, cito expansus, tum 16-33 mm latus, usque ad 20 mm altus, juvenile senatus umbrinus, pallide brunneus, ad marginem pallidiore luteus, griseo-armeniacus, vetus uniformiter clarobrunneus, bruneo-aurantiacus, juvenile distincte crenulatus, mox secedens florum similis, siccus, non viscidus. Pileo juvenile velum arachnoideum ephemerum. Lamellae anguste adnatae, haud ventricosae, confertae, parum undulatae mox anastomosantes, pallide cinnamomeae, acie concolori crenulata, vetus celeriter deliquescentes. Stipes 40-75 mm longus, 2,5-4 mm latus, basis usque ad 6 mm lata, cavus, albus, albidus, valde longitudinaliter striatus, apice pruinatus, cetera glaber. Caro fragilis, albida, deliquescens odore intense frugoso. Sporae 7-11 x 3,5-4 μm , medio 8,8-8,9 x 3,8-3,9 μm , anguste ellipsoideae usque ad subcylindricae, tenuitunicatae, sine poro germinativo, flavo-hyalinae in KOH. Basidia tetrasporigera, 18-35 x 8,5-12 μm . Fibulae abunde basi basidiorum tramaque. Cheilocystidia nulla. Velum e hyphis 3-4 μm latis, fibulatis constans. Pileipellis hymeniformis constans ex elementis cylindraceo-clavatis, rare sphaeropedunculatis, 25-37 x 9-12 μm , pileocystidia nulla. Habitat in terra arenosa littorali.

Typus: Vanuatu, Efate island, Blue Water Beach, on sandy soil near *Pandanus* spec., 8. 4. 2003, leg. INGRID HAUSKNECHT (WU 22832, holotypus).

Characters:

Pileus: unexpanded 10-15 mm broad, 8-11 mm high, glandiform, quickly expanding and then 16-33 mm broad, up to 20 mm high; young and fresh in the centre siena, cognac, light brown (KORNERUP & WANSCHER 1975: 6DE7, 6D7), paler towards the margin, golden blond, grey orange (5C4, 5BC4); older almost uniformly pale brown, brown orange (6D8, 6C8); young distinctly sulcate similar to a *Coprinus*, soon almost up to the centre splitting in parts and the single part expanding and turning up as in a flower; dry, not viscid. Veil distinctly present on the young pileus as single, white, arachnoid fibrils, soon disappearing.

Lamellae: narrowly adnate, hardly ventricose, very crowded, slightly undulate and soon anastomosing, pale brownish yellow with concolorous, crenulate lamellar edge; old quickly deliquescent.

Stipe: 40-75 mm long, 2.5-4, base up to 6 mm thick, enlarging towards base, hollow, throughout white to whitish, strongly longitudinally striate, apex pruinose, otherwise smooth.

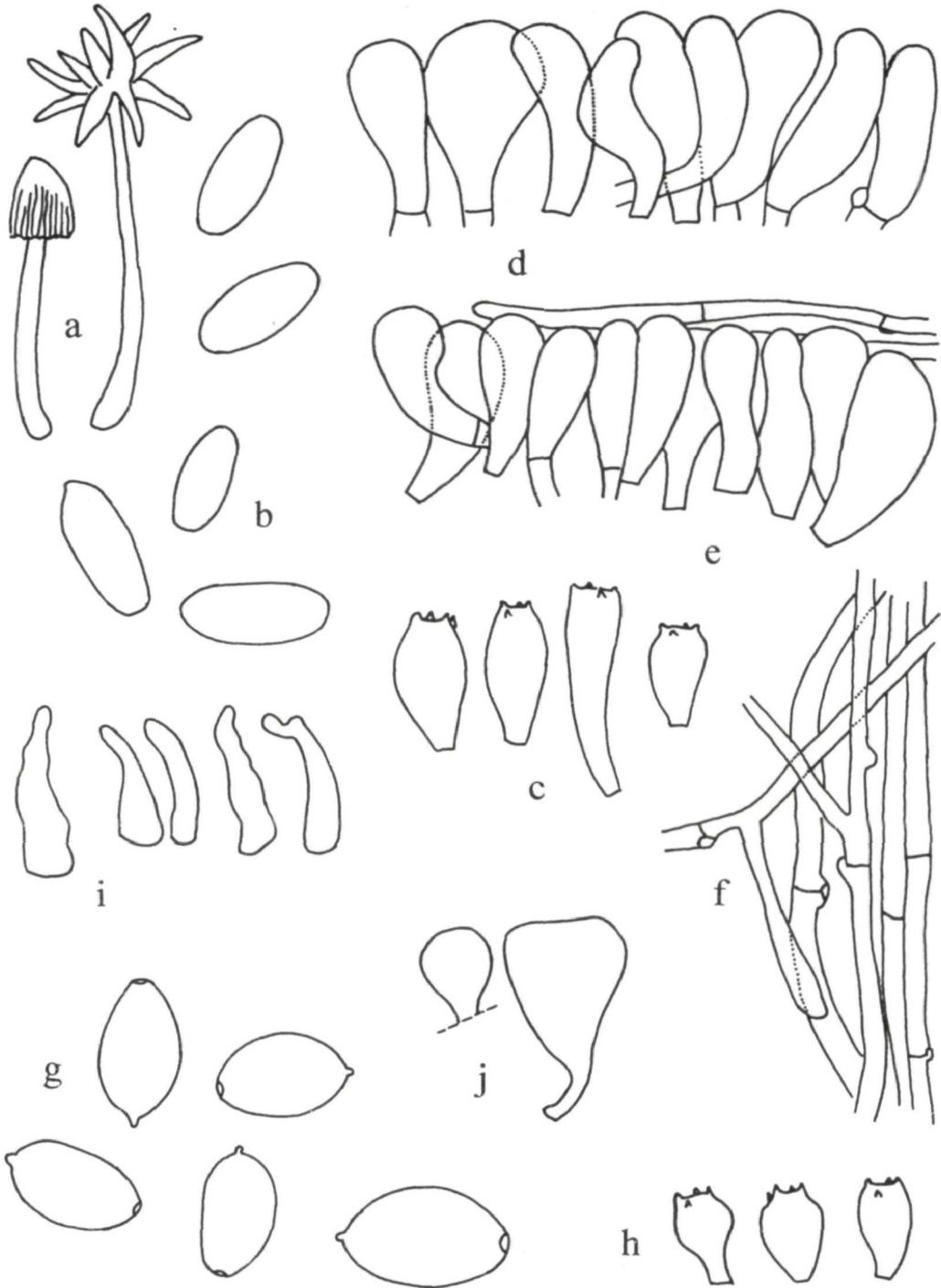


Fig. 1 a-f. *Galerella floriformis* (holotype). a habit, x 1; b spores, x 2000; c basidia, x 800; d pileipellis from mature (expanded) basidiocarp, x 800; e pileipellis from young basidiocarp, x 800; f hyphae of the veil, x 800. g-j. *Galerella microphues* (holotype). g spores, x 2000; h basidia, x 800; i cheilocystidia, x 800; j elements of pileipellis, x 800.

Context: brittle, whitish, when deliquescing exhausting an intensive fruity-sweetish smell (with a component of fermenting pears or apricots).

Spores: 7-11 x 3.5-4 µm, in average 8.8-8.9 x 3.8-3.9 µm, Q = 1.9-3.1, small ellipsoidal to almost cylindrical, thin-walled, smooth, germ-pore absent, yellowish-hyaline in KOH.

Basidia: 4-spored, 18-35 x 8.5-12 µm.

Clamp connections: abundant at the base of the basidia and in the trama.

Cheilocystidia: not found despite intensive search.

Veil: consisting of 3-4 µm thick hyphae, with clamp-connections at almost each septum.

Pileipellis: hymeniform, consisting of cylindrical-clavate, rarely spaeropedunculate elements, 25-37 x 9-20 µm, pileocystidia absent.

Habitat: on sandy soil near the coast, near *Pandanus* spec.

Collection examined (besides type): **Vanuatu:** Efate island, Blue Water Beach, 10. 4. 2003, leg. A. HAUSKNECHT (WU 22833).

Galerella floriformis is a very spectacular member of the genus, macro- as well as microscopically. At first sight the mature fruitbodies with their completely split pilei were taken for fallen, stipitate flowers of a tree by the first author. Further finds should demonstrate if this remarkable splitting of the pileus really is a constant and species-specific character. All six mature pilei of the type collection showed this phenomenon. Microscopically the almost cylindrical, very pale spores without germ-pore and the absence of cystidia are unique in the *Bolbitiaceae*.

***Galerella microphues* (BERK. & BR.) PEGLER 1986**, Kew Bull. Add. Ser. 12: 394 (Fig. 1 g-j)

Characters:

Pileus: 6-8 mm diam., membranous, convex soon appanate or slightly depressed: surface white drying brownish, plicate-striate to the centre, smooth, glabrous, dry, not viscid; margin crenate.

Lamellae: free to adnexed, light ochraceous brown, ventricose, up to 1 mm broad, distant, with occasional lamellulae.

Stipe: 10-17 mm long, 0.5-1 mm thick, filiform, with a minutely bulbous base, hollow; surface white, translucent, glabrous, smooth.

Context: very thin.

Spores: 8-11 x 5-6.5 µm, in average 9.2 x 5.5 µm, Q = 1.6-1.9, ellipsoidal, smooth, with single wall and distinct, up to 1 µm broad germ-pore, orange yellow in KOH.

Basidia: 15-20 x 8-10 µm, 4-spored, sphaeropedunculate with short sterigmata.

Clamp connections: present.

Cheilocystidia: 20-30 x 4.5-8.5 µm, ventricose with a tapering neck; lamellar edge sterile.

Pileipellis: hymeniform, consisting of subglobose to pyriform, hyaline, thin-walled elements, 16-35 x 1-20 µm; no cystidia or velar fragments seen.

Habitat: on sandy soil.

Collection examined: Sri Lanka: Kandy Distr., Peradeniya, July 1869, leg. THWAITES 1203 (K, holotype).

The above macroscopical description is taken from PEGLER (1986). The microscopical data are from the type material studied by the first author.

***Galerella plicatella* (PECK) SINGER 1951 ("1949"), Lilloa 22: 490 (Colour fig. III, Fig. 2 a-d)**

Below we give a description of the first finds of the species in Europe.

Characters:

Pileus: 3-20 mm broad, conical-convex or convex, then hemisphaerical, often nearly applanate, with small umbo, surface slightly viscid towards the centre, dry otherwards, fulvous-brown with darker centre, then alutaceous-buff with orange-apricot disc, entirely striate and typically plicate-striate, often with thin, white velar remnants in the central zone.

Lamellae: adnexed, crowded, rusty-brown, with white to paler lamellar edge.

Stipe: 15-35 mm long, 0.5-1 mm thick, cylindrical with clavate to bulbous base, decorated by very thin and fugacious, but obvious white velar remnants, longitudinally striate, entirely pruinose, pure white, rarely in older specimens slightly ochraceous.

Context: very thin, fragile, white in the pileus, up to rusty-brown in the base of the stipe, unchanging. Smell and taste none.

Spores: 7-9 x 4.5-6 x 4-5.5 μm , in average 8.0-8.1 x 5.0-5.2 x 4.7-4.9 μm , ellipsoidal to slightly limoniform, somewhat lentiform, thin-walled with small (0.5 μm wide) germ-pore, yellow to ochre-yellow in KOH.

Basidia: 4-spored, 23-31 x 9.5-11 μm .

Clamp connections: present.

Cheilocystidia: mostly lageniform with long tapering neck, often flexuous or septate, branched, rarely subcapitate, 30-55 x 7-11 μm . Lamellar edge sterile.

Caulocystidia: similar to cheilocystidia, but more uniformly lageniform with broadened base and long, tapering neck, 25-55 x 14-20 μm .

Pileipellis: hymeniform consisting of sphaeropedunculate elements 20-35 x 10-15 μm , immixed with many lageniform pileocystidia and hair-like elements.

Habitat and distribution: The European collections are from grassland under *Quercus suber* L. Confirmed records of the species (besides those listed below from Brazil, India and the USA) are from Argentina (SINGER & DIGILIO 1953, mostly on humus in woods), and Trinidad (DENNIS 1953, under bamboo).

Collections examined: Italy: Sardegna, prov. Sassari, Calangianus, locality Catala, 22. 10. 2000, leg. M. CONTU (WU 22784); - - 28. 10. 2000, leg. M. CONTU (WU 22785); - - 13. 11. 2001, leg. M. CONTU (WU 22786).

Additional material examined: Brazil: Paraná, Curitiba, in pasture, 15. 4. 1980, leg. A. DE MEIJER (E 126415).

India: Kerala, Malappuram, Calicut University, Campus, 22. 6. 1997, leg. K. A. THOMAS (WU 20897); - - 23. 6. 1997, leg. K. A. THOMAS (WU 20898).

USA: New York, Cayuga County, Sterling, on grassy ground, without date, C. H. PECK (NYS, holotype, as *Agaricus coprinooides* PECK).

So far no publication on the genus *Galerella* or description of extra-European finds of *Galerella plicatella*, respectively, (EARLE 1909, SINGER 1951, SINGER & DIGILIO 1953, DENNIS 1953, HORAK 1968, PEGLER 1986, WATLING 1992, THOMAS & al. 2001, HORAK & HAUSKNECHT 2002) mentions the presence of a veil, even though it is very ephemeral and visible only on very young fruitbodies. Thus, we suspected that the finds of Italy represented a separate new species. However, the comparison with extra-European collections (India, Brazil) and the type from the USA showed that all microscopical characters, especially those of spores and cystidia, are in perfect accordance with *Galerella plicatella*, all the more this species is very variable in shape and size of spores and shape of the cheilocystidia (see SINGER & DIGILIO 1953, SINGER 1986). So we concluded that this veil collapsed so quickly in tropical weather conditions that it escaped observation so far.

We were supported in our opinion by the recent discovery of two tropical species (*Galerella fibrillosa*, *G. floriformis*) which clearly have a veil in young stages of development. In these species a whitish arachnoid veil up to the pileus centre was observed, which is completely different from that in the genus *Pholiotina* (as fringe on the margin of the pileus or as ring-like zone on the stipe).

Galerella plicatella was reported from Sardinia by CONTU & RUGGERO (1995). This collection represents the true *Galerella plicatella* and not *Pholiotina sulcata*; it is deposited in the herbarium CAG.

Galerella spec. (Fig. 2 e, f)

Microscopical characters:

Spores: 7-9 x 4-5 μm , in average 8.0 x 4.4 μm , Q = 1.7-1.9, narrowly ellipsoidal, flattened in side view, never angular or lentiform, thin-walled with small germ-pore, pale yellowish in KOH.

Basidia: 4-spored.

Clamp connections: present.

Cheilocystidia: 40-80 x 8-12 μm , lageniform with long, tapering neck, never capitate.

Pileipellis: hymeniform, consisting of sphaeropedunculate elements and lageniform pileocystidia.

Habitat: on decayed dicotyledonous twig in tropical rain forest.

Collection examined: Brazil: Paraná, General Carneiro, Fazenda São Pedro, 20. 12. 1989, leg. A. DE MEIJER (E 126416).

This collection was ascribed to *Galerella plicatella* by WATLING (1992). However, it differs from all other hitherto known finds by very narrow, non-lentiform spores and extremely long cheilocystidia. The shape of the spores is somehow intermediary between the stronger lentiform spores of extra-European collections and the weaker lentiform spores of collections from Sardinia. The cheilocystidia are much larger and more ventricose. Only further observations and above all good macroscopic descriptions will reveal if this collection is within the variation of *Galerella plicatella* or represents a taxon of its own.

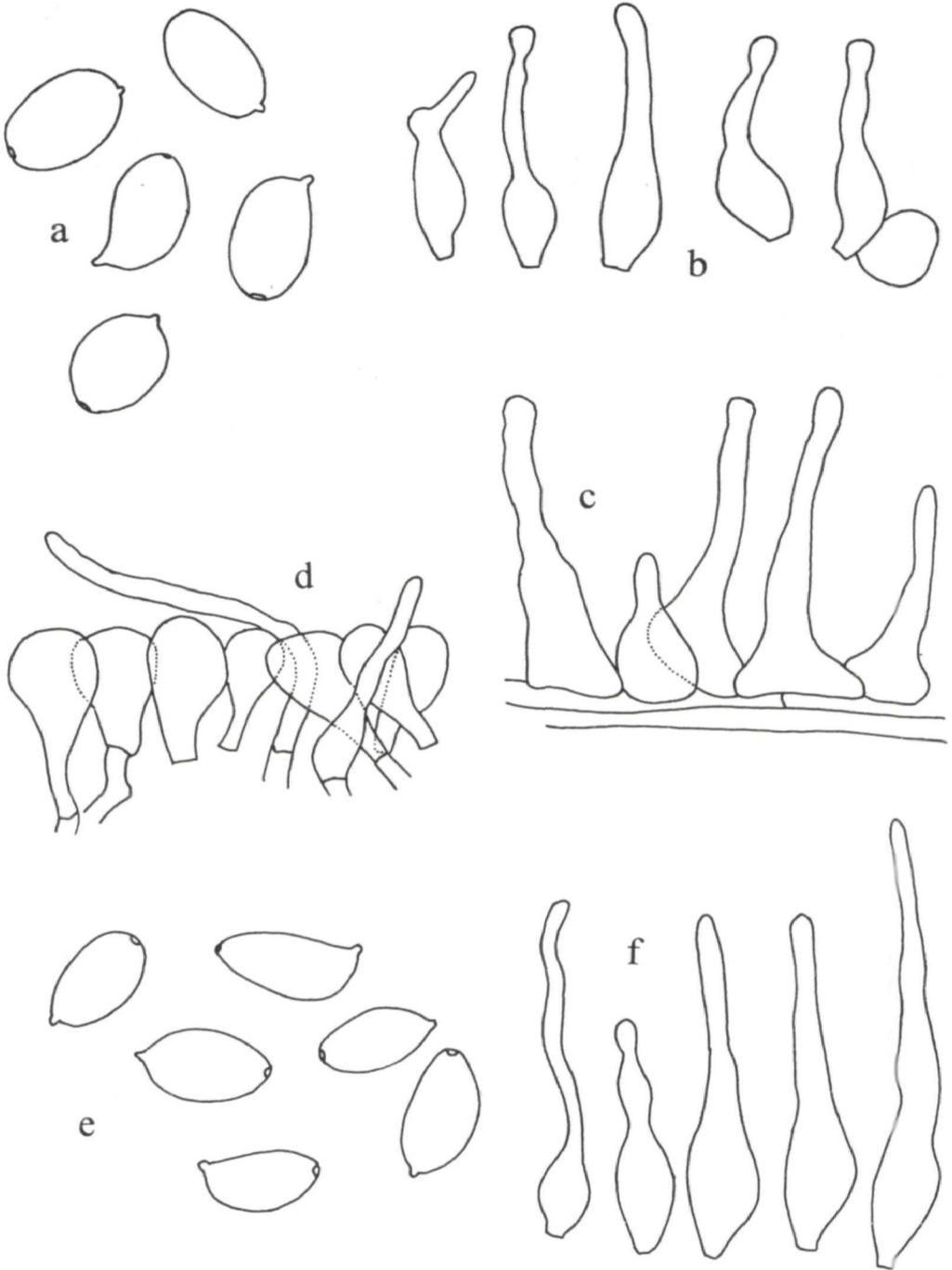


Fig. 2 a-d. *Galerella plicatella* (WU 22784). a spores, x 2000; b cheilocystidia, x 800; c caulocystidia, x 800; d pileipellis, x 800. e, f. *Galerella* spec. (E 126416). e spores, x 2000, f cheilocystidia, x 800.

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