Conocybe spinulosa, a new species of *Conocybe* subg. *Ochromarasmius* from Tanzania

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Abstract: A new species of *Conocybe* subg. *Ochromarasmius*, *Conocybe spinulosa*, is described. It was found in Tanzania (Africa). Type specimens of closely related or similar species were studied. Their macro- and microscopic characters as well as SEM-pictures of the spore ornamentation are compared with the new species. A key of all world-wide known species of subg. *Ochromarasmius* is provided.

Zusammenfassung: Eine neue *Conocybe*-Art der Untergattung *Ochromarasmius*, *Conocybe spinulosa*, die in Tanzania gefunden wurde, wird beschrieben. Typusbelege verwandter oder nahestehender Arten wurden untersucht und ihre mikro- und makroskopischen Eigenschaften sowie SEM-Aufnahmen der Sporen werden mit der neuen Art verglichen. Ein Schlüssel aller weltweit bekannten Arten der Untergattung *Ochromarasmius* wird gegeben.

During her second stay in Tanzania (Africa) the junior author discovered a small *Conocybe* on rotten wood of a deciduous tree in the tropical rain forest. Microscopically it appeared to be a member of subgenus *Ochromarasmius* SINGER. After comparison with all world-wide known species of this subgenus it turned out as an unknown species which we describe as new.

***Conocybe spinulosa* HAUSKNECHT & KRISAI-GREILHUBER**, spec. nova. Figs. (1 a-e, 2 a)

Diagnosis:

Pileus 5-6 mm latus, convexus, umbonatus, centro ochraceo-aurantiacus, margine aurantiaco-brunneus, hygrophanus, striatus, superficies glabra. Lamellae anguste adnatae, moderate distantes, haud ventricosae, pallide ferrugineo-brunneae. Stipes 10-15 mm longus, ca. 0,5 mm latus, cylindrico-filamentosus, atrobrunneus, basi bulboso brunneoque, pruinosus. Pulvis sporarum ferrugineus. Sporae 5,8-7,2 x 3,6-4,2 µm,

Q = 1,5-1,9, limoniformae, non lentiformae, poro germinativo papilloso, membrana sporae simplex, superficies sporae distincte spinuloso-tuberculata. Basidia 4-sporigera, 11-16 x 6-8 µm, fibulata, tenuiter sterigmatica. Fibulae saepe grandes, largae. Cheilocystidia lecythiformia, 16-23 x 7-12,5 µm, capitulo 5-6,5 µm grandi, collo crasso brevique. Stipitipellis elementis clavatis, cylindricis, irregularis, 8-20 x 4-11 µm et pilis consistens, cystidia lecythiformia desunt. Pileipellis hymeniformis, elementis sphaerico-pedunculatis, usque ad 30 x 20 µm grandibus consistens, immixtis cystidiis lecythiformibus, usque ad 32 x 12 µm grandibus, capitulo ad 7 µm lato. Habitat in sylvis pluvialibus, ligno carioso.

Typus: Tanzania, Sanje, S of Mikumi near Morogoro, wet rain forest along the river, on rotten wood, 10. 9. 1986, leg. I. KRISAI-GREILHUBER (WU 17981, holotype).

Characters:

Pileus: 5-6 mm broad, convex with umbo, ochre-orange in centre, more orange-brown towards margin, hygrophanous, striate to centre when moist; surface smooth, margin not incurved; no veil present.

Lamellae: narrow, adnate, moderately distant, almost non-ventricose, light rust brown; lamellae edge inconspicuous.

Stipe: 10-15 mm long, ca. 0.5 mm thick, cylindrical-filamentose with bulbous base; dark brown throughout, remarkably darker than pileus, only base slightly lighter, middle brown; pruinose, especially at apex.

Context: brittle, brown; smell and taste indistinct.

Spore print: rust-brown.

Spores: 5.8-7.2 x 3.6-4.2 µm, on average 6.4 x 3.7 µm, Q = 1.5-1.9, limoniform, not lentiform, mostly with distinct, papillose germ-pore and single, thickish wall, brownish yellow in KOH; surface distinctly rough warty to almost isolated spinulose easily visible under light microscope, under SEM with isolated to partly connected, relatively thin, and at their apex truncate spines, only apiculus and around germ-pore smooth.

Basidia: 4-spored, 11-16 x 6-8 µm, with delicate sterigmata, mostly with clamp-connections.

Clamp-connections: often very large, present on almost all septa.

Cheilocystidia: lecythiform, 16-23 x 7-12.5 µm, with capitulum 5-6.5 µm diam. and short, thick neck.

Stipe covering: consisting of clavate, cylindrical distorted to irregularly deformed elements (8-20 x 4-11 µm) and up to 3 µm thick hairs; lecythiform cystidia completely absent, even near stipe-apex.

Pileus covering: hymeniform, consisting of spherical to spherico-pedunculate, up to 30 x 20 µm large elements, intermixed with many lecythiform cystidia similar to cheilocystidia, but up to 32 x 12 µm large, with capitulum up to 7 µm diam.

Habitat: on rotten wood of deciduous tree, in tropical rain forest, ca. 900-1050 m s. m.

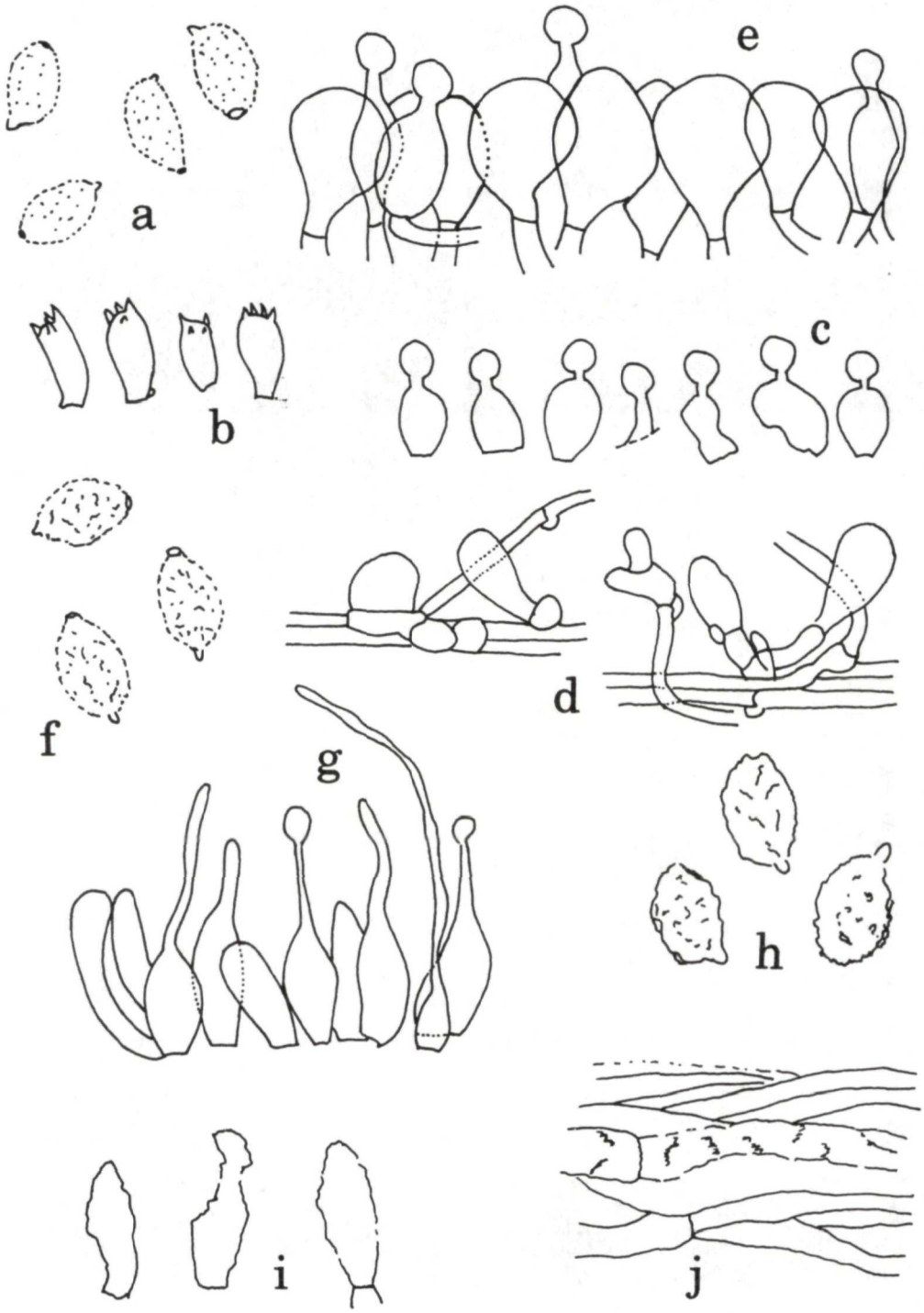

Fig. 1 a-e *Conocybe spinulosa* (holotype, WU). a spores, x 2000, b basidia, x 800, c cheilocystidia, x 800, d stipe covering, x 800, e pileus covering, x 800. - f, g *Conocybe horakii* (holotype, ZT). f spores, x 2000, g stipe covering, x 800. - h-j *Conocybe martiana* (isotype, MICH). h spores, x 2000, i cheilocystidia (collapsed), x 800, j pileus covering, x 800.

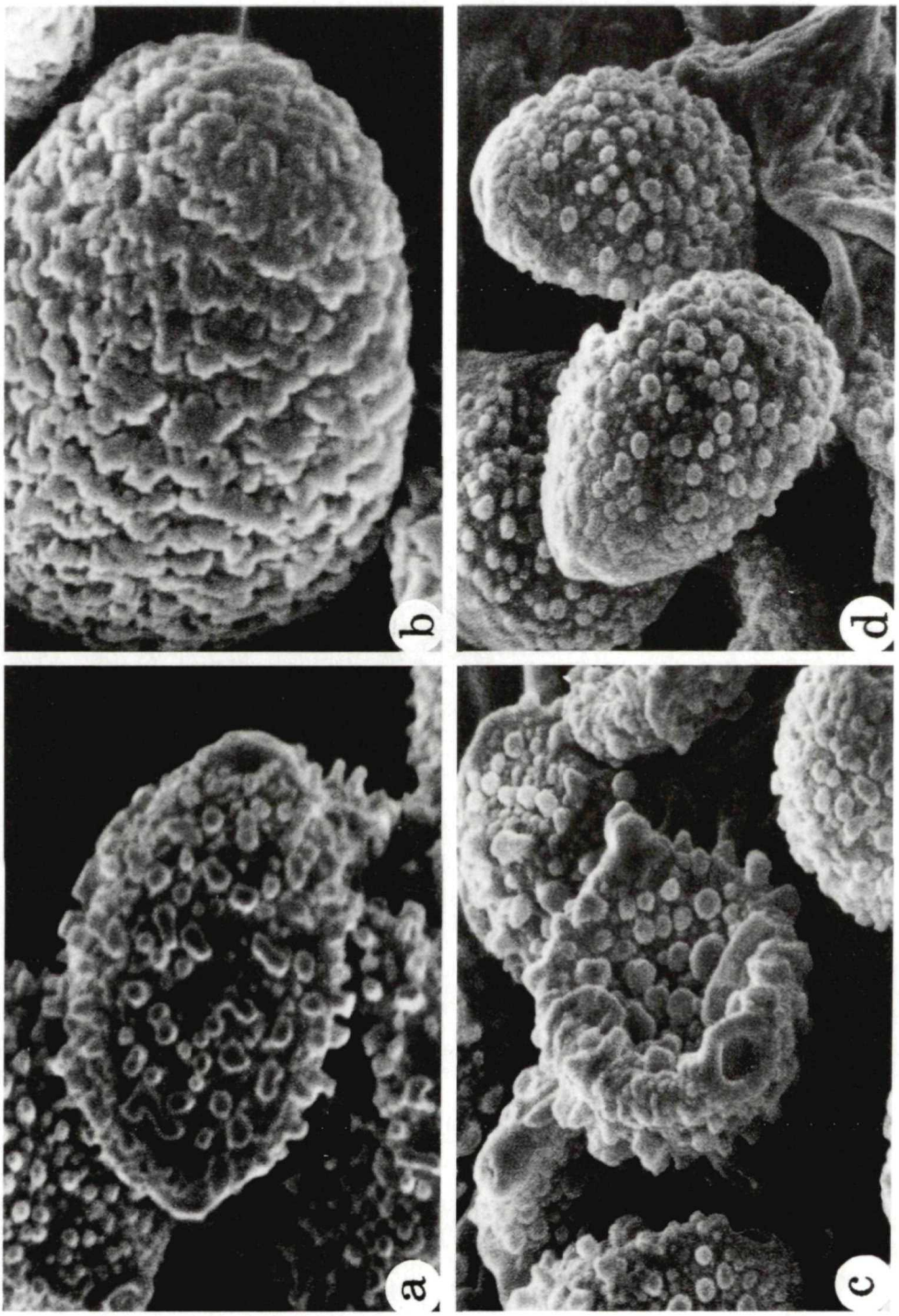

Fig. 2 a *Conocybe spinulosa*, holotype, x 10000 (WU). b *Conocybe horakii*, holotype, x 20000 (ZT). c, d *Conocybe juruensis*, holotype, x 10000 (FH); - c mature spores with high ornamentation; - d immature spores.

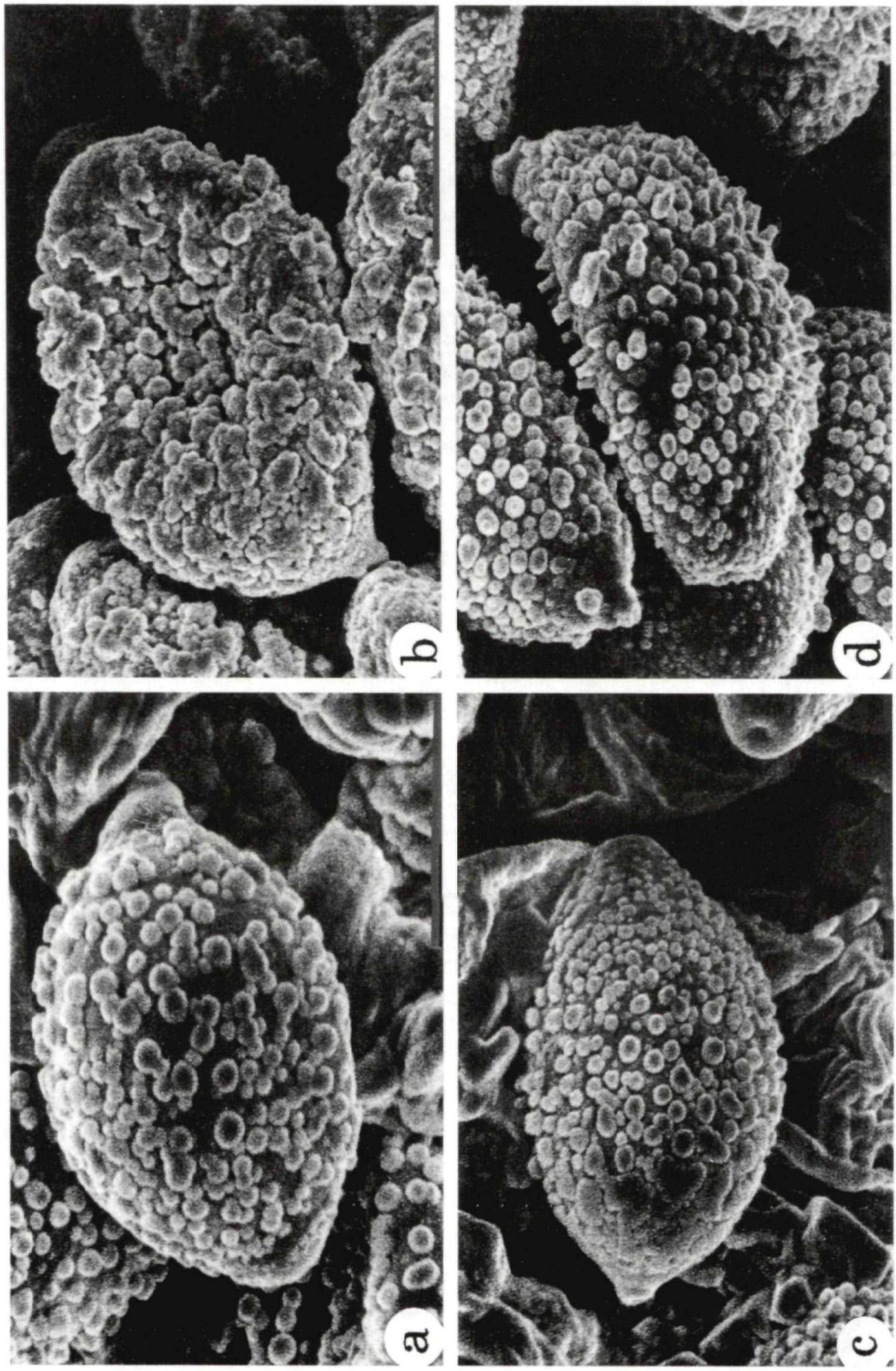

Fig. 3 a *Conocybe juruensis* ss. SINGER, x 12500 (B 4239, BAFC). b *Conocybe martiana*, isotype, x 7500 (K). c *Conocybe missionum*, isotype, x 9000 (MICH). d *Conocybe stictospora*, holotype, x 9000 (INPA).

The new species is characterised by tender, rather vividly coloured fruitbodies, growth on rotten wood in rain forest, small spores with nearly spinulose surface, cystidia with relatively large capitula and especially by the stipe covering only consisting of non-lecythiform cystidia and hairs. Among all taxa of subgenus *Ochromarasmius* with small spores there is none having this combination of characters, primarily the spore ornamentation and the stipe covering are very distinct.

Type studies of closely related or similar taxa

To confirm the discriminant characters of *Conocybe spinulosa* we examined all type specimens of closely related or similar species except the large-spored taxa *Conocybe macrorhina* (SPEG.) SINGER and *C. radicata* SINGER. In addition, SEM-pictures of the spore ornamentation were made.

***Conocybe horakii* WATLING 1987**, Bibl. Mycol. **117**: 40 (Figs. 1 f, g, 2 b)
Spores: 5.5-7.3 x 3.5-4 µm, in average 6.4 x 3.8 µm, Q = 1.5-1.8, almond-shaped, not lentiform, with slightly prolonged, distinct germ-pore and compact, single wall, punctuate-rough under light microscope, under SEM with a surface ornamentation consisting of partially connected wrinkles and rounded ridges, imparting a brain-like surface structure.

Basidia: 4-spored, 12-15 x 6-7 µm, clavate with short pedicel, and often with clamp-connections.

Clamp-connections: present in all tissues.

Cheilocystidia: lecythiform, 17-23 x 7.5-10 µm, with capitulum 4-5 µm diam. and short, thin neck.

Stipe covering: a mixture of ca. 25 % lecythiform and 75 % non-lecythiform cystidia and hairs; the lecythiform cystidia with remarkably, up to 8 µm long neck.

Pileus covering: consisting of spherico-pedunculate elements, sparingly intermixed with lecythiform cystidia.

Material examined: New Zealand, Westland, Lake Ahaura, Kopara, 10. 2. 1968, on wood of *Nothofagus fusca*, leg. E. HORAK ZT 69/24 (holotype).

Remarks: The structure of the spore surface is unique within subg. *Ochromarasmius* (cf. WATLING 1976) and differs distinctly from those of tropical species and also of the European *Conocybe dumetorum* (VELEN.) SRVCEK, even when this differentiation may be difficult to verify with the light microscope (cf. HAUSKNECHT 1995). Together with a stipe covering of the *Mixtae*-type this is a character combination which differs from all other members of the subgenus.

***Conocybe juruensis* (HENN.) SINGER 1951,** Lilloa **22**: 485 (Figs. 2 c, d, 3 a-e)
=*Naucoria juruensis* HENN. 1904, Hedwigia **43**: 183
Spores: 3.8-4.8 x 2.8-3.2 µm, in average 4.2 x 3.0 µm, Q = 1.25-1.7, ellipsoid-pip-shaped, not lentiform, with mostly isolated warts, already well visible on mature spores under light microscope, which are darker than the relatively thin spore wall and are distinctly contrasting; germ-pore present but only visible under SEM, not under light microscope; under SEM surface of mature spores with large, often irregular and partly pyramidal spines, which are less distinct and more obtusely rounded when the

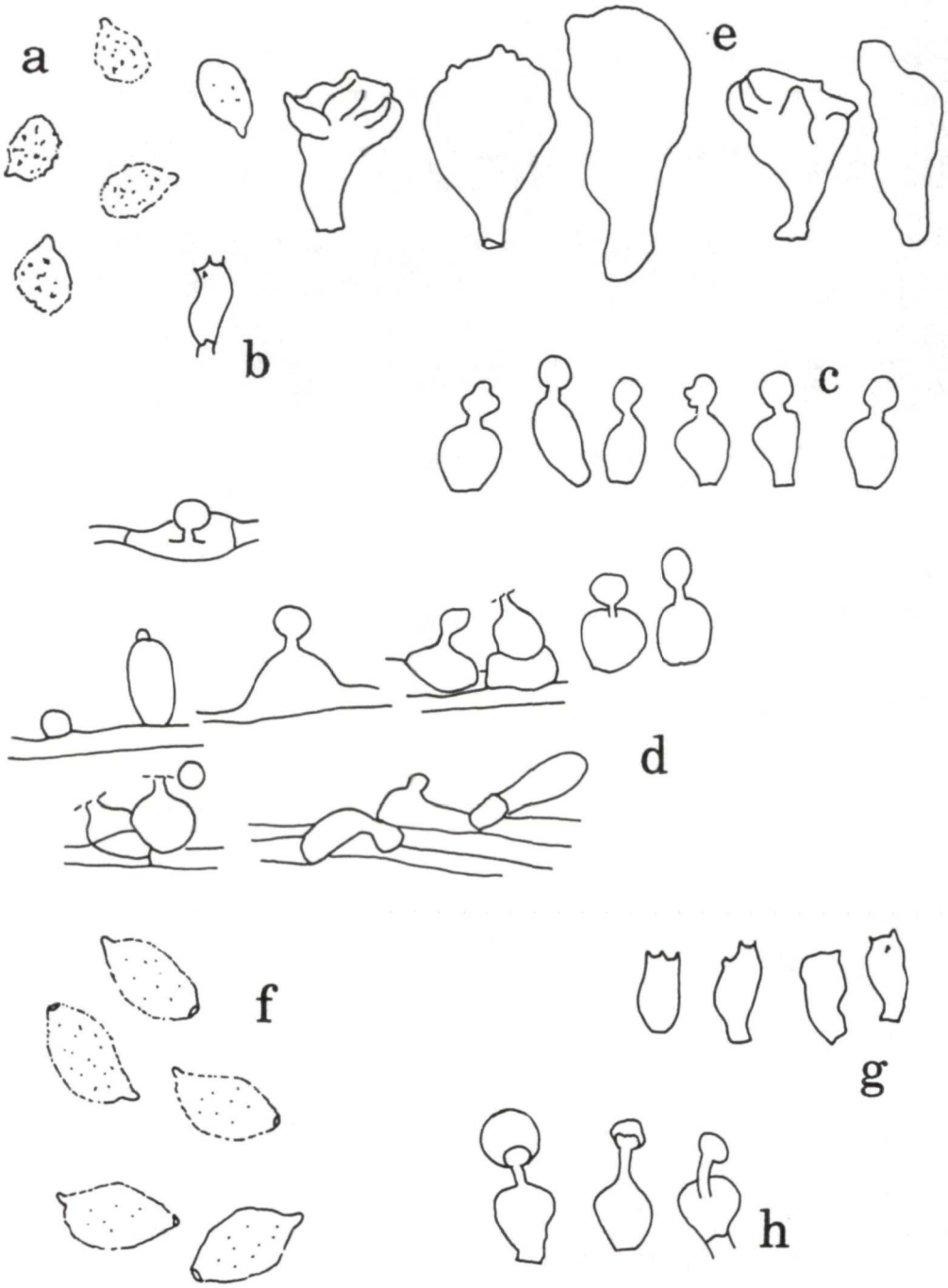

Fig. 4 a-e *Conocybe juruensis*, holotype (FH). a spores, x 2000, b basidium, x 800, c cheilocystidia, x 800, d stipe covering, x 800, e elements of pileus covering, x 800. f-h *Conocybe missionum*, isotype (MICH). f spores, x 2000, g basidia, x 800, h cheilocystidia, x 800.

spores are immature; spores light yellow brownish with distinct darker warts under light microscope.

Basidia: 4-spored, small (e.g. 12 x 5 µm).

Clamp-connections: present.

Cheilocystidia: lecythiform, 16-21 x 6.5-10 µm, with thick neck and capitulum 4.7-6 µm diam.

Stipe covering: mainly consisting of mostly collapsed, lecythiform cystidia and capitate protuberances of the hyphae, respectively, in-between cylindrical to spherical elements without capitulum; mostly thick-walled with yellow brown wall and parietal pigment; single stipe hyphae also having distinctly encrusted pigment.

Pileus covering: consisting of large, spherical-pedunculate elements 25-40 x 12-22 µm; no pileocystidia seen.

Material investigated: Brazil, Amazone, Juruá-Miry, June 1901, leg. E. ULE (holotype, FH).

Remarks: The ornamentation of mature spores of *C. juruensis* is the coarsest and most remarkable of the subgenus and even under light microscope the most distinctly visible. Further, this species has the smallest spores of subg. *Ochromarasmius*. HORAK and WATLING (pers. comm.) observed protuberances on the hyphae of the pileus covering similar to those of the pileus elements of certain *Marasmius* spp. We cannot confirm this observation, but must admit that we did not especially search for them, as we wanted to treat the type material with care. The spore surface taken alone is so typical that there can be no doubt of the autonomy of the species and also of the discriminant characters towards *C. spinulosa*.

***Conocybe juruensis* (HENN.) SINGER ss. SINGER 1969 p. p.**, Beih. Nova Hedwigia **29**: 204 (Figs. 3 a, 5 a-d)

Spores: 4.4-6 x 3.2-4 µm, in average 5.4 x 3.6 µm, Q = 1.3-1.6, short limoniform with distinct, partly slightly prolonged germ-pore, hardly lentiform depressed, fine punctuate-warty under light microscope, with low, isolated to connected, clearly flattened to depressed warts under SEM, in-between with many nearly smooth to slightly rough spots, brownish yellow in KOH.

Basidia: very collapsed, 4-spored, up to ca. 15 x 7 µm.

Clamp-connections: present.

Cheilocystidia: lecythiform, 15-20 x 5-10 µm, with capitulum 3.5-5 µm diam.

Stipe covering: mostly collapsed, but some lecythiform cystidia (up to 18 x 9 µm, with capitulum 4-5 µm diam.) and clavate-spherical elements could be found.

Pileus covering: hymeniform, consisting of spherico-pedunculate cells (25-42 x 16-22 µm), intermixed with many lecythiform cystidia similar to cheilocystidia, but narrower body only 4 µm broad.

Material investigated: Brazil, Para, near Belem, Estancia Pirelli, 7. 6. 1966, leg. R. SINGER B 4239 (BAFC).

Remarks: SINGER (1969) himself states, that the spore ornamentation of several collections is remarkably less contrasting than those of the type of *C. juruensis*. This is especially eminent under SEM and together with other microscopic differences it consequently follows that these specimens are another taxon. SINGER proposed for it in his provisional key (SINGER, ined.) a var. *sublevispora*. The spore shape resembles slightly that of *C. dumetorum*; the spore ornamentation, however, is clearly different. Macroscopically, there are only small differences between the description of SINGER

(1969) and European material of *C. dumetorum*, so that this taxon can be considered very close to it. As the existing material is insufficient and in a very bad state, a new description seems to be only meaningful when fresh collections are available.

Fig. 5 a-d *Conocybe juruensis* ss. SINGER (B 4239, BAFC). a Spores, x 2000, b cheilocystidia, x 800, c stipe covering, x 800, d pileus covering, x 800. e-g *Conocybe stictospora*, holotype (INPA). e spores, x 2000, f basidia, x 800, g cheilocystidia, x 800.

***Conocybe martiana* (BERK. & CURT.) SINGER 1955,** Sydowia **9**: 402 (Figs. 1 h-j, 3 b)

= *Agaricus martianus* BERK. & CURT. 1869, J. Linn. Soc. **10**: 291

Spores: 7.2-8.3 x 4.8-5.6 µm, in average 7.7 x 5.2 µm, Q = 1.3-1.6, ellipsoid with prolonged apiculus, without germ-pore, sporadically with weak callus, with thick, very wrinkly-uneven, distinctly calyptrate wall, strongly yellow brown in KOH.

Basidia: not found.

Cheilocystidia: sparingly very collapsed, cylindrical-clavate to lageniform; ca. 22-26 x 7-8 µm large elements present.

Stipe covering: entirely collapsed.

Pileus covering: a cutis of thin, lying hyphae with weak encrusting pigment, no pileocystidia present.

Material investigated: Cuba, in June, on rotting wood, leg. C. WRIGHT no. 70 (K, isotype).

Remarks: Because of the structure of the pileus covering and also of the spore surface this is not a member of the *Bolbitiaceae*, but a representative of the genus *Galerina*. This was already stated by DENNIS (1953: 192), who placed the species in the vicinity of *Galerina triscopa* (FR.) KÜHNER.

***Conocybe missionum* SINGER 1953,** Lilloa **25**: 308 (Figs. 3 c, 4 f-h)

Spores: 6.2-7.6 x 3.6-4.2 µm, in average 6.9 x 3.8 µm, Q = 1.6-2.1, limoniform, not lentiform, in face view often slightly angular, with distinct, papillate germ-pore, under light microscope finely punctuate-warty, under SEM with low, broad warts, which are gradually lower towards the germ-pore and the apiculus where they are scale-like and confluent; relatively thin-walled, yellow brownish in KOH.

Basidia: (2-)3-4-spored, 12-18 x 6-8 µm, mostly collapsed.

Clamp-connections: not seen.

Cheilocystidia: lecythiform, 15-20 x 9-10 µm, with capitulum up to 5 µm diam. with large slimecap and long neck.

Stipe covering: the specimen does contain fragments of a stipe, so the stipe covering could not be examined; according to the type description consisting of lecythiform cystidia.

Pileus covering: spherico-pedunculate elements.

Material investigated: Argentina, Misiones, Cataratas de Iguazú, on the ground on shaded place, 26. 11. 1949, R. SINGER M 104 (MICH, isotype).

Remarks: The species differs from the European *C. dumetorum* by slightly larger, slightly angular spores in face view, having a distinctly different surface ornamentation under SEM. Thus, the opinion of WATLING is confirmed, who considered *C. missionum* as a separate species after examination of the type (WATLING 1983: 550) and of a Brazilian collection (WATLING 1992: 93).

***Conocybe stictospora* SINGER 1989,** Fieldiana n. s. **21**: 104 (Figs. 3 d, 5 e-g)

Spores: 6.4-7.2 x 3.6-4.4 µm, in average 7.0 x 4.2 µm, Q = 1.6-1.8, ellipsoidal to slightly limoniform, with distinct germ-pore, under light microscope mainly almost smooth to finely punctate, under SEM with dense, isolated, nearly spinulose elements mixed with lower, rounded warts, which are gradually lower towards the germ-pore and the apiculus, with thin wall, brownish yellow in KOH.

Basidia: nearly all collapsed, a few 4-spored found, according to the type description up to 21 x 7 µm.

Clamp-connections: present.

Cheilocystidia: lecythiform, 14-17 x 6-7.5 µm, with capitulum 3-4.5 µm diam.

Stipe covering: completely attacked of a mould and collapsed. The structure cannot be checked any more on the type specimen. SINGER (1989) states that the stipe covering consists of lecythiform cystidia and hairs of the type of sect. *Mixtae*.

Pileus covering: hymeniform, consisting of spherico-pedunculate elements; no pileocystidia seen.

Material investigated: Brazil, Amazonas, Manaos, Embrapa, on rotting leaves in tropical forest on Terra Firma, 25. 5. 1977, leg. R. SINGER B 9715 & I. ARANJO (INPA, holotype).

Remarks: Unfortunately the type material is in a very bad state. The ornamentation of the spore surface under SEM of all species examined is the most similar to *C. spinulosa*, with more slender, a little bit shorter and denser spines, which are also more isolated. Nevertheless, *C. stictospora* differs from our new species by much larger fruitbodies (pileus 31 mm broad, stipe 53 x 3.5 mm), a stipe which is white at the apex and becomes brownish towards the base, growth on leaves and above all by the stipe covering, which according to SINGER (1989) contains many lecythiform cystidia. These are completely absent in *C. spinulosa*.

Key of the world-wide known species of subg. *Ochromarasmius*

1 Spores on average over 8 µm long and 5 µm broad; spore surface distinctly warty under light microscope 2

1* Spores smaller and narrower; spore surface more punctate to nearly smooth under light microscope 3

2 Stipe not radicant; spores on average over 10 x 6.5 µm; Brazil
C. macrorhina

2* Stipe with basal bulb and distinctly radicant; spores 7.5-9.5 x 4.8-5.5 µm, distinctly warty; Argentina
C. radicata

3 Stipe covering mainly consisting of lecythiform cystidia 4

3* Stipe covering only consisting of non-lecythiform elements and hairs; fruitbody very fragile, growing on wood; Tanzania
C. spinulosa

3** Stipe covering a mixture of lecythiform cystidia, non-lecythiform elements and hairs 7

4 Spores very small, below 5.0 x 3.2 µm, already under light microscope with distinctly visible warts, which are remarkably darker than the spore wall; Brazil
C. juruensis

4* Spores larger, under light microscope weakly rough to smooth; if spore surface punctate, then warts not darker than the spore wall 5

5 Stipe radicant; spores smooth under light microscope, with fine wrinkled-uneven surface under SEM; Italy
***C.* spec.** (cf. HAUSKNECHT 1996: 198)

5* Stipe not radicant; spores smooth to punctate under light microscope, with distinct warts under SEM 6

6 Spores finely punctate under light microscope, in face-view slightly angular; under SEM spore ornamentation consisting of flat, depressed and often confluent warts and flakes; Argentina, Brazil
C. missionum

6* Spores under light microscope finely punctate to smooth, never angular; under SEM spore ornamentation consisting of higher, rarely confluent, rounded warts; Europe, Africa
C. dumetorum and varieties

7 Fruitbody large, pileus ca. 30 mm, stipe ca. 50 x 3.5 mm; spores finely spinulose under SEM; Brazil

C. stictospora

7* Fruitbody remarkably small: pileus rarely reaching 15 mm 8

8 Spores fine warty under light microscope, under SEM with confluent ridges and wrinkles; New Zealand

C. horakii

8* Spores smooth under light microscope, under SEM with low, wrinkly-uneven projections; The Netherlands

***C.* spec. II** (ined.)

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