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NOTES ON *CLAVARIA*

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(With 8 Text-figures)

Revised descriptions are given of *Clavaria atrofusca* Vel., *C. corbieri* Bourd. & Galz., *C. crosslandii* Cotton, *C. greletii* Bourd., and *C. rosea* Fr.

New species and varieties described are *C. argillacea* Fr. var. *pusilla* from England, *C. congesta* from Java, *C. greletii* Bourd. var. *grandispora* from Brazil, *C. longispora* from U.S.A., *C. martinii* from Panama, *C. neofossicola* and *C. rosea* Fr. var. *grandispora* and var. *pallida* from tropical America.

Excluded species are *C. falcatispora* Vel., *C. parasitica* Viegas & Texeira, *C. tonkinensis* Pat.

Notes are also included on *C. alliacea* Corner, *C. gibbsiae* Rambs. *C. minima* Corner. *C. tenuipes* Berk. & Br., *C. vermicularis* Fr., *C. zollingeri* Lév.

C. ALLIACEA Corner (1950, p. 224); Reid, *Kew Bull.* **17**, 303, 1963.

Receptacula ad 7 cm × 2·5–3·5 mm, simplicia, solitaria v. subcaespitosa, cylindrica, obtusa v. subacuta, albida; stipite 10–15 × 1–2 mm; odore alliaceo. Sporae 9–11 × 8·5–9·5μ, late ellipsoideae v. subglobosae, multiguttulatae. Basidia 50–55 × 8–9μ, sterigmata 2. Hyphae 5–20μ latae, afibulatae. Typus, leg. E. J. H. Corner s.n., Singapore, Bukit Timah, ad terram in silva, 10 Nov. 1929 (an in bello 1942–45, ut videtur, perditus).

New Zealand; J. H. Warcup 61 et 61A, Wellington, odore alliaceo; sp. 8–10 × 6·5–8μ (n, 61A), 9–11 × 7–8·5μ (n. 61); basidia afibulata; sterigmatibus 2–4; hyphae ordine secundo septatae afibulatae.

The Latin description of this was overlooked in my monograph (Corner, 1950). The two New Zealand collections bear out the character of the species, which Reid has also recorded from Stewart Island, and prove that it belongs in subgen. *Holocoryne* near to *C. acuta* Fr.

C. ARGILLACEA Fr. var. **pusilla** var. nov. (Fig. 1)

Receptacula ad 15 × 2–5 mm subcaespitosa, pallide ochracea, in aetate saturatiora v. subincarnata, obtusa, valde clavata, compressa, etiam cava; stipite –5 × 1–2 mm.

Ad terram arenosam calcariam, England; Berrow Dunes, north Somerset, leg. T. J. Wallace 9 Oct. 1954 (typus, **CGE**; Braunton Burrows, north Devon, leg. F. R. Elliston Wright (f. T. J. Wallace).

Sporae 8–10 × 5·5–6μ, 1-multiguttulatae. Basidia 50–70μ longa, ad basim late fibulata; sterigmatibus 4, 8–9μ longis. Hyphae –20μ latae, ordine secundo septatae, afibulatae.

var. *BREVISPORA* Corner (1950, p. 225).

Syn. *C. citrinescens* Vel., *Nov. Myc.* p. 164, 1939.

I have examined the type of Velenovsky's species, Fl. Bohemica 154903 and found the short spores 6–8 × 4·5–6μ. The following collection, which is the first record of the species from South America, must belong here:

Lloyd Catal. n. 30199, leg. J. Rick, Brazil, on the ground (? São Leopoldo); –7 cm. ×

2–2·5 mm., caespitose, white then yellow with age; sp. 6–10 × 3·5–5μ, subcylindric, obtuse, the apiculus 1μ; basidia with a wide clamp; hyphae –20μ wide, secondarily septate, without clamps.

C. ATROFUSCA Vel. *Nov. Myc.*, p. 164, 1939; Pilat, *Sb. nár. Mus. Praze* (bot.) **14**, 221, 1958. (Fig. 2)

Fruit bodies –4 cm high, 2–3 mm thick, simple, solitary, subclavate, shortly stipitate, smooth, fuscous black.

On charcoal and burnt ground, Czechoslovakia; Fl. Bohemica 147956, leg. Velenovsky, pr. Božkov, 1922 (typus **PR**).

Spores 6–8·5 × 3·5–5μ, ellipsoid, apparently aguttate, the wall in dried spores distinctly thickened, fuscous brownish and minutely roughened with subacute projections mostly less than 0·5μ high, the apiculus small. Basidia 40–50 × 8μ, without clamps; sterigmata 4,

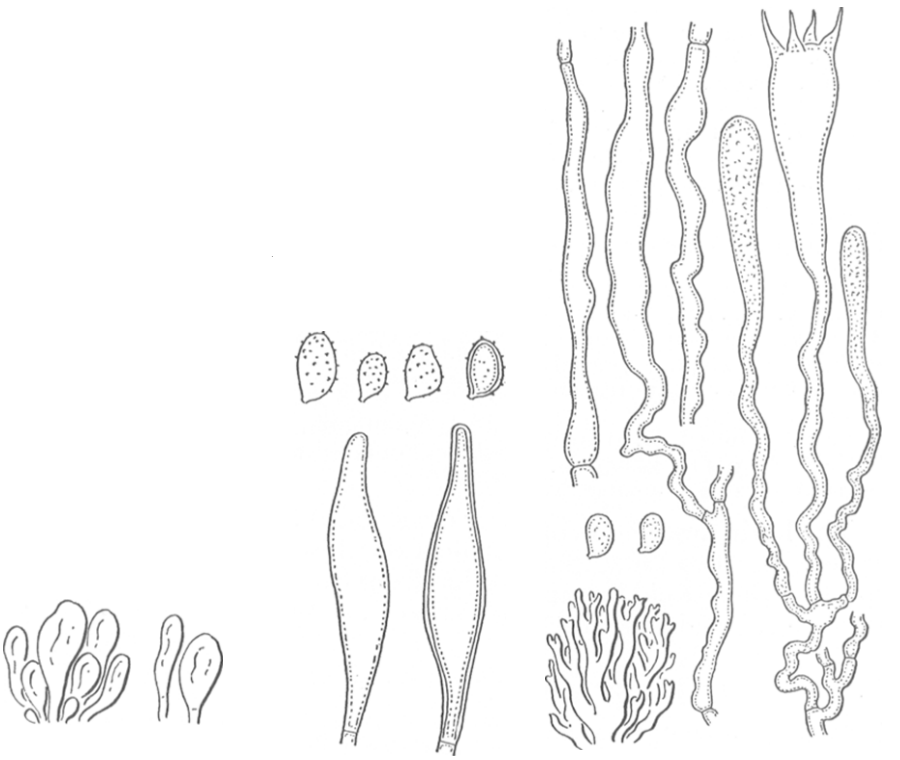

Fig. 1 Fig. 2 Fig. 3

Fig. 1. *C. argillacea* Fr. var. *pusilla* Corner, × 1.

Fig. 2. *C. atrofusca* Vel. Spores and cystidia × 1000.

Fig. 3. *C. congesta* Corner. Fruit body × 1; spores, basidia, and hyphae × 1000.

5–6μ long; a few larger basidia –14μ wide immersed in the thickened hymenium, apparently abnormal and not forming spores. Hymenium thickened –90μ; subhymenial hyphae 2–3·5μ wide, without clamps. Cystidia very occasional, ventricoso-fusiform, obtuse, with slightly thickened walls, of the same size as the basidia. Hyphae 2–20μ wide, much inflated, secondarily septate, without clamps, slightly constricted at the septa, with firm, scarcely thickened, fuscous walls.

This remarkable species belongs to subgen. *Clavaria* (*Syncoryne*, of my monograph), apparently in the affinity of the other brown species, but the fuscous asperulate spores seem very distinct. Velenovsky described them as hyaline and smooth. I could examine only dried material in which any fuscous sap of the hyphae may have coloured the spores during drying, but the young basidia were colourless.

C. congesta sp.nov. (subgen. *Clavaria*; Fig. 3)

Receptacula ad 2 cm alta, caespitosa congesta, e stipitibus brevissimis 1·5–2 mm latis bis v. quater dichotoma, ramulis 1 mm. latis, apicibus acutis, ex integro alba, subtenacia.

Ad terram, Java; Tjibodas, Bergtuin, 1400 m. alt., W. J. Lütjeharms 2426 (**BO**).

Sporae 4·5–5 × 3·3–3·5μ, albae leves ellipsoideae, tenue tunicatae. Basidia 50–70 × 7–8·5μ, stipitibus angustis elongatis sinuosis 2–2·5μ latis; sterigmatibus 4, 6–7μ longis. Cystidia nulla. Hymenium –130μ incrassatum. Hyphae 2–10μ latae, afibulatae, ordine secundo septatae, tenue tunicatae, cellulis 8–100μ longis, ad septa leniter constrictae.

This inconspicuous fungus is interesting because branched species are infrequent in *Clavaria*. The narrow hyphae and small spores indicate affinity with *C. fossicola* Corner. Compare *C. martinii* Corner with yellow fruit-bodies and larger spores.

C. CORBIEREI Bourd. & Galz., *Hym. Fr.* p. 112, f. 46, 1928; Corner (1950, p. 230). (Fig. 4)

Fruit bodies –18 mm high; stem –7 × 0·5 mm, yellowish or brownish towards the base; fertile part narrowly clavate, expanded into a shallow cyathiform apex –4 mm wide, becoming lobed and crisped round the margin, white, the lower part longitudinally rugulose.

Among moss and on needles in coniferous woods; British Columbia, Monning Park, Cambie Creek, leg. R. J. Bandoni B.C. 699, 3 Oct. 1959 (**CGE**); U.S.A., Priest R., Idaho, J. R. Weir 16963, 18 Oct. 1920 (**BPI**).

Spores 3–4 × 2·2–3μ, white, smooth, obtuse, ellipsoid, with small apiculus, not amyloid. Basidia 20–25 × 4–5μ, not clamped. Hymenium not thickening; cystidia none; subhymenial hyphae 1·5–2·5μ wide, subgelatinous, rendering the hymenium gelatinous-tough. Hyphae 3–15(–20)μ wide, inflated, without clamps, frequently septate. Cyathiform apex sterile with the internal hyphae splayed out and with a gelatinous pellicle at the surface, without hymenium or sterile palisade (the fertile hymenium continuing up to the thin margin).

This suggests a gill-less *Omphalina*, but the hyphae are typical of *Clavaria*. Thus it is not to be classed with *Araeocoryne* or *Clavicorona tuba* (Heim) Corner. Compare *C. lithocras* Reid (these *Transactions*, **41**, 438, 1958).

C. CROSSLANDII Cotton; Corner (1950, p. 230).

Fruit bodies –35 mm high, 3–7 mm wide, simple, gregarious, becoming clavate and compressed, with a short stem-like base, varying grooved or subtruncate, wholly pale brownish drab, drying yellowish brownish, waxy, brittle, without smell.

Among mosses, particularly *Funaria*, growing in pots in the Institute of Rural Science, Penglais, Aberystwyth, Wales; leg. E. Griffiths, Feb. 1958 (**CGE**).

Spores 5–6 × 2·5–3·5μ, white, smooth, ellipsoid, obtuse, aguttate, shortly apiculate; basidia short, without clamps, four-spored. Hymenium not thickening; cystidia none. Hyphae –15μ wide, thin-walled, secondarily septate without clamps.

C. crosslandii was described as grey with slightly shorter spores 4–5 × 2·5–3μ, but I can find no other fungus with which to identify this collection and the differences are slight.

C. FALCATISPORA Vel., *Nov. Myc.* p. 166, 1939; *Nov. Myc. Noviss.* t. II, f. 20, 1947.

There is no specimen in Velenovsky's collections. The muscicolous habitat and the arcuate-fusiform spores 12–6 × 2–3 μ indicate *Eocronartium* Atk.

Fig. 4

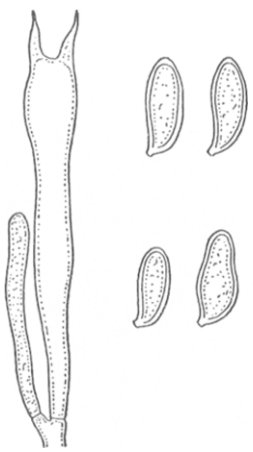

Fig. 5

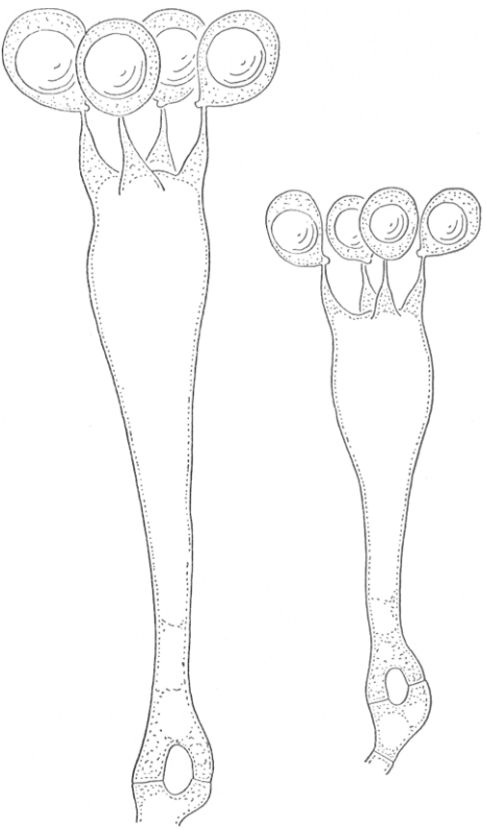

Fig. 6

Fig. 4. *C. corbierei* Bourd. & Galz. Fruit body × 2; spores × 1000; (coll. R. Bandoni s.n., 3 Oct. 1959).

Fig. 5. *C. greletii* Boud. Spores and basidia of var. *greletii* (right; coll. Corner s.n. Trinidad, 10 Oct. 1947) and var. *grandispora* Corner (left; coll. Corner s.n., Corvocado, 20 Mar. 1948), × 1000.

Fig. 6. *C. longispora* Corner. Spores and basidia × 1000.

C. GIBBSIAE Ramsb. var. *MEGASPORA* Corner (1950, p. 239).

Brazil; Rio de Janeiro, Corcovado, *c.* 500 m. alt., leg. E. J. H. Corner s.n., 4 Dec. 1948, 19 Dec. 1948; –12 cm high. 2–3 mm wide, or flattened –5 mm, pallid white, brittle, solitary or 2–3 together, stem 10–20 × 1–1·5 mm; sp. 10–13 × 7–10μ, multiguttulate; basidia 60–85 × 13–16μ, with a wide clamp; sterigmata 4; hymenium not thickening; hyphae –25μ wide, rather sparsely secondarily septate.

This has even wider spores than the Malayan collections.

var. *TENUIS* Corner f. *MICROSPORA* Corner (1950, p. 238).

Brazil; J. Rick s.n., Parecy, 1918 (**BPI**); sp. 6–8 × 5–7μ.

Panama; G. W. Martin 2386, Prov. Chiriqué, valley of Upper Chiriqué Viejo, *c.* 1600 m. alt., 3 July 1935 (immature); G. W. Martin and A. L. Welden 7448, Barro Colorado, 6 July 1952 (**IA**), white, sp. 6–7 × 4–5μ.

Peru; E. J. H. Corner s.n., Iquitos, 11 April 1948, on the ground in the forest; sp. 7–8 × 5–6μ; basidia 40–50 × 9–10μ; sterigmata 4; hyphae –12μ wide, secondarily septate.

Trinidad, W.I.; E. J. H. Corner s.n., 10 Oct. 1947, on the ground under bamboos; –30 × 1 mm.; sp. 6·1–8·5 × 5–8μ; hyphae –16μ wide, secondarily septate.

This form may be regarded as a slender, four-spored state of *C. acuta* Fr. There seem, indeed, to be all transitions from temperate *C. acuta* to tropical *C. gibbsiae* and its varieties.

C. GRELETII Boud.; Corner (1950, p. 241); Maas Geesteranus, *Fungus* **25**, 48, 1955. (Fig. 5)

Fruit bodies –9 cm × 2·5–6 mm, cylindric to subfusiform, compressed, occasionally sulcate, obtuse or subacute, becoming hollow, fuliginous grey to bistre; stem –20 mm, cylindric, glabrous except the white cottony base; smell as in *Amanita citrina*. Spores 8–9 × 6·3–7·2μ, ovoid, smooth, multiguttulate, apiculus distinct. Basidia 45–60 × 6–8μ, with a loop-like clamp at the base; sterigmata 4, 8–11·5μ long. Hyphae without clamps.

This is the description of the collection made by Maas Geesteranus in the Netherlands. It shows that the species belongs in subgen. *Holocoryne*. Accordingly I place here the following collection from Trinidad, and I make a new variety for a Brazilian collection. Thus, *C. greletii* begins to parallel *C. gibbsiae* as a grey, fuliginous, or black species, the colour apparently in the cytoplasm of the basidia.

Trinidad, W.I.; E. J. H. Corner s.n., on the ground under bamboos, 10 Oct. 1947; –4 cm × 1–2 mm, or compressed –4 mm, simple, solitary, pale grey, sometimes with a lilaceous tint, waxy, inodorous; stem 5–8 × 1–2 mm; sp. 7·5–9 (–10) × 6·5–7·5(–8)μ, subglobose, 1-guttate, apiculus –1μ long; basidia 48–60 × 11–13μ, with a wide clamp at the base; sterigmata 4; hymenium slightly thickened; cystidia none; hyphae –25μ wide, closely secondarily septate, short-celled, thin-walled, without clamps.

var. **grandispora** var. nov. (Fig. 5)

Sporae 10–13 × 9·5–11μ, lacrymiformes, 1-guttatae, apiculo 1–1·5μ. Basidia 65–80 × 13–15μ, multiguttulatae, ad basim late fibulatae; sterigmatibus 4, 11–13μ longis. Hyphae –20μ latae, cellulis 27–170μ longis, ordine secundo septatae, afibulatae.

Add terram arenosam in silva, Brazil; E. J. H. Corner s.n., 20 March 1948, Rio de Janeiro, Corcovado, 600 m. alt. (**CGE**); pallide fuliginea v. fusco-grisea, simplex, solitaria, ceraceo-mollis, inodora.

C. cinero-atra Rick must be this variety or var. *greletii*.

C. longispora sp.nov. (subgen. *Clavaria*; Fig. 6)

Receptacula ad 4.5 cm × 1.5–2 mm, simplicia gregaria cylindrica subacuta dein obtusa, sicco cremeo-incarnata v. subaurantiaca; stipite –10 × 1–1·5 mm, glabro, sicco saturatiori.

Ad terram, U.S.A.; W. Diehl s.n., 11 Sept. 1935, Shenandoah National Park, Hawksbill Mt., Virginia (**BPI**).

Sporae 9–11·3 × 3·5–4·7μ, hyalinae leves elongato-ellipsoideae, subacutae v. obtusae et subclavatae, tunica distincte incrassata, apiculo 1–1·5μ longo. Basidia 40–50 × 6–6·5μ, afibulata; sterigmatibus 2, raro 1 v. 3, 6–8μ longis. Cystidia nulla. Hymenium vix incrassatum. Hyphae 2·5–7μ latae, afibulatae, haud ordine secundo septatae, tenue tunicatae, paullo inflatae.

This resembles *C. helicoides* Pat. & Dém. in the narrow hyphae and long spores, but their walls are characteristically thickened and the basidia are two-spored. The fruit bodies seem to have been pink when fresh.

C. martinii sp.nov. (subgen. *Clavaria*; Fig. 7)

Receptacula ad 4 cm alta, caespitosa, bis v. ter dichotoma, laete flava (chrome yellow), fragilia; stipite 1·5–3 mm crasso; ramis 1–2 mm crassis cylindricis v. inferioribus subcompressis, arcuato-ascendentibus, axillis sublunatis, apicibus obtusis.

Ad terram inter gramina, Panama; G. W. Martin 8015, 30 July 1952, Prov. Chiriqué, ad montem supra Boguete, *c.* 2000 m alt.; G. W. Martin 8148, eodem loco, 1 Aug. 1952 (typus, **IA**).

Sporae 5·5–7 × 3–3·7μ, hyalinae ellipsoideae v. subcylindricae, leves obtusae, tenue tunicatae, apiculo parvo, ? aguttatae. Basidia 55–70 × 7–9μ, clavata, longe et anguste stipitata, afibulata; sterigmatibus (2–)4, 4–5μ longis. Cystidia nulla. Hymenium vix incrassatum. Hyphae 2·5–10μ latae, afibulatae, cellulis 8–60μ longis, ordine secundo septatae tenue tunicatae, subundulatae, medullares vix inflatae.

This remarkable species, superficially like *Clavulinopsis corniculata* (Fr.) Corner but fragile, comes near to *C. congesta* Corner, which is white and has smaller pores.

C. MINIMA Corner, *Darwiniana*, **11**, 194, 1957.

This was the smallest species known in the genus and has the smallest spores, but I must add the following collections with larger fruit bodies and slightly larger spores. These collections differ, also, in lacking the narrow cystidia.

Brazil; Corner 51/48, and 52/48, 23 March 1948, on the ground in secondary forest, Campo Grande, Matto Grosso; –3 cm high, 1–2 mm thick, simple, solitary to subcaespitose, white then isabelline drab; stem –1 cm. long, subtranslucent; spores 3·5–4·5 × 2–2·5μ; basidia 24–30 × 4·5–5μ, with a stout clamp at the base; sterigmata 4; cystidia none; hyphae 2–11 (–14)μ wide, without clamps, rather infrequently secondarily septate, the cells 10–250μ long.

C. neofossicola sp.nov. (subgen. *Clavaria*); Mattick, *Ber. dt. bot. Ges.* **66**, 296, 1953.

Receptacula 1–4 cm × 1–2 mm, solitaria v. gregaria, simplicia v. sparsim ramosa (ut in *C. fossicola*), cylindrica, spathulata v. compressa 2–3 mm lata, acute dein obtusa, albida dein cremea, aetate sordide subochracea v. subincarnata, tenacia, inodora.

Ad terram inter Protococcoideas, phycophila, praesertim in silva, America Australi et Centrali (Panama, Bolivia, Brazil).

Sporae 6–9 × 2·7–4μ, hyalinae leves, ellipsoideae v. subcylindricae, obtusae, tenue tunicatae, saepe medio subconstrictae, intus minute multiguttulatae v. nebulosae. Basidia 26–38 × 6·5–8μ, subcapitata, afibulata; sterigmatibus 4, 5–7μ longis. Hymenium –150μ incrassatum. Cystidia nulla. Hyphae 3–10μ latae, afibulatae, plus minus ordine secundo septatae, tunicis subincrassatis.

Bolivia; Corner s.n., 31 Jan. 1948, Cobija.—Brazil; Corner s.n., 25 Aug. 1947, Niteroi, Estado do Rio; Corner s.n., 16 Dec. 1948 (typus, **CGE**) and s.n. 20 Mar. 1948, Corcovado,

500 m. alt., Rio de Janeiro; Corner s.n., Manaus, Amazonas, 1948; O. Fidalgo OKF-1278, 8 Apr. 1957, Tijuca, Rio de Janeiro.—Panama; G. W. Martin 6229, 1 Sept. 1945, Canal Zone, Fort Sherman area.

This is common in Brazil where it develops in large troops after the rains. Like *C. fossicola*, it prefers banks and ditches. The two species are

Fig. 7

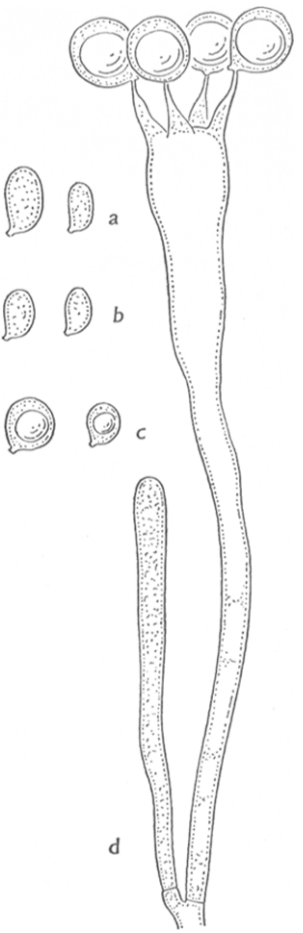

Fig. 8

Fig. 7. *C. martinii* Corner. Fruit body × 1; spores and basidia × 1000.

Fig. 8. *C. rosea* Fr. *a*, Var. *rosea* (coll. **TRIN** 1500, Trinidad); *b*, var. *rosea* (coll. Lütjeharms 4877, Sumatra); *c*, var. *subglobosa* Corner (coll. Corner s.n., Trinidad, 10 Oct. 1947); *d*, var. *grandispora* Corner (type, Brazil); × 1000.

very close, but *C. neofossicola* has larger spores and may develop much larger fruit-bodies. It is, surely, the so-called lichen Clavaria described by Mattick but as with other phycophilous species, the algae are invaded by the fungus and do not enjoy its fructification. Whether *C. scabra* Berk. is merely a very young state of this, or of *C. minima*, I cannot decide.

var. **armeniaca** var. nov.

Receptacula pallide incarnata, armeniaca, v. aurantio-rosea. Sporae 6–8 × 3–4μ. Basidia 30–40 × 7–7·5μ, afibulata. Hyphae 3–10 (–12)μ, in medulla et subhymenio coloratae.

Brazil; Corner s.n., 14 June 1947, Manaus, Amazonas (typus, **CGE**); Corner s.n., 7 Feb. 1948, Campo Grande, Matto Grosso; C. Torrend s.n., Bahia (Lloyd Catal. n. 24023, **BPI**).

This has the same habit as var. *neofossicola* and differs only in colour. It resembles *C. helicoides* superficially, but this species has not been found in America.

C. PARASITICA Viegas & Teixeira, *Rodriguesia*, **9**, 54, f. 5, 1945.

I think that this is a fungus imperfectus.

C. ROSEA Fr.; Corner (1950, p. 215, 248); S. Ahmad, *Biol. Soc. Pakistan Mon.* 1, 68, 1956; Pilat, *Sb. nár. Mus. Praze* (bot) **14**, 219, 1958. (Fig. 8)

C. schweinfurthiana P. Henn., *Hedwigia*, **37**, 284, 1898; Corner, (1950, p. 264).

C. sanguinaria Heim, *Mém. Soc. Hist. nat. Afr. N.* **2**, 153, f. 4, 5, 1949.

Fruit bodies –7 cm high, simple, rarely bifurcate, gregarious to caespitose, brittle, rose-red to dark crimson; stem –15 × 1·5 mm, paler, distinct. Spores 5–8 × 2·7–4μ, ellipsoid, smooth, with a small apiculus –0·5μ long. Basidia 45–60 × 6·5–8μ, without clamps; sterigmata 4, 4–5μ long. Cystidia none. Hymenium thickening –110μ. Hyphae –22μ wide, secondarily septate, without clamps, the cells 20–200μ long, narrow next the uninflated subhymenium.

Panama: C. W. Dodge 4021, 4 Sept. 1925. Barro Colorado.

Trinidad, W. I.; R. E. D. Baker (**TRIN** 1500), 9 Aug. 1947, on the ground under bamboos, wholly dull crimson.

Sierra Leone; F. C. Deighton M 2889 (**IMI** 37490), 25 July 1959, Kori, Njala; bright red, almost vermilion, becoming flattened –3·5 mm. wide.

West Pakistan; S. Ahmad s.n., 30 Oct. 1953, Raviside, Lahore, on the ground among *Cynodon dactylon*; red.

Sumatra; W. J. Lütjeharms 4812, 4877, Engagno Isl., 19–21 June 1936, on the ground; dark crimson.

Java; Herb. Hort. Bot. Bog. n. 1728 (painting); dark crimson.

Madagascar; ? *C. sanguinaria*; blood red; spores 5·5–7 × 3–3·6μ.

This is a revised description from tropical material. At the time of writing my monograph, there was no evidence that this species occurred outside the north temperate region. It seems to be pantropical, though it was not found by Petch in Ceylon or by myself in Malaya or Borneo. The two new varieties which I describe show that the species varies much in colour from pale to vivid pink and rose-red to crimson. There is, also, a range in spore size as in *C. argillacea*, *C. gibbsiae*, and *C. vermicularis*. However, the varieties with subglobose spores may prove to be a separate species.

var. *SUBGLOBOSA* Corner (1950, p. 248, 691); Malençon, *C.r. Séanc. mens Soc. Sci. nat. phys. Maroc*, n. 2, 5, 1961 (ut *C. barlae*).

Through the kindness of Prof. Malençon I have been able to examine his collection 5933 from Morocco, identified as *C. barlae*. I refer it to this variety of *C. rosea* but it certainly indicates that *C. barlae* is the somewhat branched state of *C. rosea*. The rose-lilac fruit bodies, −25 mm high, were simple or obtusely furcate, and had ovoid spores 5·5–7 × 3·5–5 μ and basidia without clamps. Several normally simple clavarias have a tendency to produce sparingly branched forms, such as *C. fossicola* and *Clavulinopsis amoena* (Zoll. & Mor.) Corner, and I regard this as a reversion to their ancestral branched condition. *C. zollingeri* and *Clavulinopsis corniculata* show, by contrast, the tendency to produce simple forms by loss of branching.

The following collection from Trinidad seems to be a pale form of var. *subglobosa*.

Trinidad, W.I.; Corner s.n., 10 Oct. 1947, on the ground under bamboos; –20 × 1 mm, solitary, dingy reddish pink, stem 8 × 0·5–0·7 mm; smell none; sp. 5–6·5 × 4·7–5·5 μ, white, aguttate, the apiculus –0·7 μ long; basidia 40–55 × 7–8 μ, without clamps; sterigmata 4, 5–7 μ long; hymenium thickening –100 μ; cystidia none; hyphae –6 μ wide, sparsely secondarily septate, without clamps.

var. **grandispora** var. nov. (Fig. 8)

Receptacula –9 cm × 2–3·5 mm, simplicia sparsa clavata, dein compressa –5 mm lata, obtusa, ex integro miniata v. aurantio-carminea; stipite –25 × 1·5–2·5 mm; subfragilia, inodora.

Ad terram in silva, Brazil; Corner s.n., 8 Dec. 1948, Corcovado, *c.* 500 m. alt., Rio de Janeiro.

Sporae 7·5–8·5 × 6·5–7·5 μ, hyalinae, leves, 1-guttatae, apiculo 0·5 μ longo. Basidia 85–110 × 8–10 μ, clavata, longe et anguste stiptata, ad basim 2–3 μ lata, afibulata; sterigmatibus (2–3–)4, 8–12 μ longis. Cystidia nulla. Hymenium –150 μ incrassatum; subhymenium –150 μ crassum, hyphis angustis 2–3.5 μ latis laxe intertextis. Hyphae –12 μ latae, afibulatae, ordine secundo sparsim v. frequenter septatae. Color miniatus praecipue in cellulis subhymenii et hypharum adjicientium.

This fine collection, superficially like *Clavulinopsis miniata* (Berk.) Corner, is distinguished by its large fruit bodies, spores, and basidia. I take it to represent the best developed, yet unbranched, state of the cosmopolitan *C. rosea*.

var. **pallida** var. nov.

Receptacula –7·5 cm alta, caespitosa, cylindrica et subclavata, dein compressa v. fistulosa 2–3·5 mm lata, obtusa, pallide incarnata v. carneo-alutacea; stipite –20 × 1·5 mm., ad basim villoso.

Ad terram in silva, Jamaica; R. W. G. Dennis J 78, 26 Dec. 1949, Blue Mountains, Newhaven Gap, *c.* 1200 m. alt. (**K**).

Sporae 5·5–7·3 × 3·5–4·3 μ, ellipsoideae. Basidia 50–68 × 7–8 μ, afibulata; sterigmatibus 4, 5–6 μ longis. Hyphae –17 μ latae, afibulatae.

This differs from var. *rosea* in the pale colour.

C. TENUIPES B. & Br.; Corner (1950, p. 250).

I can see no means of distinguishing the following Australian collection from *C. tenuipes*, which has not been recorded hitherto outside of Europe.

South Australia; J. B. Cleland 933, gregarious on dead wood (Lloyd Catal. n. 2809, **BPI**); –20 × 1 mm, simple, with short stem, white ?; sp. 7·5–9 × 4·5–5μ, white, elongate pip-shaped or subcylindric, thin-walled; basidia collapsed; hyphae –25μ wide, much inflated, with few secondary septa, without clamps.

C. TONKINENSIS Pat., *Bull. Soc. mycol. Fr. 8*, 49, 1892; Corner (1950, p. 265).

I have examined the type in the Farlow Herbarium. It is the stipe of an agaric and consists of longitudinal inflated hyphae 8–25μ wide, with broad septa, not constricted at the septa, long-celled, thin-walled, and apparently clamped. There is no trace of pileus or hymenium, the apex of the stipe being broken or eaten off.

C. VERMICULARIS Fr., Imai, *Trans. Sapporo nat. Hist. Soc.* **16**, 214, 1941; S. Ahmad, *Biol. Soc. Pakistan Monogr.* 1, 68, 1956; Corner, *Darwiniana* **11**, 195, 1957; Pilat, *Sb nár. Mus. Praze* (bot), **14**, 225, t. 45*b*, 1958; Welden, *J. Tennessee Ac. Sci.* **35**, 232, 1960; Thind, *The Clavariaceae of India* p. 150, f. 49, 1961.

Syn. ?*C. radotinensis* Vel., *Nov. Myc.* p. 166, 1939 (apparently no type-collection).

?*Clavulinopsis filipes* Corner (1950, p. 365); Petersen. *Bull. Torrey bot. Club*, *91*, 277, 1964.

This species is now known from West Pakistan, India, Africa, and Argentina, as well as the north and south temperate regions. I add the following records which seem to prove that it is cosmopolitan. Concerning *Clavulinopsis filipes*, Petersen found that Coker was wrong in ascribing clamps to its hyphae; it appears, therefore, to be subsolitary *C. vermicularis*.

Brazil; J. Rick s.n., São Leopoldo (Lloyd Catal. n. B7705, **BPI**); J. Rick s.n. (**BPI**); sp. 5·5–7 × 3–4μ.
Costa Rica; several collections by C. W. Dodge (**MO**).
Solomon Islands; T. C. Whitmore s.n., 1962, Guadalcanal.

var. *GRACILIS* Bourd. & Galz.; Thind, *The Clavariaceae of India* p. 152, t. 50, 1961.

This is known also from Africa.

Trinidad, W.I.; R. E. D. Baker (**TRIN** 1503), 9 Aug. 1947; sp. 4·5–5 × 3–3·5μ.
North Borneo; Corner s.n., 31 Jan. 1964, Kinabalu, Mesilau River, 1500 m alt., in humus in the forest; –3·5 cm high. caespitose, white; sp. 3·3–4 × 2·8–3·3μ, unusually small; hyphae –14μ wide.

var. *SPHAEROSPORA* Bourd. & Galz.; Ahmad, l.c. p. 68; Thind, l.c. p. 154.

Himalayas (West Pakistan, India).

C. ZOLLINGERI Lév.; Pilat, *Sb.nár. Mus. Praze* (bot) **14**, 217, 1958; *Česká Mykol.* **16**, 6, t. 45, 1962; Kotlaba & Pilat, *Česká Mykol.* **18**, t. 1, 1964; Thind, *The Clavariaceae of India*, p. 155, f. 52, 1961.

This is another species that is beginning to assume world-wide distribution. It has been suggested that *C. lavendula* Pk. with ellipsoid spores could be distinguished from *C. zollingeri* with subglobose spores, but I find intermediates, as shown in Table 1, and the spore shape and size does not

Table 1. *Spore-shape in* Clavaria zollingeri

Collection	Mean length (μ)	E*	Notes
Lütjeharms 3926, 3958, 4131, 4290, 4498	4·65	2·0	Sumatra, lilac to deep violet
MO 57499, 59741	5·75	1·6	U.S.A., lilac with pink tinge
Dodge 1933	5·0	1·5	U.S.A.
Singer B28	6·0	1·5	Brazil, purple-lilac
Reid s.n.	5·5	1·5	Scotland
RSNB 5004, 8194	5·0	1·5	Borneo, deep lilac-purple
Lütjeharms 4659	5·0	1·4	Sumatra, pale lilac
Lloyd Cat. 30214	6·0	1·3	Brazil, rose, then brownish
Warcup C16	5·75	1·3	New Zealand
Thind	5·2	1·3	India, light to pale violet
Sinber B538	5·8	1·3	Bolivia
Lütjeharms s.n.	4·75	1·2	Java

* E is the proportion of length to width.

always tally with differences in the shape and colour of the fruit body. Nevertheless, it is a variable species which may be resolved into varieties when better known. I have noted that young plants are compact and that the internodes lengthen through secondary septation of the hyphae to produce the lanky old plants.

U.S.A.; A. Hibbard s.n., 13 Sept. 1920, West Roxburg, Mass. (**MO** 57499); W. R. Lowater s.n., 5 Aug. 1921, Ohio (**MO** 59741); C. W. Dodge 1933, Pawlet, Vermont; lilac with pink tinge; sp. 5–6·5 × 3–3μ ellipsoid; (in all three collections).

Borneo; RSNB 5004, 18 June 1964, Kinabalu, 1600 m alt; RSNB 8194, 9 Apr. 1964, Kinabalu; –10 cm high, caespitose, very brittle, deep lilac purple, 3–4 times dichotomous; sp. 4·7–5·5 × 3–3·7μ.

Sumatra; Enganno Isl., W. J. Lütjeharms 3926, 3958, 4131, 4290, 4498, 30 May –9 June 1936; –5·5 cm high, caespitose, lilac to pale or deep violet with pinkish or yellowish base; stem 5–10 × 2–3 mm, branches strict, cylindric, 3–4 times dichotomous in alternating planes, brittle; sp. 4–5·3 × 2·5–3·2μ, ellipsoid; basidia 30–45 × 6–7μ, four sterigmata 5μ long; hyphae –20μ wide, cells 15–30μ long.

Lütjeharms 4659, 13 June 1936, Enganno Isl.,; as the previous collections but pale lilac; sp. 4·7–5·7 × 3·2–4μ.

Java; W. J. Lütjeharms s.n., 25 Mar. 1936, Hort. Bogor.; –5 cm high, 3–6 times dichotomous, colour ?; sp. 4.5–5 × 3·7–4μ.

Brazil; J. Rick s.n., São Leopoldo (Lloyd Catal. n. 30214); –6 cm high, caespitose, rose then brownish, once or twice dichotomous; sp. 5·5–6·5 × 4·5–5μ; R. Singer B28, 31 Oct. 1951, São Leopoldo, on roots of bamboos at the edge of the forest; –3·5 cm high, simple or forked once at the apex, purplish lilac; sp. 5·5–6·5 × 3·5–4·7μ, subglobose to broadly ellipsoid.

Trinidad, W.I.; R. W. G. Dennis 210, 20 Oct. 1949, on the ground under bamboos; –2·5 cm high, sparingly branched, pinkish lilac; sp. 4·5–5·5 × 3·7–4·7μ, broadly pip-shaped.

Bolivia; R. Singer B538, 26 Jan. 1956, Dpto. La Paz, Prov. Nor-Yungas, Coraica; –5 cm high, amethyst lilac; sp. 5–6·5 (–7) × 4–5·2 μ.
New Zealand; J. Warcup C16, Wellington; sp. 5–6·5 × 4–5 μ.

The following two collections from Bolivia seem to be a small-spored variety:

Bolivia; R. Singer B 1650, 7 Mar. 1956, Dpto. Beni, Prov. Vaca Diez, Guayaramirim, and B 1912, 12 Mar. 1956, id.; –3·5 cm high, branched, amethyst; sp. 3·5–4·3 × 3–3·5 μ; hyphae –12 μ wide, secondarily septate without clamps.

A painting, n. 1435, in the Kebun Raya, Hortus Bogoriensis of Java, shows a white, subcaespitose fruit body –7 cm high, –3 times dichotomous, with blunt tips; spores *c.* 6 × 3–3·5 μ, and wide, short-celled hyphae without clamps. It suggests an albino state of *C. zollingeri*, but there is neither description nor specimen.

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