

THE MYCOLOGICAL PUBLICATIONS OF K. B. BOEDIJN

M. A. DONK
Rijksherbarium, Leiden

(With Plate 4)

After a distinguished career as a collaborator of Prof. Hugo de Vries, the famous geneticist, Karel Bernard Boedijn (born June 29, 1893, at Amsterdam) became a mycologist, and it is in this latter capacity that he will be primarily remembered.

He had already started to pay attention to the fungi during his Amsterdam period when C. van Overeem, Miss D. M. G. de Haas (who later married van Overeem), and Boedijn banded together and called themselves the "Mycologisch Museum te Weesp". They started building up a collection which, however, never became very big. After some years van Overeem accepted a position in the Herbarium of the Botanic Gardens at Buitenzorg (now Bogor) in Java, where he died after a short but active period (1921-1927). The collections on liquid of the "Mycologisch Museum" are now at the "Hugo de Vries-Laboratorium", Amsterdam, while the dried material, taken to Java by van Overeem, will be found in the collections of Herbarium Bogoriense.

Boedijn, too, wanted to become better acquainted with the tropics. To further this goal he accepted a position as a botanist in the "Algemeen Proefstation A.V.R.O.S." (General Experimental Station A.V.R.O.S.) at Medan (Sumatra East Coast) in 1926. Thus a long period of active collecting and studying fungi started, interrupted only by World War II and its aftermath, and not ending until he finally returned to The Netherlands in 1958.

After a short stay at Medan and after having returned to The Netherlands, Boedijn succeeded van Overeem as a mycologist in the Buitenzorg Herbarium (1928-1941). In 1933 he was appointed Extraordinary Professor of Botany at the Faculty of Medicine at Batavia (now Djakarta) in addition to his other duties. Shortly after the beginning of the war with Japan he gave up his position at the Herbarium and became a full-time Professor of Botany in the Faculty of Medicine and at the same time in the Faculty of Agriculture at Buitenzorg (1941). After the war this task was divided and his professorship became restricted to Buitenzorg (Bogor). In 1958 he retired and returned to The Netherlands, The Hague, continuing his mycological studies at home in close connection with the Mycological Department of the Rijksherbarium at Leiden. During this last period he contributed several papers to the newly founded mycological periodical "Persoonia". On the occasion of the 70th anniversary of his birthday in 1963 his many friends paid homage to him as a distinguished mycologist of world-wide fame. The "Nederlandse

Mycologische Vereniging" made him a Honorary Member on that occasion. He died suddenly on Augustus 26th, 1964, at The Hague.

With Boedijn's death a very remarkable mycological career came to an end. His prominence was the result of a composite set of factors. He was one of the very few mycologists who lived in the tropics for a long span of time and maintained a keen interest in his fieldwork. During most of his activity in the tropics he was able to refer to the libraries at Buitenzorg (Bogor) which contain a good collection of mycological publications. Moreover, he never really specialized in one group in particular for a very long period. As soon as he had mastered one subject and had committed his knowledge of it to a manuscript, he started work on another, often quite unrelated, group. He always maintained a high standard both in his microscopical and cytological observations as well as in his cultural work. All this resulted in a long series of excellent notes and usually rather short monographs on the most diverse groups of Indonesian fungi. The following bibliography shows how astonishingly wide his field of interests was.

A mycologist with such wide a knowledge was excellently suited to work up local collections: he actually undertook this kind of work twice, in naming the fungi collected by Dr. O. Jaag in the Lesser Sunda Islands and by various collectors (including himself) of the islands of the Krakatau group.

Many of his published papers are short and often deal only with small groups. Nevertheless they form together with the more extensive papers an unequalled fund of information on the mycology of Indonesia. It is perhaps safe to say that in this regard Boedijn has surpassed the mycological efforts of all other botanists. When interest in the fungi is revived in Indonesia it may be advisable to consider the production of a photoprint edition of his collected work on Indonesian fungi, because it will form the basis of much future work in that area.

Most of his Indonesian collections were deposited in Herbarium Bogoriense but he also built up a personal herbarium which was sold to the Botanical Museum and Herbarium at Utrecht.

BIBLIOGRAPHY

- 1 (1918).—K. B. BOEDIJN & C. VAN OVEREEM. Mykologische Mitteilungen. Serie I. Ascomycten. Erstes Stück. Ueber das Vorkommen von Carotinkristallen in zwei neuen Pezizaarten. *In* Hedwigia 59: 307-312 *pl.* 2.
- 2 (1918).—Mestzwammen. *In* Meded. Nederl. mycol. Ver. 9: 110-118 4 *fs.*
- 3 (1921).—Nieuwe Nederlandsche Saprolegniaceeën. *In* Meded. Nederl. mycol. Ver. 11: 116-121 *textpl.* 3.
- 4 (1922).—Over de systematiek der Basidiomyceten. *In* Meded. Nederl. mycol. Ver. 12: 39-53 14 *fs.*
- 5 (1923).—Nieuwe Nederlandsche Saprolegniineae II. *In* Meded. Nederl. mycol. Ver. 13: 84-90 (4) *fs.*

- 6 (1923).—On the development of *Stigmatomyces*. In Meded. Nederl. mycol. Ver. **13**: 91–97 *textpl.* 2.
- 7 (1925).—De Nederlandsche *Inocybe*-soorten. (Voorloopige mededeeling.) In Meded. Nederl. mycol. Ver. **14**: 89–122 (45) *fs.*
- 8 (1926).—Een nieuwe *Septobasidium* op de thee. In Meded. Alg. Proefst. A.V.R.O.S., Medan (Algem. Ser.) No. 26: 6–11 2 *fs.* — Also issued in English: A new *Septobasidium* on tea. In Comm. gen. exp. Sta. A.V.R.O.S., Medan (Gen. Ser.) No. 26: 6–10 2 *fs.*
- 9 (1926).—De spinnewebsschimmels van *Hevea brasiliensis*. Three kinds of thread blight of *Hevea brasiliensis*. In Arch. Rubbercult., Buitenz. **10**: 369–376 (1) *f.*, (1) *pl.* (Rubberserie No. 50).
- 10 (1927).—Nieuwe en zeldzame Nederlandsche fungi. In Nederl. kruidk. Arch. **36**: 66–70. “1926”.
- 11 (1927).—Mycetozoa von Sumatra [I]. In Misc. zool. sumatrana No. 17: 3 pp. 1 *f.*
- 12 (1927).—Mycetozoa von Sumatra (II). In Misc. zool. sumatrana No. 24: 4 pp. (1) *f.*
- 13 (1927).—Ueber *Rhopalomyces elegans* Corda. In Ann. mycol., Berl. **25**: 161–166 4 *fs.*
- 14 (1928).—Notes on some *Aspergilli* from Sumatra. In Ann. mycol., Berl. **26**: 69–84 10 *fs.*
- 15 (1928).—Verzeichnis der von Sumatra bekannten Mycetozoa. In Ann. mycol., Berl. **26**: 450–453.
- 16 (1928).—Das Myzel von *Parodiella spagazzinii* Theissen et Sydow. In Z. PflKrankh. **38**: 129–132 4 *fs.*
- 17 (1929).—Beitrag zur Kenntnis der Pilzflora von Sumatra. In Rec. Trav. bot. néerl. **26**: 396–439 17 *fs.*
- 18 (1929).—Een zeer merkwaardige groeciplaats voor een paddestoel. In Trop. Natuur, Weltevr. **18**: 154–155 1 *f.*
- 19 (1930).—Die Gattung *Glaziella* Berkeley. In Bull. Jard. bot. Buitenz. III **11**: 57–66 7 *fs.*
- 20 (1930).—K. B. BOEDIJN & A. STEINMANN. Over de op thee en andere cultuurplanten in Ned.-Indië optredende *Helicobasidium*- en *Septobasidium*-soorten. On the species of *Helicobasidium* and *Septobasidium* occurring on tea and other cultivated plants in the Dutch East Indies. In Arch. Theecult. Ned.-Indië **4**: 5–59 *pls.* 1–29.
- 21 (1930).—Over eenige Nederlandsch-Indische Stinkzwammen. In Trop. Natuur, Weltevr. **19**: 201–209 7 *fs.*, 1 *pl.*
- 22 (1931).—K. B. BOEDIJN & A. STEINMANN. Les espèces des genres *Helicobasidium* et *Septobasidium* des Indes néerlandaises. In Bull. Jard. bot. Buitenz. III **11**: 165–219 31 *fs.*, *pls.* 14–18.
- 23 (1931).—Notes on some sooty moulds. In Bull. Jard. bot. Buitenz. III **11**: 220–231 1 *f.*

- 24 (1931).—K. B. BOEDIJN & A. STEINMANN. Over de roetdauwschimmels van de thee. On the so-called sooty moulds of tea. *In Arch. Theecult. Ned.-Indië* **5**: 25-27 (1) f., 9 textpls.
- 25 (1931).—Over *Simblum periphragmoides* en een parasiet van *Dictyophora*. *In Trop. Natuur, Weltevr.* **20**: 11-13 2 fs.
- 26 (1931).—Over *Ithyphallus aurantiacus*. *In Trop. Natuur, Weltevr.* **20**: 97-99 3 fs.
- 27 (1932).—The Phallineae of the Netherlands East Indies. *In Bull. Jard. bot. Buitenz.* III **12**: 71-103 12 fs.
- 28 (1932).—The genus *Sarcosoma* in Netherlands India. *In Bull. Jard. bot. Buitenz.* III **12**: 273-279 (1) f.
- 29 (1932).—Einige Bemerkungen zu der Abhandlung von S. C. Teng. „Fungi of Nanking I”. *In Ann. mycol., Berl.* **30**: 478-479.
- 30 (1932).—D. R. KOOLHAAS & K. B. BOEDIJN. De „Theeschimmel” in Nederlandsch Indië. (Voorloopige mededeeling.) *In Bergcultures* **6** (I): 299-303 2 fs.
- 31 (1932).—*Aseroë rubra*. *In Trop. Natuur, Weltevr.* **21**: 212 1 f.
- 32 (1933).—The genera *Phillipsia* and *Cookeina* in Netherlands India. *In Bull. Jard. bot. Buitenz.* III **13**: 57-76 7 fs.
- 33 (1933).—Ueber einige phragmosporen Dematiaceen. *In Bull. Jard. bot. Buitenz.* III **13**: 120-134 6 fs.
- 34 (1933).—Een gallenvormende schimmel (*Exobasidium Cinnamomi* Petch). *In Trop. Natuur, Weltevr.* **22**: 132-134 2 fs.
- 35 (1934).—The genus *Sarawakus* in the Netherlands Indies. *In Bull. Jard. bot. Buitenz.* III **13**: 263-265 1 f.
- 36 (1934).—The genus *Sirobasidium* in the Netherlands Indies. *In Bull. Jard. bot. Buitenz.* III **13**: 266-268 1 f.
- 37 (1934).—The genus *Podostroma* in the Netherlands Indies. *In Bull. Jard. bot. Buitenz.* III **13**: 269-275 1 f.
- 38 (1934).—The genus *Chitoniella* with remarks on the Chlorosporae. *In Bull. Jard. bot. Buitenz.* III **13**: 276-280 1 f.
- 39 (1934).—Ueber die neue Gattung *Trigonia* van Beyma thoe Kingma. *In Ann. mycol., Berl.* **32**: 302.
- 40 (1934).—Malaiische Blumenpilze: Verwandte unsrer Stinkmorchel. *In Natur u. Volk* **64**: 399-406 9 fs.
- 41 (1935).—A new Malaysian species of *Coprinus*. *In Bull. Jard. bot. Buitenz.* III **13**: 470-471 1 f.
- 42 (1935).—The genus *Dendrosphaera* in the Netherlands Indies. *In Bull. Jard. bot. Buitenz.* III **13**: 472-477 4 fs.
- 43 (1935).—Two new Malaysian genera of Discomycetes. *In Bull. Jard. bot. Buitenz.* III **13**: 478-483 3 fs.
- 44 (1935).—On some species of *Ustilago* occurring on *Erianthus* and *Saccharum*. *In Bull. Jard. bot. Buitenz.* III **13**: 484-486.
- 45 (1935).—On *Dothidea sordidula* Lévillé. *In Bull. Jard. bot. Buitenz.* III **13**: 497-502 1 f.

- 46 (1935).—The genera *Endogone* and *Sclerocystis* in the Netherlands Indies. In Bull. Jard. bot. Buitenz. III 13: 503–508 3 fs.
- 47 (1935).—On the morphology and cytology of *Trichocoma paradoxa*. In Ann. Jard. bot. Buitenz. 44: 243–256 16 fs.
- 48 (1935).—Treub Laboratory investigations. Mycetozoa, Fungi & Lichenes. In Ann. Jard. bot. Buitenz. 45: 105–112.
- 49 (1935).—Ueber die Gattung *Xylariopsis* Tai. In Ann. mycol., Berl. 33: 229.
- 50 (1935).—De zwammenflora van Nederlandsch Indië. In Levende Natuur 40 (Nos. 3, 4 = Gedenkb. Thijssse): 101–108 2 fs.
- 51 (1936).—The genus *Cordierites* in the Netherlands Indies. In Bull. Jard. bot. Buitenz. III 13: 525–529 2 fs.
- 52 (1937).—The genus *Helicogloea* in the Netherlands Indies. In Bull. Jard. bot. Buitenz. III 14: 187–196 4 fs.
- 53 (1937).—A smut causing galls on the leaves of *Hypolytrum*. In Bull. Jard. bot. Buitenz. III 14: 368–372 2 fs.
- 54 (1937).—On a new genus of the Dematiaceae. In Blumea (Suppl.) 1: 140–141 pl. 9.
- 55 (1938).—The genus *Calostoma* in the Netherlands Indies (Fungi, Bas.). In Bull. Jard. bot. Buitenz. III 16: 64–75 4 fs.
- 56 (1938).—A poisonous species of the genus *Phaeomarasmius* (Agaricaceae). In Bull. Jard. bot. Buitenz. III 16: 76–82 2 fs.
- 57 (1938).—A new species of the genus *Podostroma* from Africa. In Ann. mycol., Berl. 36: 314–317 1 f.
- 58 (1938).—K. B. BOEDIJN & J. A. VERBUNT. Annotations about dermatomycoses in Batavia. In Mycopathologia 1: 185–198 4 fs., pls. 26–31.
- 59 (1938).—Een paar schimmels, die op dieren groeien. In Trop. Natuur, Weltevr. 27: 165–169 7 fs.
- 60 (1939).—The Tuberales of the Netherlands Indies. In Bull. Jard. bot. Buitenz. III 16: 236–244 4 fs.
- 61 (1939).—K. B. BOEDIJN & A. F. SCHOOREL. De steenroode wortelschimmel (*Poria hypolateritia*). (With a summary: The red-root disease of tea — *Poria hypolateritia*.) In Arch. Theecult. Ned.-Indië 13: 19–25 2 pls.
- 62 (1939).—De morieljes van Java. In Trop. Natuur, Weltevr. 28: 1–3 3 fs.
- 63 (1940).—The fungi collected by Dr. O. Jaag, in Alor, Bali and Flores (Lesser Sunda Islands). In Bull. Jard. bot. Buitenz. III 16: 245–252 3 fs.
- 64 (1940).—The genus *Pyronema* in the Netherlands Indies (Fungi, Ascom.). In Bull. Jard. bot. Buitenz. III 16: 272–275.
- 65 (1940).—The Mycetozoa, Fungi and Lichenes of the Krakatau group. In Bull. Jard. bot. Buitenz. III 16: 358–429 14 fs.
- 66 (1942?).—*Circinoconis*, a new genus of Dematiaceae (Fungi imperfectae). In 150th Ann. Vol. bot. Gdn Calcutta 209–211 2 fs. — The volume and reprints were not distributed until after the war.
- 67 (1950).—K. B. BOEDIJN & J. REITSMA. Notes on the genus *Cylindrocladium* (Fungi: Mucedinaceae). In Reinwardtia 1: 51–60 3 fs.

- 68 (1951).—Notes on Trichophytonaeae from Java. *In* Mycopath. & Mycol. appl., Den Haag **6**: 116-134 7 fs.
- 69 (1951).—Some mycological notes. *In* Sydowia **5**: 211-229 7 fs.
- 70 (1951).—Notes on Indonesian Fungi. *In* Sydowia **5**: 317-327 5 fs.
- 71 (1956).—Trypan blue as a stain for Fungi. *In* Stain Technology **31**: 115-116.
- 72 (1957).—On *Uromyces Inocarpi* Raciborski. *In* Beih. Sydowia **1**: 277-279.
- 73 (1958).—Notes on the Mucorales of Indonesia. *In* Sydowia **12**: 321-362 12 fs.
- 74 (1959).—The fungi in Rumphius's Herbarium Amboinense. *In* Rumphius Memor. Vol. 289-294.
- 75 (1959).—Notes on the genus *Sarcosoma*. *In* Persoonia **1**: 7-9.
- 76 (1959).—The genus *Actiniceps* Berk. & Br. *In* Persoonia **1**: 11-14 5 fs.
- 77 (1959).—On a new family of the Sphaeriales. *In* Persoonia **1**: 15-19 3 fs.
- 78 (1959).—A species of *Septobasidium* shedding its immature basidia. *In* Persoonia **1**: 21-23 5 fs.
- 79 (1959).—On black and white Piedra. *In* Mycop. & Mycol. appl., Den Haag **11**: 354-358 2 fs.
- 80 (1960).—On a new genus of the Endomycetaceae, *In* Mycop. & Mycol. appl., Den Haag **12**: 163-167 2 fs.
- 81 (1960).—Stigmatomycosis in Indonesia. *In* Mycopath. & Mycol. appl., Den Haag **13**: 243-246 2 fs.
- 82 (1960).—The Strobilomycetaceae of Indonesia. *In* Persoonia **1**: 315-318 6 fs.
- 83 (1960).—A new *Sclerographium* from Indonesia. *In* Persoonia **1**: 319-320 3 fs.
- 84 (1960).—The Uredinales of Indonesia. *In* Nova Hedwigia, Weinheim **1**: 463-496 pls. 105, 106.
- 85 (1961).—Notes on the Meliolales. *In* Persoonia **1**: 393-404 24 fs.
- 86 (1961).—Myriangiales from Indonesia. *In* Persoonia **2**: 63-75 3 fs. — And see "Correction" in Persoonia **2**: 194. 1962.
- 87 (1962).—On *Xylaria spathulata* Berk. & Br. *In* Persoonia **2**: 193-194.
- 88 (1962).—The Sordariaceae of Indonesia. *In* Persoonia **2**: 305-320 12 fs.
- 89 (1962).—The genus *Cercospora* in Indonesia. *In* Nova Hedwigia, Weinheim **3**: 411-438 pls. 108-111.
- 90 (1964).—The genus *Thuemenella* with remarks on Hypocreaceae and Nectriaceae. *In* Persoonia **3**: 1-7 5 fs.

THE GENUS *SQUAMANITA*

C. BAS
Rijksherbarium, Leiden

(With 42 Text-figures)

By transferring *Cystoderma paradoxum* Smith & Sing. and *Vaginata umbonata* Sumst. to the genus *Squamanita* and the description of the new species, *S. pearsonii*, the number of species of that genus is raised from two to five. In addition two more species of *Squamanita* are provisionally described. An emended description of the genus and a key to the species is given. The production of abundant chlamydo-spores on special conidiophores is described in three species. The relationships of the genus are discussed.

In 1918 Miss Catharina Cool, at that time curator of the herbarium of the Netherlands Mycological Society, described the species *Lepiota odorata* Cool from material collected in The Netherlands. The simultaneous discovery of such a remarkable fungus (a small violet-grey *Tricholoma*-like fungus with a scaly cap and base of the stem, a sclerotial bulb and a strong aromatic smell) from several places in this country caused some sensation among the Dutch mycologists, especially after it appeared that it was unknown to such famous mycologists as Patouillard and Ricken.

After that time *Lepiota odorata* was found in The Netherlands several times again, but after very irregular intervals. In 1943 Huijsman published observations on a number of species of *Lepiota* and on that occasion erected the genus *Coolia* to accommodate *Lepiota odorata*, unfortunately without furnishing a Latin diagnosis.

In about 1935 another striking fungus turned up in Switzerland and was described and depicted by Schreier (1938: 97, pl. 2) as "*Tricholoma* X". Probably it was due to the beautiful coloured plate that this publication immediately aroused much interest. The tricholomatoid habit, the scales on the cap and at the base of the stem and the sclerotial bulb of Schreier's species are reminiscent of *Lepiota odorata*, but the brownish yellow colour and the much larger size point to a distinct species.

Schreier's publication caused three independent reactions. First, Imbach (1942: 152) proposed the creation of the genus *Squamamanita* [!] for *Tricholoma* X and to name that species *S. schreieri*, but Latin descriptions were lacking. Some years later, Imbach (1946: 18) validly published the generic name *Squamanita* and the specific name *S. schreieri*.

Secondly, Huijsman (1943: 60), in his paper on *Coolia*, proposed the epithet 'schreieri' for *Tricholoma* X and the tentative combination *Coolia schreieri* Huijsman, an abortive name for several reasons.

Thirdly, Maire & Konrad, who studied a part of Schreier's material, published

the name *Tricholoma schreieri* in a paper by Maire (1945: 27) the publication of which was delayed because of the war: it escaped notice for the same reason. Although Maire & Konrad's name is the first validly published one for the Swiss fungus it can not be transferred to *Squamanita* because the resulting recombination would be a later homonym of *Squamanita schreieri* Imbach, reason why Imbach's later name has to be used.

The combination *Squamanita odorata* (Cool) is usually attributed to Imbach. But he (1946: 83) did not definitely accept this name and so the combination has still to be validly published.

The author's attention was drawn to the genus *Squamanita* rather accidentally. Among material of Malayan species of *Amanita* collected by Mr. E. J. H. Corner, one species (*Amanita* 6) showed some features unknown in the genus *Amanita*. For one thing, in the button-stage the gills did not touch the stem thus having free edges during their development, and for another, the basal bulb was apparently able to produce more than one fruit-body. Moreover the gills were narrow, rather irregular and slightly decurrent and the margin of the cap was not striate, while the spores were non-amyloid. The sclerotial bulb particularly reminded one of the genus *Squamanita*. A comparison of the descriptions of Corner's *Amanita* 6 and *S. schreieri* showed that those species resemble each other closely.

While screening the American literature for descriptions of species of *Amanita*, the author came across *Vaginata umbonata* Sumstine. The conical cap and the rings of pointed scales at the base of the stem and the top of the bulb reminded him again of *S. schreieri* Imbach and a study of the type of *V. umbonata* revealed that this species differs from the Swiss one mainly by the occurrence of large hymenial cystidia. It was a piece of luck that *S. umbonata* was collected during the meeting of the Mycological Society of America at Amherst in August 1963, so that the author had the opportunity of studying this species in fresh condition.

Talking over the genus *Squamanita* with Dr. A. H. Smith, Ann Arbor, this great expert on North American Agaricales and Gasteromycetes drew the author's attention to a remarkable fungus, collected by him in the western U.S.A. and described by Smith and Singer (1948: 454) as *Cystoderma paradoxum*, a species later recorded from Europe by Herink (1954: 60) and by Horak (1962: 16). Although this species has a loosening universal veil mainly made up of chains of spherocysts, the pigmentation and the fact that a number of fruit-bodies were found to grow on a sclerotial body are reminiscent of *Squamanita odorata*, which species is undoubtedly more closely related to it than the other species of *Cystoderma*.

Having come to this, it seemed of interest to bring together all the available information on *Squamanita*.

Pearson (1952: 99) reported *Tricholoma odoratum* (Cool) Konr. & Maubl. from Scotland. However, this material turned out to represent a new species. A collection of another new species from the same area was preserved at Edinburgh under the same name.

Grateful acknowledgements are expressed to the Director of the University

Herbarium, University of Michigan, Ann Arbor, to the Director of the Carnegie Institute, Pittsburgh, to the Director of the Botanical Museum and Herbarium, Copenhagen, to the Director of the Royal Botanic Garden, Edinburgh, to the Director of the Department of Plant Pathology, Cornell University, Ithaca, and to the Director of the Herbarium, Royal Botanic Gardens, Kew for lending material and documents. For the same reason thanks are due to Mr. W. Bettschen, Biel (Switzerland), to Mr. E. J. H. Corner, Cambridge, to Dr. J. Herink, Mnichovo Hradiště (Czechoslovakia), to Dr. E. Horak, Zürich, and to Dr. D. S. Stuntz, Seattle.

SQUAMANITA Imbach

Squamanita Imbach in Mitt. naturf. Ges. Luzern 15: 81. 1946. — Protonym: *Squamamanita* [!] Imbach in Schweiz. Z. Pilzk. 20: 152. 1942 (nom. nud.; no Latin descr.). — Type: *Squamanita schreieri* Imbach.

Coolia Huijsman in Meded. Nederl. mycol. Ver. 28: 59. 1943 (no Latin descr.). — *Tricholoma* sect. *Coolia* (Huijsman) Konr. & Maubl., Agaricales 1: 345. 1948 (no Latin descr.). — Type: *Lepiota odorata* Cool.

Cystoderma subgenus *Dissoderma* A. H. Sm. & Sing. in Mycologia 40: 454. 1948. — Type: *Cystoderma paradoxum* Smith & Sing.

Fruit-bodies tricholomatoid, terrestrial, gregarious to subcaespitose, sometimes solitary, arising from simple to compound sclerotial bodies. Cap fleshy, dry, radially fibrillose to scaly, sometimes slightly squarrose, violaceous grey, yellow-brown or buff, young margin straight or very slightly involute. Gills crowded to distant, very narrow to broad, always more or less adnate (narrowly adnate, sinuate, emarginate, broadly adnate or subdecurrent), often unciniate, often with irregular edge, whitish or concolorous with cap, often intervenose. Stem solid, mostly equal, relatively short, fibrillose, concolorous with cap, often on lower half or at base with fibrillose, pointed, erect to appressed scales similar to those on cap, or if these scales are absent, base surrounded by a volval limb; sometimes with a fibrillose annular zone. Flesh without or, more often, with a strong smell. Sclerotial bodies either simple, subcylindrical, fusiform, napiform, or subglobose, or compound with a varying number of subglobose, ellipsoid or cylindrical bodies on a common basal one, solid, sometimes becoming hollow, firm, whitish to ochraceous, in 3 of the present 7 species with abundant thick-walled chlamydosporous on surface or just under cortical layer.

Spores medium to small, thin- to rather thick-walled, colourless (or very slightly coloured ?; see p. 351), ellipsoid, subreniform or globose, smooth, without germ-pore, binucleate in at least 1 species, non-amyloid or amyloid or pseudo-amyloid, sometimes distinctly metachromatic in Cresyl Blue. Basidia mainly 4-spored, but often partly 1-, 2-, and 3-spored, without carminophilous granules. Edge of gills homomorphous; large, fusiform, colourless hymenial cystidia present in one species. Trama of gills regular, becoming very slightly irregular by inflation of cells of central hyphae. Subhymenium very narrow, densely ramose. Cuticle, scales on cap, and if present scales on base of stem consisting of parallel, rather broad, coloured hyphae. Trama of stem confluent with that of cap. Pigments intercellular-encrusting or membranous, distinctly intracellular in oleiferous type of hyphae. Clamps abundant.

Development of *S. odorata* studied by Reijnders (1952: 23); monovelangiocarpous + gymangiocarpous according to Reijnders's, hemiangiocarpous according to Singer's, terminology. Probably bivelangiocarpous in some species.

ECOLOGY.—Terrestrial, probably always near trees (deciduous or coniferous) in temperate and tropical regions.

DISTRIBUTION.—Europe, North America, south-eastern Asia.

In the above generic description the terms universal veil and partial veil have been avoided as the velar relations in *Squamanita* are far from being clear (see p. 352).

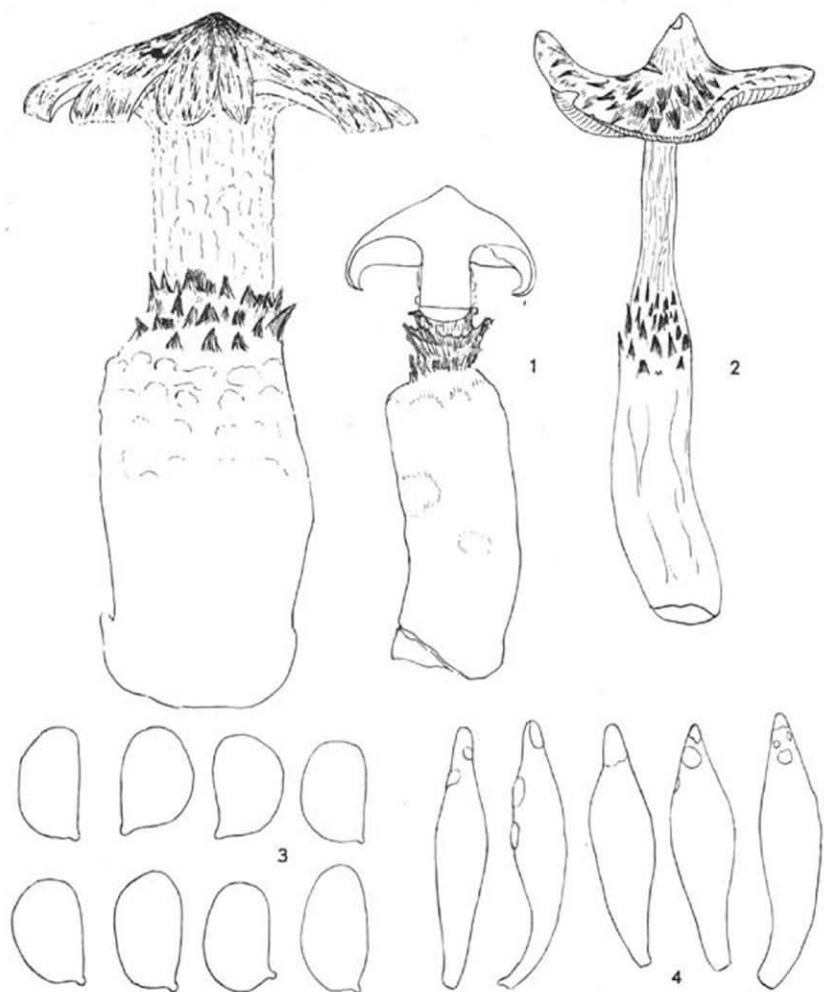
KEY TO THE SPECIES OF *SQUAMANITA*

1. Cortical layer of sclerotial bulb, if present, without spherocysts and disappearing from buds in a very early stage.
 2. Cap whitish, yellowish, ochraceous, tawny or reddish brown.
 3. Large hymenial cystidia present *S. umbonata*, p. 334
 3. Hymenial cystidia absent.
 4. Base of stem and top of bulb set with pointed fibrillose scales; smell indistinct
S. schreieri, p. 337
 4. Base of stem surrounded by a thick rim or low volva; smell distinct.
 5. Base of stem surrounded by a 10–15 mm high, sheathing, distant volva; smell rather strong, fruity *S. tropica*, p. 338
 5. Base of stem surrounded by an appressed thick rim; smell farinaceous
S. species?, p. 340
 2. Cap greyish lilac, greyish violet, purplish grey or brownish grey.
 6. Spores globose, amyloid *S. scotica*, p. 341
 6. Spores ellipsoid, non-amyloid or pseudo-amyloid.
 7. Spores non-amyloid, thin-walled *S. odorata*, p. 342
 7. Spores pseudo-amyloid, rather thick-walled *S. pearsonii*, p. 345
1. Cortical layer of sclerotial bulb with chains of spherocysts, covering young fruit-bodies like a volva; cap violaceous grey *S. paradoxa*, p. 348

Squamanita umbonata (Sumstine) Bas, *comb. nov.*—FIGS. 1–4.

Vaginata umbonata Sumstine in *Mycologia* 6: 35, pl. 117 fig. 1. 1914. — *Armillaria umbonata* (Sumstine) Murrill in *N. Amer. Fl.* 10: 38. 1914.

Fruit-bodies solitary, gregarious or subcaespitose. Cap 35–60 mm wide, at first conical with slightly incurved margin, later on expanding and then with a sometimes very pronounced, acute, conical umbo, seldom becoming plano-convex to flat with slightly depressed centre; not hygrophanous, whitish, pale buff to ochraceous buff, fibrillose, the greater part covered with slightly darker ochraceous buff to pale ochraceous brown, coarsely fibrillose, appressed, often pointed, more or less concentrically arranged scales, which tend to darken to brown in older specimens; dry, somewhat shiny at margin, fleshy in centre, thin at margin. Gills moderately crowded, with 1–3 rounded to truncate small ones between each pair, white, rather thin, moderately broad, 3–5 mm wide, slightly ventricose, adnate, emarginately adnate or adnexed, sometimes slightly uncinatate, often rather irregular, not or slightly intervenose; edge concolorous, often more or less incised. Stem 25–80 × 5–18 mm, equal or somewhat broadening at base and apex, whitish with buff-coloured floccose-fibrillose or slightly fibrillose-scaly zones, arising from a cylindrical to clavate fusiform bulb which measures 30–70 × 24–40 mm (sometimes confluent at base with other bulbs); bulb greyish white with brownish to rusty spots, somewhat felted, sometimes slightly scaly (caused by superficial cracks in cortex), often the greater part covered with particles of soil; the transitional zone between stem and



Figs. 1-4. *Squamanita umbonata*. — 1. Fruit-bodies of Atkinson 20181 ($\times 1$). — 2. Fruit-body of type after dried material ($\times 1$). — 3. Spores of type ($\times 2500$). — 4. Cystidia of type ($\times 500$).

bulb with some irregular rings of tawny-ochraceous to dingy brown, fibrillose, appressed, or erect, obliquely upward-pointing scales or lacerate scales ("fimbriate volva" of Sumstine); sometimes with a slight floccose annular zone near apex (mentioned in Atkinson's description). Flesh white, rather firm. Smell rather strongly musty when crushed. Taste indistinct. Spore print wanting.

Spores (Fig. 3) $6.2-8.7 \times 3.8-5.2 \mu$, ellipsoid to elongate ellipsoid, sometimes subreniform, with small apiculus, thin-walled, colourless, smooth, not reacting with Melzer's solution, not metachromatic in Cresyl Blue, not accumulating Congo Red. Basidia 4-spored, $27-32 \times 9-10 \mu$, with clamp at base. Cystidia (Fig. 4) scattered on sides and edges of gills, $(45-55-88(-140) \times 8.5-20 \mu$, slenderly fusiform to ventricose-fusiform, sometimes sublageniform, with obtuse to acute apex, thin-walled to moderately thick-walled, colourless, sometimes with some refractive bodies, especially in apex. Trama of gills regular, made up of hyphae with equal or inflated cells, from $3-6 \mu$ wide just below subhymenium, to $30(-45) \mu$ wide in the middle; subhymenium densely ramose, very narrow. Scales on cap consisting of $(5-10-25(-35) \mu$ wide, yellow-brown, radial hyphae, constricted at septa, with slightly thickened, coloured walls (pigment not distinctly encrusting, nor vacuolar). Cuticle as scales but hyphae slightly narrower, paler, and with thinner walls, scales and cuticle gradually passing into each other. Scales on base of stem of similar structure to scales on cap. Trama of stem consisting of longitudinal hyphae, their cells cylindrical to clavate, but always in chains; oleiferous hyphae present, scarce. Trama of bulb irregular, made up of thin-walled sometimes inflated elements, difficult to reinflate. Clamps abundant.

HABITAT.—Terrestrial in woods.

DISTRIBUTION.—North-eastern U.S.A.: Pennsylvania, New York, Massachusetts.

COLLECTIONS EXAMINED.—U.S.A.: Pennsylvania, Fayette Co., Ohio pyle, 12 Aug. 1908, *D. R. Sumstine* (type, 2 dried specim. & photograph, as *Amanitopsis umbonata*, CM); New York, Long Island, Port Jefferson, 26 Aug.—2 Sept. 1904, *G. F. Atkinson 20181* (no specim., but photograph & description, as *Armillaria* n. sp., CUP); Massachusetts, Hampshire Co., Mt. Toby forest, 25 Aug. 1963, *C. Bas 3808* (L, MASS).

In 1918 Atkinson studied the type of *Vaginata umbonata* and concluded that his Long Island fungus was identical and that the species belonged to the genus *Armillaria* (according to a letter of Atkinson to the Carnegie Museum, May 17, 1918). Unfortunately Atkinson's specimens seem to have been lost, but excellent photographs (copies of which were kindly presented by Prof. Dr. R. P. Korf to the Rijks-herbarium at Leiden) and a detailed description are kept at Cornell University.

Thus far *S. umbonata* is the only species of *Squamanita* which has cystidia. In other respects this species is rather similar to *S. schreieri*, but the colours are much more faded.

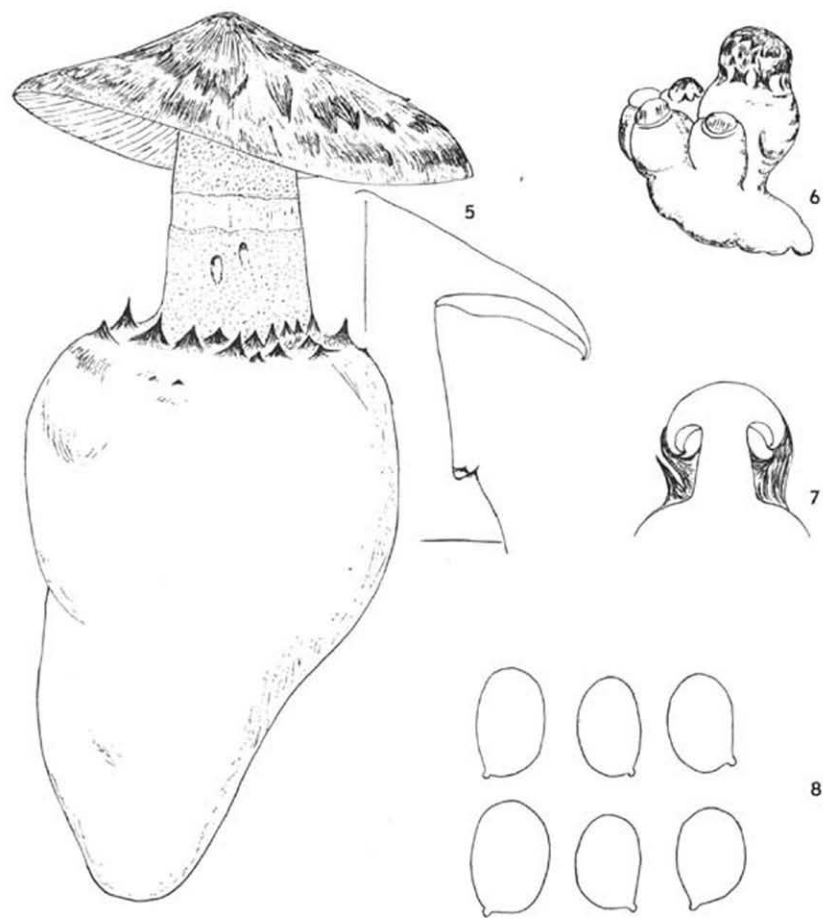
When the present author studied the type, he was not aware of the occurrence of conidia in some species of *Squamanita* and did not specially look for them. In Bas 3808 he did not find any.

In connection with the interpretation of the part of the fruit-bodies below the scaly zone on the stem, it is significant that Sumstine as well as Atkinson described it as a bulb (a "bulbous root" and a "bulb" respectively).

SQUAMANITA SCHREIERI Imbach. — FIGS. 5-8.

Tricholoma schreieri Maire & Konrad *apud* Maire in Bull. Soc. Hist. nat. **36**: 27. 1945; Konrad in Schweiz. Z. Pilzk. **25**: 122. 1947; Konrad & Maubl., Agaricales **1**: 346. 1948.

Squamanita schreieri Imbach in Schweiz. Z. Pilzk. **20**: 130, 152. 1942 (no Latin descr.; "*Squamamanita*"). — *Squamanita schreieri* Imbach in Mitt. naturf. Ges. Luzern **16**: 83. 1946. *Coolia schreieri* Huijsman in Meded. Nederl. mycol. Ver. **28**: 60. 1943 (nomen nudum).



Figs. 5-8. *Squamanita schreieri*. — 5. Fruit-bodies ($\times 1$). — 6. Cluster of buds ($\times \frac{1}{3}$). — 7. Section of bud ($\times 1$). — 8. Spores ($\times 2500$; from specimen leg. Bettschen). — Figs. 5-7 after Schreier.

DESCRIPTIONS AND ILLUSTRATIONS.—Schreier in *Schweiz. Z. Pilzk.* **16**: 97–100, pl. 2, 177–179. 1938 (as *Tricholoma* X); *Schweiz. Pilztafeln* **4**: fig. 1. 1945; Haller in *Mitt. aargau. naturf. Ges.* **24**: 144. 1953 (not seen); Bässler in *Z. Pilzk.* **25**: 113. 1959.

Fruit-bodies gregarious to subcaespitose. Cap 60–100 mm wide, hemispherical to convex at first, becoming plano-conical to flat with sometimes rather acute umbo, with acute margin at first slightly incurved, but soon expanding and often splitting, fleshy, not hygrophaneous, whitish to yellow-ochraceous, fibrillose with mostly appressed, ochraceous brown to golden yellow or yellow-brown, fibrillose scales, dry, rather shiny; fibrillose cuticle adnate and confluent with scales. Gills crowded, narrow, 3–4 mm wide, thin, sometimes irregular, whitish, mostly subarcuate, attenuate at both ends, subdecurrent, sometimes adnate or slightly emarginate or nearly free; edge concolorous, often more or less crenulate; small gills abundant. Stem 25–50 × 20–30 mm, subcylindrical, arising from a firm whitish, often turnip-shaped bulb measuring up to 100 × 80 mm which is sometimes confluent with other bulbs; pale yellow, flocculose, at base of stem and on top of bulb with girdles of yellow to yellow-brown, fibrillose, pointed, appressed to erect scales, at apex with a whitish, later on brownish yellow fibrillose annular zone. Flesh white, rather solid, homogeneous. Smell nearly absent. Taste mild. Spore print white.

Spores (4–)5–7 × (3.5–)4–5 μ (6–8 × 5–6 μ according to Bässler, l.c.), broadly ellipsoid, thin-walled, with small apiculus, smooth, colourless, not reacting with Melzer's solution, not metachromatic in Cresyl Blue, not accumulating Congo Red. Basidia 4-spored, sometimes 2- or 3-spored, with clamp at base. Cystidia absent. Subhymenium narrow, ramose. Trama of gills subregular, composed of 4–12 μ wide hyphae, with some scattered oleiferous hyphae. Cuticle and scales on cuticle consisting of more or less parallel-radial, rather thin-walled golden yellow to brownish golden yellow, (5–)12–20 μ wide hyphae, in which pigment probably precipitated against inside of walls; just beneath the cuticle many oleiferous hyphae with distinctly intracellular pigment. Scales on top of bulb and base of stem of same structure as those on cap. Trama of stem made up of 5–15 μ wide, parallel-longitudinal hyphae. Trama of bulb consisting of 4–12(–25) μ wide parallel hyphae; cortex of bulb of interwoven 4–10 μ wide hyphae mixed with elongated ellipsoid to subglobose, up to 135 μ long and 80 μ wide inflated cells. Annular zone consisting of 3–15 μ wide, pale to golden yellow, thin-walled hyphae. Clamps abundant.

HABITAT.—Terrestrial in mixed, mostly alluvial woods on calcareous soil in north-western Switzerland and south-western Germany (Pfalz, near Neustad, Bässler, l.c.), often in the same habitat as *Amanita strobiliformis* (Vitt.) Gonn. & Rab. and *A. echinocephala* (Vitt.) Quel. An enumeration of localities was given by Imbach (1946: 83).

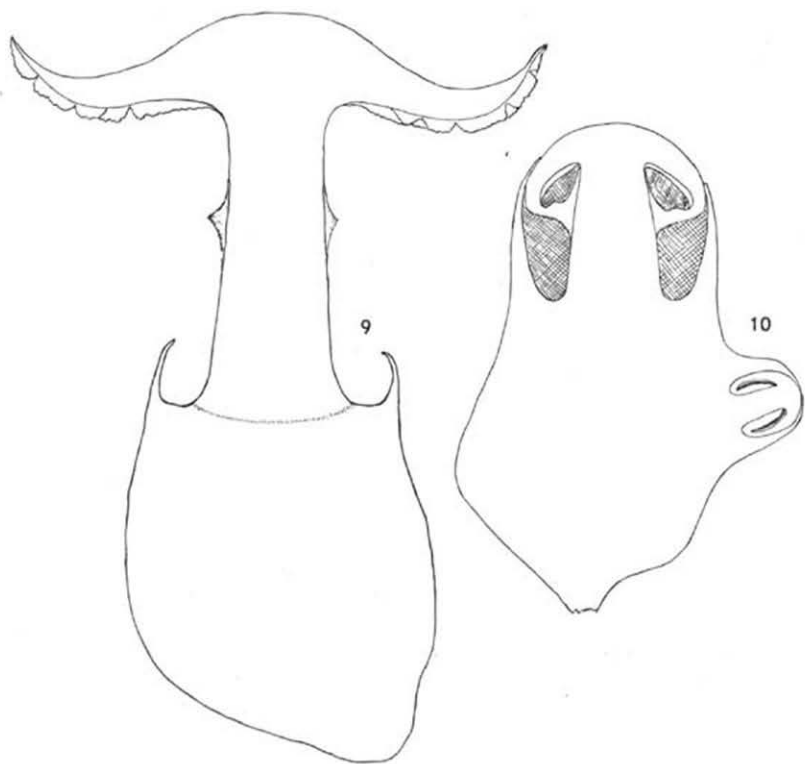
The description above is compiled from those published by Konrad & Maire, Schreier, and Imbach, completed with the author's observations on a fragment kindly sent to him by Mr. W. Bettschen, Biel. No conidia were found on this fragment.

Squamanita schreieri is undoubtedly very rare, only a few localities are known in spite of the fact that the human population in its area is very mushroom-minded and this large and magnificent fungus is not likely to escape notice.

SQUAMANITA TROPICA Bas, *nomen provisorium*—FIGS. 9–10

The present species was collected by Mr. E. J. H. Corner in Malaya. Unfortunately the material got lost. However, from the drawings and the extensive descriptions available, it appears that it very probably belongs to the genus *Squamanita*.

Fruit-bodies gregarious or subcaespitose. Cap 80–110 mm wide, becoming plane and gibbous, margin incurved at first, revolute with age, dry or somewhat smeary at first, covered with broad, adpressed membranous to subfibrillose, tawny squamules derived from the breaking up of the veil which is continuous over the tawny disc, paler, yellowish white toward margin, there with adpressed tawny or yellow-tawny fibrils, rarely subsquamulose. Gills very crowded, shortly-decurrent or appearing free and distant owing to dilation of stem apex, rather irregular,



Figs. 9–10. *Squamanita tropica*. — 9. Section of mature fruit-body ($\times \frac{3}{4}$). — 10. Section of bulb with two primordia ($\times 1$).

white, narrow, 2–3 mm wide, tapering toward stem, breaking up transversely into short lengths; edge irregularly serrate-dentate, subundulate. Stem 60–70 \times 16–23 mm, cylindrical, short, tawny-yellow, reticulately fibrillose to the narrow, villose-arachnoid tawny ring which is 20–30 mm from apex, tawny ochraceous and subfibrillose above ring, but extreme apex white and subscabrous; arising from a huge shortly-cylindrical or subclavate bulb, 50–60 \times 45–55 mm, sometimes

confluent with other bulbs, whitish, discolouring brownish, nearly smooth on outside, firm, sunk in humus, with a distant, thick, sheathing volva arising from margin of bulb, 5–10 mm from base of stem, forming a 10–15 mm deep cup; thin surface layer of bulb easily separable as a pellicle. Flesh white, thick in pileus, 12–18 mm over centre, 5–6 mm at half-way to margin, firm, fibrillose, somewhat spongy in bulb, and sharply distinct from fibrillose flesh of stem. Smell rather strong, of ethylacetate or pears, as in *Tricholoma caligatum* (Viv.) Ricken.

Spores 6–8 × 4–5 μ , subreniform or ellipsoid, colourless, smooth, with vacuolate contents, not colouring in JKJ. Basidia 26–32 × 8.5–11 μ , 2- and 4-spored, sterigmata 5 μ long. Cystidia absent.

HABITAT.—Terrestrial in humus in jungle.

COLLECTIONS EXAMINED.—Malaya, Johore, near Gunong Panti, 30 March 1930, E. J. H. Corner (as *Amanita* 6; material lost, only large pencil-drawings and long description, L).

The following observations were added to the description: "Remarkable for the very large cylindrical sterile base, which is immersed in the humus. In some cases the bases of two or three individuals are confluent and in others two individuals appear to rise from the same sterile base, but each has its own volval cupula. Evidently the large base is first formed, surrounded by a thin separable pellicle of its own, then the fruit-body proper develops at the distal end of this structure, endogeneously with a gill-chamber and double veil. The outer veil is continuous with the tissue of the bulb and remains as a cupular volva at the base of the stem, while the second sheaths the stem and covers over the pileus: it is tawny yellow and forms the fibrillose-membranous ring and the fibrillose-membranous squamules over the pileus; these flat squamules as well as the even layer over the disc is fairly easily washed off by rain, so that the pileus becomes almost wholly white."

This species looks very much like a species of *Amanita*, but the mere fact that the narrow, subdecurrent gills have free edges during their development in the gill-chamber, makes it clear that it represents a different genus. And, although the structure of the trama of the gills, the cuticle and the scales on the cap and the occurrence of clamps have not been studied, it is very probable that this species belongs to the genus *Squamanita*. The sclerotial bulb particularly on which more than one fruit-body may develop and the type of gills remind one of that genus.

Squamanita tropica seems to be rather closely related to *S. schreieri* and *S. umbonata*, but is easy to distinguish by the presence of a volva on the top of the bulb and the absence of pointed scales at the base of the stem. This does not necessarily imply that this volva and these scales are homologous (see discussion on p. 353).

SQUAMANITA species?

A description of an unnamed agaric, which may be a species of *Squamanita*, was published by Sandor (1957: 50) from material collected from three localities near München. As the present author did not succeed in contacting Mr. R. Sandor, only an abstract of the description follows.

Fruit-bodies in clusters of 4–8. Cap 30–45 mm, convex to conico-convex, becoming expanded with or without umbo and margin sometimes turned upward, whitish with brownish red centre and with similar spots on limb, radially fibrillose, often with split margin. Gills subdistant, 4–7 mm wide, ventricose, emarginate, whitish

with pale but distinct yellowish-pinkish tinge; edge concolorous, turning brownish when bruised, entire. Stem 25–50 × 5–10 mm, white with reddish to blackish red or blackish purple streaks and spots, minutely white felted to pruinose in places, arising from 12–17 mm wide bulbs which are connected by a common basal bulb; each stem at base surrounded by a volva-like, thick rim. Flesh whitish, not turning reddish, slightly hygrophaneous, with farinaceous smell and taste, very slightly acid. Spore print faintly but distinctly pinkish-yellowish.

Spores 4.8–5.6 × 4–4.6 μ , subglobose, faintly hexagonal when seen from above, non-amyloid. Basidia 4-spored, 28–34 × 7–8 μ , without carminophilous granules. Cystidia absent. Trama of gills regular, composed of 8–36 μ wide hyphae. Clamps present.

HABITAT.—Damp *Picea*-forest; October.

DISTRIBUTION.—Germany, Bavaria.

If the spores were not described as being faintly hexagonal when seen from above, there would be little doubt about Sandor's collections representing an unnamed species of *Squamanita*, as was already suggested by Schwöbel & Wandel (1958: 53). The colours, the lack of scales at the base of the stem, the size, the farinaceous smell, and the shape of the spores make it very improbable that Sandor's species is identical with *S. schreieri*, a possibility put forward by Benedix (1958: 53).

SQUAMANITA SCOTICA Bas, *nomen provisorium*—FIGS. 25–26

From the Royal Botanic Garden at Edinburgh a collection was received on loan under the name *S. odorata*, which appeared to represent an unnamed species. As the material is too poor to be designated type, this new species is only provisionally described here. There is no description of the fresh fungus available.

Cap about 9 mm, plano-convex, dark grey-brown with very faint lilaceous tinge (*Amanita porphyria* colour), subfibrillose, rather shiny (dried cap rather strongly rugulose), without evident scales. Gills (broken off) not very crowded, 23, probably adnate, dark brownish grey with violaceous tinge, intervenose. Stem about 20 mm long; the upper 8 mm about 1 mm thick, dark brownish grey with faint violaceous tinge and with loosely appressed, pale, fibrillose covering in places; the lower 12 mm (sclerotial part?) about 2 mm thick, tawny ochraceous, longitudinally appressedly to innately fibrillose; the pale fibrils on the upper part suggesting a faint annular zone about 2.5 mm below apex; no scales, no volva. Spore print white (according to note on label; now pale cream).

Spores 5.4–6.5 × 5.4–6.3 μ , globose to subglobose, colourless, but sometimes somewhat dingy, slightly thick-walled, smooth, with small apiculus, amyloid, in Cresyl Blue a number of the spores with a metachromatic inner layer (which becomes detached from outer wall when contents contract), but many spores not metachromatic at all; spore-wall not accumulating Congo Red. Basidia 4-spored, few seen, 28–32 × 7–8 μ , with clamp at base; sterigmata remarkably long and slightly inflated in basal part. Edge of gills not studied. Pleurocystidia absent. Cuticle consisting of radial, faintly greyish-violaceous, 4–10 μ wide hyphae, surmounted by some scattered patches of more irregularly radial, darker hyphae of same width; grey-violet pigment membranal. Trama of stem made up of up to 15 μ wide longitudinal hyphae consisting of long cells; hyphae in cortex 3–8 μ wide; at surface loosely interwoven, 4–15 μ wide and greyish-violet by membranal or minutely encrusting pigment. Trama of bulb made up of 4–12 μ wide, longitudinal hyphae

consisting of rather short cells; in cortex cells longer and hyphae narrower; at surface of bulb 4–10 μ wide, golden yellow encrusted, slightly irregular, longitudinal hyphae, absolutely without sphaerocysts. Clamps abundant. No conidia observed.

HABITAT.—In meadow land amongst short grass.

COLLECTIONS EXAMINED.—Scotland, Inverness-shire, Aviemore, Rothiemurchus, 16 Sept. 1957, *D. M. Henderson* 3655 (1 dried, broken tiny specimen; E).

Because of the amyloid spores, the species described above is an aberrant one in the present genus. However, the type of cuticle, probably with microscopical remnants of a fibrillose, coloured veil, the colours, the type of pigmentation, the relatively short stem arising from a broader cylindrical body (which may be broken off judging from the basal end of it), the small spores of which some are distinctly dingy, the presence of clamps, all make it probable that this species is a true *Squamanita*.

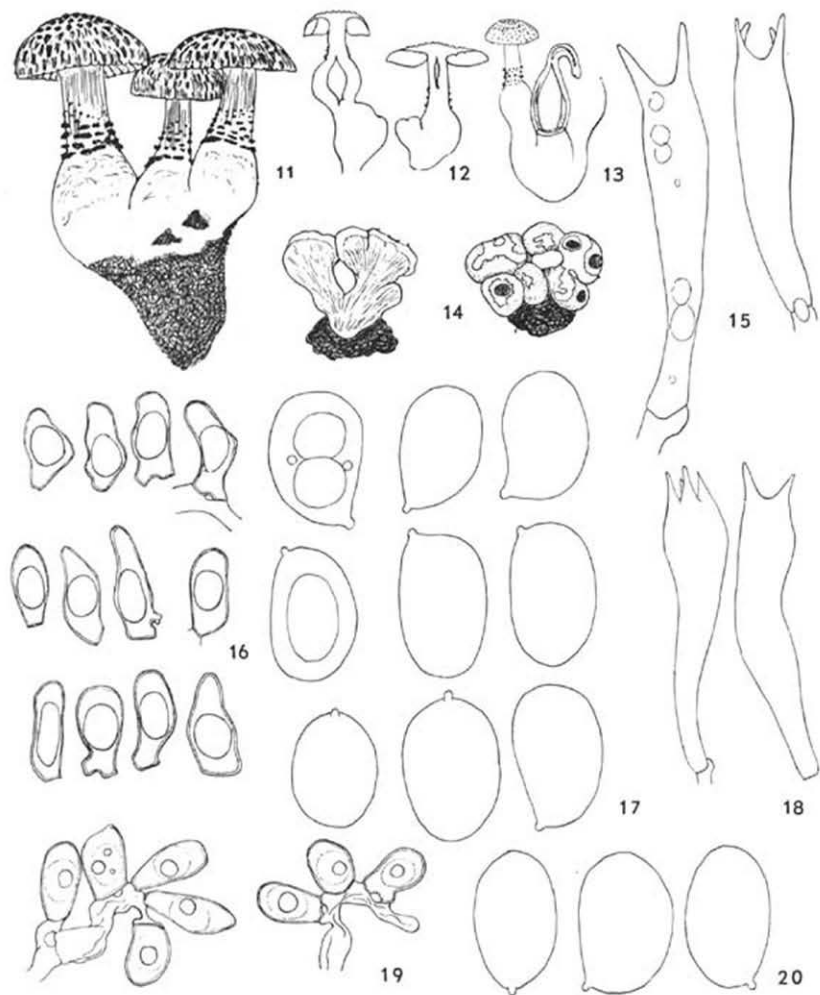
***Squamanita odorata* (Cool) Bas, comb. nov.—Figs. 11–20**

Lepiota odorata Cool in Meded. Nederl. mycol. Ver. **9**: 47, pl. 1, fig. 1, 1918. — *Coolia odorata* (Cool) Huijsman in Meded. Nederl. mycol. Ver. **28**: 54, 1943 (generic name not validly publ.). — *Tricholoma odoratum* (Cool) Konr. & Maubl., Agaricales **1**: 346, 1948. — *Squamanita odorata* (Cool) Imbach in Mitt. naturf. Ges. Luzern **15**: 83, 1946 (nomen provisorium); Moser, Blätter- u. Bauchpilze **66**, 1953 (no full reference, no Latin descr.); 2. Aufl., 76, 1955 (ditto); Sing., Agaricales, 2nd Ed., 234, 1962 (ditto).

Coolia odorata (Cool) Huijsman forma *bispora* M. Lange in Friesia **4**: 309, 1953 (nom. nud., specific name not validly publ.).

DESCRIPTIONS & ILLUSTRATIONS.—Flora Batava **26**: pl. 2039a, 1924; Pearson in Trans. Brit. mycol. Soc. **35**: pl. 3 fig. 2 (exclusive of pl. 3 fig. 1 and descr. on p. 99); Stuntz & Isaacs in Mycologia **54**: 279, figs. 4–6, 39, 1962.

Mostly subcaespitose, sometimes forming clusters of more than 10 fruit-bodies. Cap 5–20(–40) mm wide, hemispherical at first, convex to plano-convex later on, sometimes with a broad low umbo, with margin slightly bent in or bent down, not entirely expanding, rather thin, not hygrophanous, dark greyish violaceous to dingy violaceous or lilaceous grey or grey-brown (e.g. Séguy 714), dry, fibrillose, covered with slightly darker scales, small, flat obtuse-angular felted patches in centre, but radially fibrillose, pointed scales, sometimes with recurving tips on limb, making cap minutely squarrose, especially at margin; the latter denticulate-fimbriate when young, easily splitting with age; scales and cuticle adnate. Gills somewhat crowded to rather distant, with 1–3 small gills between each pair, moderately broad, 2.5–7 mm wide, adnate, emarginate, or uncinatate, rather thick, sometimes branching, slightly paler than cap, violaceous lilac-grey (e.g. between Séguy 180 and 232); edge concolorous, entire. Stem 10–35 \times 3–10 mm, cylindrical or slightly widening below, concolorous with gills, minutely loosely longitudinally fibrillose, slightly shining, at base set with 2–4 incomplete rings of more or less erect floccose-fibrillose, dark violaceous grey-brown warts; stem arising from a 15–30 \times 10–25 mm large, rather soft, ochraceous, ochraceous buff to rusty ochraceous, subglobose to ellipsoid, sometimes marginate bulb often fused with other bulbs or with several bulbs seated on a common basal one; outside of bulb felted to subglabrous, sometimes with a slight and narrow, membranous, ochraceous limb on upper part. Flesh pale dingy violaceous to whitish in cap and stem, ochraceous buff in bulb. Smell strong, heavy, sweetish aromatic, reminding the present author of the smell of *Hebeloma*



Figs. 11-20. *Squamanita odorata*. — 11. Fruit-bodies of lectotype ($\times 1$). — 12. Sections of fruit-bodies ($\times 1$). — 13. Abortive fruit-body with conidial layer (dotted area) in wall of bulb ($\times 1$). — 14. Cluster of bulbs producing conidia just below peeling cortex; dark discs are probably primordia ($\times 1$). — 15. Basidia ($\times 1250$). — 16. Conidia ($\times 1250$). — 17. Spores ($\times 2500$). — 18. Basidia of type of *S. odorata* forma *bispora* ($\times 1250$). — 19. Conidiophores ($\times 1250$). — 20. Spores of type of *S. odorata* forma *bispora* ($\times 2500$).

sacchariolens, but sweeter. Taste not distinctive. Spore print white (?; see discussion on p. 351).

Spores $6.5-8.5(-9.3) \times 4.2-6.2 \mu$, ellipsoid, ovoid, obovoid, or subreniform, thin-walled, colourless to slightly dingy, smooth, with small apiculus, not reacting with Melzer's solution, not metachromatic in Cresyl Blue, not accumulating Congo Red. Basidia $27-42 \times 6-8.5 \mu$, 4-spored but a small number 2- and 3-spored, with clamp at base. Cystidia absent. Subhymenium very narrow, about 10μ wide, ramose. Trama of gills subregular, made up of slightly wavy, $3-20(-30) \mu$ wide, longitudinal hyphae, the broader ones in the centre and constricted at the septa. Cuticle and scales on cuticle consisting of more or less radial, $5-16 \mu$ wide, violaceous-grey to brownish-grey hyphae, the broader ones constricted at the septa; hyphae of scales darker than those of cuticle; cells mostly between 30 and 60μ long; pigment probably membranous, but some hyphae minutely granular at surface; dark grey oleiferous hyphae rather abundant. Trama of stem composed of $4-14 \mu$ wide, parallel longitudinal, nearly colourless hyphae intermixed with scattered violaceous grey oleiferous hyphae. Scales at base of stem of same structure as those on cap. Cortex of bulb made up of interwoven, brownish yellow encrusted, $2-8(-20) \mu$ wide hyphae with slightly thickened walls, not gelatinized at surface. Trama of bulb consisting of $3-10 \mu$ wide parallel to slightly interwoven, nearly colourless hyphae.

Conidia (Fig. 16) found in Bas 4000 in the wall of the hollow bulb of an abortive or damaged fruit-body (attached to a cluster of three normal ones), forming a layer (looking cartilaginous in dried state) between inner and outer layer of wall and in another collection (Netherlands, Amersfoort, Sept. 1916, leg. A. Joman) on top of some sclerotia, forming a thick layer just below cortex, $9-13 \times 4.5-6 \mu$, irregularly clavate, cylindrical, ellipsoid or broadly fusiform, with clamps when young, later more or less bifid at base, colourless, with moderately thickened wall; conidiophores very thin-walled, colourless, easily collapsing, bearing clamps; older conidia-bearing branches non-septate, sickle-shaped (Fig. 19); development of conidia basifugal.

HABITAT.—Terrestrial in gardens (only in wooded areas), parks, forest plantations and woods; apparently in wooded areas where original structure of soil has been disturbed; in The Netherlands on sandy and loamy soil.

DISTRIBUTION.—KNOWN from nearly 20 localities in The Netherlands, mostly in the central part, from one in Denmark (M. Lange, 1953: 307) and from one in the western U.S.A. (Stuntz & Isaacs, 1962: 279).

SPECIMENS EXAMINED.—NETHERLANDS: Gelderland: Wilp, 2 Oct. 1955, *W. J. Reuvecamp jr.* (L); 19 Sept. 1954, *W. J. Reuvecamp jr.* (L); Wageningen, 18 Oct. 1963, *C. Bas 4000* (L); Utrecht: Amersfoort, Sept. 1916 (3 collections), 23 Sept. 1916, *A. Joman* (L); Huis ter Heide, "Bosch en Duin", 5 Oct. 1916, *A. W. Beckering* (LECTOTYPE), cluster of specimens in liquid, depicted in *Flora Batava* 26: pl. 2039b upper fig., in *Meded. Ned. mycol. Ver.* 9: fig. 1, pl. 1 fig. 2, and in *Levende Nat.* 22: 424 fig. 3; L); Huis ter Heide, Sept. 1917, 2 Sept. 1917, Oct. 1917, *J. A. R. van Stolk* (L), Sept. 1920, *H. van Stolk* (L); Bilthoven, Oct. 1933, *B. E. Bouwman* (L). Noord-Holland: Laren, Oct. 1942, *A. J. Sevenhuijsen* (L). — DENMARK: North Seeland, Tokkekøb, 18 Sept. & 9 Oct. 1948, *M. Lange* (C). — U.S.A.: Washington, north of Olympia, Oct. 1951, *Stuntz 6400* (WTU, L).

RECORDS IN DUTCH LITERATURE.—Overijssel: Delden, 1942, *A. C. S. Schweers* (in *Meded. Nederl. mycol. Ver.* 28: 55, 1943). Gelderland: Wapenveld, 6 Oct. 1920, *van der Meulen* (in *Levende Nat.* 25: 294, 1921). Utrecht: Zeist, 1917, *C. Brakman* (in *Meded. Nederl. mycol. Ver.* 9: 48, 1918); near Loosdrecht, 1938, *J. Daams* (ditto, 28: 55, 1943); Baarn, 10 Oct. 1937, *anonymus* (in *Fungus* 9: 28, 1937). Noord-Brabant: Dorst, Oct. 1955, *P. B. Jansen* (in *Coolia* 4: 19, 1957).

In the original description the spores are said to be pinkish, but Cool merely observed them under the microscope. It seems that the only spore print (a thin one) was obtained by A. C. S. Schweers, which one was white (Huijsman, 1943: 55). But under high power a number of the spores are distinctly dingy and it is to be expected that a thick spore print will show some colour. However, the sporulation seems to be rather poor.

M. Lange's (1953: 309) forma *bispora* has no taxonomical value. The present author found 2-, 3-, and 4-spored basidia in the type-material of that form, as well as in other collections of *S. odorata*. Clamps were found to be present too.

The distribution of *S. odorata* is remarkable. The species has been known now for nearly 50 years and still its area in Europe seems to be almost restricted to the central part of The Netherlands. The only correct European record from outside this area, is that from Denmark. The recent discovery of *S. odorata* in the western U.S.A. by Stuntz & Isaacs (1962: 279) makes it probable that its area of distribution is a very disjunct one. However, its sudden appearance in several places in The Netherlands in 1915-1917 and its ecology (probable preference for disturbed forest-soil) might indicate that it is imported into Europe. It is remarkable that *S. paradoxa* seems to have the same type of distribution pattern. It will be very interesting to know more about the ecology of both species.

The development of *S. odorata* has been studied by Reijnders (1952: 23) and will be discussed on p. 352.

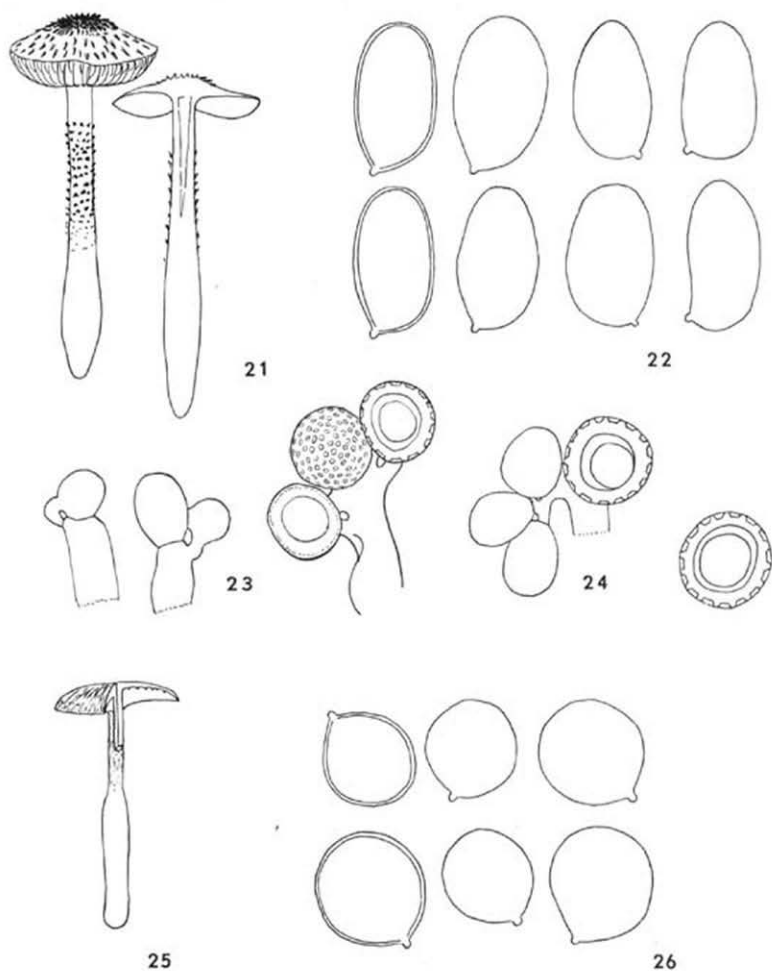
The discovery of chlamydospores on some of the sclerotial bulbs raises the question of what the function of the bulbs can be. Do they produce first chlamydospores and then fruit-bodies or do they produce only chlamydospores when the fruit-bodies fail to develop, or are some of the bulbs specialized in producing chlamydospores? It is possible that the bulbs have a longer life than the fruit-bodies. It is even possible, though in view of the soft consistency rather improbable, that they are perennial, and that the process of producing fruit-bodies and/or chlamydospores is repeated.

Squamanita pearsonii Bas, *spec. nov.*—FIGS. 21-24

MISAPPLICATION.—*Tricholoma odoratum* (Cool) Konrad & Maubl. *sensu* Pearson in Trans. Brit. mycol. Soc. 35: 99, pl. 3 fig. 1. 1952.

Pileus 25 mm latus, convexus, dein appplanatus, griseo-lilaceus vel violaceo-lilaceus, squamulis obscure purpureis fibrillosis ornatus. Lamellae subconfertae, adnatae vel emarginatae, albae. Stipes 55 × 5 mm, flocculoso-fibrillosus, apice violaceo-lilaceus, infra pallide lilaceus vel sordide ochraceus verrucisque erectis obscure purpureis ornatus. Bulbus elongatus, ochraceus. Sporae 7-9(-10) × 4.5-5(-6) μ, ellipsoideae vel elongato-ellipsoideae, interdum subovatae, hyalinae, pseudo-amyloideae. Cystidia nulla. Pilei cuticula squamulaeque hyphis radiatis 3-25 μ latis violaceo-griscolis compositae. Trama lamellarum regulare. Fibulae creberrimae. — TYPUS: R. W. G. Dennis s. n., 24 Sept. 1950, Scotland, Rothiemurchus Forest (K).

Cap 25 mm wide, convex then nearly flat, greyish lilac to violaceous lilac, dry, fibrillose, sometimes slightly shiny, with dark purplish, fibrillose, rather narrow, pointed scales, appressed and scattered at margin, erect and crowded on disc.



Figs. 21-24. *Squamanita pearsonii*. — 21. Fruit-bodies ($\times 1$; after Pearson). — 22. Spores ($\times 2500$). — 23. Young conidiophores ($\times 1250$). — 24. Older conidiophores and chlamydo-spores ($\times 1250$).

Figs. 25-26. *Squamanita scotica*. — 25. Fruit-body, reconstructed from dried broken specimen ($\times 2$). — 26. Spores ($\times 2500$).

Gills rather distant, ventricose, adnate-emarginate, moderately broad, whitish, intervenose, with 1-3 attenuate small gills between each pair; edge concolorous, entire. Stem about 30×5 mm, slightly tapering upward, probably becoming more or less hollow, from violaceous lilac at apex to dingy yellow below, flocculose-fibrillose, lower two thirds set with dark purple erect to slightly recurved fibrillose small scales; lower part gradually passing into a slender fusiform, about 20×8 mm large bulb, ochraceous yellow, subfibrillose under a pale very thin pruinose covering (conidia!). Flesh violaceous in cap, paler in stem and yellow in bulb. Taste and smell unknown. Spore print wanting.

Spores $7.2-8.9(-10.1) \times 4.3-5.1(-6.0) \mu$, ellipsoid to elongate, sometimes elongate-subovoid, mostly colourless, but some distinctly dingy, thick-walled (wall about 0.8μ thick), with granular contents and with very small apiculus, without germ pore or callus, smooth, distinctly pseudo-amyloid (double wall equally colouring), not metachromatic in Cresyl Blue [but contents blue with 2(-3) reddish bodies; nuclei?], strongly colouring in Congo Red. Basidia 4-spored, sometimes 3- or 2-spored, $27-32 \times 7.3-9.7 \mu$, with clamp at base; sterigmata up to 5.5μ long. Cystidia absent. Edge of gills fertile. Trama of gills regular, consisting of $4-25(-40) \mu$ wide hyphae, the broader ones constricted at the septa; subhymenium narrow, $10-15 \mu$ wide, ramose. Cuticle made up of loosely interwoven to subradial, $3-25 \mu$ wide, pale greyish, thin-walled hyphae. Scales on cap consisting of parallel, radial, rather dark brownish grey, slightly thick-walled, $3-20 \mu$ wide hyphae and some scattered dark brown-grey oleiferous hyphae. Scales on stem of same structure as those on cap; hyphae $8-16 \mu$ wide. Covering of bulb consisting of $3-12 \mu$ wide more or less parallel, longitudinal, brownish yellow hyphae and densely branching conidiophores and conidia. Trama of bulb consisting of longitudinal, parallel to slightly interwoven, $3-10 \mu$ wide hyphae and some brownish yellow oleiferous hyphae. Trama of stem consisting of longitudinal, parallel $3-30 \mu$ wide, very pale hyphae and some yellowish grey oleiferous hyphae. Pigments: (lilaceous-)brownish grey pigment membranal (or very minutely encrusting?) but distinctly encrusting in some of the narrowest hyphae of scales on stem and intracellular in oleiferous hyphae; brownish yellow pigment difficult to localize, probably membranal, but intracellular in oleiferous hyphae. Clamps abundant.

Conidia (Fig. 24), chlamydo-spores, $9.5-12.3 \times 8.5-10.4 \mu$, at first colourless and obovoid, becoming brownish yellow and globose, very thick-walled; wall not reacting with Melzer's solution, consisting of at least 3 layers, when mature the outer one hyaline colourless, embedding the truncate-conical brownish yellow warts on the middle layer; in Cresyl Blue outer layer not colouring, middle layer becoming lilac pink to blue, inner layer lilac-red. Conidiophores colourless, thin-walled, densely branching, with clamps, the older conidia-bearing branches non-septate, sickle-shaped.

HABITAT.—Type found under *Pinus silvestris* amongst moss.

DISTRIBUTION.—Scotland.

COLLECTION EXAMINED.—SCOTLAND, Inverness-shire, Aviemore, Rothiemurchus Forest, 24 Sept. 1950, R. W. G. Dennis (type: 2 dried, broken but nearly complete specimens, K).

Undoubtedly *S. pearsonii* differs widely from *S. odorata*. The spores are thick-walled and distinctly pseudo-amyloid. Heating of a small part of a gill in ammoniacal Congo Red renders the spores much more coloured than the underlying tissue; this is not the case in *S. odorata*. The gills are whitish. Moreover the conidia are globose and ornamented in *S. pearsonii* and irregularly clavate to fusiform and smooth in *S. odorata*.

As the type is the only collection known, it is difficult to say whether the much more slender habit of the type-specimen, especially of the bulb, is a distinctive character too.

The pseudo-amyloid spores and the scaly cap of *S. pearsonii* remind one of the genus *Lepiota*. However, the adnate gills and the remarkable chlamydospores on the bulb make it clear that this is a true *Squamanita*.

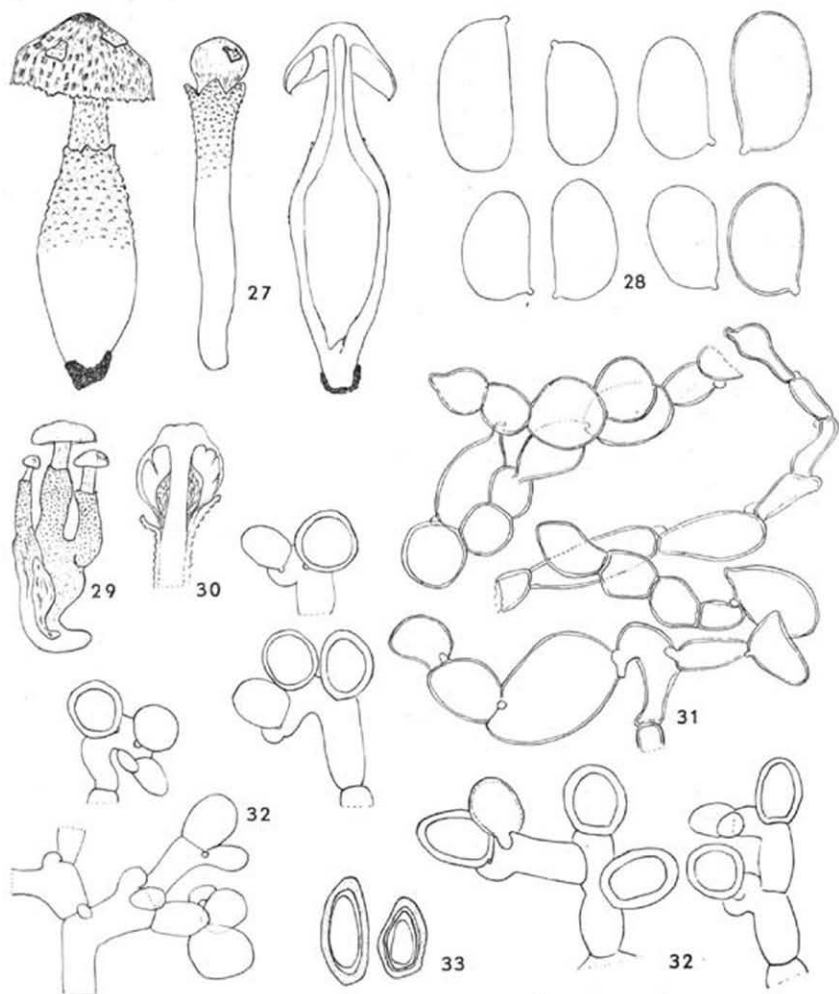
Squamanita paradoxa (A. H. Sm. & Singer) Bas, *comb. nov.*—FIGS. 27–33

Cystoderma paradoxum A. H. Sm. & Singer in *Mycologia* 40: 454, fig. 1. 1948.

DESCRIPTIONS AND ILLUSTRATIONS.—Herink in *Česká Mykol.* 8: 60. 1954; Horak in *Z. Pilzk.* 28: 16, fig. 2. 1962; in *Mitt. schweiz. Anst. forstl. Versuchsw.* 39: 73, pl. 3 fig. 17. 1963.

Gregarious to subcaespitose. Cap 8–35 mm wide, convex to plano-convex, often with a broad, low umbo, but sometimes flat or even slightly depressed in centre, margin slightly incurved at first, becoming straight and somewhat lacerate later on, thin, not hygrophaneous, only slightly translucent-striate at margin when extremely wet, pallid lilac to dark violaceous drab or lilaceous grey, appressedly fibrillose, at margin sometimes appressedly fibrillose-scaly, dry, superficial fibrils becoming blackish with age; young buttons entirely covered with a brownish ochraceous ("Sudan brown" according to Smith & Singer), granular-warty, membranous veil, leaving patches on young caps but mostly soon completely disappearing. Gills 10–24, with 0–3 rounded to attenuate small ones between each pair, subdistant to distant, thick, broad, arcuate-adnate, subdecurrent, broadly adnate or adnexed, sometimes anastomosing, intervenose, lilaceous grey to brownish vinaceous (slightly paler than cap); edge concolorous, entire. Stem 8–25 × 1–6 mm, subcylindrical, pale lilac to pale violaceous, fibrillose-subsquamulose, arising from a stem-like to ventricose fusiform, 20–60 × 4–18 mm large, ochraceous brown to tawny ochraceous brown, granular-warty, solid to hollow sclerotial body often confluent with other such sclerotia or inserted on a common basal body; sometimes lower parts of sclerotium whitish felted. Flesh in stem and cap greyish violaceous, greyish lilac or pale brownish drab, in sclerotium pale with ochraceous brown outline. Smell not distinctive according to Smith & Singer; intensively perfume-like when young, fetid with age according to Horak; obnoxious as in *Lactarius porinensis* according to Herink. Taste mild. Spore print white (Horak).

Spores (7.7–)8.1–10.8 × 4.5–6.1 μ, elongate-ellipsoid, colourless to distinctly dingy, with moderately thickened hyaline wall and granular contents, binucleate, with small apiculus, non-amyloid to weakly but distinctly pseudo-amyloid; wall probably double, slightly accumulating Congo Red, distinctly metachromatic in Cresyl Blue. Basidia 4-spored, 34–43 × 7.5–10 μ, with clamps at base, non-carminophilous; sterigmata up to 6.5 μ long, Cystidia absent. Edge of gills fertile. Trama of gills regular, composed of about 5 μ wide hyphae just beneath subhymenium to chains of up to 35 μ wide cells in the middle; subhymenium ramose, very narrow, about 10 μ wide. Cuticle made up of 4–18 μ wide, more or less radial (at surface sometimes irregular arranged), pale brownish grey hyphae, constricted at septa, probably with membranal pigment, gradually passing into denser trama below, with some grey-brown oleiferous hyphae; very rarely cells of most superficial hyphae so short that they are nearly isodiametric. Brownish ochraceous veil composed of thin-walled and colourless to slightly thick-walled and yellow brown encrusted, globose, ellipsoid, ovoid, or citriform, up to 55 × 35 μ large cells in chains forming



Figs. 27-33. *Squamanita paradoxa*. — 27. Fruit-bodies ($\times 1$). — 28. Spores ($\times 2500$). — 29. Cluster of fruit-bodies ($\times 1$; after dried material). — 30. Section of bud ($\times 5$). — 31. Chains of cells on limb of volva ($\times 550$). — 32. Conidiophores ($\times 850$). — 33. Mature chlamyospores ($\times 850$). All figures from Horak 61/152.

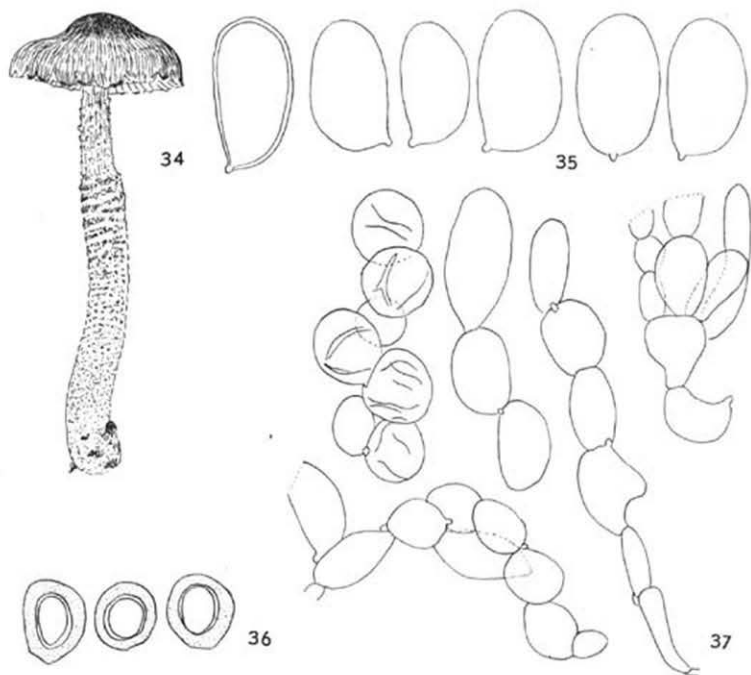
the warts and more or less parallel, colourless to pale yellow-brown hyphae forming the layer on which the warts are situated. Yellow-brown-pigment turning brownish red in KOH. Tissue of warts on sclerotial part often intermixed with numerous chlamydospores (very few in paratype). Covering of stem consisting of 6–12 μ wide, loosely interwoven pale hyphae; flocks formed by free ends. Trama of stem: 4–22 μ wide, pale greyish, longitudinal hyphae. Trama of stem-like part of sclerotial body: 2.5–10 μ wide, longitudinal, nearly colourless hyphae and many coiling-interweaving hyphae of same width. Clamps abundant.

Conidia (Fig. 33) 11–16(–19) \times 7.5–12.5 μ , very thick-walled, colourless to pale brownish yellow, ovoid, ellipsoid, subglobose, broadly fusiform or fusiform; conidial wall composed of at least 2 layers, fixing Congo Red rather strongly, inner layer (sometimes also outer layer) strongly metachromatic in Cresyl Blue. Conidiophores colourless, 4–6 μ wide, septate, thin-walled, branching hyphae with clamps; conidia-bearing branches non-septate sickle-shaped.

HABITAT.—Terrestrial among mosses in woods or near scattered trees.

DISTRIBUTION.—U.S.A. (Oregon), Czechoslovakia, Switzerland.

COLLECTIONS EXAMINED.—U.S.A., Oregon, Mt. Hood National Forest, 27 Oct.



Figs. 34–37. *Squamanita paradoxa*. — 34. Fruit-body of type ($\times 1$; after Smith & Sing.). — 35. Spores ($\times 2500$). — 36. Chlamydospores found on stem ($\times 850$). — 37. Chains of cells on limb of volva ($\times 550$). — Figs. 35–37 from paratype Smith 28341.

1947, A. H. Smith 28341 (paratype, MICH). — CZECHOSLOVAKIA, Bohemia, Kluky near Hradec Králové, 2 Oct. 1949, *Žd. Schaeffer* (herb. J. A. Herink 651/49; fragments in L). — SWITZERLAND, Graubünden, Dischmatal, 27 Sept. 1961, E. Horak 61/152 (Herb. Horak).

The above description is compiled mainly from the descriptions of Smith & Singer (1948: 454) and Horak (1962: 16, 1963: 73) and supplemented with the present author's observations on the dried material of the collections mentioned above.

Smith & Singer reported the odour of the American material as being indistinct, while Horak as well as Herink (1954: 60) mentioned a strong smell. The spores of Smith 28341 are slightly but distinctly pseudo-amyloid and those of the two European collections not or perhaps very faintly so. Moreover the inflated cells of the outer veil are less strongly pigmented and thinner in the American material than in the European. However, these slight discrepancies seems not to warrant the description of the European form as a distinct taxon.

The conidia are very abundant on the surface of the stem-like sclerotium in Herink's as well as in Horak's material. In Smith 28341 conidiophores have not been observed, but as several loose conidia occur among the cells of the covering on the sclerotial body, apparently conidia are produced in the American form too.

There is some doubt about the colour of the spores. Horak's spore print of the present species is extremely thin; too thin indeed to be sure that the spores are really white. In Smith 28341 there are accumulations of spores on the gill, which are macroscopically visible as rather dark brown (!) stripes. Under high magnification these spores are distinctly hyaline dingy. This colour is not due to the fact that one is looking through many spore-walls at once, owing to the accumulation of the spores. Individual dingy spores are distinguishable from more scattered colourless spores elsewhere on the gills. It is as if the accumulations of spores become coloured by diffusion of a pigment from the inner parts of the gill. The same phenomenon was observed to a lesser degree in *S. odorata*, *S. pearsonii*, and *S. scotica*.

In none of the published descriptions of the present species are an annulus or other remnants of a velum parziale mentioned. However, in a very young bud (Fig. 30) in Horak's collection, the space between the edges of the gills and the stem is stuffed with a very loose, whitish fibrillose tissue, consisting of 4–10 μ wide colourless, thin-walled, rather short-celled hyphae, more or less constricted at septa and with clamps. Apparently this tissue is so little coherent that it is found on the elongated stem only as a slight fibrillose coating.

DISCUSSION

The genus *Squamanita* as treated in the present paper shows a great deal of variation in certain important characters. The spores for instance may be thin- or thick-walled, non-amyloid, amyloid, or pseudo-amyloid, orthochromatic or metachromatic in Cresyl Blye, strongly colouring in ammoniacal Congo Red or not.

Apparently complications arise only in species which have thick-walled spores.

The pale to yellow-brown species and *S. odorata* of the violet-grey group have thin-walled spores, which are non-amyloid, orthochromatic in Cresyl Blue, and do not accumulate Congo Red. However, the other three species of the violet-grey group have more or less thick-walled spores and those are pseudo-amyloid and accumulate Congo Red in two of the species, and are amyloid and do not accumulate Congo Red in the third. In one of the species characterized by pseudo-amyloid spores, the latter are, in addition, distinctly metachromatic in Cresyl Blue.

The combination of species with amyloid, non-amyloid and pseudo-amyloid spores in one genus is rare but does occur, e.g. in *Cystoderma* (Singer 1962: 485). Moreover, a number of other characters (veils, chlamydospores, bulb, pigmentation) makes a close relationship of the species concerned very probable.

The interpretation of veils and velar remnants offers a real problem in *Squamanita*. In *S. paradoxa* (Fig. 27) and *S. tropica* (Fig. 9) a more or less membranal volva seems to represent the universal veil. In *S. tropica* (Fig. 9), *S. schreieri* (Fig. 5), and perhaps *S. paradoxa* (Fig. 27) there seem to be more or less developed remnants of a partial veil. And last but not least in *S. odorata* (Fig. 11), *S. pearsonii* (Fig. 21), *S. schreieri* (Fig. 5) and *S. umbonata* (Fig. 1) the base of the stem bears a number of pointed scales, which find their equals on the cap.

Reijnders (1952: 23) studied the development of *S. odorata* and found that the hymenium in that species develops entirely endogeneously on account of the fact that in the primordium the margin of the cap is confluent with the base of the stem. A partial veil seems to be lacking. The peripheral layer of the very young cap is differentiated from the trama of the cap, as its hyphae run parallel and the cells are shorter and broader than those of the trama. From this peripheral layer, called the universal veil by Reijnders, the scales on the cap and on the base of the stem (Fig. 38b) in adult specimens are derived.

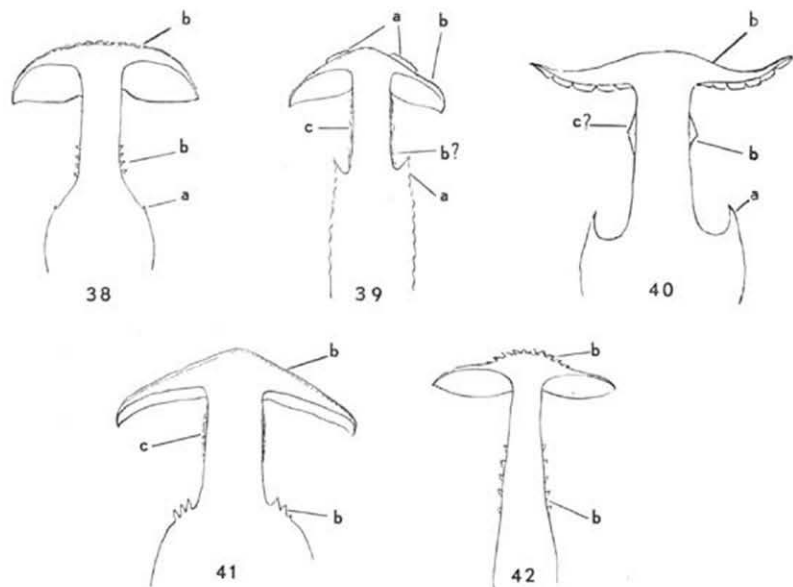
It is interesting that Reijnders found that the cortical layer of the sclerotium-like bulb covers the very young primordium. This layer consists of hyphae which are sometimes thick-walled, becomes gelatinous in places, and disappears very early according to Reijnders. From his own observations the present author may add that in some adult fruit-bodies of *S. odorata*, there is a very faint limb (Fig. 38a) on the top of the bulb, just below the scaly zone on the base of the stem. It is remarkable that Reijnders did not call this layer a veil. Perhaps he considered the bulb not a part of the fruit-body. Still it is difficult to see the difference between the situation in *Squamanita* and that in *Amanita* and *Volvariella*, where the fruit-body also develops inside a bulb and where the universal veil is continuous with the bulb.

Consideration of the facts revealed by Reijnders about the development of *S. odorata* renders the velar structure of *S. paradoxa* less paradoxical than they seem to be at first sight. It is very probable that the brownish ochraceous warty veil (Fig. 39a), which covers the young buds and continues over the surface of the bulb in that species, is homologous with the early disappearing cortical layer in *S. odorata* (Fig. 38a). The layer, which in *S. odorata* is called universal veil by Reijnders, is less developed in *S. paradoxa* where the cap and the stem are merely fibrillose-

subsquamulose. However, in a section of a dried bud (Fig. 30) it was found that the lower part of the fibrillose covering of the stem (Fig. 39b) is probably derived from the outer layer of the margin of the cap.

In the same section the space between the edges of the gills and the stem is filled with loose, whitish hyphae. There seems therefore to be a slight partial veil in *S. paradoxa*, which forms the upper part of the fibrillose covering of the stem (Fig. 39c). Consequently *S. paradoxa* would have three veils, although two of them are only slightly developed.

In *S. tropica* there is a distinct volval limb around the base of the stem (Fig. 40a). As there are no scales at the base of the stem as in *S. odorata* and *S. schreieri*, one is tempted to consider this volval limb of *S. tropica* as being homologous with the scales on the base of the stem of the other species. But from Corner's observation (see p. 340) that the outer veil forming the cupular volva is continuous with the tissue of the bulb, it is more plausible that this limb is homologous with the ochraceous-brown veil of *S. paradoxa* and the rudimentary cortical layer in *S. odorata*. The more so as Corner described a second veil which is tawny yellow, sheaths the stem, covers the cap, and forms the ring and the flat squamules on the cap (Fig. 40b). It is



Figs. 38-42. Schematic fruit-bodies of species of *Squamanita*. — 38. *S. odorata*. — 39. *S. paradoxa*. — 40. *S. tropica*. — 41. *S. schreieri*. — 42. *S. pearsonii*. — Letters a-c referring to remnants of veils. a, outer universal veil, b, inner universal veil, c, partial veil.

apparently the ring, or at least a part of it, of *S. tropica* which is homologous with the scales on the base of the stem in *S. odorata* and *S. schreieri*. From Corner's drawing one gets the impression that a partial veil is also present and participates in the formation of the ring. Probably the reticulate fibrillose covering of the stem between volva and ring is a remnant of the second outer veil, which has been torn apart by the relatively strong elongation of the basal part of the stem in this species.

In *S. schreieri* there is evidence again of a true partial veil (Fig. 41c). The scales on the base of the stem are formed by the inner universal veil (Fig. 41b). The outer universal veil (the rudimentary cortical layer in *S. odorata*; the volva in *S. paradoxa* and *S. tropica*) seems to be lacking but may be found perhaps in very young primordia.

In *S. umbonata* the situation seems to be the same as in *S. schreieri*. In the few fruit-bodies known of *S. pearsonii* only the remnants of the inner universal veil are evident (Fig. 42b).

To summarize it may be said that in the genus *Squamanita* probably three veils are potentially present, although seldom all are present in one species. First, there is the outer universal veil, which is continuous with the cortex of the bulb and consequently covers the young primordium and the bulb. This veil is very obvious in *S. paradoxa* and *S. tropica*, but only visible in very young stages of *S. odorata*. As *S. odorata* is the only species of which the development has been studied, it is well possible that such a rudimentary outer universal veil is present in some of the other species too. In the author's opinion this veil is the one that is comparable to the universal veil of such genera as *Amanita* and *Volvariella*.

The second veil is here provisionally called the inner universal veil. It covers the primordial cap, gills and stem. It is not sharply different from the trama of the cap and is attached to that part of the primordium which is going to form the base of the stem. Later on, its remnants form the fibrillose to scaly covering of the cap and of the base of the stem: more rarely it seems to participate in the formation of an annulus together with the partial veil (*S. tropica*). This inner universal veil is apparently present in all species studied but very evidently so in *S. odorata*, *S. pearsonii*, *S. tropica*, *S. umbonata*, and *S. schreieri*. It seems to be one of the important features of *Squamanita*.

The third veil is the partial veil of which evidence is found in *S. umbonata*, *S. schreieri*, *S. tropica*, and *S. paradoxa*. However, it is never very strongly developed. In *S. paradoxa* it seems to fill the space between the edges of the gills and the stem.

It hardly needs to be stressed that many of the facts mentioned above have to be checked on further collections, as only scanty material was available of most of the species treated in this paper.

As the production of chlamydospores on or in the fruit-bodies of Agaricales is rather rare, it is remarkable that three of the seven species of *Squamanita* described in this paper, viz. *S. odorata*, *S. pearsonii*, and *S. paradoxa*, appear to produce terminal chlamydospores (aleuriospores) in profusion on or just below the cortex of the bulb.

Moreover, the chlamydospores of those three species are so different that they can be distinguished at once (Figs. 16, 24, 33): yet they are all formed in the same peculiar way, probably not described before, viz. by the proliferation of clamps, which is clearly illustrated in the Figs. 23 and 32.

One may look upon this way of producing conidia as a rather extraordinary one. However, from literature it appears that proliferation of clamps is perhaps a common way of multiplication of asci and basidia. In this connection the opinion of Greis (1938) is very interesting. That author considered the production of many asci in a small area by means of proliferation to be the main function of the clamp of the Ascomycetes. His figures show how, in this manner, clusters of asci are formed in *Pyronema* and *Sordaria*. In the Basidiomycetes the clamp would be in the process of losing its function. But still in a number of cases, e.g. *Hypholoma* and *Corticium* according to Greis, proliferation of clamps at the base of basidia would occur.

Rogers (1936) described how, by means of proliferation of clamps at the base of basidia in *Sebacina prolifera* Rogers, unilateral cymose clusters of basidia are formed. Heinemann (1963: 453) considered the group of *Hygrophorus psittacinus* and related species to be of subgeneric rank, to be named *Hygrophorus* subgenus *Gliophorus* (Herink) Heinemann, on account of the bifid basidia and the therefore reticulate structure of the subhymenium. His fig. 40c especially shows that very probably this structure is due to the formation of basidia by proliferation of clamps. By including some species with a dry cap and stem in this subgenus *Gliophorus*, Heinemann even made the structure of the base of the basidia and the subhymenium the key-character of it.

The foregoing are only examples of proliferation of clamps at the base of reproductive cells. However, Routien (1948) described the formation of complex branching systems of hyphae in cultures of *Polyporus cinnabarinus* Fr. by proliferation of clamps at the septa of hyphae. With these examples in mind it will be clear that the way of formation of conidia in *Squamanita* is less peculiar than one would think at first sight.

The fact that the conidia in *Squamanita* are formed on the bulbs, raises the question whether these bulbs have a longer life than the fruit-bodies. It is even possible that the production of conidia on the bulbs is more or less independent of the formation of basidiocarps. As far as is known at present, conidia and basidiocarps occur simultaneously in *S. pearsonii* and *S. paradoxa*. However, in *S. odorata* bulbs are found on which conidia are born at a time when the primordia are still very small (Fig. 14). If it should prove that the growth of basidiocarps on such bulbs is suppressed in favour of the formation of conidia, these bulbs would be comparable to the clavarioid conidiocarps which Singer (1952: 73) described for *Armillariella ditopa* Sing. from South America.

It is a problem what to call the tubers on which the basidiocarps in *Squamanita* develop. Singer (1962: 25) tentatively named them carpophoroids, which he defined as sterile bodies and gasteroid carpophores that have no visible function, formed

the same way as carpophores. In other words, carpophoroids are sterile bodies replacing carpophores or aberrant carpophores which have adopted a gastroid shape.

The tubers of *Squamanita* do not fit into these two categories of carpophoroids. They are formed in advance, and not instead, of the basidiocarps. Moreover they develop at a different level from the basidiocarps with regard to the surface of the substrate. The same applies to the tubers of the American *Tricholoma sclerotoideum* described by Morse (1943: 573) and mentioned by Singer (1962: 20) as bodies that perhaps may be considered carpophoroids. In that case the carpophores arise from cheese-like, up to 8×12 cm large tubers, which very probably are formed shortly before, and in the same rainy period as, the carpophores. These tubers have no differentiated cortex.

The tubers of *Squamanita* have been called sclerotia by some authors. This seems the right thing to do if one follows Jossierand (1952: 99), who defined a sclerotium as a condensation of mycelium of variable size and from which fruit-bodies arise. However, the present author thinks that Snell & Dick's definition (1957: 139) of a sclerotium is more to the point. It runs: "A sclerotium is a resting body of variable size, composed of a hardened mass of hyphae . . ., usually with a darkened rind, from which fruit-bodies, stromata, conidiophores or mycelium may develop." This definition considerably restricts the meaning of the term sclerotium, making it more precise by stressing the relatively long duration of life, the firm consistency, and the usually present cortex. In this way the definition comes closer to that of the classical sclerotium, which is a durable mycelial formation enabling species not only to endure unfavourable periods but also to produce fruit-bodies at the desired moments or to resume growth with great power after improved environmental conditions.

Taken in this sense the term sclerotium is not applicable to the tubers found in the species of *Squamanita* or in *Tricholoma sclerotoideum*. The term "protocarpic tubers" is proposed herewith for these short-lived, relatively soft and fleshy tubers without a true rind and which are able to produce carpophores.

R e l a t i o n s h i p s.—The name *Squamanita* is not a very felicitous one for the present genus. Although some of its species, e.g. *S. tropica*, at first sight resemble certain species of *Amanita* rather closely, there is a very large gap between these two genera. Not only is the bilateral structure of the trama of the gills lacking in *Squamanita*, but also the development and attachment of the gills is completely different, the trama of the stem lacks the typical terminal inflated elements of the stem of *Amanita* and the structure of the cuticle is different.

The structure and attachment of the gills and the kind of basidia in *Squamanita* make it probable that this genus belongs to the Tricholomataceae. In this connection it is significant that Konrad & Maublanc (1948: 345) treated the genus *Squamanita* under its synonym *Coolia* as a section of the genus *Tricholoma*! However, there is hardly any doubt now that *Squamanita* deserves generic rank. Especially the complicated velar structures and the sclerotium on which fruit-bodies as well as typical chlamydo-spores may be formed are important features. It may be stressed here, that the

species of the genus *Tricholoma*, as recently treated by Singer (1962: 246), which most strongly resemble the species of *Squamanita* by the presence of a distinct veil and a scaly cap, such as *T. caligatum* (Viv.) Rick. and *T. focale* (Fr.) Rick., have clampless hyphae (checked in two collections of both species). Reijnders (1952: 33) studied the development of *T. focale* and found the veil of that species to be a reinforced velum partiale, which means that the development of *T. focale* is much simpler than that of *Squamanita odorata* (see p. 352).

The genus *Catathelasma* Lovej. (= *Biannularia* G. Beck) is one of the genera with the most complicated velar structures within the Tricholomataceae. According to Reijnders (1963: 57) *C. imperiale* (Fr. apud Lund) Sing. is biveliangiocarp, which means that there is a velum universale and a velum partiale. The trama of the young gills is divergent but becomes more regular with age. The spores are large, elongate and amyloid. Clamps are present. There are some special points of resemblance to *Squamanita*. Kühner & Romagnesi (1953: 143) mentioned that the brown fibrils of the cuticle continue on the underside of the inner veil, this reminds one very much of the "inner velum universale" of *Squamanita* described above (see p. 354). In the section of a bud depicted by Konrad & Maublanc (1926: pl. 280) it may be observed that the base of the stem is a more or less fusiform bulb and that the inner veil as well as the outer veil are attached to it very closely together and just above its broadest part. On the other hand, the development of *C. imperiale* appears to be widely different from that of *S. odorata*, as the margin of the primordial cap is strongly involute and the gill-room is stuffed with lipsanenchym (Reijnders 1963: pl. 16 fig. 3).

A genus that certainly has to be compared with *Squamanita* is *Floccularia* Pouzar alias *Armillaria* (Fr. ex Fr.) Staude sensu Sing. Its best known representative is *F. luteovirens* (A. & S. ex Fr.) Pouzar. This species has colourless, thin-walled, amyloid spores, a distinct annulus, and a fibrillose-scaly cap and lower part of the stem. Some authors place it in the genus *Amanita* on account of the bilateral trama of the gills. The present author studied a collection of this species kindly sent on loan by Dr. A. H. Smith, Ann Arbor, (Smith 47434, U.S.A., Washington, Mt. Rainier, 1954). In a young specimen, of which the cap had just opened, he found the trama of the gills to be very regular in the central part and only very slightly diverging in a thin layer about one tenth of the width of the gills under the subhymenium (deviation not more than 10°). This is very unlike the structure of the gill in *Amanita*. Moreover, the stem of *F. luteovirens* consists of regular, 4-10 μ wide, longitudinal hyphae. Consequently the genus *Floccularia* is better placed in the Tricholomataceae.

The scales on the cap of *F. luteovirens* consist of broad, irregularly arranged to radial hyphae, constricted at the septa, similar to those on the cap of *Squamanita*, and just as in that genus the scales are not sharply distinct from the cuticle¹ and the

¹ The present author did not find the cuticle of thin subparallel hyphae mentioned by Singer (1948: 120).

trama underneath. Clamps are abundant. However, a sclerotial bulb is lacking and the only species of *Squamanita* with amyloid spores (*S. scotica*) does not resemble *F. luteovirens* very much. Yet, *Floccularia* is probably more closely related to *Squamanita* than *Catathelasma*. In this connection the fact that the margin of the cap seems to be only slightly incurved in *Floccularia* may be of importance.

Some features of *Squamanita* are reminiscent of the Agaricaceae *sensu stricto*, especially the pseudo-amyloid spores of two species, viz. *S. pearsonii* and *S. paradoxa*. What is more, the last named species bears such a great resemblance to certain species of *Cystoderma*, that it was originally described as belonging to that genus, mainly on account of the chains of spherocysts forming the outer layer of the "outer" universal veil. In addition to this, the fact that *Cystoderma*, like *Squamanita*, is one of the few genera in which species occur with non-amyloid, amyloid, and pseudo-amyloid spores (Singer 1963: 485) and the fact that the yellow-brown pigment in the veil of *S. paradoxa* turns reddish in KOH as in some species of *Cystoderma*, lead one to conclude that there is a close relationship between *Cystoderma* and *Squamanita*. However, in the author's opinion this speaks more for placing *Cystoderma* in the Tricholomataceae, than for placing *Squamanita* in the Agaricaceae. Against the latter arrangement militate the adnate gills, the continuation of the trama of the stem in the trama of the cap, the homomorphous edge of the gills, and the hardly differentiated cuticle. None of these characters on its own is decisive, but together they give a strong indication. On the other hand, the spores of *Squamanita* are probably binucleate (*S. pearsonii*, *S. paradoxa*). This would be a character in favour of placing it in the Agaricaceae (Kühner 1945: 620).

Summarizing, it may be said that the genus *Squamanita* seems to represent one of the more intricately constructed genera of the Tricholomataceae, but that some of its characters suggest relations with the Agaricaceae.

REFERENCES

- BENEDIX, E. H. (1958). In *Z. Pilzk.* **24**: 53.
 COOL, C. (1918). In *Meded. Nederl. mycol. Ver.* **9**: 45-52.
 GREIS, H. (1938). In *Jahrb. wiss. Bot.* **86**: 81-106.
 HEINEMANN, P. (1963). In *Bull. Jard. bot. Brux.* **33**: 421-458.
 HERINK, J. (1954). In *Česká Mykol.* **8**: 60-66.
 HORAK, E. (1962). In *Z. Pilzk.* **28**: 14-20.
 — (1963). In *Mitt. Schweiz. Anst. forstl. Versuchsw.* **39**: 1-112.
 HUIJSMAN, H. S. C. (1943). In *Meded. Nederl. mycol. Ver.* **28**: 54-60.
 IMBACH, E. J. (1942). In *schweiz. Z. Pilzk.* **20**: 130, 152.
 — (1946). In *Mitt. naturf. Ges. Luzern* **15**: 5-85.
 JOSSEAND, M. (1952). *La description des champignons supérieurs*. Paris.
 KONRAD, P. & A. MAUBLANC (1926). *Icones selectae Fungorum* **3** (Fasc. 2). Paris.
 — & — (1948). *Les Agaricales* **1**. Paris.
 KÜHNER, R. (1945). In *C.R. Acad., Sci., Paris* **220**: 618-620.
 KÜHNER, R. & H. ROMAGNESI (1953). *Flore analytique des champignons supérieurs*. Paris.
 LANGE, M. (1953). In *Friesia* **4**: 307-309.

- MAIRE, R. (1945). In *Bull. Soc. Hist. nat. Afr. N.* **36**: 24-42.
- MORSE, E. E. (1943). In *Mycologia* **35**: 573-581.
- PEARSON, A. A. (1952). In *Trans. Brit. mycol. Soc.* **35**: 97-122.
- REIJNDERS, A. F. M. (1952). In *Meded. Nederl. mycol. Ver.* **30**: 1-116.
- (1963). Les problèmes du développement des carpophores des Agaricales et de quelques groupes voisins. Den Haag.
- ROGERS, D. P. (1936). In *Mycologia* **28**: 347-362.
- ROUTIEN, J. B. (1948). In *Mycologia* **40**: 194-198.
- SANDOR, R. (1957). In *Z. Pilzk.* **23**: 48-52.
- SCHREIER, L. (1938). In *Schweiz. Z. Pilzk.* **16**: 97-100.
- SCHWÖBEL, H. & J. WANDEL (1958). In *Z. Pilzk.* **24**: 52-53.
- SINGER, R. (1948). In *Pap. Mich. Acad. Sci.* **32** (Part 1): 103-150. "1946".
- (1952). In *Lilloa* **25**: 5-462. "1951".
- (1962). *The Agaricales in modern taxonomy*. 2nd. Ed. Weinheim.
- SMITH, A. H. & R. SINGER (1948). In *Mycologia* **40**: 454-460.
- SNELL, W. H. & E. A. DICK (1957). *A glossary of mycology*. Cambridge (U.S.A.).
- STUNTZ, D. E. & B. F. ISAACS (1962). In *Mycologia* **54**: 272-298.

A NEW GALERINA FROM PEAT-BOGS

C. BAS
Rijksherbarium, Leiden

(With five Text-figures)

Galerina propinqua Bas, sp. nov., belonging to *Galerina* section *Tubariopsis*, is described. The name *Galerina* sect. *Tubariopsis* Kühn. is validly published by providing a Latin description; the taxonomic status of this section is discussed.

During the past few years, Dr. J. J. Barkman, Mr. P. B. Jansen, and I collected on several occasions a small, pale, entirely pruinose species of *Galerina* in peat-bogs in The Netherlands and north-western Germany. Sometimes it was found growing on bare or mossy peat, sometimes among *Sphagnum*.

At first view I identified this species with *G. laevis* (Pers.) Sing., usually called *G. graminea* (Velen.) Kühner. However, repeated close observations revealed that the spores differed considerably.

The description of a new species of *Galerina* is a hazardous undertaking on account of the many new North American species published by Smith (1953) and Smith & Singer (1955, 1958a). Fortunately, Dr. A. H. Smith, Ann Arbor, was so kind as to study material of the present species and to express as his opinion that he too considered it undescribed.

I am convinced that the taxonomy of *Galerina* in Europe is considerably more complicated than one would conclude from the literature. Quite a number of collections in the Rijksherbarium at Leiden seem to represent undescribed species. The same I found true when I studied the material under the names *G. marginata* and *G. unicolor* in the herbaria at Stockholm and Uppsala. However, before publishing a new species in a genus as difficult as *Galerina* it is important to have a clear picture in mind of its habit and habitat. That is why at the moment only one of the unnamed species met with is considered for publication.

In the following description, the abbreviation "Expo" refers to the colour-card of Cailleux A. & Taylor G., Code Expolaire, Boubée & Cie, Paris.

Galerina propinqua Bas, nov. spec.

Pileus 5-13 mm latus, pallide ochraceus vel pallide ochraceo-brunneus, pellucido-striatus, sub lente minute pubescens. Lamellae subconfertae vel subdistantes, pallide ochraceae. Stipes 12-32 × 0.4-2 mm, pallidus, minute pubescens. Sporae 8-10 × 4.5-5.5 μ, pallidae, leviter vel mediocriter rugulosae, sine areola supra-apiculari glabra, obtuse subamygdaliformes, non-collapsae. Pleurocystidia nulla. Cheilocystidia 20-40 × 5-10 μ, collo 1.5-2.5 μ lata, apice 3-5.5 μ. Pileocystidia caulocystidiaque praesentia. Hyphae defibulatae vel fibulis raris praeditae. — Typus: J. J. Barkman 7837, 27 May 1964, Germany, Hannover, Meppen, Klein Heseper Moor (L, MICH).

Etymology.—Propinquus, resembling, related (on account of the resemblance of this species to *Galerina laevis* = *G. graminea*).

Cap 5–14 mm wide and 2–7 mm high, at first parabolical with slightly incurved margin to hemispherical with obtuse umbo, becoming conical to plano-conical with obtuse apex, pale ochraceous to pale brownish ochraceous, ochraceous brown or buff, honey-buff or pale honey, sometimes pale tawny with age (Expo C66, D66, C74 but less dingy, A84), often somewhat dingy, translucently striate almost to centre (4/5 R), pruinose under hand-lens when young, without remnants of veil, subviscid, slightly shining. Gills moderately crowded to rather distant, 11–16 with 1–3 small ones between each pair, rather thin, ventricose, ascendent, narrowly adnate to adnate-emarginate, pale ochraceous or yellowish buff (Expo A78) when young, pale but rather clear honey-ochraceous (\pm Expo D66 but brighter) to rusty ochraceous with age, with whitish pruinose, sometimes minutely crenulate edge. Stem 12–32(–50) \times 0.4–2 mm, equal or slightly attenuate upward, often with small, 1.2–1.8 mm wide bulb at base, becoming fistulose, hyaline whitish, pale buff or pale honey, mostly unicoloured, very seldom slightly darker toward base, pruinose all over, sometimes whitish tomentose at base, remnants of veil as some scattered, minute, white fibrils only in young specimens. Flesh concolorous with surface. Taste weak, subraphanoid, not farinaceous. Smell herbaceous when crushed.

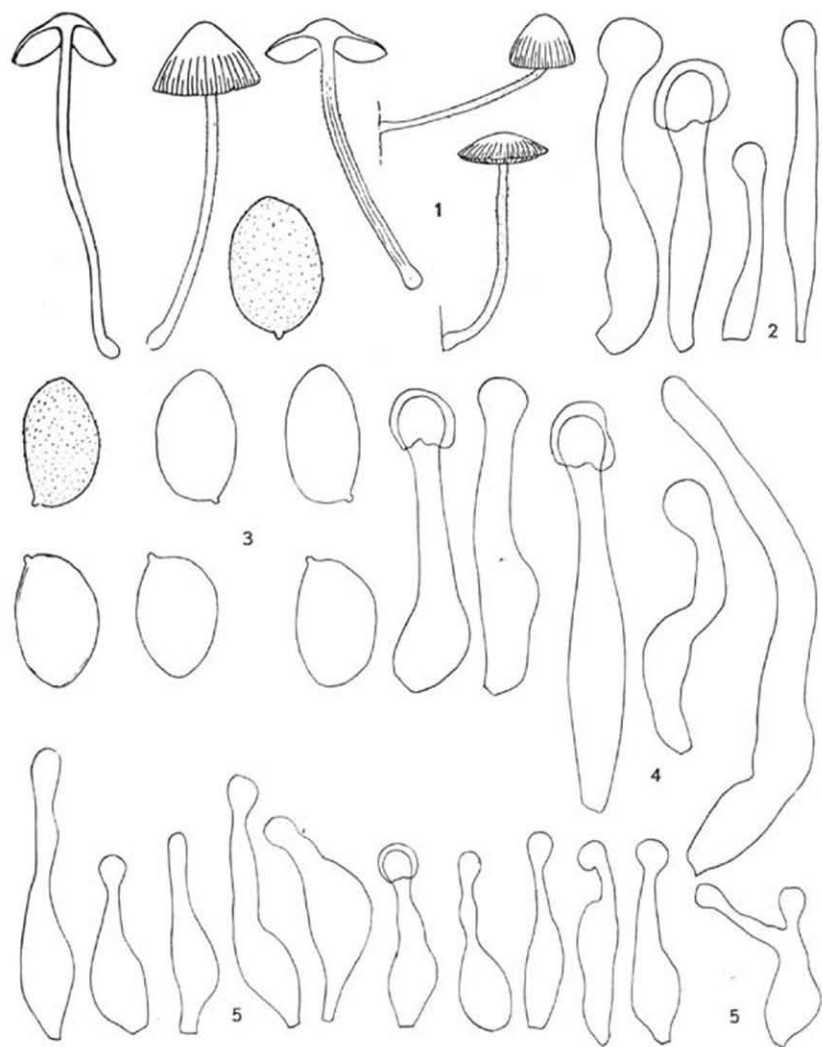
Spores 7.8–10.4(–11.2) \times 4.3–5.9 μ , subamygdaliform to amygdaliform, mostly with rather obtuse apex, with small apical pore (several spores germinating through this pore), faintly to moderately rough, without plage, with somewhat thickened wall (consisting of at least two layers) and therefore not easily collapsing, pale dingy yellow in water, pale brownish yellow in NH_4OH solution, moderately dark dingy rusty brown in KOH solution, not or only faintly pseudo-amyloid after many hours. Basidia 4-, rarely 2-spored, with clamps when young. Cheilocystidia 20–39 \times 4.2–10.8 μ with neck 1.4–2.8 μ , and apex 2.6–7.1 μ , wide, abundant, rendering edge of gills sterile, capitate to subcapitate lageniform, broader, up to 15 μ wide, near edge of cap and there sometimes vesiculose with or without a non-capitate neck, thin-walled, colourless sometimes forked, often bearing small to very large apical hyaline globules. Pleurocystidia absent. Cuticle composed of (4–)8–18 μ wide, radial to interwoven hyphae, the thinner ones sometimes pale yellow encrusted, not gelatinized at surface, with scattered to numerous subcapitate to capitate filiform to slender-lageniform pileocystidia, 26–55 \times 3–12 μ . Caulocystidia similar but larger, 38–81 \times 8–14 μ . Trama of gills subregular. Clamps present at base of young basidia; absent or very scarce elsewhere (only a very few seen at narrow hyphae of stem and gills).

HABITAT.—On bare or mossy peat and on *Sphagnum*.

DISTRIBUTION.—North-west Germany, Netherlands.

COLLECTIONS EXAMINED.—GERMANY: Hannover, Meppen, Klein Heseper Moor, 27 May 1964, *J. J. Barkman* 7837 (type, L, MICH); Ostfriesland, Ewiges Mehr, north of Aurich, 22 Aug. 1962, *C. Bas* 2607 (L). — NETHERLANDS: Drente, Meerstalblok near Zwartemeer, east of Coevorden, 20 May 1960, *J. J. Barkman* & *C. Bas* (L, MICH); Noord-Brabant, Grote Peel, near Asten, east of Eindhoven, 12 Sept. 1963, *P. B. Jansen* (L); Goudbergven near Strijbeek, south of Breda, 27 May 1954, *M. Jansen-van der Plaats* (L); same locality, 10 Oct. 1961, *P. B. Jansen* (L).

On account of the pale colours and the minutely pruinose stem and cap, the species described above is very similar to *G. laevis* (Pers.) Sing. which has been



Figs. 1-5. *Galerina propinqua*. — 1. Fruit-bodies ($\times 2$). — 2. Pileocystidia ($\times 1000$). — 3. Spores ($\times 2500$). — 4. Caulocystidia ($\times 1000$). — 5. Cheilocystidia ($\times 1000$). — All Figs. from type.

currently called *G. graminea* (Velen.) Kühner. It differs, however, from the latter by rather thick-walled, more amygdaliform spores with a small but distinct apical pore and cheilocystidia which cover the edge of the gills completely, whereas those in *G. laevis* occur scattered among the basidia.

When I tried to determine the present species by means of a provisional, unpublished key to the North American species of *Galerina*, I arrived at *G. dimorphocystis*, a species published by Smith & Singer (1955: 558). Dr. A. H. Smith, Ann Arbor, was so kind as to compare material of the collection from Drente cited above, with that of *G. dimorphocystis* and found it different, mainly on account of the spores, which have a more obvious apical pore in *G. propinqua*.

During the summer of 1963 I had the privilege to collect agarics in Michigan under the guidance of Dr. A. H. Smith. We met *G. dimorphocystis* several times (Bas 3184, 3213, 3228). In my opinion it has also more slender, less ornamented spores than *G. propinqua*. In addition it has a different habitat: it mainly occurs on mossy logs in woods, whereas *G. propinqua* typically grows on peat or among *Sphagnum* in open peat-bogs.

One collection studied (Netherlands, Noord-Brabant, Strijbeek, Goudbergven, 12 May 1954, M. Jansen-van der Plaats, L) appears to represent a form which is closely related to *G. propinqua*. It differs from the latter mainly in the red-brown colour of the cap and the much rougher spores, which turn considerably darker in KOH solution. This may be a variety of *G. propinqua* or an independent but closely related species.

Though in *G. propinqua* clamps occur at the base of young basidia, I think that in the classification of Smith & Singer (1958: 446) this species belongs to *Galerina* subgenus *Tubariopsis* (Kühner) A. H. Sm. & Sing. As I found clamps at the base of the basidia of *G. dimorphocystis* too (checked in several collections of that species) it would seem that the absence of clamps as a character of '*Tubariopsis*' should be dropped, a fact that undoubtedly weakens the status of this group.

On the other hand, the following set of characters seem to be common to such species as *G. heterocystis* (Atk.) A. H. Sm. & Sing. [= *G. clavata* (Velen.) Kühner], *G. laevis*, *G. dimorphocystis* and *G. propinqua*: the absence of a plage on the spores, the pruinose stem, the absence or the extreme scarcity of clamps on the hyphae, the capitate cheilocystidia with thin necks and the lacking or very weak pseudo-amyloid reaction in Melzer's solution. For this reason I prefer to maintain this group, but merely as a section. Unfortunately, the epithet *Tubariopsis* Kühner was not validly published, the original publication lacking a Latin description.

Galerina sectio **Tubariopsis** Kühner ex Bas, *nov. sect.* — Protonym: *Galerina* "section" *Tubariopsis* Kühner, *Le Genre Galera in Encycl. mycol.* 7: 168. 1935. — Sporae leviter vel forte ornatae, sine areola supra-apiculari glabra. Hyphae defibulatae vel fibulis raris praeditae. — Lectotypus (Sing. in *Lilloa* 22: 571. 1951): *Galerina graminea* (Velen.) Kühner = *G. laevis* (Pers.) Sing.

REFERENCES

- KÜHNER, R. (1935). Le genre *Galera*. *In* *Encycl. mycol.* **7**.
SMITH, A. H. (1953). *In* *Mycologia* **45**: 892-925.
SMITH, A. H. & SINGER, R. (1955). *In* *Mycologia* **47**: 557-596.
— (1958a). *In* *Mycologia* **50**: 469-489.
— (1958b). *In* *Sydowia* **11**: 446-453. "1957".

DENDROTHELE (1907) VS. ALEUROCORTICIUM (1963)

PAUL ARENZ LEMKE

The Biological Laboratories, Harvard University

The author rejects his previous use of the name *Aleurocorticium* Lemke and takes up *Dendrothele* Höhn. & Litsch. as the correct name for the genus. The necessary new combinations with *Dendrothele* (18) are made.

The name *Dendrothele* Höhn. & Litsch. was originally and has been repeatedly and consistently used in a limited sense to segregate aleurodiscoïd fungi with a spinulose hymenium—a feature which, taken alone, is now generally regarded as trivial. In a recent treatise on the genus *Aleurodiscus* Rabenh. ex J. Schroet. (sensu lato) the author (1964) rejected this stereotyped concept of *Dendrothele* and assembled most of the nonamyloid-spored aleurodiscoïd fungi under a new and taxonomically more meaningful generic name—*Aleurocorticium* Lemke. Included in this assemblage, however, was the type species of *Dendrothele*, [*D. papillosa* Höhn. & Litsch. =] *D. griseo-cana* (Bres.) Bourd. & Galz.

Since *Dendrothele* (1907) is a validly published and legitimate name, it might well have been adopted and extended to embody that generic concept put forward as *Aleurocorticium* (1964). The nomenclatural decision to do otherwise proves now to be unfounded (see Code, Arts. 51, 62). According to the dictates of the Code, *Aleurocorticium* is impriorable and superfluous (Art. 63), and should be abandoned in favor of *Dendrothele*—all of which invites the following nomenclatural revisions.

- D E N D R O T H E L E Höhn. & Litsch. in S.B. Akad. Wiss. Wien (Math.-nat. Kl. I) **116**: 819. 1907. Type species: [*Dendrothele papillosa* Höhn. & Litsch. =] *Dendrothele griseo-cana* (Bres.) Bourd. & Galz.
Aleurodiscus subg. *Dendrophysium* Pilát in Ann. mycol. **24**: 207. 1926 (pro parte).
Lectotype: [*Aleurodiscus acerinus* (Pers. per Fr.) Höhn. & Litsch. =] *Dendrothele acerina* (Pers. per Fr.) Lemke, comb. nov.
Aleurodiscus sect. *Rigidodiscus* T. Ito in Bot. Mag., Tokyo **43**: 462. 1929 (pro parte).
Lectotype: [*Aleurodiscus acerinus* (Pers. per Fr.) Höhn. & Litsch. =] *Dendrothele acerina* (Pers. per Fr.) Lemke, comb. nov.
Aleurocorticium Lemke in Can. J. Bot. **42**: 724. 1964 (superfluous name). Type species: [*Aleurocorticium acerinum* (Pers. per Fr.) Lemke =] *Dendrothele acerina* (Pers. per Fr.) Lemke, comb. nov.

The name *Dendrothele*, thus emended, replaces *Aleurocorticium*. For the taxonomic details concerning *Aleurocorticium* Lemke = *Dendrothele* Höhn. & Litsch. emend. Lemke consult the author (1964).

List of species referable to *Dendrothele* Höhn. & Litsch.
emend. Lemke

1. ***Dendrothele acerina*** (Pers. per Fr.) Lemke, *comb. nov.*
Thelephora acerina Pers. per Fr., Syst. mycol. **1**: 453. 1821, Hymen. eur. 645. 1874; Pers., Mycol. eur. **1**: 152. 1822.
2. *Dendrothele alba* Viégas in Rodriguésia **4** (13): 286. 1940 = *Dendrothele duthieae* Talbot in Bothalia **6**: 478. 1956.
3. ***Dendrothele alliacea*** (Quél.) Lemke, *comb. nov.*
Corticium alliaceum Quél. in C.R. Assoc. fr. Avanç. Sci. **12**: 505. 1884, Fl. mycol. **5**. 1888.
4. ***Dendrothele biapiculata*** (G. H. Cunn.) Lemke, *comb. nov.*
Acanthophysium biapiculatum G. H. Cunn. in Bull. New Zeal. Dep. sci. indust. Res. No. 145: 165. 1963.
5. ***Dendrothele candida*** (Schw.) Lemke, *comb. nov.*
Thelephora candida Schw. in Schr. naturf. Ges. Leipzig **1**: 110. 1822; Fr., Elench. Fung. **1**: 189. 1828 [nec *T. candida* (Schw.) Fr., Syst. Orb. veg. **82**. 1825, Elench. Fung. **1**: 168. 1828 (= *Tremellodendron candicans* (Fr.) Donk].
6. ***Dendrothele dryina*** (Pers.) Lemke, *comb. nov.*
Thelephora dryina Pers., Mycol. eur. **1**: 152. 1822.
7. ***Dendrothele fasciculata*** (G. H. Cunn.) Lemke, *comb. nov.*
Acanthophysium fasciculatum G. H. Cunn. in Bull. New Zeal. Dep. sci. indust. Res. No. 145: 167. 1963.
8. *Dendrothele griseo-cana* (Bres.) Bourd. & Galz. in Bull. mycol. Soc. Fr. **28**: 354. [1913], Hymen. Fr. 338. [1928].
Corticium griseo-canum Bres., Fung. trid. **2**: 58. 1898 = *Dendrothele papillosa* Höhn. & Litsch. in S.B. Akad. Wiss. Wien (Math.-nat. Kl. I) **116**: 820. 1907.
9. ***Dendrothele incrustans*** (Lemke) Lemke, *comb. nov.*
Aleurocorticium incrustans Lemke in Can. J. Bot. **42**: 739. 1964 (nomen generis impriorabile)
10. ***Dendrothele lepra*** (Berk. et Br.) Lemke, *comb. nov.*
Stereum lepra Berk. & Br. in J. Linn. Soc. (Bot.) **14**: 67. 1873.
11. ***Dendrothele macrodens*** (Coker) Lemke, *comb. nov.*
Aleurodiscus macrodens Coker in J. E. Mitchell sci. Soc. **36**: 155. 1921
12. ***Dendrothele macrospora*** (Bres.) Lemke, *comb. nov.*
Corticium macrosporum Bres. in Ann. mycol. **6**: 43. 1908.

13. **Dendrothele maculata** (Jacks. & Lemke) Lemke, *comb. nov.*
Aleurocorticium maculatum Jacks. & Lemke *apud* Lemke in Can. J. Bot. **42**: 742.
1964 (nomen generis impriorabile).
14. **Dendrothele mexicana** (Lemke) Lemke, *comb. nov.*
Aleurocorticium mexicanum Lemke in Can. J. Bot. **42**: 743. 1964 (nomen generis
impriorabile).
15. **Dendrothele microspora** (Jacks. & Lemke) Lemke, *comb. nov.*
Aleurocorticium microsporum Jacks. & Lemke *apud* Lemke in Can. J. Bot. **42**:
745. 1964 (nomen generis impriorabile).
16. **Dendrothele moquiniara** (Viégas) Lemke, *comb. nov.*
Aleurodiscus moquiniarum Viégas in Rev. Agric., Piracicaba **14**: 6. 1939.
17. **Dendrothele nivosa** (Berk. ex Höhn. & Litsch.) Lemke, *comb. nov.*
[*Stereum acerinum* (Pers. per Fr.) Fr. var. *mentosum* Berk. in Grevillea **1**: 165.
1873 (nomen nudum) =] *Aleurodiscus nivosus* (Berk.) ex Höhn. & Litsch.
in S.B. Akad. Wiss. Wien (Math.-nat. Kl. I) **116**: 808. 1907 ("Berk. et
Cke.").
18. **Dendrothele pachysterigmata** (Jacks. & Lemke) Lemke, *comb. nov.*
Aleurocorticium pachysterigmatum Jacks. & Lemke *apud* Lemke in Can. J. Bot.
42: 750. 1964 (nomen generis impriorabile).
19. **Dendrothele pulvinata** (G. H. Cunn.) Lemke, *comb. nov.*
Acanthophysium pulvinatum G. H. Cunn. in Bull. New Zeal. Dep. sci. indust.
Res. No. 145: 164. 1963.
20. **Dendrothele seriata** (Berk. & Curt.) Lemke, *comb. nov.*
Stereum seriatum Berk. & Curt. in J. Linn. Soc. (Bot.) **10**: 332. 1868.
21. **Dendrothele strumosa** (Fr.) Lemke, *comb. nov.*
Stereum strumosum Fr. in Nova Acta Soc. Sci. upsal. III **1**: 111. 1851.

ACKNOWLEDGEMENTS

The author is grateful to Prof. J. A. Nannfeldt of Uppsala for questioning the nomenclatural status of *Aleurocorticium* Lemke and to Dr. M. A. Donk of Leiden for answering that question.

REFERENCE

- LEMKE, P. A. (1964). The genus *Aleurodiscus* (sensu lato) in North America. In Can. J. Bot. **42**: 723-768 10 fs.

REVIEWS

L. R. HESLER & A. H. SMITH, *North American species of Hygrophorus*. (The University of Tennessee Press, Knoxville, Tenn. 1963.) Pp. xvi + 416, 126 text-figures + full-colour photograph on cover. Price: U.S. \$ 12.00.

The genus *Hygrophorus* is perhaps one of the most attractive among the genera of the Agaricales. It is surprising, therefore, that no full treatment of this genus in Europe has ever been published. Doubtless, European mycologists will be strongly stimulated by this American monograph in which 244 taxa are described and 116 illustrated by excellent black and white photographs. Of these 244 taxa, 41 are new to science: about 65 occur also in Europe.

The European mycologist will be astonished by the strikingly high number of taxa in this monograph. The "Flore analytique" of Kühner & Romagnesi covers 80 species and varieties of *Hygrophorus* and there are 86 in the second edition of Moser's "Die Röhrlinge, Blätter- und Bauchpilze". Though the actual number of taxa of *Hygrophorus* in Europe may be much higher (Orton's treatment of *Hygrocybe* in the "New check list of British Agarics and Boleti" is already an indication), it is not to be expected that Europe will have more than half as many species as North America.

Hesler & Smith's monograph is cloth bound and printed on coated paper. The subject matter is arranged in a very surveyable way. The first 45 pages comprise chapters on the history of the genus; on macroscopical, microscopical, and chemical characters; on the ecology, geographical distribution, and seasonal occurrence; and on phylogeny and classification. The chapter on microscopical characters is illustrated with elucidating drawings.

The synopsis on pages 4 to 6 makes it clear that the authors have treated the genus *Hygrophorus* in its widest sense. *Hygrocybe*, *Camarophyllus* sensu auct. (renamed *Camarophylloopsis*), and *Limacium*, currently mostly considered subgenera, as well as Singer's genera *Hygrotrama* and *Hygroaster*, are all lowered to the rank of section. *Hygrophorus marginatus* (the type species of *Humidicutis* Sing.) is placed in section *Hygrocybe* series *Conici*. This may be understood by reading the report on the occurrence of clamp-connections in *Hygrophorus* sensu lato on page 31.

To my mind the sections were allotted one rank too low. This was done to emphasize the outstanding position of *Hygrophorus angelesianus* (p. 47: "... at first sight a typical member of the section *Camarophylloopsis* . . .") with its amyloid spores (which, however, occur also in section *Amylohygrocybe*) and flesh that colours red in KOH solution. In this way subgenus *Pseudohygrophorus* with only one species (i.e. *H. angelesianus*), became opposed to subgenus *Hygrophorus* with more than 200 species. In my opinion it would have been a preferable solution if all the sections had been treated as subgenera like subgenus *Pseudohygrophorus*.

The introduction of the sectional epithet *Camarophylloopsis* Hesl. & Sm. for *Camarophyllus* sensu auct. is not a lucky one because Herink (1959) has already published it as a generic name for a different group with *H. schulzeri* as type species. The

authors seem to have overlooked Herink's paper (probably due to its publication in a not very well known journal) although it is cited in their bibliography. In this publication several innovations relating to the taxonomy of the *Hygrophoraceae* were introduced.

The remaining part of the book contains the keys to the infrageneric taxa, the descriptions, and the photographs: it is closed by an extensive bibliography and index. The keys attract attention by their simplicity and seem to work quite well. The descriptions impress one as being at the same time concise and yet giving all the essential information.

One must appreciate that the authors have tried to compare their American material of species originally described from Europe with European material. That they have not completely succeeded is probably due to the difficulty of locating good collections accompanied with sufficient descriptions taken from material in fresh condition. It is a pity that the authors did not study *Hygrophorus* material from Sweden, such as has been issued in Lundell & Nannfeldt's "Fungi exciccati suecici", the more so because many European species were published by Fries.

By omitting the pre-Friesian authors in the author's citations of the names, a part of the history of the *Hygrophorus* species is suppressed; for instance *H. psittacinus* is a species of Schaeffer and *H. ovinus* one of Bulliard. The type-localities of these species, the names of which were re-validated by Fries, are in fact in Bavaria and France respectively and not in Sweden as one would deduce from the author's citations in Hesler & Smith's book. The type of *H. psittacinus* is in fact represented by Schaeffer's plate 301, of *H. ovinus* by Bulliard's plate 580 (excl. fig. a, b.).

These few remarks certainly do not detract from my great admiration for this attractive and clearly written monograph for which such an enormous amount of material was studied. It is to be hoped that more monographs on agarics of this high quality will appear in the future.

C. BAS

E. GÄUMANN, *Die Pilze. Grundzüge ihrer Entwicklungsgeschichte und Morphologie*. Zweite, umgearbeitete und erweiterte Auflage. (Birkhäuser Verlag Basel und Stuttgart. 1964.) 541 pp., 610 figures. Price sFr. 66.—.

This second edition of a work of the same title published in 1949 is in fact the fourth edition of an earlier work. Many mycologists will still remember Gäumann's "Vergleichende Morphologie der Pilze" issued in 1926 and which reached a wider appreciative public when it was published in a translated and revised edition by C. W. Dodge (1928).

Now that several text- and handbooks on Fungi are available the appearance of still another raises the question of what the particular merits of this one are. The introduction states that it 'tries briefly to expose the more important facts of the "Entwicklungsgeschichte."' However, it must be said at once that 'Stammesgeschichte' (phylogeny) is also very strongly emphasized, perhaps too strongly for

those who are inclined to distrust phylogenetic speculations, especially if these are presented as an established fact as is very often the case in this book. If there is one extensive group of which very little is known about fossils (which in addition are only very exceptionally suitable for finer taxonomic discrimination) and of other factual evidence, this is first of all the Fungi and the phylogenetic thread must of necessity be one largely derived from imagination. It would seem best at present to treat the taxonomy of the fungi quite separately from often oversimplified considerations on their phylogeny and not to mix the two subjects indiscriminately as is done in this work.

In some instances the author has kept to his earlier views without taking more recent ones into account; for instance in connection with the primary divisions of Fungi no attention is paid to F. Moreau's considerations in "Les champignons", 1952-4. This work is not even cited although it is undoubtedly of great importance in the context of this book. — Few mycologists will now agree with the view still defended by Gäumann that the swollen bodies on the *Tulasnella* basidium are sessile spores; still fewer will not be surprised to read that these basidiospores "ja, normalerweise nicht, wie die echten Sterigmata, eine Basidiospore, sondern bloss eine uncharakteristische Konidie [tragen]."

It should not be denied however that this well-edited book has its great merits and will come in as a handy companion for those who want a rapid and profusely illustrated account of a group in order to learn the essential information on it quickly.

M. A. DONK



K. Boedijn

PROF. DR. K. B. BOEDIJN

From a photograph taken on the occasion of the 70th anniversary of his birthday