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STUDIES IN THE AGARICS OF DENMARK

BY

JAKOB E. LANGE

PART IV

PHOLIOTA. MARASMIUS. RHODOPHYLLUS

WITH ONE PLATE



KØBENHAVN

H. HAGERUP'S BOGHANDEL

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THE GENUS PHOLIOTA.

The great French mycologist QUÉLET, that ingenious contriver of genera, in his »Flore Mycologique« splits up the old genus *Pholiota* so completely that it is difficult to trace the scattered remnants to their new position. Most of the Friesian section *Humigeni* he lumps (sub nom. *Cyclopus*) with *Hebeloma* and *Naucoria* in a new genus *Hylophila*. Only *P. aurea* (= *Vahlü*) does not go into this genus but is placed in *Lepiota*, next to *L. amianthina* and others of the section *Granulosi* (sub nom. *Lepiota pyrenæa*). (What Quélet calls *P. aurea* is *P. spectabilis* Fr.). — Of the section *Truncigeni* of Fries together with most *Flammulas* and the *fascicularis*-tribe of *Hypholoma* he forms another large genus (*Dryophila*], while *P. mycenoides* is shifted to *Galera*.

As any student of these agarics will see this revolutionary reclassification is in fact a rather natural one, uniting species which really have numerous traits in common, while the old

^{*)} Part I of these Studies (General introduction. The genus *Mycena*) was published in D. B. A. vol. I no 5 (1914); part II (*Amanita, Lepiota, Coprinus*) in vol. II no. 3 (1915); part III (*Pluteus, Collybia, Inocybe*) in vol. II no. 7 (1917). — »Danmarks Agariceer« now comprises over 900 watercolour-plates, (Library of the Bot. Museum, Copenhagen) all painted by the author. For further particulars see part I.

Friesian classification is rather artificial — lumping plants of so different a nature as f. inst. *P. præcox*, *P. Vahlîi*, *P. squarrosa* and *P. mycenoides* in one genus, merely because their spores are rusty or brown and their stem annulate. My only reason for not following Quélet are the practical difficulties of most innovations. Mycologists are used to regard spore-colour as the leading character of the main divisions of the Agaric family and will find the new paths rather bewildering. Probably a total reclassification of the whole family of Agarics had better be postponed till we have acquired a more detailed and precise knowledge of all the species (including their anatomy), while all we at present know of innumerable species are brief diagnoses made up of a few vague adjectives (partly contradictory in the different textbooks).

But while thus maintaining the genus *Pholiota* in the Friesian sense I cannot altogether approve the minor points of his classification. Thus he places *P. erebia* in *Eudermi* although its spore-colour decidedly refers it to *Phaeoti*. And the sharp distinction which he tries to establish in the section *Squamosi* between the pallid-gilled and the yellow-gilled species is hardly valid.

The proper delimitation of the genus is no easy task, even when one does not attempt any great deviation from the Friesian classification. Thus f. inst. some of the velate *Galeras* have a veil almost like that found in *Lepiota seminuda* (a membranous white one which, when the cap expands, forms a row of marginal appendiculate teeth). But I refrain from including them in *Pholiota*, restricting the genus to embrace the distinctly annulate species. — Some sub-annulate *Cortinari* may also easily be mistaken for true *Pholiotas*. In most cases the want of cystidia will serve as an indication of their true nature. Lastly some sub-annulate *Hebelomas* may be mentioned as running into *Pholiota* (and vice versa). In fact *P. radicata* and *P. erebia* are by some authors shifted to *Hebeloma*.

Microscopic characteristics. Two-spored basidia appear to be rare in this genus. The only cases within my range of observation are *P. erebia* and a little *Galera*-like species which I call *P. teneroides*. — The form and size of the spore is not very variable within the genus; the extremes are $4-5 \times 2\frac{1}{2} \mu$ (*P. flammans*) and $12-14 \times 7-8$ (*P. caperata*). In most cases the epispore is smooth, but in some species it is rough or minutely warty. This is especially the case in species

which deviate from the normal *Pholiota*-type and branch off into *Hebeloma* (*P. radicata*), *Cortinarius* (*P. caperata*) etc.; but also such a typical *Pholiota* as *P. spectabilis* has rough spores.

Cystidia are found in most species; but in most cases they are rather trivial: obtusely hairshaped or slightly clubshaped. In a few cases they are vesiculose or inflated-bottleshaped (f. inst. *P. præcox*). Another characteristic type of *Cystidium* is that found in *P. squarrosa*: obovate-clubshaped, generally tipped with a short cylindrical-hairshaped appendix.

The number of *Pholiotas* figured in »Danmarks Agaricaceer« is comparatively small, only 18, while FRIES in »Hymenomycetes Europæi« enumerates 47 (of which 37 seen by himself). The geographical position of Denmark is too northern to give us a fair representation of the South-European tribe *Aegeritini*. And our woods — nearly all of which are under rational cultivation by the forester (old stumps lifted, superannuated and sick trees not allowed to stand etc.) — are a rather poor home for xylophilous fungi.

Still the number of species could undoubtedly be added to. Thus SEV. PETERSEN (Danske Agaricaceer) records *P. sphaleromorpha* and *phragmatophylla* as well as *P. terrigena* and *P. muricata*. And I myself have seen a specimen (from Sjælland) of a xylophilous *Pholiota* which probably was *P. aegerita*. If these be added the number of Danish species approaches very much that of the Central-European *Pholiotas* recorded by RICKEN (27). —

KEY

TO THE SPECIES OF THE GENUS PHOLIOTA FIGURED IN »DANMARKS AGARICACEER«

- A. Humigenæ** (Fr.). Growing on the ground (vide nos. 9 and 10).
- α. Velatæ.** Cap with a powdery bloom or set with fibrillous scales (from universal veil).
- a. Cap smooth, mealy; outside of ring granulate, radiately sulcate 1. *P. VahlII.*
- b. Cap rugose-rivulose, sparsely set with fugacious, fibrillous or cobweb-like scales 2. *P. caperata.*
- β. Nudæ.** Cap smooth.
- a. *Phæotæ* (Fr.). Spores dark brown.
1. Basidia 2-spored; cap watery umber or fuscous . . . 3. *P. erebia.*
2. Basidia 4-spored; cap whitish or argillaceous.
- * Cap almost white, fleshy. Spores $12-13 \times 7\frac{1}{2} \mu$. 4. *P. dura.*
- * Cap pallid argillaceous, subhygrophanous. Spores $9 \times 5 \mu$ 5. *P. præcox.*
- b. *Eudermiæ* (Fr.). Spores rusty.
1. Basidia 4-spored. Ring radiately sulcate 6. *P. togularis.*
2. Basidia 2-spored. Ring almost smooth 7. *P. teneroides.*
(Large, fleshy mushroom with incomplete ring:
vide *Phlegmacium claricolor* etc.)
- B. Truncigenæ** (Fr.). Growing on or around stumps or standing trees, on sticks or needles (or attached to Sphagnum).
- α. Carnosæ.** Cap fleshy, rather compact, not hygrophanous.
- a. *Phæotæ.* Spores dull brown.
1. Cap set with cottony, white, deciduous scales . . . 8. *P. destruens.*
2. Cap smooth or slightly fibrillose-scaly towards the edge 9. *P. radicata.*
(Cap smooth, rootless: *P. aegerita*, pag. 9).
- b. *Eudermiæ.* Spores rusty,
1. Cap more or less viscose or smeary.
- * Spores small ($6 \times 3\frac{1}{2} \mu$); stem with glutinous scales 10. *P. adiposa.*
- * Spores larger ($8-9 \times 5 \mu$); stem fibrillous, dry. 11. *P. aurivella.*
2. Cap dry.
- * Cap and stem squarrosely scaly.
- † Spores $6-8 \mu$ long. Cap with brown squarrose scales 12. *P. squarrosa.*
- †† Spores $4-5 \times 2\frac{1}{2} \mu$. Cap with sulphur-yellow scales 13. *P. flammans.*
- * Cap with adpressed fibrillous scales. Stem fibrillous 14. *P. spectabilis.*

- β. *Hygrophanæ* (Fr.). Cap but slightly fleshy, hygrophanous smooth.
- a. Stem with brown scales below the ring 15. *P. mutabilis*.
 - b. Stem without brown scales.
 1. Growing on wood (twigs, needles).
 - * Cap 2—5 cm broad; gills rather narrow . 16. *P. marginata*.
 - ** Cap about 2 cm; gills broad 17. *P. unicolor*.
 2. Growing on Sphagnum. Stem very slender. . 18. *P. mycenoides*.

SYSTEMATIC AND FLORISTIC NOTES.

A. HUMIGENÆ.

α. VELATÆ.

1. *P. VahlII* (Schum.) (= *P. aurea* Matt.)

Spores $12 \times 5 \mu$, fusiformly ellipsoid. Basidia 4-spored. Cystidia 0. Cells on surface of cap inflated (ovate, subspheric or almost fusiform), light yellow, up to 30μ long.

Figured specimens: Copenhagen, on the ground (rich soil) in churchyard (Vestre Kirkegård), Oct. 1905 (numerous specimens). — Also found at Holmstrup, in a garden, Oct. 1913 (solitary).

The name *P. aurea* has by several authors (f. inst. Quélet) been applied to *P. spectabilis*, with which this plant has nothing to do. — A very elaborate description is given by SEV. PETERSEN in »Meddelser fra Foreningen til Svampekundskabens Fremme« (Hæfte 1, 1916). — In my specimens the radiating ridges on the ring (which are well shown in Fries' figure — Icon. selectæ II, 101 —) extend half way down the stem or more. This form is figured by COOKE (loc. cit. tab. 347) sub nom. var. *Herefordensis* Renny. — I do not think there is any real difference between *P. VahlII* and *P. aurea*; but as the latter name has been so much misapplied I deem the former one preferable.

2. *P. caperata* (Pers.) (*Rozites c.* Karsten)

Spores $11\frac{1}{2} - 13 \times 7\frac{1}{2} - 8\frac{1}{2} \mu$, broadly ovate or somewhat lemon-shaped, minutely granulate, somewhat oblique. Basidia generally 4-spored. (1913: Spores $12 - 14 \times 7 - 7\frac{3}{4} \mu$).

Fig. specimens: Grib skov, wood of Fagus, Sept. 1896. Chiefly in beech-woods, but also met with in mixed (coniferous-foleaceous) woods. Not common.

On account of the rudimentary universal veil KARSTEN has placed this species in a new genus, *Rozites*, intended to form a parallel to *Amanita*. FRIES in his earlier works referred it to *Cortinarius* (*Phlegmacium*).

3. NUDÆ.

3. *P. erebia* Fr.

Spores $10-13 \times 5-6 \mu$, ellipsoid. Basidia 2-spored, about 7μ broad. Cystidia cylindric-clubshaped, about $10-12 \mu$ broad (1909).

Fig. specimens: Trolleborg, wood of *Fagus*, gregarious on moist ground. Not rare.

FRIES (loc. cit.) figures this species sub nom. *Armillaria denigrata*. RICKEN (Die Blätterpilze) besides *P. erebia* (in the supplementary notes pag. 460) describes a plant which he calls *P. ombrophila* Fr. But the two descriptions are almost identical. Fries' figure of *P. ombrophila* var. *brunneola* is not unlike a pale *P. erebia*; but according to his descriptions it belongs to *Eudermini*, close to *P. togularis*. However as he also — erroneously — places *P. erebia* in *Eudermini*, it is not improbable that his figure represents a form of *P. erebia*.

4. *P. dura* Quélet ((Bolt.) Fr.?)

Spores $12-13 \times 7\frac{1}{2} \mu$, ovate-ellipsoid. Edge of gills rather sparsely set with broad, obtuse, cylindric-sackshaped, $14-16 \mu$ broad cystidia.

Fig. specimens: Hjallesø, border of road, in grass, July 1897. Rather common on roadsides and in cultivated fields.

Not clearly distinguished by several authors from *P. præcox*. It differs from *P. p.* macroscopically by its cream-white, rather fleshy and absolutely non-hygrophanous cap (while in *P. p.* the cap is more or less argillaceous or horn-brownish and subhygrophanous) and microscopically by the larger spores etc. — SCHROETER (loc. cit.) describes it very well sub nom. *P. candidans* (Schaeff.); but the dimensions of the spores which he gives are rather those of *P. præcox*. FRIES (Hym. Europæi) describes it as having a »fulvous« or »alutaceo-fuscescent« cap. And probably what he calls *P. dura* is really but an open-air form of *P. præcox*. — I follow Quélet, Ricken and others in attaching the name *P. dura* to the white species.

4 a. *P. dura* var. (*P. vermiflua* Peck)

Spores as in type. Cystidia ovate or balloon-shaped, about 18μ broad.

Fig. specimens: Hunderup, on naked ground amongst garden-shrubs, July 1915.

A large and strongly areolate-rimose form very much like the one (var. *xanthophylla*) figured by BRESADOLA (loc. cit. fig. 159), but the gills are not yellowish.

5. *P. præcox* (Pers.)

Spores $9-10 \times 5-5\frac{1}{2} \mu$, ovate-ellipsoid. Cystidia rather sparse (on edge and faces of gill). up to 20μ broad, inflated flask-shaped, obtuse.

Fig. specimens: Hunderup, wood of *Fagus*, on the ground, June 1899. Rather common, like the preceding species, from midsummer till harvest-time.

5 a. *P. præcox* var. *paludosa* J. E. L.

Spores etc. as in type.

Fig. specimens: Dalumgård, marshy meadow, June 1901, and Lindvedgård (similar locality), June 1907.

This little slender form has the stature of a *Naucoria*. The cap is only $1\frac{1}{2}$ —3 cm broad, the stem very slender, somewhat wavy, 5—6 cm \times 2—3 mm. When fresh it is minutely striate around the edge.

5 b. *P. præcox* var. *cutefracta* J. E. L.

Spores etc. as in type.

Fig. specimens: 1) Hesselager, border of road, Oct. 1906. 2) Horsens, amongst grass in outskirts of wood of *Fagus* near the fjord.

More compact, not hygrophanous, at last areolate-rimose. This probably is what Fries called *P. dura* (vide supr.).

6. *P. togularis* (Bull.)

Spores $7\frac{1}{2}$ —9 \times $4\frac{3}{4}$ —5. Basidia 4-spored. Cystidia hairshaped, protruding portion 30—35 μ long, apex obtuse, slightly swelled, up to 7 μ broad.

Fig. specimens: 1) Hjallesø, on old lawn, April 1898. 2) Same garden, on cultivated ground, Maj 1903. Common in similar localities.

The first figure represents the paler form, the second a larger and darker brownish (subferrugineous) form, which somewhat approaches the description of *P. ombrophila* Fr.

(FRIES in his earlier works applied the name *P. Arrhenii* to this species, using the name *P. togularis* for the plant which in »*Hymenomyces* Eur.« he calls *P. ombrophila*.)

6 a. *P. togularis* var. *filaris* Fr. (Icon. sel. tab. 104).

Spores $7\frac{1}{3}$ \times $4\frac{1}{4}$ μ . Cystidia hairshaped.

Fig. specimens: Hjallesø, copsewood, on the ground, 1) Oct. 1895 and 2) Sept. 1897.

Smaller (cap 1—1,6 cm) and more slender (stem 2 mm), cap somewhat striate. — Like the typical *P. t.* it is characterized by the radiately sulcate ring. Ricken (loc. cit.) applies the name *P. blattaria* Fr. to this species; but the Friesian species has a smooth ring (vide his »*Monographia Hymenomycetum Sueciae*«, vol. I pag. 308).

7. *P. teneroides* nov. sp.

Spores 11—12 \times 5— $5\frac{1}{2}$ μ ellipsoid. Basidia 2-spored. Cystidia cylindrical-flaskshaped, obtuse, about 12 μ broad.

Fig. specimens; Erholm, moist ground in wood of Fagus, amongst dead sticks and twigs of Picea, Sept 1913. (Also at Hjallese, moist copsewood, on the ground, Sept. and Oct. 1915).

Pileo 1,5–1,8 cm, convexo-campanulato, hygrophano, exstrio, ochraceo-ferrugineo (sicco: ochraceo-lutescente, rugoso). Stipite elato, tenui (6.5 cm × 2 mm), subtiliter striato, lutescente, e basi fuscescente, intus ferrugineo, glabro (primitus leviter albo-plumuloso). Annulo angusto, plano, laeviusculo, membranaceo. Lamellis latis, primitus pallide ochraceis, dein ferrugineis, subdistantibus (subliberis)-Sporæ et cystidia ut supr.

It is not improbable that this species is identical with *P. togularis* (Bull.) sensu Ricken (loc. cit. pag. 199) which again he considers almost like *Galera ovalis* Fr.; but neither of the Friesian descriptions appear to me to confirm this opinion. From *Galera tener* (with some forms of which it has a habitual likeness) it can easily be distinguished, not only by the annulate stem but also by the totally different cystidia.

B. TRUNCIGENÆ.

α. CARNOSÆ.

8. *P. destruens* Brond.

Spores $7\frac{1}{2}$ – $8\frac{1}{2}$ × 5 μ, oval, sub micr. pale brown. Basidia 4-spored. Cystidia hairshaped, obtuse, about 5 μ broad.

Fig. specimens: Flødstrup, on stump and dead trunk of *Populus canadensis*, Sept. 1899. Not uncommon, always on Poplar. The fruitbodies always spring from the central part (the pith-region) of the stump, while in most other xylophilous fungi they are chiefly to be found in the peripheral region. — *Bresadola* (loc. cit.) and others consider *P. heteroclita* Fr. identic. And as Fries has not seen *P. destruens*, this is not unlikely. However I have never met *P. destruens* on *Betula*, on which tree *P. heteroclita* is said to grow profusely in Northern Europe.

9. *P. radicata* (Bull.)

Spores $7\frac{1}{2}$ – $9\frac{1}{2}$ × 5 – $5\frac{1}{2}$ μ, ovate-ellipsoid, very minutely asperulate. Basidia 4-spored. Cystidia hairshaped-clubshaped, up to 40 μ long and 8 μ broad (in some cases broader, up to 12 μ).

Fig. specimens: Ravnholt, in wood of Fagus and Quercus, Oct. 1897. — Not uncommon, but generally solitary.

The cap, which Fries describes as »laevi, glabro«, is often more or less squamose-fibrillose towards the edge (from velum). The spores are very much like those of most Hebelomas (not coarsely warty as shown in Ricken's figure (loc. cit. tab. 33).

A form, *P. radicata minor* (not figured) was found by me in wood of *Betula* (Trolleborg 1897). The cap was only $3\frac{1}{2}$ cm broad, the stem almost rootless. It grew in numbers on the ground.

[*P. aegerita* Brond. I have seen a specimen of a fungus (found in northern Sjælland growing on an old board) which probably was a true *P. ae.* The spores were $9 \times 5 \mu$, sub micr. transparent, light brownish-yellow. The cap looked like a large *P. præcox*. This somewhat dubious record is the first for Denmark, I believe, of a representative of this South-European tribe.]

10. *P. adiposa* Fr.

Spores $5\frac{1}{2}$ – $6\frac{2}{3} \times 3\frac{1}{2}$ – $3\frac{3}{4} \mu$, oval, smooth, sub micr. pale brownish-yellow, Basidia 4-spored.

Fig. specimens: Hesbjerg, clustered at the base of stumps of *Fagus*. — Rather common, generally fasciculate on (and occasionally in the vicinity of) stumps of *Fagus*.

Although this agaric is one of the most characteristic species (and rather common) authors disagree very much about it. Thus QUÉLET (and Saccardo) says the spores are about 9μ long. And FRIES himself (in *Hymenomyc. Europæi*) describes it as »*intus albus*«, while in fact the flesh of the cap is pale yellowish, that of the stem yellow.

11. *P. aurivella* (Batsch)

Spores 8 – $9 \times 5 \mu$ (or $7\frac{1}{2}$ – $9 \times 4\frac{3}{4}$ – $5\frac{1}{2}$).

Fig. specimens: »Fjellebro« near Egeskov, fasciculate on dead *Alnus* (?) (several meter from the ground), Oct. 1900. (Also found at »Fruens Bøge«, on *Fagus*, Oct. 1914 and at Krabbesholm (on *Juglans*), Oct. 1918, in both cases nestling in small clusters in decaying knotholes of living trees).

Very well characterized by the triangular, broad, adpressed, dark bay-brown scales on the yellow or subferruginous cap. FRIES describes the cap as »*subviscido*«. But whenever I have seen it I have found the surface of the cap strongly slimy. I have never met with this species on stumps or at the foot of trees.

11 a. *P. auriv.* var.

Spores 9×5 – $5\frac{1}{3} \mu$, oval-ovate, sub micr. yellowish-brown (Spore-powder dark cinnamon). Cystidia hairshaped, short.

Fig. specimens: Fruens Bøge, solitary on living *Fagus*, Oct. 1912 (and 1917) and on another beech Oct. 1914.

Differing from the type by the pale yellow (central part somewhat ferruginous) cap and the stem which up to the ringlike zone is densely clad with recurved squarrose scales which at first (like the stem) are whitish, but soon turn brownish-rusty (from base upward). — Is this *P. cerifera* Karst. (*Mycologia Fennica* III p. 169)?

12. *P. squarrosa* (Müll.)

Spores 7 – $8 \times 4 \mu$, ellipsoid-oval. I have also met with specimens of this species (on *Fraxinus*) with somewhat smaller spores

($6\frac{1}{2} \times 3\frac{1}{4} \mu$) and obovate-clubshaped cystidia (8–10 μ broad) with or without a short hairlike appendix.

Fig. specimens: Hjallese, fasciculate on foot of *Quercus*, Oct. 1895. — Rather common, on various trees (*Malus*, *Robinia Picea* etc.).

13. ***P. flammans*** Fr.

Spores 4–5 \times 5 $\frac{1}{2}$ μ . ellipsoid. Cystidia crowded, rather obtuse, cylindrical-bottleshaped, total length about 30 μ .

Fig. specimens: Kumpedal near Kellerup (Jyll.), on stump of *Picea*, Sept. 1897. Rather rare.

14. ***P. spectabilis*** Fr.

Spores 8–10 \times 5–5 $\frac{1}{2}$ μ , ovate-ellipsoid, minutely granulate. Cystidia crowded, obtuse, hairshaped, apex slightly swelled. Basidia 4-spored.

Fig. specimens: Dyrehaven near Copenhagen, on foot of living *Crataegus*, Oct. 1897. Not uncommon on stumps and at the base of old trees (*Ulmus*, *Fagus*, *Quercus* etc.).

The plant varies very much in size (from 4 cm to 23 cm broad) and surface of cap (from almost smooth, slightly fibrillose to almost squarrose).

β . HYGROPHANÆ.

15. ***P. mutabilis*** (Schaeff.)

Spores 6–7 \times 4–5 μ , ovate-ellipsoid. Cystidia crowded, short, hairshaped, apex slightly swelled and rounded, free portion about 12–14 μ long.

Fig. specimens: Hunderup, on stump, densely fasciculate, June 1901. Common, exclusively on foliaceous trees, from spring till late in the autumn.

16. ***P. marginata*** (Batsch)

Spores $8\frac{1}{2} \times 5\frac{1}{2}$ μ , ovate-ellipsoid (1896) or $7\frac{1}{3} - 9 \times 5 - 5\frac{1}{2}$ μ . Cystidia hairshaped, apex obtuse, base somewhat inflated (1910).

Fig. specimens: Hjallese, on stump of *Picea*, fasciculate, Oct. 1896. — Typical form rather rare, generally confined to coniferous wood; but I have also (1910) seen it growing on stump of foliaceous tree (*Fagus*?) — a form with very narrow and crowded gills.

17. ***P. unicolor*** (Vahl)

Spores A: $7\frac{1}{2} - 9 \times 4\frac{1}{2} - 5$ μ , ovate or ovate-ellipsoid. B: 9–10 \times 5–5 $\frac{1}{2}$ μ . Cystidia obtuse, hairshaped, base somewhat inflated (6–9 μ), free portion 40–50 μ long.

Fig. specimens: A. Hjallese, on stump of *Salix capræa*, solitary Oct. 1898. B. Hjallese, on rotten stump of *Picea* (a number of specimens) Oct. 1898.

The form B. had darker (almost ferruginous-fuscous) stem and broader, more triangular gills than A. — Rather rare; but on fallen sticks of *Picea* an intermediate form between nos. 16 and 17 is not rarely met with. It seems to me that the specific value of *P. unicolor* is rather dubious; it is hardly more than a small and dwarfy form of *P. marginata*.

18. *P. mycenoides* Fr. (?)

Spores $10-11 \times 6\frac{1}{2} \mu$, ovate (1898) or $9-10 \times 6 \mu$, somewhat lemonshaped (1914-17). Cystidia obtuse, cylindric-hairshaped, base slightly swelled, total length about 30μ , base 9μ , apex $5-6 \mu$. Basidia 4-spored.

Fig. specimens: Holstenshus, growing on *Sphagnum* in a bog, July 1898 (and Sept. 1909, July 1914 and 17).

I add a brief description of this little Galera-like fungus: Cap $1\frac{1}{2}-2$ cm, conic-convex with small umbo, pellucido-striate, at first gilvo-ochraceous, then somewhat ferruginous, strongly hygrophanous. Stem slender ($7-8$ cm \times 2 mm), paler than the cap, with a little cottony ring that soon disappears, above the ring slightly mealy and just below the ring with some few scattered white, fugacious squamules. Gills rather crowded, broadly adnate with a slightly decurrent tooth, ochraceous.

On account of its fugacious ring I refer this species to *Pholiota*; but it is very closely allied to the hypnophile Galeras and Tubarias. *Pholiota muscigena* Quélet appears to me (to judge from his description) very nearly the same plant; and *Tubaria paludosa* Fr. forma *stygia* (Icones selecta pag. 28) chiefly differs in the even, not pellucido-striate cap. — The typical *P. mycenoides* (of Fries) differs from my plant in having a »membranaceous, entire and persistent« ring (Fries: Monographia I pag. 321).

For figures of spores and cystidia of the several species vide the plate.

THE GENUS MARASMIUS.

The synonymy of the *Marasmii* appears to me less entangled than that of most other genera of the Agarics. Presumably this is chiefly due to the fact that these fungi can be preserved. While dried specimens of most other agarics are hardly recognizable, type-specimens of a *Marasmius* can be kept for examination in a herbarium in a comparatively good condition. And while the description of f. inst. a *Coprinus* or a *Cortinarius* to be of any value must almost be written down on the spot, at the right moment, a *Marasmius* requires no hurried work: it can be correctly described in the laboratory days or weeks after the foray. — Still a good deal of ambiguity exists, and probably the number of names is considerably larger than the number of species. Thus in a recent work (F. BATAILLE: Flore monographique des Marasmes d'Europe) the author describes 96 species (while FRIES in *Hymenomycetes Eur.* only has about 60). But of these Bataille has only seen 24 (one fourth), that is to say about the same number and almost the same species as Fries himself knew and which are also on record from Denmark in recent years. This suggests to me that at least some of the other 72 species — when properly compared and critically examined — will be found to be mere names.

But while well worked up by the earlier mycologists, the classification of the genus *Marasmius* has not profited much by modern methods of investigation. The introduction of the microscope in mycological work has not considerably altered our conception of the different species. If you cannot distinguish two nearly allied species by means of a pocket-lens, the microscope in most cases is not likely to help you. Thus the spores, which in most genera are of the highest value as a specific character (and may serve even to characterize sections or subgenera), are in *Marasmius* almost uniform. Only a single European species (which has not been found in Northern Europe)

M. epodius Bres. has extraordinarily long, almost needleshaped spores. In general the spores are sub-ellipsoid, smooth, attenuated of the base. In most cases they are pipshaped, but occasionally they are more narrow, fusiform or almost club-shaped. Nor do they vary much in size. The extremes in the species observed by me are $11 \times 7 \mu$ (*M. alliaceus*), $11 \times 4\frac{3}{4} \mu$ (*M. recubans*), $6 \times 3\frac{1}{2} \mu$ (*M. perforans*)*).

The genus appears to comprise no 2-spored species. — Cystidia in most species are wanting or inconspicuous; but some few species have characteristic setulæ (borstlike cystidia?) on the gills or the stem. Another type of cystidia (which is very commonly met with in *Mycena*) is found in some few of the smaller *Marasmii* on the edge of the gills. These cystidia are obovate with small wartlike excrescences. Finally in a single species (*M. cohærens*) the surface of the cap is made up of cells crowned with a number of small coloured setula which give to the cap a somewhat velvety bloom.

Classification. I do not think the systematic arrangement of the species within the genus *Marasmius* has been very much improved since the time of Fries. Probably a really satisfactory classification cannot be attained as long as we know so very little about the innumerable tropical species. (Although our knowledge of the mycological flora of the Tropics is as yet very fragmentary the number of *Marasmii* recorded from these parts is very large. As early as in the eighties of last century SACCARDO (Sylloge Fung. vol. V) enumerates about 200). *Marasmius* (and the same holds true of *Lentinus*) evidently has its centre of distribution in the tropical countries, the European species being only as it were the sentinels of an army — similar in this respect to the *Ericas* of Northern Europe as compared with those of the Mediterranean flora.

Some few of the Friesian species are now generally regarded as mere forms or varieties. Thus *M. urens* and *M. peronatus* are by most authors treated as synonymous, and so are *M. Wynnei*, *M. globularis* and others. *M. epichloë* is hardly anything but *Collybia stipitaria*, and *M. calopus* too close to *M. scorodonius* to be considered a distinct species. Even *M. argyropus* I feel

*) MASSEE (European Fungus Flora) mentions several species with gigantic or very minute spores. Thus for *M. prasiosmus* he has $14-16 \times 7 \mu$, for *M. alliaceus* $14-16 \times 8 \mu$, for *M. fuscopurpureus* $4 \times 3 \mu$, for *M. graminum* $4 \times 3 \mu$ etc. But to my mind these observations are not altogether reliable.

inclined (like Schroeter) to regard as identical with *Collybia confluens* (see below). Such alterations will reduce the number of *Marasmii* a little, but on the other hand *Mycena cohærens* evidently is a true *Marasmius*, very close to *M. lupuletorum*.

Several post-Friesian authors have tried materially to alter his classification. Thus KARSTEN (loc. cit.) splits the genus in two, making of the Friesian section *Mycena* a new genus *Androsaceus* (Patouillard) and uniting his section *Collybia* (sub nom. *Eu-Marasmius*) with the genuine *Collybias* in a genus *Marasmius* (sens. nov.). Evidently a good deal can be said in favour of this rearrangement. Still such species as *M. globularis*, *M. lupuletorum* (Bresad.) and *M. scorodonius* (of the *Eu-Marasmii*) differ considerably from the *Collybia*-type and link the *Collybia*-like species to the *Androsacei*, f. inst. *M. cohærens*, *M. alliaceus* and others.

RICKEN, who maintains the Friesian genus, alters the classification by dividing the section *Collybia* in two instead of the original three. This is done by splitting up the second lot (*Tergini*) and dividing its constituents between the first (*Scortei*) and the third (*Calopodes*). I consider this a decided improvement. In fact the group *Tergini* is not very well defined by Fries. Thus while he places *M. globularis* in group A, he puts *M. Wynnei* (which is probably identical) in group B. — But like QUÉLET I think it better to transfer *M. alliaceus* and its allies (the Friesian group *Chordales*) from sect. II (*Mycena*) to sect. I (*Collybia*); and consequently I also adopt the Quéletian names for the two main sections, viz: *Radicosi* and *Insititii*. (The annulate, resupinate and sessile marasmioid species I leave entirely out of consideration, as I have never seen any of them.)

The most ambiguous species to fit into any system are *M. foetidus*, *M. ramealis* and their allies. FRIES places them in *Calopodes*, together with *M. scorodonius* etc. with which they have very little in common; QUÉLET on the other hand transfers them to *Insititii*. I am inclined to think they cannot be properly classified without working up simultaneously the whole field of allied species from the Tropics. — *M. scorodonius* too stands rather isolated, without any natural affinity to other species here mentioned. Like Ricken I place it next to *M. lupuletorum* etc.

The minor points of my classification can be seen in the Key and will require no particular explanation.

KEY

TO THE SPECIES OF THE GENUS MARASMIUS FIGURED IN
»DANMARKS AGARICACEER«.

- A. Radicosi** (Quélet). Large or medium-sized species (cap $1\frac{1}{2}$ cm or more): Stem somewhat rooting or attached to the substratum by means of mycelium. Generally growing on the ground. (NB.: nos. 9–11.)
- α . *Scortei* (Fr. ext.). Stem tough, but not cartilagineous or horny, generally becoming hollow with age, but not distinctly fistulose from the beginning, more or less fibrillose.
- a. Taste pungent. 1. *M. urens*.
- b. Taste fade
1. Base of stem strigose.
- * Cap wrinkled, but not pellucido-striate, becoming dark purplish-brown. Base of stem curved, attached to dead foliage. 2. *M. fuscopurpureus*.
- * Cap pellucido-striate. Stem straightly rooting amongst dead needles (of Pinus). 3. *M. putillus*.
2. Base not strigose.
- * Gills distant. Growing on the ground (parasitic on grass-roots) forming »fairy-rings« 4. *M. Oreades*.
- * Gills very crowded (vide *Collybia confluens*).
- β . *Cartilaginei*. Stem cartilagineous or almost horny, distinctly fistulose, polished or velvety-pruinose, generally becoming bay-brown or sepia from base upward.
- a. Without smell.
1. Cap, gills and apex of stem at first milkwhite. 5. *M. globularis*.
2. Cap brownish or ochraceous-pallid. Gills wood-coloured (pallid) or yellow.
- * Gills pallid, almost free.
- † Gills (especially on the edge) set with brown setulae or borsts. Stem polished. 6. *M. cohærens*.
- †† Gills without borsts. Stem minutely velvety-pruinose 7. *M. lupuletorum*.
- * Gills decurrent, yellow: *M. causticinalis*.
- b. Smelling of garlic.
1. Stem polished, glabrous, fulvous-bay. 8. *M. scorodonius*.
2. Stem powdery or velvety.

- * Stem without root, attached to dead foliage, base bay-brown, velvety. 9. *M. prasiosmus*.
 - * Stem rooting, blackish or fuscous, velvety-pruinose. 10. *M. alliaceus*.
- B. Rameali.** Small or dwarf (less than 3 cm high). Stem insititious, tough (but not horny) minutely flocculose or velvety. Growing on twigs (or on dead stems of herbaceous plants).
- α . Cap 2—3 cm. Stem blackish, velvety. Stinking. 11. *M. foetidus*.
 - β . Cap about 1 cm. Stem pale or brownish. Inodorous.
 - a. Stem brown, setulose. Cap whitish with minute brown fibrillose adpressed scales (vide *Collybia stipitaria*).
 - b. Stem pale, slightly downy or flocculose.
 - 1. Cap pallid, slightly incarnate 12. *M. ramealis*.
 - 2. Cap pure white (*M. candidus*).
- C. Insititii** (Quélet). Stem insititious, borst- or hairlike, blackish or umber.
- α . *Rotulæ* (Fr. ex parte). Gills forming a short tube around the stem, like the nave of a wheel.
 - a. Cap milk-white, 0,6—1,5 cm 13. *M. Rotula*.
 - b. Cap tile-red or pallid woodcolour.
 - 1. Cap wood-coloured, pallid.
 - * Stem about 3 cm. Growing on dead foliage. Spores < 10 μ long. Gills 8—12 14. *M. Bulliardi*.
 - * Stem capillary. Growing on dead grass. Spores > 10 μ . Gills 6—7. 15. *M. limosus*.
 - 1. Cap more or less tinged tile-red 16. *M. graminum*.
 - β . *Perforantes*. Gills not forming a tube or nave around the stem.
 - a. Stem glabrous 17. *M. androsaceus*.
 - b. Stem velvety, hairy or downy.
 - 1. Gills rather broad.
 - * Foetid. Cap about 1 cm, pale with a rufous tinge. Stem black, velvety 18. *M. perforans*.
 - * Inodorous. Cap 3—4 mm, semiglobate, milk-white. Stem capillary, umber, slightly hairy 19. *M. recubans*.
 - 2. Gills fold-like or reduced to wrinkles on lower surface of cap. Cap milk-white, about 1 cm, flat. 20. *M. epiphyllus*.

SYSTEMATIC AND FLORISTIC NOTES.

A. RADICOSI (QUÉLET).

α. SCORTEI (FR. ext.).

1. *M. urens* (Bull.) (*M. peronatus* Bolt.)

Spores $9 \times 3\frac{3}{4} \mu$, pipshaped-lanceolate. Cystidia crowded, short, cylindrical.

Fig. specimens: Hjallesø, in wood of *Fagus*, Aug. 1896. Common in woods amongst foliage (also in coniferous woods).

This species varies a good deal in colour (from pallid to dingy rufous wood-colour. The base of the stem is more or less peronate. But like Schroeter and other authors I can see no sufficient reason for distinguishing two species (*M. urens* and *M. peronatus*). — SACCARDO gives for *M. urens* the spore-measure $3-4 \times 2\frac{1}{2}-3 \mu$, for *peronatus* $6-8 \times 3-5 \mu$; MASSEE has $8 \times 4 \mu$ and $10 \times 6-7 \mu$ respectively. But I have never observed either the very small or the very large spores in any specimens.

2. *M. fuscopurpureus* (Pers.)

Spores $6\frac{1}{2}-8 \times 3-3\frac{1}{2}$, pipshaped-lanceolate. Basidia with very long sterigms (8μ).

Fig. specimens: Hjallesø, wood of *Fagus*, Oct. 1895 and 1909 (young). FRIES places this species in *Tergini*, but its natural position is next to *M. urens*. He describes the strigose coating at the base as »rubiginous«; but it is generally dingy ochraceous-pallid. When young the whole plant is much lighter in colour (pale gilvous-ochraceous), the edge minutely striate. This to my mind is probably *M. terginus* Fr.

3. *M. putillus* Fr.

Spores $9 \times 3\frac{3}{4} \mu$, pipshaped-lanceolate.

Fig. specimens: Håre Bjerge, rather numerous, rooting in a deep layer of *Pinus montana*-needles, Oct. 1906. Also found at Arup, Oct. 1911, in wood of *Pinus silvestris*.

4. *M. Oreades* (Bolt.)

Spores $9\frac{1}{2}-10\frac{1}{2} \times 5\frac{1}{2}-6 \mu$, broadly pipshaped.

Fig. specimens: Fruens Bøge, old grassfield, border of road,

Aug. 1904. — Very common, generally forming »fairy-rings« by its parasitic growth.

[*M. argyropus* (Pers.) I consider synonymous with *Collybia confluens* (vide part III of these Studies).]

β. CARTILAGINEI.

5. *M. globularis* Fr.

Spores 6—7 × 4 μ, broadly pipshaped.

Fig. specimens: Hjallese, wood of *Fagus*, Oct. 1895, subfasciculate. Rather common in woods of *Fagus* (and *Picea*). —

Like Ricken I see no real difference between this species and *M. Wynnei* Berk. and *M. fuscescens* Schroet.

6. *M. cohærens* (Pers.) (*M. erythropus* Schroeter.)

Spores 9—9½ × 5 μ, obovate-pipshaped, base somewhat oblique. The face and especially the edge of the gills is generally (but not always) set with long, brown, acute, awlshaped setulæ (about 50 μ × 7—8 μ). The surface of the cap is formed of basidiiform, hyaline cells the top of which are crowned with numerous small brown borsts. Among these cells are isolated setulæ like those on the gills.

Fig. specimens: Hjallese, copsewood, Sept. 1897 and 1898. Not uncommon. FRIES places this species in *Mycena*. I consider *Mycena balanina* Berk. identic. RICKEN and others give *M. ceratopus* Pers. as a synonym.

7. *M. lupuletorum* (Weinm.) Bres. (nec Fries).

Spores 9 × 4½ μ pipshaped. Cystidia on edge obovate, 20 × 11 μ. Setulæ on stem brown, acute, 60 × 6 μ.

Fig. specimens: Ålykkeskov near Odense, on the ground amongst dead foliage, twigs etc., Aug. 1918. Rather common.

Differs from the preceding species by the cap not being pruinose and generally of a paler colour, and by the stem which is everywhere minutely powdery-flocculose (from the setulæ). — It is rather peculiar that these brown setulæ which in the one are found on the cap and gills, but not on the stem, are in the other wanting on the cap and gills but present on the stem. —

BRESADOLA (loc. cit. tab. 130) describes and figures this species with a short incurved stem what I think rather abnormal. Rickens description is more to the point. Fries' (*Collybia*) *lupuletorum* (Weinm.) is totally different; but some authors think his *M. erythropus* is a synonym to *M. lupuletorum* as here understood (not to no: 6), although he describes its stem as glabrous.

[The characteristic little species *M. caudicinalis* (With.), which is not uncommon in the Scandinavian pinewoods, is probably also to be met with in similar localities in Denmark. It differs from all the other species by the clear yellow, decurrent gills.]

8. *M. scorodonius* Fr. (*M. alliatus* Schaeff.)

Spores $7-8 \times 3\frac{1}{2}-4$ μ , pipshaped.

Fig. specimens: Årup, on tufts of grass in plantation, Sept. 1899. — Common, chiefly on grass but also on twigs of *Calluna*, *Picea* etc. (especially on sandy land).

9. *M. prasioemus* Fr.

Spores 9×5 μ pipshaped. (Another find: $8 \times 4\frac{1}{2}-5$ μ).

Fig. specimens: Hjallese, in wood, attached to dead leaves of *Quercus*, Oct. 1985. Rather rare, chiefly on oak-leaves but also found in wood of *Fagus*.

My plant is almost intermediate between the descriptions of *M. prasioemus* and *M. porreus* (Pers.). On account of the persistent smell, the rather crowded and thin gills etc. I refer it to *M. prasioemus*. The stem is minutely powdery-pubescent above and densely clad with a bay-brown velvety coating below, which dilates on the leaf on which it grows. According to MASSEE the spores of *M. prasioemus* are $14-15 \times 7$ μ (those of *M. porreus* subglobose, 4 μ in diameter). According to RICKEN they are 7×4 μ , while BATAILLE has $8-11 \times 4-5$ μ .

10. *M. alliaceus* (Jacq.)

Spores $10-11\frac{1}{2} \times 6\frac{1}{2}-7$ μ , ovate. Cystidia on edge crowded, inflated-cylindric or subfusiform, about 11 μ broad. The coating of the stem is made up of hyaline, cylindric, obtuse, 6-9 μ broad hairs.

Fig. specimens: Grib skov, (wood of *Fagus*), Sept. 1896. Common. The root springs from buried sticks or branches (always of *Fagus*).

10 a. *M. alliaceus* var. *subtilis* (nov. var.)

Spores $10 \times 6\frac{1}{2}$ μ , broadly ellipsoid-ovate. Cystidia obtuse, cylindric-hairshaped or slightly ventricose, 6-8 μ broad. Hairs on stem scattered, short, erect.

Fig. specimens: Ry, on the ground under old *Fagus*, in wood, Aug. 1902. (Also found at »Fruens Bøge« Aug. 1916, similar locality.)

Cap $3-4\frac{1}{3}$ mm, convex, pellucido-striate, pallid fuscous. Stem setaceous, rooting, 3-4 cm high, 0.4 mm broad, fuscous, apex whitish, pruinose. Gills free, distant, broad, ventricose, dingy whitish. — Although this little tiny plant at first sight not at all reminds you of *M. alliaceus* I do not think it deserves specific rank.

B. RAMEALI.

11. *M. foetidus* (Sow.)

Spores $8\frac{1}{2}-10 \times 3\frac{3}{4}-4$ μ , lanceolate-ellipsoid, somewhat flattened on one side.

Fig. specimens: Hjallesø, on sticks and stumps of *Corylus*, Oct. 1895. (Also found at Revninge, on *Corylus*).

[Probably the pretty little *Collybia stipitaria* (Studies III pag. 19) has its proper place here. *Marasmius epichloë*, *M. caulicinalis* (Bull.) and *M. scabellus* (Alb. at Schw.) to my mind are all synonymous.]

12. *M. ramealis* (Bull.)

Spores $8-9 \times 2\frac{1}{2}$ (or $8\frac{1}{2} \times 3\frac{1}{4}$) μ , lanceolate-ellipsoid. Cystidia sackshaped with short hairlike excrescences, small.

Fig. specimens: Hjallesø, on twigs of *Corylus*, gregarious, Nov. 1896. Very common on twigs, sticks and dead herbaceous stems, often densely crowded. — Cooke erroneously figures and describes the spores as only $4 \times 2 \mu$ (loc. cit. tab. 1127 B.).

[*M. amadelphus* (Bull.). On twigs of *Cratægus* I have met a form with more saturately coloured (dingy incarnate-fulvous) cap which was very much like the plant figured by BULLIARD (550 III) as *M. a.* But as it did not differ in any other way from *M. ramealis*, I do not regard it as a distinct species. The *M. amadelphus* described and figured by BRESADOLA (loc. cit. tab. 130 II) is also very much like mine, but has somewhat larger spores. (10—12 μ .)]

[*M. candidus* (Bolt.). In moist and shady places, amongst grass (on dead tufts of grass, small twigs etc.) a little slender form of *M. ramealis* is occasionally met with. The cap soon becomes snow-white, the stem is almost glabrous, whitish. This probably is *M. candidus* (Bolt.), but I am inclined to regard it as an etiolated form of *M. ramealis*. The spores are somewhat shorter ($7\frac{1}{2} \times 3\frac{1}{4} \mu$), while Quélet has 16 μ and Bataille $12-14 \times 5-6 \mu$. But on Cooke's figure (loc. cit. tab. 1127 C), said to be »after Bolton«, they are much smaller.]

C. INSITITII (QUÉLET)

α. ROTULÆ (Fr. ex parte).

13. *M. Rotula* (Scop.)

Spores $8-9 \times 3\frac{1}{2}-4\frac{1}{2} \mu$, pipshaped. Cystidia few in number, inflated, apex somewhat granulate-warty.

Fig. specimens: Allerup and Hjallesø, on dead half-buried twigs and thereabout, in copsewood, Oct. 1895. — Common.

14. *M. Bulliardi* Quélet.

Spores $8\frac{1}{2}-10 \times 4\frac{1}{4}-4\frac{1}{2} \mu$, pipshaped. Cystidia as in no: 13.

Fig. specimens: Ålykkeskov near Odense, on dead foliage (under *Fraxinus* etc.) on boggy ground, Sept. 1904. Rather rare.

The somewhat smaller and pale wood-coloured cap distinguishes this species from no: 13. But the small branchlets with abor-

tive heads are only developed in damp places. When they are wanting you have *M. Rotula* var. *phyllophila* Schroeter which is rather common in our woods (on leaves of *Fagus* and *Quercus*).

15. *M. limosus* Quélet.

Spores $12 \times 5\frac{1}{2}$, pipshaped-lanceolate. Cystidia obovate, about 12μ broad, apex warty.

Fig. specimens: Kirkeby, on dead leaves of *Aira cæpitosa* (boggy ground in wood, Nov. 1911, gregarious).

Very tiny and flaccid. Cap about 2 mm, whitish with a tinge of wood-colour, stem only $\frac{1}{4}$ mm thick.

16. *M. graminum* (Lib.)

Spores $8-12 \times 5 \mu$, narrowly pipshaped.

Fig. specimens: Sanderum in bog, on dead grass, gregarious, Juli 1897. It differs from no: 15 by the tile-red cap and the fuscous (not blackish) stem. Rare.

[I have met a form of this species (?), (Kerteminde, on *Agrostis alba*, on lawn, Aug. 1917) differing from the main type by somewhat larger and paler cap (only the central part tile-reddish), at first with a small papilla but soon umbilicate (number of gills 6-13). The spores were somewhat smaller ($9\frac{1}{2}-10\frac{1}{4} \times 4\frac{1}{4}-4\frac{1}{2} \mu$) and no cystidia to be found. This probably is *M. Curreyi* (B. et Br.), Cooke's Illustr. pl. 1130; but it is rather too close to *M. graminum* to deserve specific rank. Cooke's conception of the graminum-group appears to me altogether somewhat ambiguous. *M. graminum* (as I conceive it) he describes sub nom. *Mycena juncicola* Fr., while his figure and description of *M. graminum* (loc. cit. pl. 1129) depicts quite another agaric (with globular, minute spores).]

β. PERFORANTES.

17. *M. androsaceus* (L.)

Spores $7 \times 3\frac{1}{2} \mu$, ellipsoid-pipshaped.

Fig. specimens: Tommerup, on dead branches of *Picea* in dense plantation, June 1898. Not uncommon, especially on *Calluna*, on heaths, but also on needles of *Pinus* etc. In damp places it develops an aerial mycelium consisting of black, hair-like creeping strings.

18. *M. perforans* (Hoffm.) Fr. (*M. abietis* (Batsch).)

Spores $5-7 \times 3\frac{1}{3} \mu$, pipshaped.

Fig. specimens: Årup, on dead needles of *Picea*, Oct. 1896. Very common, and often very numerous; always springing from a single needle.

19. *M. recubans* Quélet.

Spores $10-13 \times 4\frac{1}{2}-5 \mu$, fusiform-ellipsoid. Cystidia cylindrical, somewhat ventricose, total length about 40μ , breadth $7-10 \mu$.

Fig. specimens: Hjallese, solitary on the petiole of dead leaves of *Quercus* (rarely on *Salix capræa*), Sept. 1898. Not rare, but always solitary.

This little tiny plant is easily overlooked or mistaken for a small *Mycena* (from which it is most easily recognized by the bay-brown stem). It appears to be very nearly related to *M. saccharinus* Batsch, from which it differs by broader gills, sulcate cap without papilla and darker stem. My plant deviates from the description of Quélet by having the lower portion of the stem sparsely clad with long, woolly, minute hairs (not tomentum) and by larger spores (Quélet says 6—7 μ). By these two characters it approaches *M. saccharinus* which seems to be intermediate between *M. recubans* and *M. epiphyllus*.

20. ***M. epiphyllus*** Fr. (*M. squamula* Batsch).

Spores $10 \times 4\frac{1}{2} \mu$ or $10-12 \times 3\frac{1}{2}-4 \mu$, pipshaped-lanceolate. Cystidia awlshaped (free portion about 30 μ long). Hairs on stem 250—600 μ .

Fig. specimens: Hjallese on petioles and dead shoots of *Populus canadensis*, Oct. 1896. Rather common, often numerous, especially on leaves and petioles of *Fraxinus*, on boggy ground.

For figures of spores, cystidia etc. vide the plate.

THE GENUS RHODOPHYLLUS.

All the pink-spored agarics with angular spores are so intimately related — especially with regard to their microscopic characters — that like Quélet and Schroeter I think it right to unite them in one genus, regarding *Entoloma*, *Leptonia* etc. as subgenera only. And for this genus I adopt the Quéletian name *Rhodophyllus*. — Schroeter coined the name *Hyporhodium* (adapted from the Friesian tribal name *Hyporhodii*) for the same purpose, but his name is less appropriate as the *Hyporhodii* of Fries include also smooth-spored agarics, f. inst. *Pluteus* and *Volvaria*.

When the nature of the spore is thus made the leading character of this genus one of the Friesian subgenera (*Clitopilus*) must needs be split up, as it includes smooth-spored species as well as angular-spored ones. While the smooth-spored species can probably be shifted to *Paxillus* (at least such species as *C. Prunulus* and *C. mundulus*) all the angular-spored species (of which I know anything) can fairly well be transferred to *Eccilia*, without materially altering the natural limits of this subgenus.

Of course in doing so you impair the parallelism which Fries tried to establish between the whitespored series and the pinkspored one (*Tricholoma*—*Entoloma*, *Clitocybe*—*Clitopilus* etc. But this parallelism evidently is more apparent than real.

Although the *Rhodophylli* are very uniform with regard to their anatomical structure (they all have large, subventricose and somewhat protruding basidia with long sterigms, rarely any characteristic cystidia etc.) there is one leading microscopic feature which comes very useful for purposes of classification, viz. the form of the spore. Nearly all the species can be placed within two groups: the one with almost isodiametric the other with heterodiametric spores. The first type of spore is subglobular, generally more or less acutely 5-(6-) angular; the second ovate or oval, more or less angular or wavy. To the former belongs the majority of the *Entolomas* (*Genuini*

and *Nolanidei* of Fries) besides some few species of *Nolanea* and *Eccilia*. To the latter the group *Leptonidei* of *Entoloma*, all the *Leptonias* and the majority of the *Nolaneas* and *Eccilias*. Besides these two types (with small variations within each type) we have in *Nolanea pascua* (and some few other species) a third: the quadrangular-stellate or almost cruciform spore.

2-spored basidia are rare. *Nolanea cetrata* is constantly twospored (as already observed by Schroeter). In *Leptonia chalybaea* the number appears to vary (even on the same gill) from two to four, three being the ordinary number. In the specimens of *L. euchlora* which I have investigated the number of sterigms was 2—3 (but I have only found this species once).

Cystidia are rarely met with; and when present they are generally very trivial: hairshaped or subcylindric.

Classification. The numerous species of the genus *Rhodophyllus* represent comparatively few types. Many species are almost too intimately related to deserve specific rank. This is especially true of the *Entolomæ Nolanidei* Fr. From *E. clypeatum* through *E. rhodopolium*, *E. nidorosum* etc. to *E. speculum* all the species form a chain of almost imperceptible links. And when this holds true of the living plants themselves the case is of course still worse when it comes to recognizing and distinguishing species from figures and descriptions. In the figure the minutiae which characterize the different species (shades of colour, villosity etc.) are either entirely lost or accentuated out of all proportion. — It is therefore rather difficult to attain to a fully correct identification and naming of the species found. Still I hope that my list will not show many serious mistakes.

The number of Danish Rhodophylli appears to be comparatively large. The number of species found and figured by me is 47 (besides some few species which I have not found in a condition fit for portraying). — FRIES in *Hymenomyc. Europ.* enumerates 69 species (including the angular-spored *Clitopili* and *Eccilias*) which he has seen himself. And RICKEN (*loc. cit.*) has about eighty (besides some dubious natives) for all Central Europe. — The species mentioned by me are not all the Danish Rhodophylli. SEV. PETERSEN (*loc. cit.*) describes several species — f. inst. *Leptonia formosa*, *L. solstitialis*, *Nolanea cocles*, *N. vineacea* and *Eccilia parkensis* — which I have not met with. Thus probably the total number of Danish Rhodophylli is considerably above 50.

KEY

TO THE SPECIES OF THE GENUS RHODOPHYLLUS FIGURED IN
»DANMARKS AGARICACEER«.

I. ENTOLOMA Fr.

A. *Ovisporæ* (Leptonidei Fr.)

Spores heterodiametric. Cap not hygrophanous, more or less flocculose or fibrillose, dry.

α. Stem bluish-fuscous, everywhere with darker, minute, flocculose scales 1. *R. dichrous*.

β. Stem fibrillose.

a. Cap campanulate, umbonate.

1. Gills whitish, Stem subfuscous with dingy purplish-rubescens fibrils 1. *R. porphyrophæus*.

2. Gills of a sordid-gray colour. No trace of red on stem. 3. *R. jubatus*.

b. Cap convex or slightly depressed 4. *R. griseo-cyaneus*

B. *Subsphærosporæ*.

Spores isodiametric. Cap smooth.

α. *Genuini* Fr. Cap not hygrophanous; subviscid.

a. Cap and stem with a tinge of blue. 5. *R. madidus*.

b. Cap whitish or alutaceous. No trace of blue.

1. Not umbonate. Cap very large (up to 20 cm). Gills yellowish 6. *R. lividus*.

2. More or less umbonate. Cap smaller. Gills not yellowish.

* Cap convex, umbonate, medium-sized (5—8 cm) 7. *R. prunuloides*.

‡ Cap conic-campanulate, 3—4 cm 8. *R. repandus*.

β. *Nolanidei* Fr. Cap hygrophanous.

a. Cap not viscid.

1. Large and fleshy. Cap subumbonate, lurid or sordid gray 9. *R. clypeatus*.

2. Slightly fleshy.

* Stem rather long (longer than width of cap).

† Cap not white.

○ Cap rather large, pallid gray or livid

§ Stem white. Cap obtuse 10. *R. rhodopolius*.

§§ Stem livid. Cap conic, expanding . . . 11. *R. turbidus*.

⊗ Cap smaller, dingy date-brown. Stem grayish

§ Umbonate 12. *R. majalis*.

§§ Not umbonate 13. *R. nidorosus*.

- †† Cap whitish 14. *R. speculum*.
 * Dwarfy: small and short-stemmed.
 † Cap coarsely striate half way up, not silky 15. *R. elaphinus* var.
 †† Cap even or very minutely striate.
 ○ Cap with a silky lustre, roe-brown to umber.
 Odour mealy. Gills even 16. *R. sericeus*.
 ♂ Cap pitch-brown. Odour faint. Gills transversely
 veined 17. *R. costatus*.
 b. Cap small, slightly viscid, sepia. Stem very slender,
 pallid 18. *R. Batschianus*.

II. LEPTONIA Fr.

- A. Edge of gills black or dark blue.
 α. Edge blue. Growing on stumps 1. *R. euchrous*.
 β. Edge black. Growing on the ground. 2. *R. serrulatus*.
 B. Edge of gills not darker than face.
 α. Stem not yellow or white.
 a. Gills at first pure white. Stem dark blue.
 1. Cap sepia-brown, squamulose 3. *R. placidus*.
 2. Cap blackish-blue, velvety-flocculose in the middle 4. *R. lampropus*.
 b. Gills bluish or sordid.
 1. Gills at first bluish. Stem dark blue 5. *R. chalybæus*.
 2. Gills dingy. Stem glaucous or brownish 6. *R. asprellus*.
 β. Stem yellow or white.
 a. Stem yellow, turning greenish coerulean when touched. 7. *R. euchlorus*.
 b. Stem white. Cap whitish or slightly ochraceous . 8. *R. sericellus*.

III. NOLANEA Fr.

- A. Spores 4-(5-) angular, stellate or almost cruciform
 α. Cap large (2—4 cm) 1. *R. pascuus*.
 β. Cap small (1—1½ cm) 2. *R. bryophilus*.
 B. Spores not quadrangular-stellate.
 α. Spores heterodiametric (subovate).
 a. Basidia 2-spored (whole plant with a tinge of ochraceous) 3. *R. cetratus*.
 b. Basidia 4-spored.
 1. Plant not yellowish or pallid.
 * Tall (8—11 cm) 4. *R. hirtipes*.
 * Smaller (Stem less than 7 cm).
 † Gills pure white when young 5. *R. infula*.
 †† Gills fuscous or pale umber.
 ○ Cap glabrous, 1½—2 cm.
 § Cap papillate. Stem rigid, polished. Gills not
 thick. 6. *R. mammosus*.
 §§ Stem short, fuscous, not shining. Gills
 thick 7. *R. clandestinus*.
 ♂ Cap minutely fibrillose, very small (less than
 1 cm) 8. *R. fumosellus*.

- 2. Plant yellowish or pallid.
 - * Whole plant more or less yellowish 9. *R. icterinus*.
 - * Cap very small, pallid 10. *R. minutus*.
- β. Spores isodiametric (subglobose-angular).
 - a. Cap and stem not bluish.
 - 1. Cap (and gills) fuscous, radiately striate 11. *R. junceus*.
 - 2. Cap pallid. Gills incarnate-whitish (vide *R. minutus*, no: 10).
 - b. Cap and stem with a glaucous tinge 12. *R. coelestinus*.

IV. ECCILIA Fr. (ext.).

(including the angular-spored *Clitopilus*).

- A. Spores heterodiametric (subovate).
 - α. Whole plant white or alutaceous.
 - a. Stem slender. Cap convex, subdepressed. Gills subdecurrent 1. *R. carneo-albus*.
 - b. Stem rather short. Cap convex-umbilicate. Gills decurrent 2. *R. cancrinus*.
 - β. Cap brownish or fuscous.
 - a. Stem short, not cartilagineous 3. *R. undatus*.
 - b. Stem rather long (twice width of cap or more).
 - 1. Cap subsquamulose-tomentose. Stem fibrillose. 4. *R. Mougeotii*.
 - 2. Cap smooth. Stem polished, glabrous.
 - * Cap about 2 cm. Gills slightly decurrent. 5. *R. griseo-rubellus*
 - * Cap 1 cm or less. Gills narrow, strongly decurrent. 6. *R. nigrella*.
- B. Spores isodiametric (subspheric).
 - α. Gills sordid. Cap dark umber or soot-brown 7. *R. rusticoides*.
 - β. Gills whitish. Cap pallid with pale fuscous coarse striæ. 8. *R. rhodocylix*.
 [Spores very small (about 5 μ in diam.) almost spheric: vide *Clitopilus* (*Paxillus*) *popinalis*.]

V. CLAUDOPUS Fr.

- Cap reniform, sordid gray; paler and silky when dry. Stem very short 1. *R. byssisedus*.

SYSTEMATIC AND FLORISTIC NOTES.

I. ENTOLOMA.

A. OVISPORÆ (LEPTONIDEI FR.).

1. *R. dichrous* (Pers.)

Spores $9-10\frac{1}{2} \times 6\frac{1}{2}-7 \mu$, ovate, obtusely angular. Basidia 4-spored. Edge of gills formed of cylindric-hairshaped, $6-7 \mu$ broad cells. Squamules on stem made up of cylindric, up to 9μ broad cells with bluish-gray content.

Figured specimens: Husmandsskolen near Odense, on the ground amongst grass and foliage in wood of *Quercus* and *Corylus*, solitary, Oct. 1919.

This species is very well characterized by the bluish-fuscous stem, all over sparsely set with minute blackish flocci. RICKEN (loc. cit.) gives a very good description of it. It has a habitual likeness to *Tricholoma terreum*.

2. *R. porphyrophæus* Fr. (*R. subrubens* Karst.)

Spores $10-12 \times 6 \mu$, obtusely angular-wavy. Cystidia inflated, large, flask-shaped, occasionally with a roundish head.

Fig. specimens: Heshbjerg near Tommerup, growing aggregately in a meadow in wood of *Fagus*, Oct. 1901. Also found at Langå (Jyll.) in similar locality, 1914.

I do not see any real divergence between *porphyrophæus* and *subrubens*. FRIES places *R. p.* in *Genuini*, but it is related to *R. jubatum*, and the spores also indicate its proper place to be in *Leptonidei*. — KARSTEN (Symb. ad Mycol. Fenn. VI) describes the stem (of *R. subrubens*) as hollow, at first furfuraceo-squamulose then glabrous, the gills as white, turning sordidly incarnate. FRIES (*Icones selectæ*) has (for *R. porphyrophæus*) »lamellæ primo griseo-albidæ, dein sporis griseo-rubellæ« and »stipes nudus sed impolitus, opacus... solidus«. In my specimens the stem was slightly furfuraceo-squamulose and fibrillose-striate with a very narrow cavity, the gills at first white then dusky incarnate. These differences appear to me too slight to make good any claim to specific distinction for the two.

3. *R. jubatus* Fr.

Spores $9-10\frac{1}{2} \times 5\frac{1}{2}-6 \mu$, outline oval (base obliquely pointed) wavy-angular.

Fig. specimens: Near Blåkilde (by Arden), in short, mossy grass in a meadow, Sept. 1900.

Differs from no: 2 by the dark gills, smaller dimensions and total want of any trace of red on stem. Cooke's figure (loc. cit. tab. 317) is more like *R. porphyrophæus*.

4. *R. griseo-cyaneus* Fr. var.

Spores $9\frac{1}{2}-11 \times 7-8 \mu$, wavy-angular.

Fig. specimens: Between Lindved and Hollufgård, boggy ground amongst Carices, Hypna and Mnium, Sept. 1902.

This is not the typical form, which I have met in several other places (Rudme, Sept. 1912 and Sanderum Aug. 1909) always in grass on peaty ground, and which is characterized by a convex, not depressed cap with a tomentose (only very slightly flocculose) coating and almost free gills (without hairshaped cells on the edge). — The form here figured forms a transition to *R. (Eccilia) Mongeotii* (vide pag. 39), and is possibly not specifically distinct from this species. It is very much like Cooke's figure of *Ag. ardosiacus* (loc. cit. tab. 328), which most authors consider a synonym of *R. Mongeotii*. — I add a brief description of my plant: Cap $2-4\frac{1}{2}$ cm, convex, slightly depressed, dingy lilac, central part becoming paler and discoloured, everywhere minutely tomentose-squamulose. Stem 4—6 cm, attenuated upward, base white, apex lilac-gray, fibrillose, subfistulose. Gills white, adnate, almost plane, turning rosy. It appears to be rather close to *R. (Entoloma) Rozzi* Quél.

B. SUBSPHÆROSPORÆ.

α. GENUINI FR.

5. *R. madidus* Fr.

Spores $7-8 \mu$ in diam., almost spheric, obtusely pentangular.

Not figured. — I have only met with this characteristic species once (at Bellinge, grassy slopes near river, Oct. 1908). It is very well distinguished from all other species by the stout, steel-blue, striate-fibrillose stem.

6. *R. lividus* (Bull.) (*R. sinuatus* Fr.)

Spores $7\frac{1}{2}-10 \mu$ in diam., subspheric, obtusely 5-(6-)angular.

Fig. specimens: Tommerup, in wood of *Quercus* and *Fagus*, on moist clayey ground. (Also in Trelle skov, near Fredericia, Sept. 1910 and at Langesø by Odense (wood of *Quercus*) Sept. 1915.)

The cap in my specimens was yellowish alutaceous, smooth,

not fibrillose. It has a faint smell (of fresh meal or raw cucumber). — Like Schroeter I see no real difference between *R. lividus* and *R. sinuatus*.

7. ***R. prunuloides* Fr.**

Spores $8-10 \times 7\frac{1}{2} \mu$, globose-ovate, obtusely angular.

Fig. specimens: Hjallesø, under *Populus* on roadbank, solitary, June 1898. (Also on old common near Nyborg («Øen»), Sept. 1905, and at Dalum, on grassy slopes towards river, Sept. 1905.)

8. ***R. repandus* (Bull.)**

Spores about $7\frac{1}{2} \mu$ in diam., almost spheric, obtusely 5-(6-)angular. Basidia 4-spored.

Fig. specimens: Tommerup, in grass on green slope between wood and bog, Sept. 1908. (Also at Langesø, near Odense, in similar locality Oct. 1914. — The cap is slightly viscid at first, when dry somewhat shining or glossy. The gills are crowded, emarginate-free. It has a faint odour of fresh meal or raw cucumber.

β. NOLANIDEI FR.

9. ***R. clypeatus* (L.)**

Spores $8-10 \times 7\frac{1}{3}-8 \mu$, outline spheric or globular-oval.

Fig. specimens: Odense, on the ground in orchard, gregarious and subfasciculate, June 1898. Rather common in May and June, under hedges etc.

It has a distinct »mealy« odour. Specimens with paler cap and more pallid-whitish gills — which are not uncommonly to be met with — form a transition to *R. rhodopolius*.

10. ***R. rhodopolius* Fr.**

Spores $10-10\frac{1}{2} \times 7-8 \mu$, obtusely pentangular, ovate-subglobular. Basidia 4-spored.

Fig. specimens: Vissenbjerg, wood of *Fagus*, Sept. 1908. — Common, generally gregarious, but never fasciculate. The typical form is chiefly to be met with in woods of *Fagus*.

An absolutely sterile form, with pure white, abnormally ruffled and curled gills, is occasionally found.

11. ***R. turbidus* Fr. (?) var.**

Spores $9-10 \times 6\frac{1}{2}-7 \mu$, irregularly (6-)angular, broadly ovate.

Fig. specimens: Lundeborg, wood of *Quercus*, Aug. 1917.

Typical specimens of *R. turbidus* — answering to Fries' description and figure (Icon. sel. I) — I have never seen. But the form here portrayed (which I refer to *R. t.*) I have met in several places, especially under *Betula* on boggy ground. It is very close to *R. rhodopolius*, perhaps only a variety of this species. I add a brief description:

Cap 4—7½ cm, conical, at last expanded and rather acutely umbonate; flesh thin. The colour resembles that of darker forms of *R. rhodopolius*. The edge is somewhat striolate. Stem somewhat clubshaped, tall and rather slender, 9—10 cm × 4—8 mm (above) and 6—10 mm (below), striate, paler than the cap (recalling *R. (Nolanea) pascuus*). Gills rather narrow, somewhat distant, free or almost free, at first pallid, then light trout-red. Odour none.

12. *R. majalis* Fr.

Spores 7—10 × 7—8 μ, subspheric, 5-(6-)angular.

Fig. specimens: Hjallese, in copsewood, gregarious, May 1902.

Cap dingy date-brown, margin striolate, with a distinct umbo. Stem striate, of a pale watery-gray colour, slightly hollow.

13. *R. nidorosus* Fr.

Not figured. Plants answering to the description of *R. n.* are rather common in moist and close copsewoods, especially on boggy ground under *Salices*. It is almost too close to no. 12, only differing in want of umbo and in having a more pronounced »nitric« odour. The stem is generally more slender. Microscopically there is no difference.

14. *R. speculum* Fr.

Spores 9 × 6½—7 μ, spheric-oval, irregularly 5-(6-)angular.

Fig. specimens: Hjallese, gregarious in wood of *Corylus* and *Quercus*, Sept. 1908. Not uncommon. — My plants differ from the description of Fries in having a (very faint) nitric odour. Intermediate forms between 13 and 14 occur.

15. *R. elaphinus* Fr. (?) var. *radiatus* (nov. var.)

Spores 8—9½ × 7—7½ μ, subglobular-ovate, obtusely angular.

Fig. specimens: Fruens Bøge, edge of a young plantation of *Fagus*, Oct. 1902 (and Aug. 1903).

Cap slightly fleshy, 1½—2½ cm, convex-expanding, with a small, rather acute umbo, hygrophanous, coarsely radiato-striate half way up, pale dingy date-brownish. Stem short (3 cm), pallid, slightly hollow. Gills horizontal, rounded behind, pallid.

This species is the smallest and most dwarfy form of the series which begins with *R. clypeatus* and includes no. 9—15, all of which run into each other without any distinct lines of demarcation. — My plant differs very materially from the type of Fries (gills not so broad, cap less fleshy, somewhat umbonate, colour lighter etc.) and forms a transition to *R. sericeus*.

16. *R. sericeus* (Bull.)

Spores 8—10 × 6—7 μ, irregularly and obtusely angular, subspheric-oval.

Fig. specimens: 1) Trolleborg, drive in wood, amongst grass and moss, Sept. 1900; 2) Hjallese, on old lawn, Sept. 1900. — Common.

Rather variable. Fig. 1 represents the comparatively slender and light-coloured form which is occasionally mistaken for *R. (Nolanea) pascuus*, from which it is easily distinguished by the subspheric, obtusely angular spores and the »mealy« odour.

17. **R. costatus** Fr. var.

Spores $7-8 \times 6\frac{1}{2}-7 \mu$, subspheric-pentangular.

Fig. specimens: Hjallese, permanent pasture-field, Nov. 1899 (and 1914), subfasciculate.

Not very well distinguished from dark forms of no: 16. My plant had a (very faint) mealy smell. The stem was not white-squamulose above as indicated by Fries. By its pitch-brown colour and the rather small spores it formed a transition to *Ent. Cordæ* Karst.

18. **R. Batschianus** Fr.

Spores $6\frac{1}{2}-7\frac{1}{2} \times 6-6\frac{1}{2} \mu$ (or $6\frac{1}{2} \times 5\frac{3}{4}$) almost spheric, slightly angular. Cystidia absent. Basidia 4-spored. Sporedust very pale incarnate.

Fig. specimens: Kirkeby, wood of *Picea*, on mossy ground, Oct. 1914. Also found in Håre Bjerger, Oct. 1906 and 14, and at Hesbjerg, Oct. 1912 in similar localities.

This species differs very much from all other *Entolomas* which I know. It has the slightly viscid cap of the *Genuini*, but it is somewhat hygrophanous. The almost sootbrown, small cap (which is minutely striate at the margin) and the long and slender stem reminds one of *Nolanea*, the at length somewhat depressed cap and the at last slightly descending gills recall *Eccilia* — My plant belongs to the second type of Fries (with whitish gills).

II. LEPTONIA.

1. **R. euchrous** (Pers.)

Spores $9-11 \times 5-7\frac{1}{2} \mu$, oval or ovate, obtusely angular-wavy.

Fig. specimens: Hjallese, 1) solitary on stump of *Corylus*, Sept. 1897; 2) gregarious on stump of *Alnus*, Oct. 1899. — Not uncommon.

When examined by means of a pocket-lens the stem is seen to be dusky with minute violet fibrils.

2. **R. serrulatus** (Pers.)

Spores $8-11 \times 6-7 \mu$, ovate-oval, with 5-8 rather sharp angles. Basidia 4-spored (in B.). Cystidia clavate, $11-12 \mu$ broad, fasciculate, pale gray (1909).

Fig. specimens: A) Flensborg, grassy slope on rather sandy

soil, Sept. 1900. B) Nyfæste near Årup, amongst grass and heather, on sloping ground, Oct. 1900. — Not common.

Very variable. A) forms a transition to *Eccilia atrides* (which as Fries says is hardly specifically distinct). The gills had a long decurrent tooth; the cap was black, shining (sunburnt). In B) the gills were extraordinarily broad, semicircular and broadly adnate. The stem had no black points above, but black striæ formed of the decurrent edge of the gills. — In other cases the cap is rather profoundly umbilicate, even when young. But I do not think these differences sufficient for establishing several distinct species.

The figure of COOKE (loc. cit. tab. 333) is without the blackish edging and altogether different from what I call *R. s.* It looks like a form of *R. (Entoloma) griseo-cyaneus* or *E. ardosiacus* (Quélet).

3. *R. placidus* Fr.

Spores $9-10 \times 6-6\frac{1}{2} \mu$, obtusely angular-wavy.

Fig. specimens: Trolleborg, around stump of *Fagus*, in grass Sept. 1900. Not uncommon, on and around old stumps of *Fagus*.

In the figured specimens the stem was minutely striate, not white-pruinose above.

On decaying stump of *Fagus* (Hjallese, Oct. 1909) I have met with another, considerably stouter form of this species: Cap up to 4 cm broad, mousegray-brownish, fibrilloso-squamose. Stem short, curved, coarsely striate, (almost grooved) blackish-blue.

The very large form which Fries figures (Icon. sel. tab. 97) with squamose cap and the stem all over set with darker squamules is more like *R. (Entoloma) dichrous*.

4. *R. lampropus* Fr.

Spores $9\frac{1}{2}-11\frac{1}{2} \times 6\frac{1}{2}-7 \mu$, irregularly oval, nodulose; (also $10-13 \times 7-8 \mu$).

Fig. specimens: Vissenbjerg, amongst grass and heather, on hillslope outside a plantation of *Picea*, Aug. 1905. Here and there in similar localities.

The figured specimen was rather slender-stemmed and blackish-blue, almost like no. 5, except for the white gills. In other places I have met with more short-stemmed specimens and also with a form with rather profoundly umbilicate cap.

5. *R. chalybæus* (Pers.)

Spores $10 \times 7 \mu$, irregularly ovate, about 6-angular. Basidia generally 3-spored (but varying, even on the same gill, from 2- to 4-spored. -Cystidia 0.

Fig. specimens: Hollufgård, in copsewood (*Betula*, *Prunus Padus* etc.), gregarious, Sept. 1917. — Also found at Krabbesholm, Sept. 1917 (in wood of *Fraxinus* and *Alnus*).

6. *R. asprellus* Fr.

Spores $11\frac{1}{2} \times 7\frac{1}{2}$ μ , oval, angular. Basidia 4-spored.

Fig. specimens: 1) Sanderum, boggy meadow, amongst grass, July 1897; 2) Bramstrup, in a mossy bog, July 1897. — Rather common. The stem varies in colour (brownish, bluish gray etc.).

7. *R. euehlorus* (Lasch)

Spores $10\frac{1}{2}$ — 13×7 — 8 μ , irregularly angular, broadly or narrowly ovate. Basidia with 2 or 3 long sterigms.

Fig. specimens: Border of main road between Korinth and Høbbed, in grass, Oct. 1900, gregarious.

My specimens differed from the description of FRIES in having a smooth stem. When bruised the flesh (especially that of the stem) becomes verdigris-skyblue. — This species (which Fries only knew from herbaria and figures) is hardly distinct from the Friesian species *R. (L.) incanus*.

8. *R. sericellus* Fr. (*Entoloma* s.)

Spores 11 — $11\frac{1}{2} \times 7$ — $7\frac{1}{2}$ (or 9 — 10×7 μ), broadly ovate, rather angular.

Fig. specimens: 1) Skørping, old grass-field, Sept. 1897; 2) Årup, border of road in wood, Sept. 1898. — 2) is a slender form from a shady place, a transition to *R. (Eccilia) carneo-albus*. — Common in old grassfields etc., especially on light soil.

Like other modern authors I place this species in *Leptonia*, although it has no near relations here, but rather in *Eccilia*.

III: NOLANEA.

A. SUBSTELLATÆ.

1. *R. pascuus* (Pers.)

Spores 9 — 10×7 — 9 μ , 4—6-angular, with prominent angles or almost stellate Basidia 4-spored.

Fig. specimens: Gelsted, amongst moss and grass, green walk in wood of *Picea*, Oct. 1906. Rather common, especially in open spaces in coniferous plantations, rarely met with in frondose woods. In open pastures a more dwarfy and somewhat lighter form occurs.

[Some French mycologists apply the name *R. proletarius* Fr. to this species; but as Fries («*Monographia*» I p. 293) expressly states that *R. proletarius* is characterized by its cap being «*medio villosus et umbrinus*» I must needs disagree from this opinion. The same authors reserve the name *R. pascuus* for the species here described sub nom. *R. cetratus* Schroeter, which

to my mind is not the typical *R. pascuus* of Fries 'but probably identical with the plant mentioned in his »Monographia« as a pinophile distinct variety of *R. pascuus*, or probably a distinct species.] —

2. ***R. xylophilus*** nov. spec.

Spores $10 \times 8\frac{1}{2}$ μ , irregularly angular-stellate.

Fig. specimens: S. Nærå, on rotten stump of *Fagus*, Sept. 1901. Also on stump of *Corylus*, Hjallesø, Oct. 1909.

Although microscopically almost identical to the preceding species this little tiny plant can hardly be regarded as a variety of *R. pascuus*. Habitually it has much in common with *R. minutus* Karst. (no: 10). I add a brief diagnosis:

Pileus 1 cm *latus*, *convexus*, *pellucido-striatus*, *pallidus* (*pars centralis subfusca*, *striis isabellino-argillaceis*, *leviter in incarnato vergentibus*). *Stipes* 4 cm \times 1 mm, *subpellucidus*, *albidus*. *Lamellæ liberæ, albæ, dein pallide roseo-incarnatæ*. *Sporæ ut supr.*

B. NODULOSÆ.

α . OVISPORÆ.

3. ***R. cetratus*** (Fr.?) Schroeter.

Spores $10\frac{1}{2}$ — 11×7 — $7\frac{1}{2}$ μ , subovate, obtusely angular-wavy. Basidia always 2-spored.

Fig. specimens, Kirkeby, amongst moss and sticks in wood of *Picea*, Oct. 1904. Not uncommon in coniferous woods.

This species is often confounded with *R. pascuus*, but it is easily recognized by its microscopic characters. Macroscopically it differs in being more slender, with a slight tinge of ochraceous all over. The description of FRIES does not fit very well, and besides his plant is said to grow »in fagetis«, what the species here mentioned never does. Saccardo says the spore is »4-apiculatis«, an observation which probably refers to a form of *R. pascuus*.

4. ***R. hirtipes*** (Schum.?) J. E. Lange = *R. mammosus* Ricken (nec Fries).

Spores 10 — 14×7 — $8\frac{1}{2}$, ovate or oval, rather obtusely angular. Basidia 4-spored. Cystidia hairshaped.

Fig. specimens: Hjallesø, in wood of *Quercus*, *Corylus* etc., solitary, Oct. 1895. Not uncommon in similar localities.

RICKEN describes this plant very well sub nom. (N.) *mamosus* Fr., but it is not at all like the *Ag. mammosus* figured in *Icones selectæ*. The habitat also differs, as *Ag. mammosus* is said to grow »in locis apricis, graminosis«, while my plant grows in dense and rather moist copsewoods. — To my mind the *Ag. hirtipes* figured in *FLORA DANICA* represents this species,

although it is said to grow »in silvis inter folia pinea putrescentia«. The chief characters of this plant are as follows: Cap conic-convex, with a minute, at last disappearing, papilla, 2—4 $\frac{1}{2}$ cm broad, somewhat pellucido-striatulate, dingy brownish (when dry paler and silky). The edge of the cap extends a little over the gills and is at first somewhat inflexed. Stem tall (8—12 cm), slender and straight, silky, striate, paler than the cap, slightly thickened towards the base which about 2 cm up is clad with a pure white cobweb-like tomentum. Gills ventricose, almost free, at first whitish then incarnate-pallid. It has a faint smell of cucumber.

5. **R. infula** Fr.

Spores 8—9 \times 6 μ , oval, rather prominently angular-wavy. Basidia 4-spored. Cystidia 0.

Fig. specimens: Sanderum, boggy pasture, Aug. 1909. Not uncommon.

This species has much in common with no: 6, but the gills are pure white at first, then rosy-incarnate.

6. **R. mammosus** (L.?) Fr.

Spores 9 $\frac{1}{2}$ —10 $\frac{1}{2}$ \times 7—7 $\frac{1}{2}$ μ , subovate, obtusely angular-wavy. Basidia 4-spored.

Fig. specimens: Gerup, near Holstenshus, amongst grass, border of road through wood of Picea, Aug. 1902. Not uncommon, especially on hill-slopes etc. My plant is identic with the form figured by FRIES (Icones selectæ). What the larger form mentioned in the text as figured by Bulliard is, I do not know (vide no: 4). — *R. papillatus* Bres. is probably identical.

7. **R. clandestinus** Fr.

Spores 11—12 $\frac{1}{2}$ \times 7—7 $\frac{1}{2}$ μ , oblong, irregularly wavy-angular. Basidia 4-spored.

Fig. specimens: Våsemose near Holmstrup, grassy slope outside a wood, Sept. 1902. — My plant differs somewhat from other descriptions of *R. c.*, and I therefore add a short diagnosis:

Cap about 1 $\frac{1}{2}$ cm, at first conic-convex, then slightly depressed with a small papilla, sootbrown, indistinctly striate (when dry silky-fibrillose, grayish-brown). Stem short, comparatively stout. (2—3 cm \times 2—3 mm), grayish-brown, hollow, smooth and even. Gills thick, distant, broader towards the stem and broadly adnate, grayish-brown. Smell none.

8. **R. fumosellus** Wint.

Spores very large (14—18 \times 7 $\frac{1}{2}$ —9 μ), oblong-ellipsoid, wavy-angular. Basidia 4-spored.

Fig. specimens: Lykkesholm, in a bog under Alnus, Sept. 1909, solitary. Cap 0,9 cm, conic-convex, coarsely pellucido-striate, sootbrown, sparsely clad with minute, pallid, flocculose fibrils. Stem 4 cm \times 1 mm, of the same colour, with pallid, minute

flocci above and flocculose-fibrillose below. Gills distant, broad, sootbrown (at last with a rubescent tinge from the spores) broadly adnate, slightly emarginate with a decurrent tooth, edge not darker than face. This last character and the distant gills are the only differences between my plant and the description of Winter (Saccardo V no: 2996), and I do not think them sufficient for considering it specifically distinct.

9. *R. icterinus* Fr.

Spores $8-12 \times 7 \mu$. Cystidia (in figured specimens) rather short, somewhat nodulose hairshaped. (In other finds 0.)

Fig. specimens: I: Odense, on boggy ground in park under Alnus, Oct. 1896. — Rather common in similar localities. It has a faint, but very characteristic fragrant smell (almost like pineapples).

9a. *R. i.* forma *gracillima* J. E. Lange.

Spores $9-10 \times 7 \mu$, subovate, with rather prominent angles. Cystidia 0.

Fig. specimens II: in a grassy ditch under hedge, Våsemose near Holmstrup, Sept. 1902. Differing only in being smaller (cap 1 cm) and very-slender (stem $6 \text{ cm} \times 1,5 \text{ mm}$).

Intermediate forms are often met with. The cap is often almost devoid of yellow, rather pallid and watery dingy incarnate, with a fulvous tinge at the top. Such forms, which especially occur late in the season after the first frosty nights, might be referred to *Ag. pleopodius* (Bull.), which Ricken takes to be identical with *Ag. verecundus* Fr. But the characteristic smell (first noted by Schroeter, but not observed by Ricken) makes me believe they are only reduced forms of *R. icterinus*.

10. *R. minutus* Karst.

Spores $9-10 \times 7-7\frac{1}{2} \mu$, 5-(6-)angular.

Fig. specimens: Pederstrup, on boggy ground in wood, under Alnus, gregarious, Aug. 1902. Also found at »Egeskov«, Sept. 1916.

Cap $1-1\frac{1}{2} \text{ cm}$, plano-convex, slightly umbilicate, minutely striate to umbilicus, pallid, striæ a little darker (dingy drab or pale brownish), umbilicus darker. Stem slender ($3-5 \text{ cm} \times 1\frac{1}{2} \text{ mm}$), brownish, apex paler, even, base slightly white-fibrillose. Gills whitish then rosy-incarnate, somewhat adnate. — The spores are sometimes almost spheric (as indicated by Karsten) and it might therefore be sought under β . But I place it here in the vicinity of *R. icterinus*, with the smaller forms of which it has much in common.

β . SUBSPHÆROSPORÆ.

11. *R. juncus* Fr.

Spores $8\frac{1}{2}-10\frac{1}{2} \times 7\frac{1}{2}-8 \mu$, subspheric, obtusely 5-(6-)angular. Basidia 4-spored.

Fig. specimens: Hjallesø, wood of *Fagus*, Oct. 1904. — Not common, generally solitary, in moist woods.

The form *cuspidata* figured by FRIES (Icon. sel.) with an acute, very prominent umbo I have never met. My plants are convex or somewhat campanulate, obsoletely umbonate. It is a very distinct species on account of its almost spheric spores, its subfuscous, very coarsely striate cap and the broad, dusky gills.

12. *R. coelestinus* Fr.

Spores 8—9 × 7 μ, obtusely 5-(6-)angular, spheric-ovate. Basidia 4-spored.

Fig. specimens: Tommerup, pasture on ground sloping towards bog, outside a wood, Nov. 1907.

My specimens differ from the description of Fries in not having the centre »scabrello« and the stem at first not fistulose. By the subspheric spores it can easily be distinguished from the bluish *Leptonias*. The cap is bluish-fuscous or dingy steelblue (when dry: dark steelgray and silky).

IV. ECCILIA.

A. OVISPORÆ.

1. *R. carneo-albus* Wither. (*Clitopilus c.*)

Spores 8—11 (generally 10—11) μ long, subovate, irregularly and obtusely angular.

Fig. specimens: Korsør, on hedgerow in wood of *Fagus*, Sept. 1902. — Also at Rold (Jylland), Heshbjerg (Fyn) etc., always in woods. A dwarfy form, cap only 3 mm broad, is also met with.

It is extremely close to *R. sericellus* and hardly deserves specific rank. The only differences are the somewhat decurrent gills and the slender stem. Occasionally the cap is almost snow-white. Altogether it might be characterized as an etiolated, silvan form of *R. sericellus*.

2. *R. cancrinus* Fr. (*Clitopilus c.*)

Spores 10—13 × 7—7½ μ, ovate or oval, irregularly wavy. Basidia 4-spored.

Fig. specimens: Kerteminde, sandy pasture near the coast, July 1909. — Also at Sanderum, pasture on boggy ground, Aug 1909.

Differing from no: 1 chiefly in the depressed, subinfundibuli form cap, shorter stem and strongly decurrent gills.

3. *R. undatus* Fr. (*Clitopilus u.*)

Spores $8\frac{1}{2}$ — $9\frac{1}{2}$ \times $5\frac{1}{2}$ —6 μ , oval, irregularly wavy.

Fig. specimens: I) Rønningesøgård, roadside in park, amongst grass and moss, Sept. 1902; II) Kerteminde, pasture on sandy ground near coast, Sept. 1905. Not common.

My plant differs from the description of Fries in not having a hollow stem; but in the excellent figure in Fries' Icon. sel. tab. 96 the cavity is also wanting. The agaric figured by COOKE (loc. cit. pl. 486) sub nom. *Ag. undatus* evidently has nothing to do with Fries' species. And *undatus* Fr. sensu Ricken is a smooth-spored species referred by him to *Paxillus*. — Fig. II represents a more membranaceous and infundibuliform variety, almost answering to Fries' description of **Ag. viarum*. A still more reduced form is:

3 b. *R. undatus* var. *pusillus* J. E. Lange.

Spores 9 μ long, subovate, with about 6 obtuse angles.

Fig. specimens: Hjallese, on naked soil under hedge, roadside in wood, Aug. 1907, gregarious.

Cap $\frac{1}{2}$ — $1\frac{1}{2}$ cm, plano-convex, profoundly umbilicate, indistinctly striate, dingy pale gray, at first slightly hoary-pruinose (especially towards the edge). Stem paler than cap, not hollow, at first slightly pruinose, 1—2 cm \times $1\frac{1}{3}$ mm; base slightly white-woolly. Gills rather strongly decurrent, dingy pallid, moderately crowded, arcuate, soon with a pallid-incarnate tinge. Sporedust very pale incarnate.

Although this little tiny plant at first sight does not at all recall *R. undatus*, the var. *viarum* connects them very intimately, and I therefor refrain from making it a distinct species.

4. *R. Mougeotii* Fr. var.

Spores $10 \times 7 \mu$, obtusely angular, ovate. Edge of gills set with hairshaped-cylindric, 6—8 μ broad, obtuse cells.

Fig. specimens: Bramstrup Mose, in boggy meadow, July 1902.

This plant is very closely related to the form of *R. (Entoloma) griseo-cyaneus* figured and described pag. 29. Perhaps it is only a sunburnt form of the same species.

Cap convex, at first umbilicate, then somewhat infundibuliform, $2\frac{2}{3}$ —3 cm, dark gray-violet, everywhere hairy-tomentose-squamulose. Stem 4—5 cm \times 3 mm, steelgray-lilac, hollow, somewhat fibrillose and with indistinct blackish flocci. Gills adnate, at last somewhat decurrent, whitish then pink.

5. *R. griseo-rubellus* Lasch.

Spores 9 — 10×7 — $7\frac{1}{2}$ μ , broadly ovate, wavy-angular with about 6 angles. Basidia 4-spored.

Fig. specimens: Vormark, Falleskov, growing gregariously in grass, open space in plantation of *Picea*, Sept. 1905. (Also found on sloping ground outside a plantation, at Gelsted, Sept. 1912.)

Central part of cap slightly squamulose. Stem smooth, glabrous. Gills at first whitish, rather distant, horizontal, adnate and slightly decurrent.

5 b. **R. g.** var.

Spores longer ($10-13 \times 7-8 \mu$).

Fig. specimens: Bramstrup mose, on boggy ground, July 1903.

Stem slenderer and paler, but for the rest not differing materially from the type and probably only a palustrine form.

6. **R. nigrella** (Pers.?) Quélet.?

Spores $9-12 \times 6\frac{1}{2}-7\frac{1}{2} \mu$, ovate (subspheric or oblong) irregularly wavy-angular.

Fig. specimens: Dalum Landbrugsskole, solitary in a garden, bed of hardy perennials, July 1898.

As I have only seen a single specimen of this characteristic little agaric I am not in a position to decide its systematic position. Probably it is identic with what Quélet called *R. nigrella* Pers. (Saccardo V no. 3027). As his description is very brief I give here my own diagnosis: Cap 1 cm broad, infundibuliform, fuscous (becoming blackish), edge striate. Stem smooth, subfuscous-steelgray with a slight violet tinge, somewhat fistulose, $2\frac{1}{2}$ cm \times 2 mm. Gills narrow, strongly decurrent, incarnate. Flesh steelgray.

B. SUBSPHÆROSPORÆ.

7. **R. rusticoides** Gill.

Spores $8 \times 6 \mu$, subspheric 5-angular.

Fig. specimens: 1) Håre Bjerge, sandy hillslope amongst lichens, grass and *Sarothamnus*, Oct. 1907; 2) Hjelmerup, sandy hedgerow, Oct. 1915. —

This very distinct species — which Fries did not know — appears to me very nearly allied to his *Agaricus parkensis* (especially as represented in his figure (Icon. sel. I) in which the gills are fuscous (while in the diagnosis they are said to be whitish).

8. **R. rhodocylix** (Lasch).

Spores $8-10 \mu$ in diameter, subspheric 5-angular. Basidia 4-spored. Cystidia coarsely hairshaped.

Fig. specimens: Højsholt near Tommerup, on decaying stump of *Betula* in boggy wood, Sept. 1908. Also found at Sandager, growing in a bog under *Alnus* and *Picea* (on the ground amongst dead needles), Aug. 1913.

[Under *Subsphærosporæ* also might be sought *Clitopilus popinalis* Fr. which has very small, almost spheric spores (about 5μ in diameter), but which probably should be transferred to *Paxillus*.]

V. CLAUDOPUS.

1. **R. byssisedus** (Pers.)

Spores about 9 μ long, obliquely ovate, wavy-angular. Basidia 4-spored. Cystidia 0.

Fig. specimens: Høbbed, near Korinth, edge of wood amongst foliage, Nov. 1901. — Also at Våsemose, on decaying stump (of Fagus) in wood, Oct. 1915. — My plants were not resupinate at first. The (very short) stem is almost lateral

For figures of spores etc. vide the plate.

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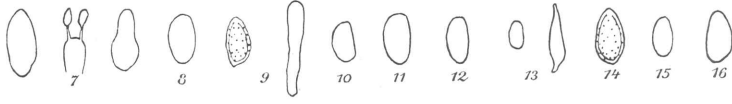
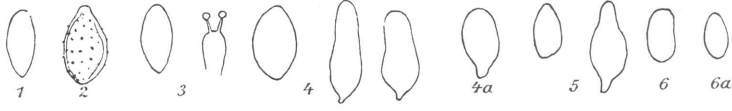
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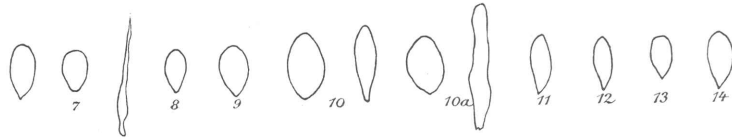
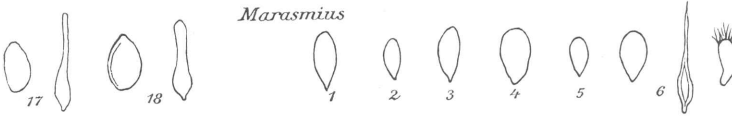
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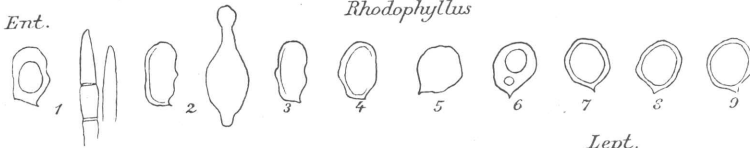


Marasmius

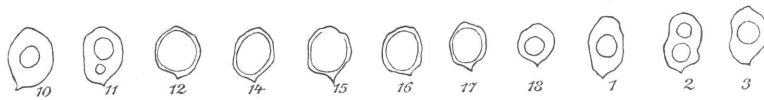


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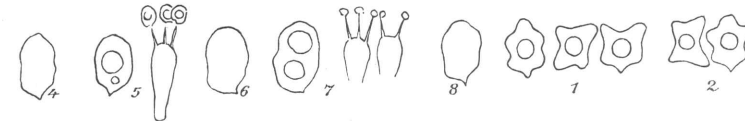
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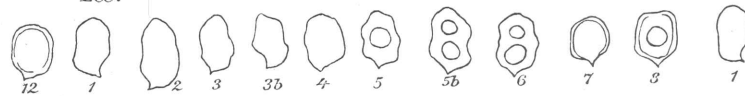


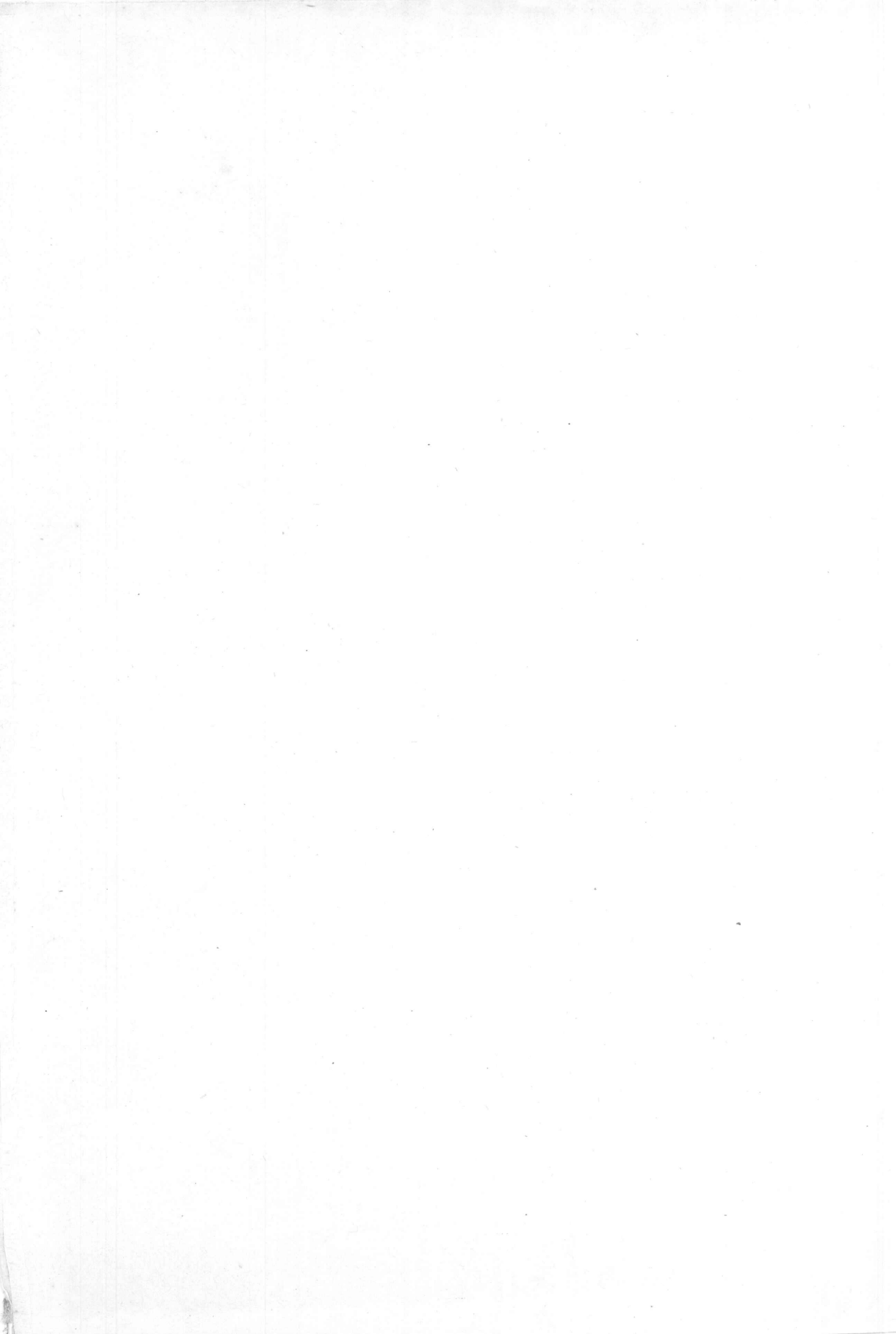
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