

NOTES ON THE GENUS PSATHYRELLA—I

Psathyrella gracilis and *P. microrrhiza*

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Amsterdam

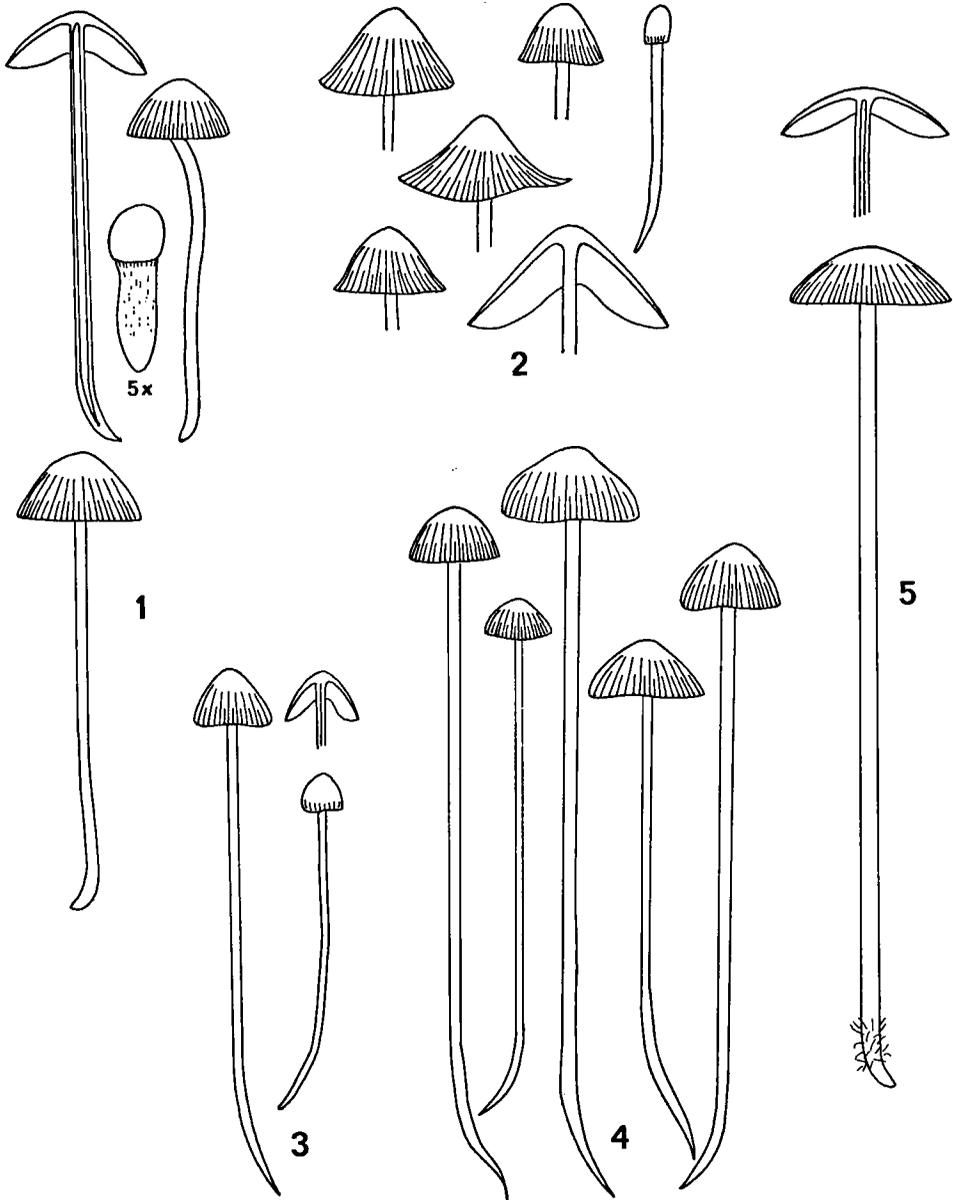
(With 62 Text-figures)

Descriptions of *Psathyrella gracilis* and *P. microrrhiza* are given. In the former the following forms are recognized: f. *gracilis*, f. *corrugis*, f. *clavigera*, f. *albolimbata*, and f. *substerilis*. The variability of both species is stressed and a new character is described that may help to distinguish between the two. Forms, indicating that intermediates between the two species exist, are discussed.

Our private herbarium containing 87 collections of *P. gracilis* and *P. microrrhiza* and their various forms, it was decided to carry out an exhaustive study of this material. All these collections are now deposited in the Rijksherbarium at Leiden (L), including the type specimens of the three new forms of *P. gracilis* to be described below.

For the description of the colours of the macroscopic structures and the spores (mounted in water and studied with oil immersion and with a rather strongly lit field of view) we used the American Munsell Soil Color Charts (abbreviated in the text to M.) and the code, designating its colours. For the methods by which we studied and depicted the microscopic structures the reader is referred to a previous paper (Kits van Waveren, 1968: 132). Spore sizes were based on samples from the gills as in the majority of cases no spore-prints were available. Great care, however, was taken to measure only mature, i.e. very dark coloured, spores. Following Pegler (1966: 74) we expressed spore measurements both as a range and with a mean value.

In order to locate the cheilo- and pleurocystidia, and particularly to examine the pigmentation of both the flesh of the cap and the hymenophoral trama, the tissue of the cap and gills was 'washed' as already described to some extent in an earlier paper (l.c. 132). From herbarium material a wedge-shaped segment of the cap, comprising four to five large gills, was cut out of the cap from margin to centre with a sharply pointed piece of a broken razor blade. The segment was then put on a slide on its 'back', i.e. gills facing upwards and the cap surface resting on the slide. The gills — very brittle, the herbarium material being very dry — were then removed by breaking them at their base from the flesh. This was done under the binocular lens with two mounted needles, one fixing the segment, the other being placed horizontally along and against the base of the gill and then gently and gradually pushing the gill from its base. All gills, large and small, having been removed in this way, a segment of the cap was obtained with the remaining 'ridges' of the gills on the upper side and also a number of full-sized gills, small and large. Both this segment and one large gill were



Figs. 1-5. *Psathyrella gracilis*, habit sketches. — 1. Denekamp, Singraven, 22 Oct. 1960. — 2. Amsterdam, Amsterdamse Bos, 7 Nov. 1959. — 3. British Isles, Scotland, Loch Lomond near Arden, 27 Aug. 1963. — 4. Nieuwersluis, Over-Holland, 8 Nov. 1962. — 5. Amsterdam, Amsterdamse Bos 19 Sept. 1961.

then placed in a large drop of 10% NH_4OH and 'washed', i.e. freed from almost all their spores by tapping the segment respectively the gill with one needle while fixing it with the other. The liquid acquired a blackish colour from the vast number of floating spores and was removed two or three times with filter paper and each time replaced by a fresh supply. In the end the remnants of the gill attachments stood out as dark coloured 'ridges' on the lighter coloured flesh of the cap between them. The gills were translucent and brown or colourless as the case may be. For the description of the colours of the flesh of the cap, the 'ridges' of the gills and the hymenophoral trama, again the Munsell Color Charts were used, the colours being observed in very bright daylight shining on a white background (white paper under the binocular lens).

Next, both the tissues of the cap segment (i.e. flesh of cap + 'ridges') and the gill were brought under a coverslip and broken up by tapping the coverslip with a hard object in order to study the pigmentation microscopically (oil immersion).

In distinguishing between *P. gracilis* and *P. microrrhiza* it proved to be important to count the number of lageniform cheilocystidia per standard (1000 μ) distance along the edge of the gills. For this we isolated and washed another full-sized gill and then cut the entire edge of the gill from the remainder with a broken piece of razor blade and with the aid of the binocular lens. Shifting the edge from one end to the other under the microscope, at the same time measuring the distance over which the edge was shifted and counting the number of cheilocystidia encountered, we were practically always able to obtain a more or less accurate figure for the density of the lageniform cheilocystidia, expressed in number per 1000 μ . Occasionally the marginal cells were beyond assessment, having deteriorated or even disappeared as a result of age and decay.

That part of the gill, which had been freed of its spores and also of its edge, was then teased up into very small pieces with the aid of two needles, placed under a coverslip, and the tissue was further dispersed by tapping the coverslip with a hard object. In this way the pleurocystidia (and pleurocystidia alone!) and basidia were well isolated so that they could easily be measured and drawn.

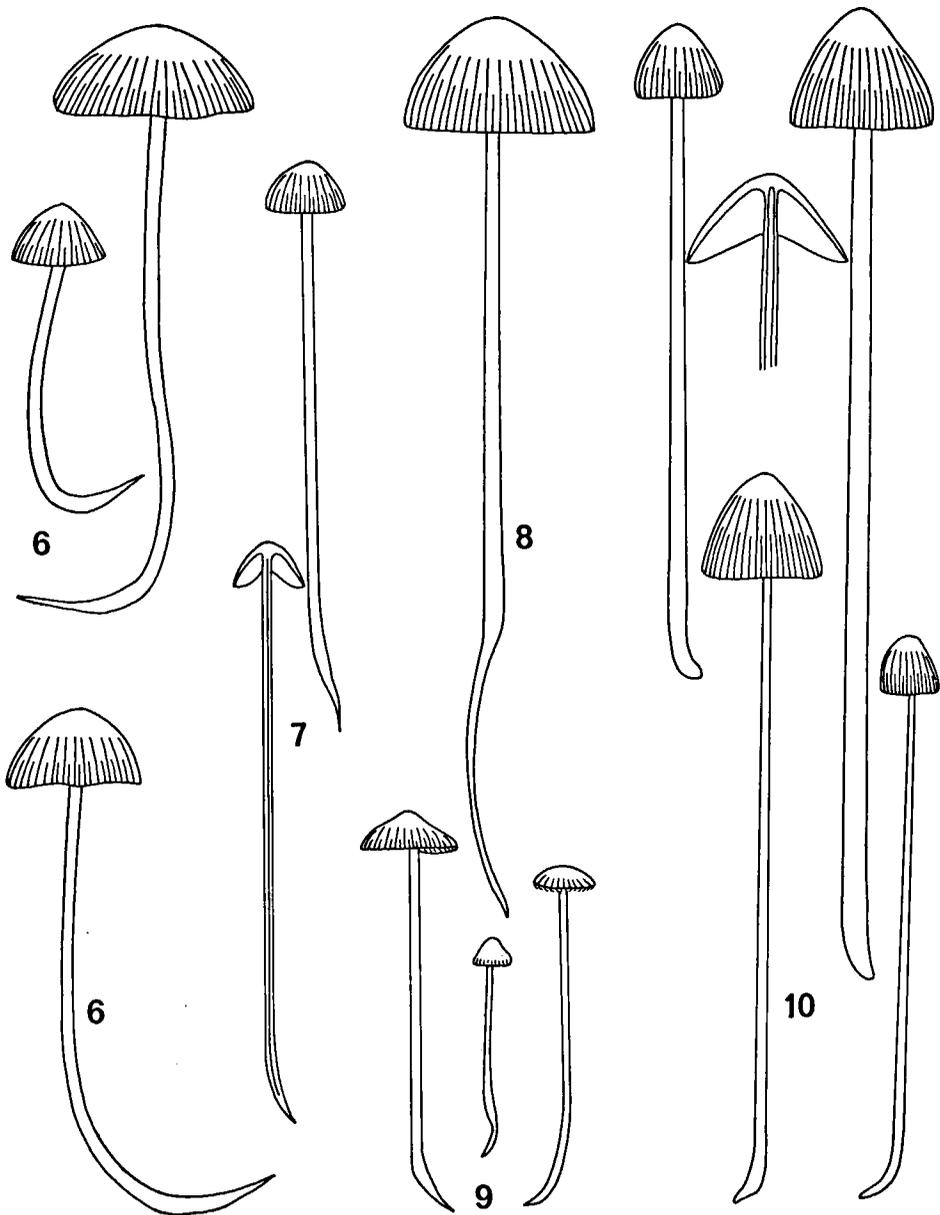
We are greatly indebted to Dr. D.N. Pegler, Kew, and particularly Dr. R.A. Maas Geesteranus, Leiden, for their very great help in correcting and reading the manuscript.

PSATHYRELLA GRACILIS (Fr.) Quél. f. GRACILIS

Figs. 1-10, 32-37, 40-42

Agaricus gracilis Fr., Syst. mycol. 1: 299. 1821; Elench. 1: 42. 1828; Epicr. 238. 1838; Monogr. Hym. Suec. 1: 448. 1857; Hym. europ. 313. 1874. — *Coprinarius gracilis* (Fr.) Kummer, Führer Pilzk. 68. 1871. — *Psathyrella gracilis* (Fr.) Quél. in Mém. Soc. Emul. Montbél. II, 5: 152. 1872. — *Psathyra gracilis* (Fr.) Bertrand in Bull. Soc. mycol. Fr. 17: 277. 1901. — *Drosophila gracilis* (Fr.) Quél., Fl. mycol. 57. 1888. — Type locality: Sweden.

SELECTED DESCRIPTIONS AND ILLUSTRATIONS. — Cooke, Ill. Br. Fungi pl. 594/616. 1884-1886 (*Agaricus bifrons* var. *semitinctus*); Ricken, Blätterp. 264, pl. 68 fig. 2. 1913;



Figs. 6-10. *Psathyrella gracilis*, habit sketches. — 6. Amsterdam, Amsterdamse Bos, 19 Oct. 1961. — 7. Denekamp, Singraven, 14 Oct. 1961. — 8. Apeldoorn, Het Loo, 20 Oct. 1964. — 9. Ommen, Ada's Hoeve, 15 Oct. 1963. — 10. Bommerig, Elzeter Bos, 2 Oct. 1964.

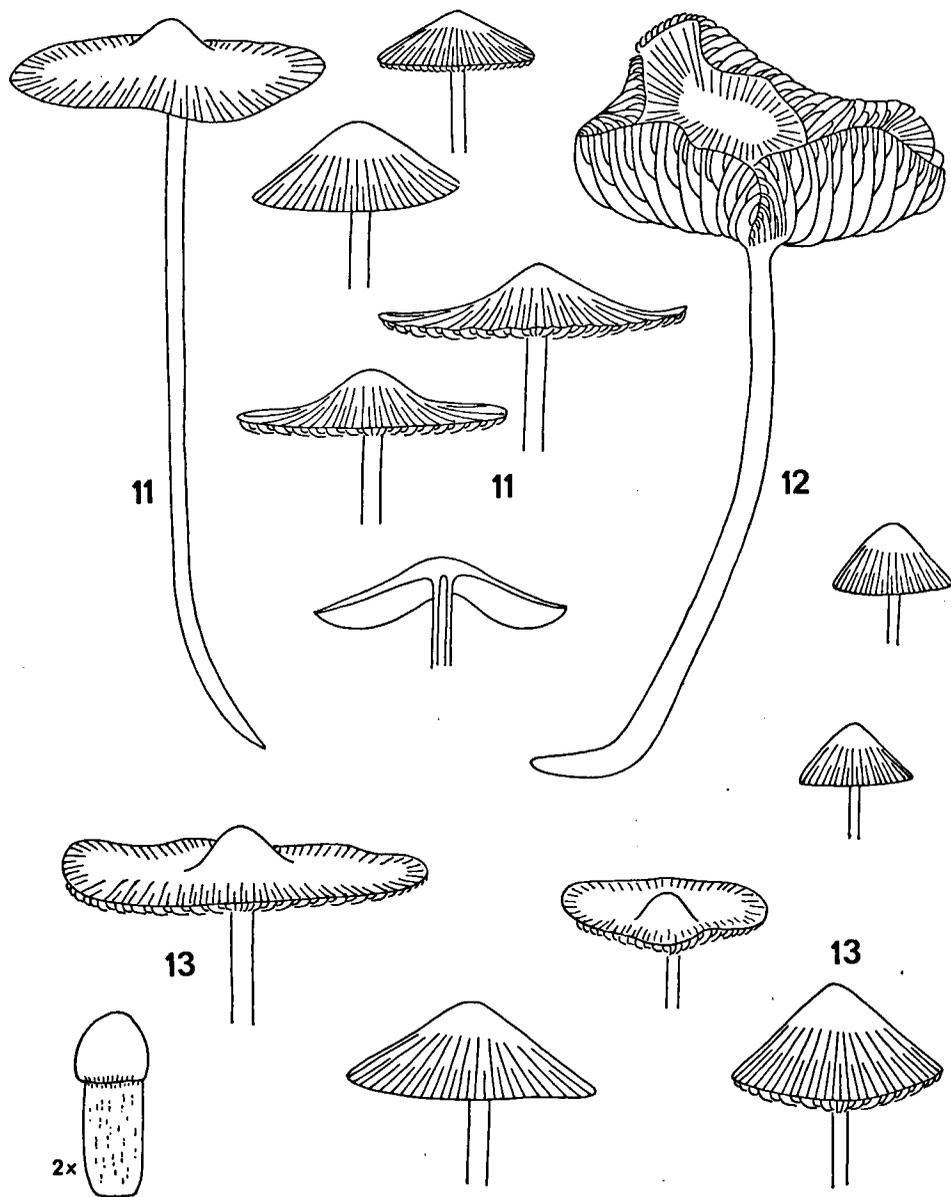
Bresadola, *Icon. mycol.* 18: pl. 871. 1931; J. E. Lange, *Fl. ag. dan.* 4: 100, pl. 154 B. 1939; Kühner & Romagn., *Fl. anal.* 357. 1953; Moser in *Kl. KryptogFl.*, Ed. 3, 2 (b/2): 214. 1967 (but cap rugulose, mistakenly called "nicht runzelig").

MACROSCOPIC CHARACTERS. — *Cap* at first (primordia or slightly older specimens, cap 2–7 mm diam.) campanulate, smooth, not striate, in centre dark reddish brown (M. 5 YR 3/4) or purplish brown (M. 7.5 YR 3/2), towards the margin lighter brown (M. 7.5 YR 4/4, 5/6, 5/8, 6/4; 10 YR 4/4, 5/6, 6/6) near the margin very pale brown (M. 10 YR 7/3) and at the margin itself whitish. Cap later campanulate, conico-campanulate or conical, often in the end campanulate-convex and sometimes with umbo, 6–30 mm broad, surface smooth and strongly striate up to 1/2–2/3 from the margin inwards; centre greasy, almost translucent, at first reddish brown (M. 5 YR 3/4, 4/4) then strong brown (M. 7.5 YR 4/4), finally yellowish brown (M. 10 YR 4/3, 4/4, 5/4, 6/4); cap outside the centre at first dark and dull brown (M. 7.5 YR 4/2; 10 YR 5/4, 5/3, 4/3, 3/3, 3/4), very soon greying towards the margin and on aging (M. 10 YR 3/2, 4/2, 5/2, 6/2) these colours sometimes being mixed with a trace of purple or lilac (M. 5 YR 4/1, 5/1, 6/1; 7.5 YR 3/2). Cap finally mud-grey (M. 10 YR 4/1, 5/1) and near the margin pale grey (M. 10 YR 6/1) the centre only showing a trace of dirty brown; striae always darker and greyer than the ridges between them; margin of the cap extremely thin and white. Cap strongly hygrophanous, drying out to very pale brown, yellowish brown, alutaceous or greyish (M. 10 YR 8/2, 8/3, 8/4, 7/3, 7/4, 6/3) sometimes to almost white (M. 10 YR 7/1, 8/1) or even pure white. Almost always a slight to strong pink or red colour enters these colour shades in the peripheral 1/2–2/3 of the cap, either only in places or all over (M. 7.5 YR 8/4, 7/4, 7/2; 5 YR 8/2, 8/3, 8/4, 7/3, 7/4; 2.5 YR 6/8, 5/8, 5/6) rarely the entire cap (except for the centre which almost always remains pale yellowish brown) becomes strikingly red (M. 10 R 5/8). At some stage during the process of drying the surface of the cap becomes distinctly and often strongly micaceous and also more or less veined (rugulose).

Veil in primordia covering the stem with a dense but thin layer of white fine longitudinal fibres, reaching and inserting at the margin of the cap, not or hardly going up any further on its surface, the veil thus being reputed to be absent on the adult cap, while leaving many adpressed patches of fibres on the stem in its lower 1/2–2/3 part in adult specimens. In primordia velar fibres not infrequently occur on the surface of the cap only along and perpendicular to the margin of the cap and occasionally a few fibres or even small bundles or networks of fibres may persist on the surface of the cap very close to the margin in very or fairly young specimens.

Gills ventricose only near the margin of the cap, then ascending straight or hardly ventricose, very broadly adnate, sometimes with a small tooth, 2–4 mm broad, at first (in primordia) white but with a very distinct trace of brown at the base, later grey (M. 10 YR 6/1, 5/1) then slightly purplish grey (M. 5 YR 6/1, 5/1) then darker grey (M. 10 YR 4/1, 3/1) and purple-grey (M. 5 YR 4/1) finally dark to very dark purple-grey and purple-black (M. 7.5 YR 5/2; 5 YR 5/2, 3/2, 2/2, 3/1; 2.5 YR 2/2; 10 YR 5/1, 4/1, 3/1, 2/2), edge white in primordia and young specimens but always red in mature specimens be it occasionally only over a small stretch near the margin of the cap and in that case often not on all gills and easily overlooked, sometimes even necessitating a search under the microscope.

Stem cylindrical or very slightly and gradually thickening near the base, 20–110 × 1–3 mm (up to 140–165 mm when growing in tall grass), conspicuously white but in its lower 1/4–1/2 often slightly isabelline, apex pruinose, hollow, rooting (root measuring up to 15–50 mm and tapering towards its end, but often hardly noticeable when attached to pieces of wood). Surface of the stem covered in its lower 1/2–2/3 by a smaller or usually larger number of adpressed white and often very conspicuous



Figs. 11-13. *Psathyrella gracilis* f. *corrugis*, habit sketches. — 11. Aerdenhout, Dunes of Amsterdam Watersupply, 6 Oct. 1961. — 12. Amsterdam, Amsterdamse Bos, 29 Oct. 1963. — 13. Denekamp, Singraven, 11 Oct. 1961.

groups of white fibres (velar remnants) and base covered (sometimes very densely) over 10–20 mm with white hairs (strigose).

Flesh of cap in centre 1–2 mm thick, dark brown to dark grey-brown (M. 10 YR 4/4, 4/3, 3/3, 4/2), of stem white (sometimes isabelline at base) but grey-brown in the area where the gills are attached. Usually and practically always when the edge of the gills is conspicuously red, the flesh of the stem alongside the attachment of the gills is red and if so, often this red color is also present in a zone along the base of the gills in the flesh of the cap close to the stem.

Spore print purple in a thin, black in a thick layer.

Pigmentation under binocular lens (for technique, see p. 249). Flesh of cap between 'ridges' of gills in centre of cap pale brown (M. 10 YR 6/3, 7/3, 7/2, rarely 6/4), paler and greyer towards the margin (slightly browner than M. 2.5 Y 6/2, 7/2, 8/2), rarely pale olive-brown (M. 2.5 Y 6/4, 5/4 or 5 Y 6/3, 7/3). 'Ridges' of gills brown but practically always with a striking olive tinge (M. 2.5 Y 5/4, 5/6, 6/4; 5 Y 5/4, 6/4, 6/3; rarely 10 YR 5/4), darker towards centre, paler towards margin of the cap. Trama of gills almost but hardly ever quite colourless, very pale grey or greyish-yellow (M. 5 Y 7/1, 7/2, 7/3, 8/2, 8/3) or very pale brownish grey (M. 2.5 Y 6/2, 7/2, 8/2), at the base usually a narrow zone of pale brown (M. 10 YR 7/3, 7/2, 8/3, 8/2).

MICROSCOPIC CHARACTERS. — *Spores* ellipsoid-amygdaliform, (9.9–) 10.8–13.5 (–14.4) \times (5.4–) 5.9–7.2 μ (12.2 \times 6.3 μ), dark reddish brown in water (M. 2.5 YR 3/4; 5 YR 3/3, 3/4), opaque to subopaque, comparatively small hilar appendix on adaxial face and large apical germ-pore ($\pm 2 \mu$ diam.).

Basidia 4-spored, (17.6–) 19.2–32 (–33.6) \times 9.6–12.8 μ .

Pleurocystidia fairly numerous, sometimes either sparse or very numerous; obclavate, lageniform to fusiform, slender, often wavy, apex subobtuse, subulate or even acute; (45–) 50–70 (–100) \times 8–15 (–17.5) μ , hyaline, no crystals or mucus.

Marginal cells very densely packed, spheropedunculate, clavate, cylindrical, often elongate or irregularly shaped, very variable in size and shape, their walls often slightly thickened and not infrequently pale brown, 12.5–35 (–40) \times 4–15 μ . In between them erratically dispersed a very variable (also locally on one and the same edge) and fairly small number — less than 100 (e.g. 9–85) per 1000 μ gill edge — of lageniform cystidia, (20–) 25–60 \times (6–) 7.5–12.5 (–15) μ . Subhymenium at gill edge reddish.

Pigmentation under microscope. Hyphae of hypodermis moderately to strongly coloured by brownish membranous pigment, yellow hyphal septa fairly to very numerous, encrustations few to numerous. Trama of gills of primordia very distinctly brown by membranous pigment, particularly at the base and very faintly right up to the edge of the gills; of mature specimens very faintly brown at base or in basal 1/4 of the gill only, often only a few slightly yellow coloured hyphal septa, no encrustations.

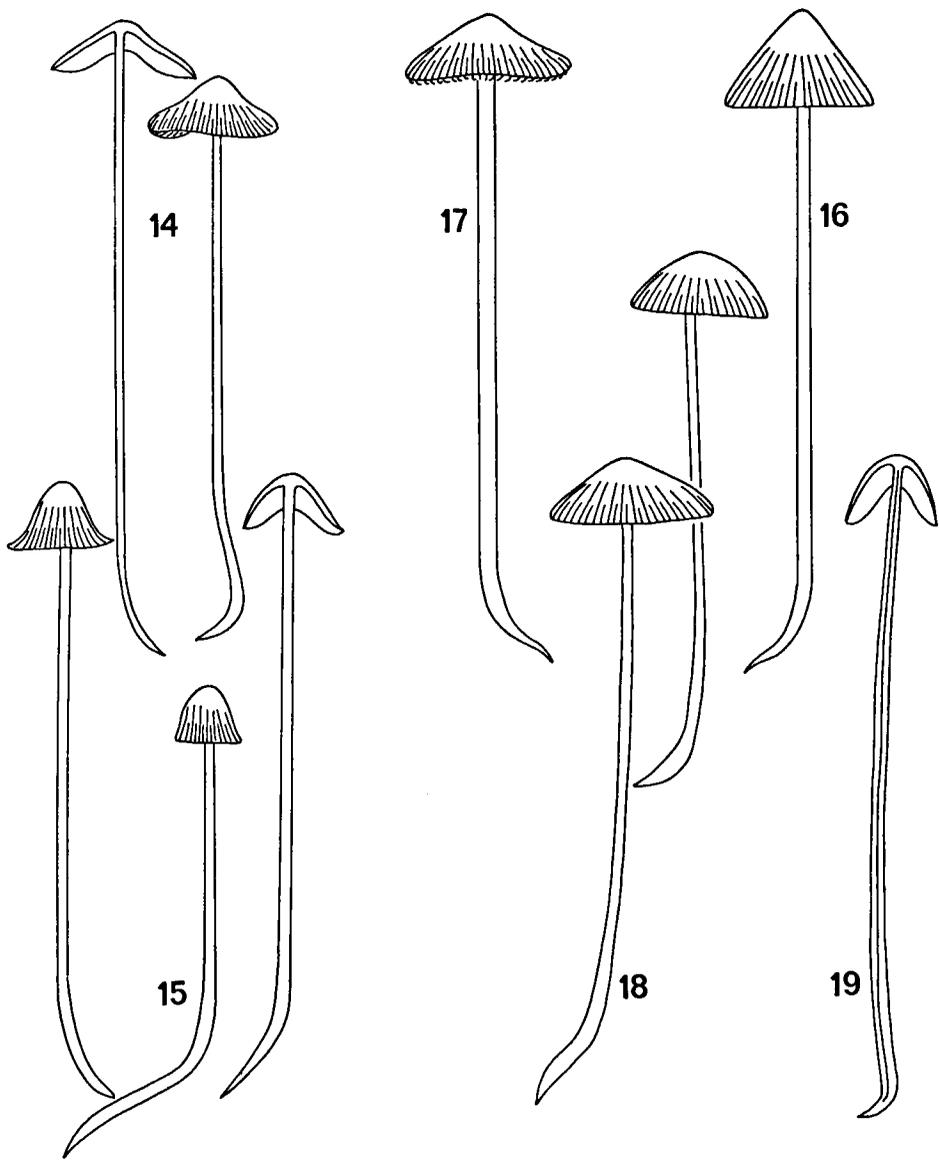
Cap cuticle cellular.

HABITAT. — In deciduous woods, parks, damp places, in rich or clayey soil, in grass by roadsides, amongst rotting leaves, on rubbish piles, on compost, the rooting stems almost always attached to dead wood or small sticks or branches just below the surface of the ground. End of August–November. Very common.

COLLECTIONS EXAMINED.

NETHERLANDS

21 collections from widely dispersed localities (Denekamp, Estate "Singraven"; Ommen, Estate "Ada's Hoeve"; Apeldoorn, Royal Estate "Het Loo"; Amsterdam,



Figs. 14-16. *Psathyrella gracilis* f. *albolimbata*, habit sketches. — 14. Linnerbroek (type), 6 Oct. 1962. — 15. Santpoort, Duin en Kruidberg, 13 Nov. 1962 — 16. British Isles, Oxford, Bagley Wood, 15 Sept. 1969.

Figs. 17-19. *Psathyrella gracilis* f. *clavigera*. — 17. Amsterdam, Amsterdamse Bos, 5 Nov. 1959. — 18. Amsterdam, Amsterdamse Bos, 27 July 1960. — 19. Ommen, Ada's Hoeve (type), 15 Oct. 1963.

Amsterdamse Bos; Overveen, Estate "Elswout"; Nieuwersluis, Estate "Over-Holland"; Mook, 1958–1969, *E. Kits van Waveren* (L); 's-Graveland, Estate "Boekestein", 25 Sept. 1968, *J. Daams* (L).

BRITISH ISLES

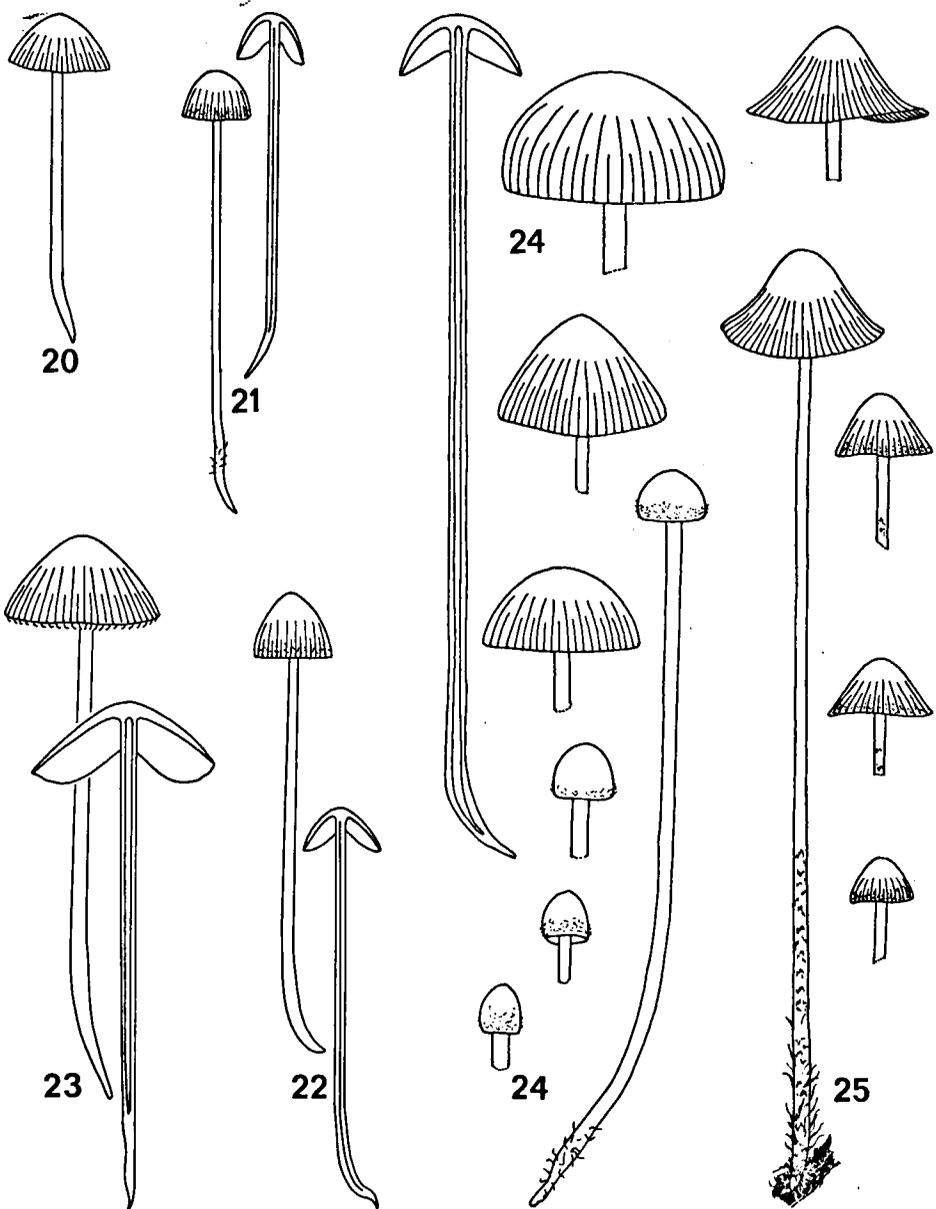
Scotland: Loch Lomond, 27 Aug. 1963, *E. Kits van Waveren* (L); Kenmore, "Taymouth Castle", 10 Sept. 1966, *E. Kits van Waveren* (L).

Wales: Lake Vyrnwy, 15 Sept. 1967, *E. Kits van Waveren* (L).

OBSERVATIONS. — Fries apparently was not quite sure whether what he named *A. gracilis* and what indeed is the taxon described above, was conspecific with what Persoon (1801: 425) had named *A. gracilis*. Citing the latter Fries added a question mark. To us, however, it seems that Persoon's *A. gracilis* is indeed conspecific with Fries's species of that name. Technically, however, the two taxa represent two different species since they were based on different material. Fries's species of course has priority. The name given by Persoon was later validated by S. F. Gray (1821: 630) as *Prunulus gracilis*. Type material of both Persoon's and Fries's species unfortunately is lacking.

We cannot agree with Kühner & Romagnesi's (1953: 355, key to the four groups of the subgenus *Psathyrella*) statement that in *P. gracilis* the veil is "rigoureusement nul à la surface du chapeau" and that the trama is "sensiblement incolore (seulement un peu brunie sur les jeunes dans la moitié supérieure de la chaire piléique, ou même uniquement dans l'hypoderme), totalement hyaline dans les lames, et, sur adulte dans le chapeau" and "chapeau n'étant jamais fauve ni rouillé avant la déshydratation." As for the veil, the fibres in primordia always reach and insert at the margin of the cap. But usually, on very close examination of the primordia, they can be seen reaching just a little bit further up, forming a dense layer of white very short fibres, running perpendicular to the margin of the cap on its surface only in a very narrow zone along the margin. Occasionally, however, they even reach a little bit further up the cap, but never by any means to the extent as in *P. microrrhiza*. This being so, it is not in the least surprising that occasionally velar fibres can be found still on the cap — be it close to the margin and in very small numbers — in slightly older specimens. We came across these minute velar fibres and sometimes even small bundles of fibres on mature caps in seven out of our 24 collections.

As for the pigment, primordia of *P. gracilis* are definitely reddish brown and although in old specimens the prevailing colour is mud-grey, some shade of brown, particularly in the centre, is practically always present. On microscopical examination one never fails to find membranal pigment, yellow hyphal septa and encrustations, particularly in the hypodermis. The pigment of the trama of the gills, less influenced as it is by external conditions (rain), is of greater importance as its assumed absence serves as one of the chief characters by which *P. gracilis* is distinguished from *P. microrrhiza* (Kühner & Romagnesi, 1953: 355). In semi-mature and mature specimens we found in 18 out of our 24 collections of *P. gracilis* the trama of the gills when



Figs. 20–25. *Psathyrella microrrhiza*, habit sketches. — 20–23. Vogelenzang, Dunes of Leiduin, 25 Oct. 1963. — 24. Amsterdam, Amsterdamse Bos, 9 Oct. 1960. — 25. Aerdenhout, Dunes of Amsterdam Watersupply, 21 Nov. 1959.

studied under the binocular lens practically colourless or very pale greyish-yellow, but in six there was a distinct shade of brown at the base of the gills. In primordia, however, the entire trama proved to be slightly coloured, strongest at the base. On microscopical examination in all 24 collections but two a distinct trace of brown was seen on hyphae of the trama of the gills, particularly at the base. This fully corresponds with the 'ridges' of the gills, always standing out as brown-olive against the paler brown flesh of the cap between them when a segment of the cap is studied under the binocular lens.

In the collections studied, the numbers of lageniform cheilocystidia per 1000 μ gill edge ranged from 7-91 with a decided preponderance of the numbers between 9 and 40: 7-9-9-11-12-12-19-19-20-24-25-30-31-32-33-35-35-38-38-50-51-76 85-91.

In four collections of *P. gracilis* only we found the pleurocystidia not quite typical of that species, rather small and thick (45-65 \times 9-15 μ) be it subulate or even acute but in some sub-obtuse or even mucronate.

The spore sizes in our collections turned out to vary rather considerably, the extreme mean values found among the 24 collections examined being 10.7-13.4 \times 6-6.7 μ .

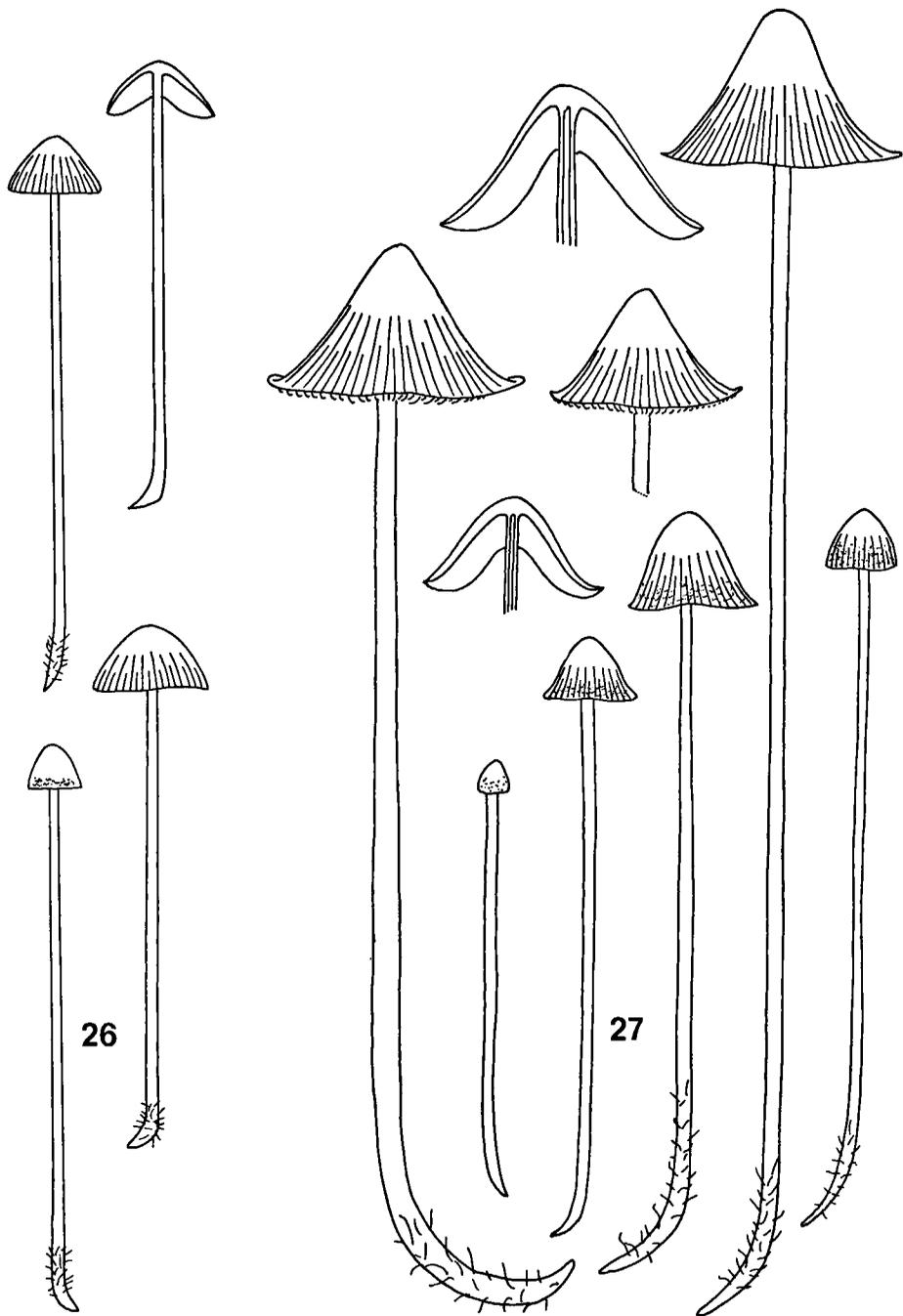
PSATHYRELLA GRACILIS f. **corrugis** (Pers. ex Fr.) Kits van Wav., *nov. comb.*

Figs. 11-13, 38, 39

Agaricus corrugis Pers. in Neues Mag. Bot. 1: 104. 1794; Syn. Fung. 424. 1801; ex Fr., Syst. mycol. 1: 298. 1821; Epicr. 231. 1838; Monogr. Hym. Succ. 1: 439. 1857; Hym. europ. 305. 1874. — *Coprinarius corrugis* (Pers. ex Fr.) Kummer, Führer Pilzk. 69. 1871. — *Psathyra corrugis* (Pers. ex Fr.) Quél. in Mém. Soc. Emul. Montbél. II, 5: 148. 1872. — *Drosophila corrugis* (Pers. ex Fr.) Quél., Ench. Fung. 116. 1886. — *Psathyra gracilis* var. *corrugis* (Pers. ex Fr.) J. E. Lange in Dansk bot. Ark. 9 (1): 15. 1936; Fl. ag. dan. 4: 100, pl. 153 B. 1939. — *Psathyrella corrugis* (Pers. ex Fr.) Konr. & Maubl., Agaricales 123. 1948. — *Psathyrella gracilis* var. *corrugis* (Pers. ex Fr.) Pearson & Dennis in Trans. Br. mycol. Soc. 31: 185. 1948. — *Drosophila gracilis* f. *corrugis* (Pers. ex Fr.) Kühner & Romagn., Fl. anal. 357. 1953 ("ss. Bres."). — Neotype (selected): "*Agaricus (Pratella) corrugis* / — *pelosporus* Bull." (L 910.258-411).

SELECTED DESCRIPTIONS AND ILLUSTRATIONS. — J. E. Lange, Fl. ag. dan. 4: 100, pl. 153 B. 1939; Kühner & Romagn., Fl. anal. 357. 1953.

This form differs from f. *gracilis* by its normally larger size (cap 15-50 mm, stem 60-150 \times 2-4 mm, gills 3-6 mm broad); the cap in the final stages being more convex, often with revolute margin and large central umbo; the cap furthermore being greyer (chiefly dark grey, M. 10 YR 4/2, 3/2, 2/2), dark greyish brown (M. 10 YR 4/3, 3/3) or dark purple (M. 5 YR 3/2), centre always somewhat browner; the cap drying alutaceous, very pale brown or dirty grey (M. 10 YR 7/1, 7/2, 8/3) and usually mixed or even replaced by pink to red, centre remaining pale yellowish brown (M. 10 YR 7/3, 7/4, 7/6), the surface becoming moderately to strongly rugulose.



Figs. 26, 27. *Psathyrella microrrhiza*, habit sketches. — 26. Denekamp, Singraven, 28 Oct. 1961. — 27. Nieuwersluis, Over-Holland, 8 Nov. 1962.

COLLECTIONS EXAMINED.

NETHERLANDS

O v e r i j s e l: Denekamp, Estate "Singraven", 11 Oct. 1961 and 22 Sept. 1962, E. Kits van Waveren (L).

U t r e c h t: Zeist, 22 Sept. 1962, A. F. M. Reynders (L).

N o o r d - H o l l a n d: Amsterdam, Amsterdamse Bos, 9 Oct. 1960 and 20 Oct. 1963, E. Kits van Waveren (L); Aerdenhout, dunes of Amsterdam Municipal Water-supply, 6 Oct. 1961. E. Kits van Waveren (L); Santpoort, Estate "Duin en Kruidberg", 14 Nov. 1959. E. Kits van Waveren (L).

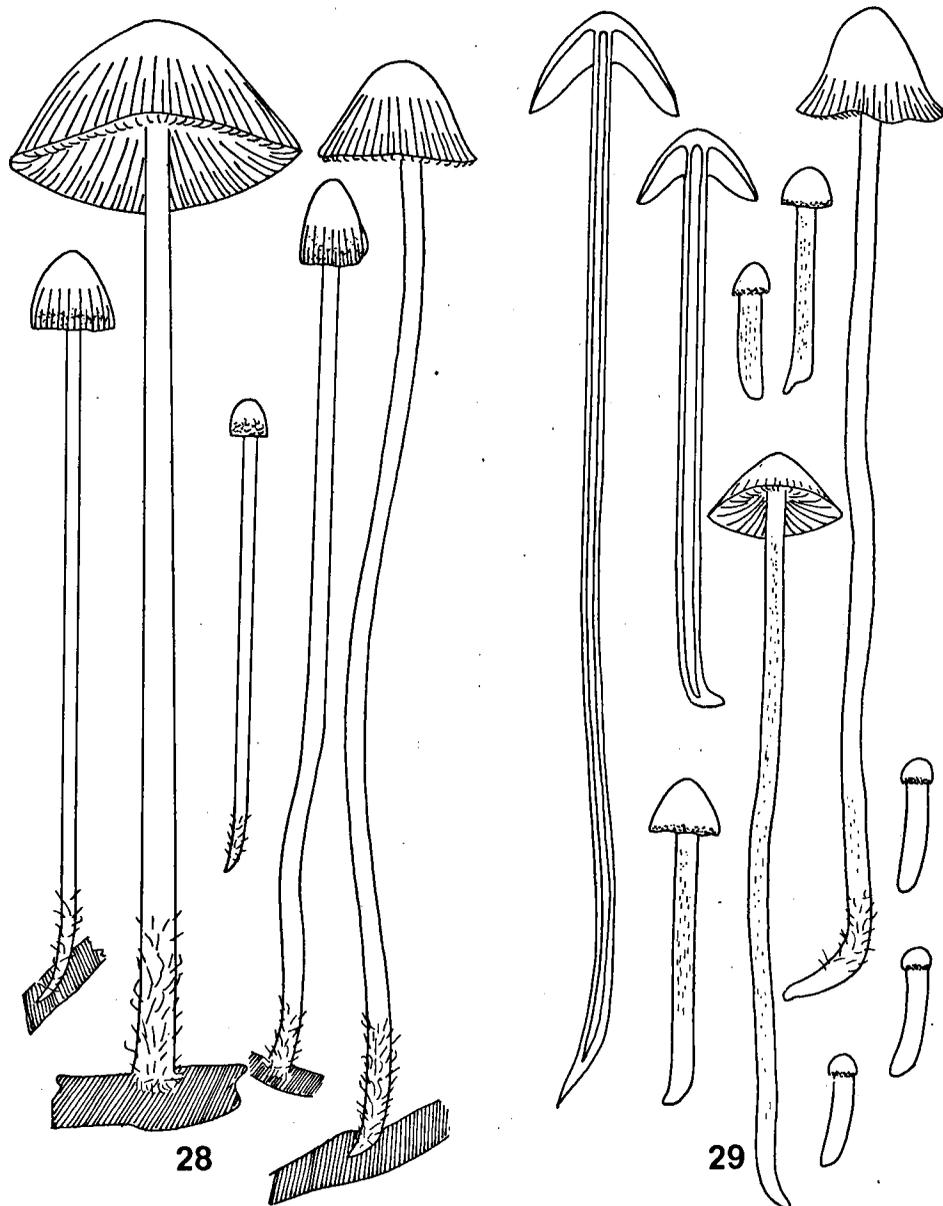
OBSERVATIONS. — There is no sharp delimitation between *P. gracilis* f. *gracilis* and f. *corrugis*, there are many intermediate forms. The two extremes, however, are easily recognisable, like both Kühner & Romagnesi (1953: 357) and J. E. Lange (1939: 100) pointed out. In summing up Kühner & Romagnesi pointedly described *P. gracilis* f. *corrugis* as a "Forme plus robuste, à st[ipe] plus épais (50–130 × 1,5–3 mm), souvent un peu flexueux ou couché, à chapeau plus étalé et fréquemment grisâtre quand il est humide, alutacé ± incarnat par le sec." Whether to raise this form to the rank of a variety or even species seems to be a matter of taste. The small and very large forms of *P. gracilis* so obviously lie in a continuum that we fully agree with Kühner & Romagnesi in distinguishing *P. gracilis* f. *corrugis* as only a form. J. E. Lange (1939: 100) shared this view. We cannot agree with Dennis, Orton & Hora (1960: 144), who raised this form to specific level.

The interpretation of the species described, depicted, and called *Psathyra corrugis* Pers. by Bresadola (1931: pl. 867) seems uncertain because of the white edge of the gills and the colour of the gills of one of the specimens depicted being that of a *Rhodophyllus*.

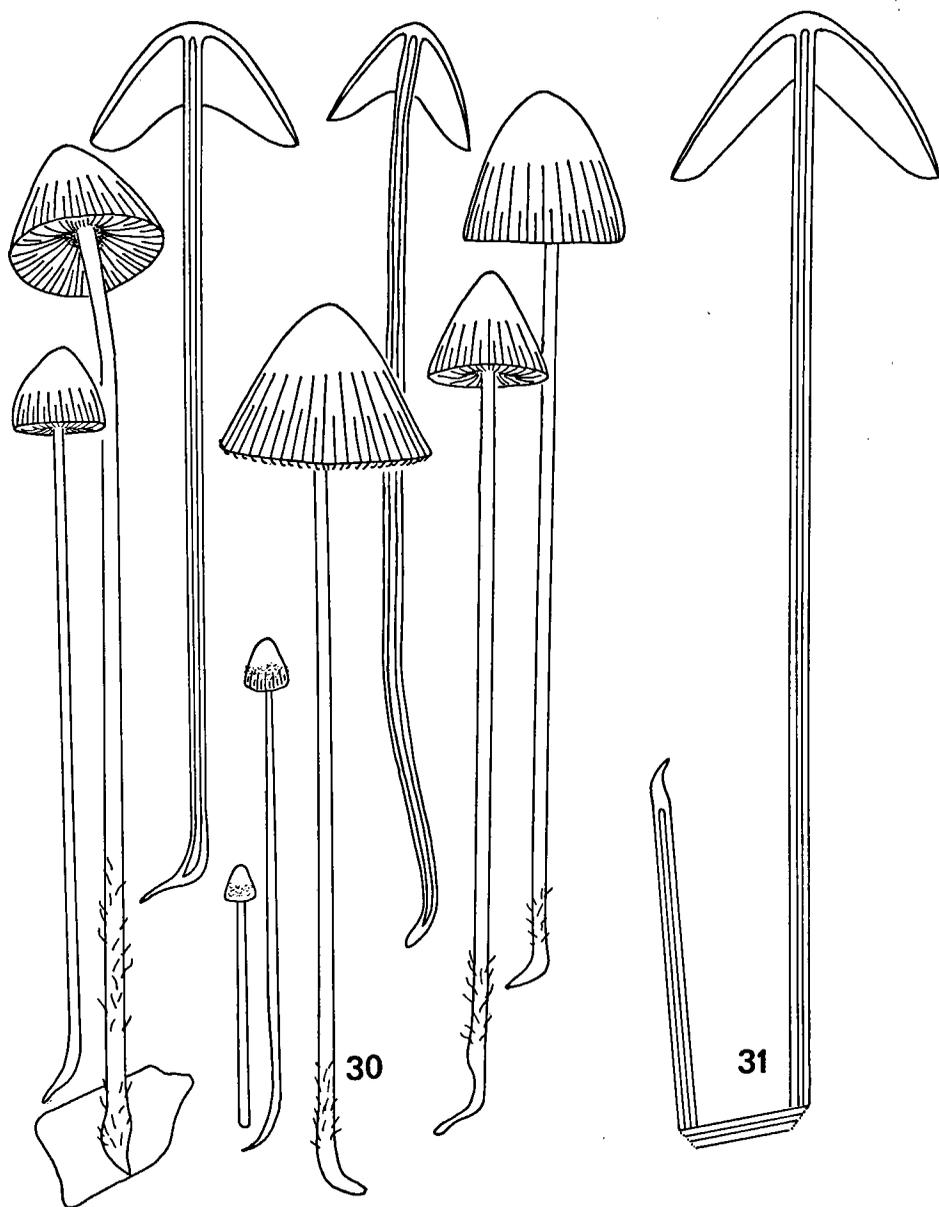
Moser (1967: 213) stated that what he calls *P. corrugis* differs from *P. gracilis* only by the rugulose cap of the former; *P. gracilis* being believed to be "nicht runzelig". This we believe to be incorrect.

Of course, it should be recalled that the microscopic characters of f. *gracilis* and f. *corrugis* are identical.

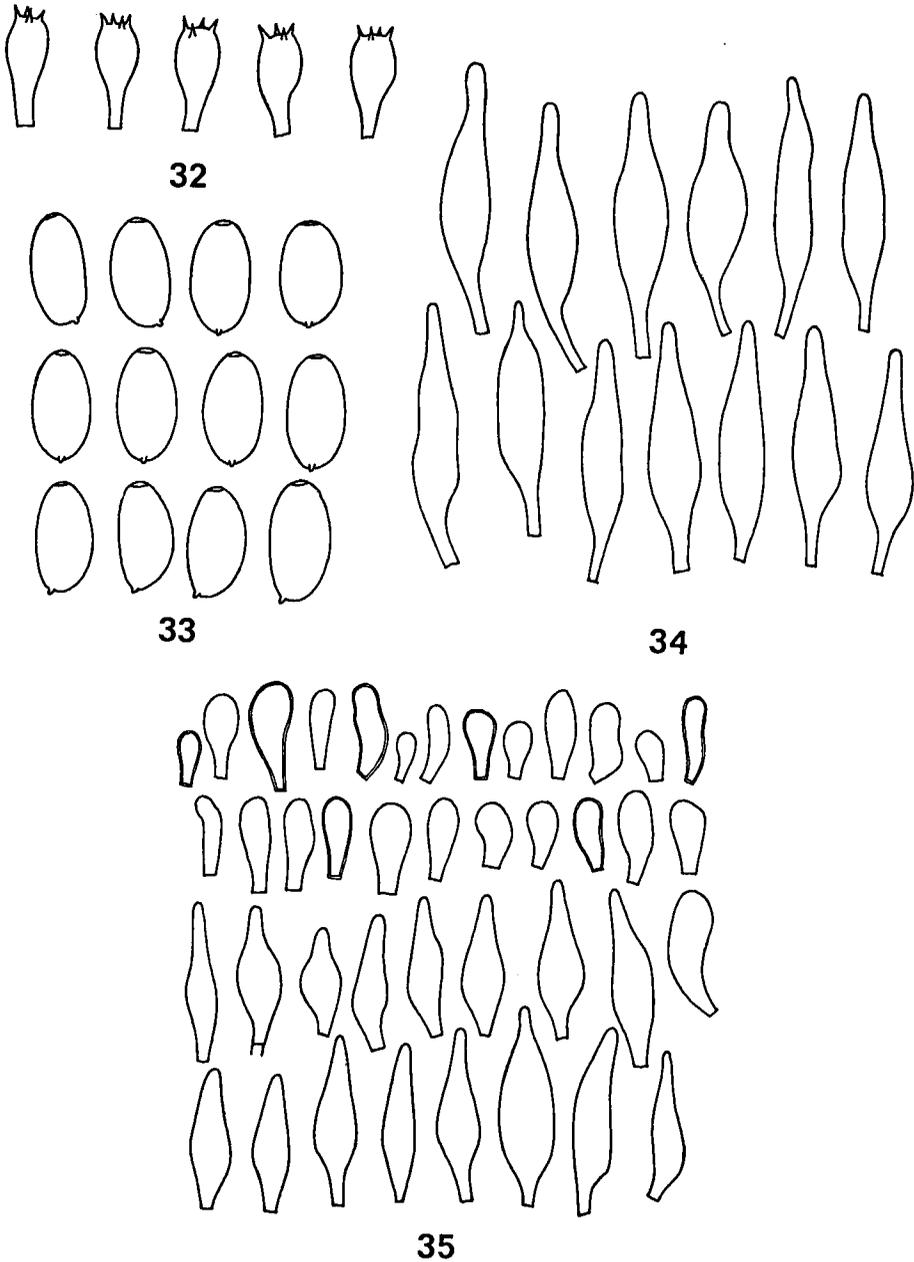
Malençon & Romagnesi (1953: 101) made a very exhaustive effort to reveal the true identity of *A. corrugis* as described by both Persoon (1794: 104; 1797: 24, and 1801: 424) and Fries (1821: 298). They came to the conclusion that with either *Agaricus*, *Psathyra*, or *Psathyrella* the epithet "*corrugis*" was a nomen confusum and therefore should be abandoned. However, they never examined the material of *A. corrugis* in Persoon's herbarium, here chosen as neotype. Both Singer (note left with this material) and us did and found the microscopic characters fully to correspond with those of *P. gracilis* and therewith of *P. corrugis*. Because of its present fairly small size this type material might represent *P. gracilis*, but it should be realised that it is dried material. In 1797 Persoon already stated that his *A. corrugis* seemed to resemble *A. subatratus*, a conspicuously large species. Later (1801: 424) Persoon cited Bulliard's *A. pellospermus*, also a large species, and in his Synopsis (1801: 424 and 425) Persoon



Figs. 28, 29. *Psathyrella microrrhiza*, habit sketches. — 28. Nieuwersluis, Over-Holland, 2 Nov. 1961. — 29. Amsterdam, Amsterdamse Bos, 7 Nov. 1961.



Figs. 30, 31. *Psathyrella microrrhiza*, habit sketches. — 30. Amsterdam, Amsterdamse Bos, 13 Oct. 1960. — 31. Ommen, Eerde, 17 Oct. 1969.



Figs. 32–35. *Psathyrella gracilis* (Overveen, Elswout, 28 Oct. 1966). — 32. Basidia. — 33. Spores. — 34. Pleurocystidiogram. — 35. Cheilocystidiogram. (Figs. 32, 34, 35: $\times 575$; Fig. 33: $\times 1212$.)

separately described *A. corrugis* and *A. gracilis*, stating of the latter that it is "totus fragilis" and "*A. gracilis* ad tenerrimas et fragillimas pertinet species." He therefore must have regarded *A. gracilis* as being a much smaller and delicate species. Both from these descriptions and our own examination of Persoon's type material (that of *A. gracilis* unfortunately is lacking) the conclusion is justified that Persoon already distinguished these two taxa, which we now regard as forms.

PSATHYRELLA GRACILIS f. **clavigera** Kits van Wav., *nov. f.*

Figs. 17-19, 51, 52

A forma typica differt pleurocystidiis variabilissimis multiformibusque, clavatis, obclavatis, cylindraceis, subcylindraceis saepe in media parte constrictis, lageniformibus, subutriformibus, apice subulatis, subobtusis, obtusis, mucronatis, $40-7 \times 9-15 \mu$.

Typus: Ommen, Ada's Hoeve, 15 Oct. 1963, *E. Kits van Waveren* (L).

This form differs from f. *gracilis* by the extremely variable and atypical shape of the rather numerous pleurocystidia on one and the same gill. They may be clavate, obclavate, cylindrical, or subcylindrical and then often are constricted in the middle, or subutriform and sometimes slightly thick-walled, lageniform. The apex of the pleurocystidia can be very obtuse to subulate or mucronate. Already under the low power microscope one immediately notices the abnormal shape of most of these cells.

COLLECTIONS EXAMINED.

NETHERLANDS

O v e r i j s e l: Ommen, Estate "Ada's Hoeve", 15 Oct. 1963, *E. Kits van Waveren* (type, L).

N o o r d - H o l l a n d: Amsterdam, Amsterdamse Bos, 5 Nov. 1959 (2 collections) and 27 July 1960, *E. Kits van Waveren* (L).

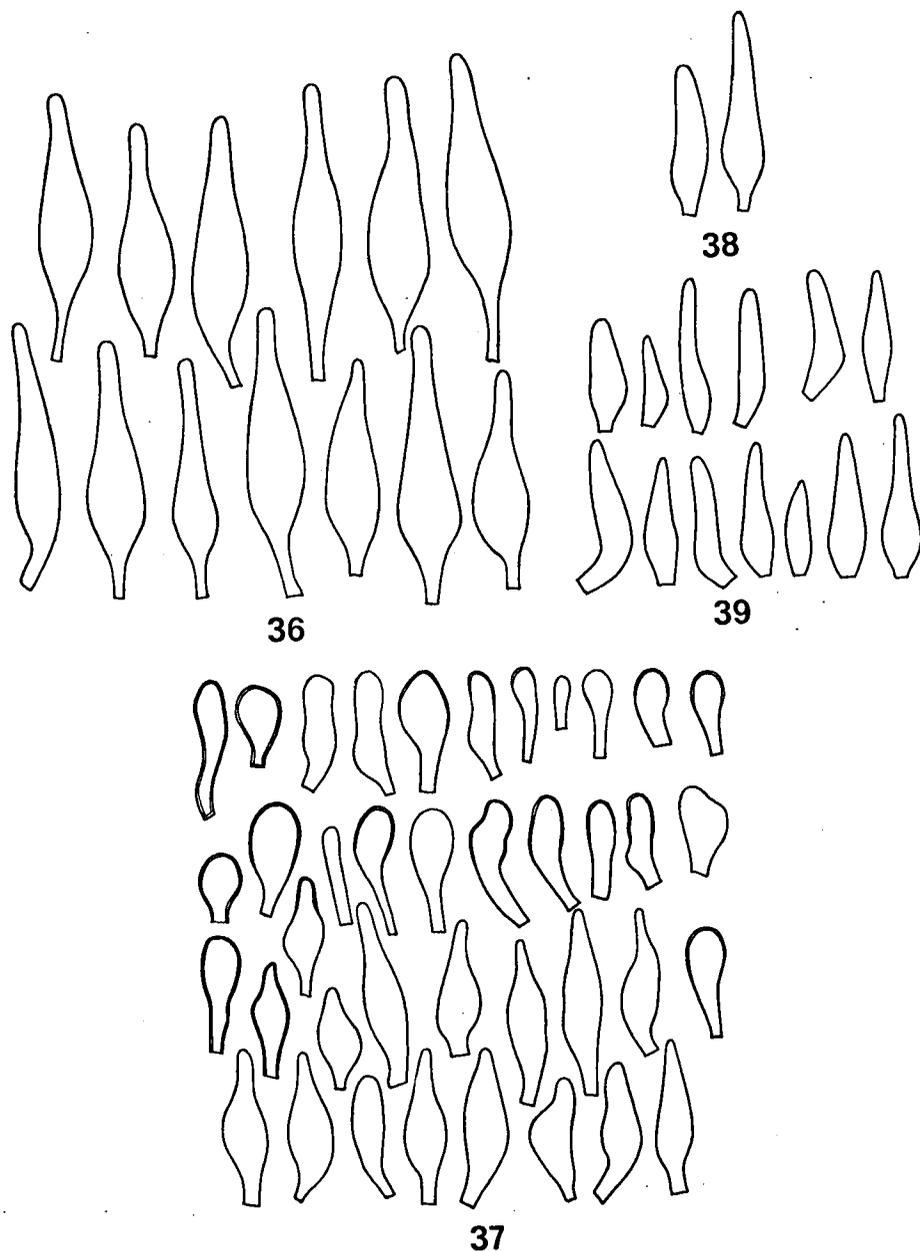
PSATHYRELLA GRACILIS f. **albolimbata** Kits van Wav., *nov. f.*

Figs. 14-16, 53-56

A forma typica differt lamellarum margine alba et pleurocystidiis variabilibus.

Typus: Linnerbroek, 6 Oct. 1962, *A. J. P. Oort* (L).

This form differs from f. *gracilis* by the entire edge being white both on macroscopical and microscopical examination of both young and mature specimens and the pleurocystidia being atypical and variable: elongate, $55-70 \times 11-12.5 \mu$, but very obtuse (collection of 6 Oct. 1962); obtuse and on the whole rather small, $40-50 \times 10-12.5 \mu$, only a few up to 60μ (collection of 13 Nov. 1962); like in f. *clavigera*, $50-80 \times 12.5-17.5 \mu$ (collection of 23 Oct. 1964); very small, $30-45 \times 8-11 \mu$ (collection of 15 Sept. 1969), see Figs. 53-56.



Figs. 36, 37. *Psathyrella gracilis* (Denekamp, Singraven, 12 Oct. 1963). — 36. Pleurocystidiogram. — 37. Cheilocystidiogram. (Both figs.: $\times 575$.)

Figs. 38, 39. *Agaricus corrugis* Persoon (lectotype). — 38. Pleurocystidia. — 39. Cheilocystidiogram. (Both figs.: $\times 575$.)

COLLECTIONS EXAMINED.

NETHERLANDS

N o o r d - H o l l a n d : Santpoort, Estate "Duin en Kruidberg", 13 Nov. 1962, *E. Kits van Waveren* (L).

L i m b u r g : Linnerbroek, 6 Oct. 1962, *A. J. P. Oort* (type, L); Mook, near Hotel "Plasmolen", 23 Oct. 1964, *E. Kits van Waveren* (L).

BRITISH ISLES

O x f o r d s h i r e : near Oxford, "Bagley Wood", 15 Sept. 1969, *E. Kits van Waveren* (L).

PSATHYRELLA GRACILIS f. **substerilis** Kits van Wav., *nov. f.*

A forma typica differt basidiis maxime non-sporigeris; pileo luteolo vel isabellino vel rubello; lamellis candidis ad aciem roseis; sporis rarissimis, $11.7-15.3 \times (6.3-6.8-8.1(-9)) \mu$.

Typus: Denekamp, Singraven, 12 Sept. 1963, *E. Kits van Waveren* (L).

This very striking form differs from f. *gracilis* by the complete or almost complete absence of spores (in the presence, however, of many basidia, carrying sterigmata!) but also by a conspicuous lack of pigment in both cap and gills. As a result the form, which in all other macroscopic aspects (shape, size, rooting stem, absence of veil, etc.) is identical with f. *gracilis*, looks exactly like a *Mycena*. Cap in centre fairly pale yellowish, brownish yellow or reddish yellow (M. 10 YR 7/6, 6/6; 7.5 YR 7/6, 6/6), sometimes yellowish brown (M. 10 YR 5/6, 5/4) or pale brown (M. 10 YR 6/3), towards the margin considerably paler (7.5 YR 6/4, 7/4; 10 YR 7/3, 7/2), finally even whitish. Gills white but gill edge red like in f. *gracilis*. The flesh of the cap is pale yellowish brown or pale brown, the flesh of the stem at the apex has a distinct red zone where it adjoins the gills (like in f. *gracilis*). When studied under the binocular lens the flesh of the cap between the 'ridges' of the gills is pale brown in the centre (M. 10 YR 7/3, 6/3), towards the margin very soon much paler and hardly brown (M. 2.5 Y 6/2, 7/2), near the margin almost white (M. 5 Y 8/2). The "ridges" of the gills are very distinctly olive, hardly brown near the centre of the cap (M. 2.5 Y 5/6 or paler than 5 Y 5/3 and 2.5 Y 5/4), towards the margin much paler (M. 5 Y 6/2, 6/3). The trama of the gills (no need to wash the gill here!) is practically colourless.

On microscopical examination the flesh of the cap is pale to very pale brown, yellowish hyphal septa and encrustations are scarce to even absent (fairly numerous in one of our collections). The trama of the gills is colourless and shows neither yellowish septa nor encrustations. Number, shape and size of the pleurocystidia, cheilocystidia and other marginal cells are identical with those of f. *gracilis*. Spores (if present) slightly larger than in the fertile form: $11.7-15.3 \times (6.3-6.8-8.1(-9)) \mu$.

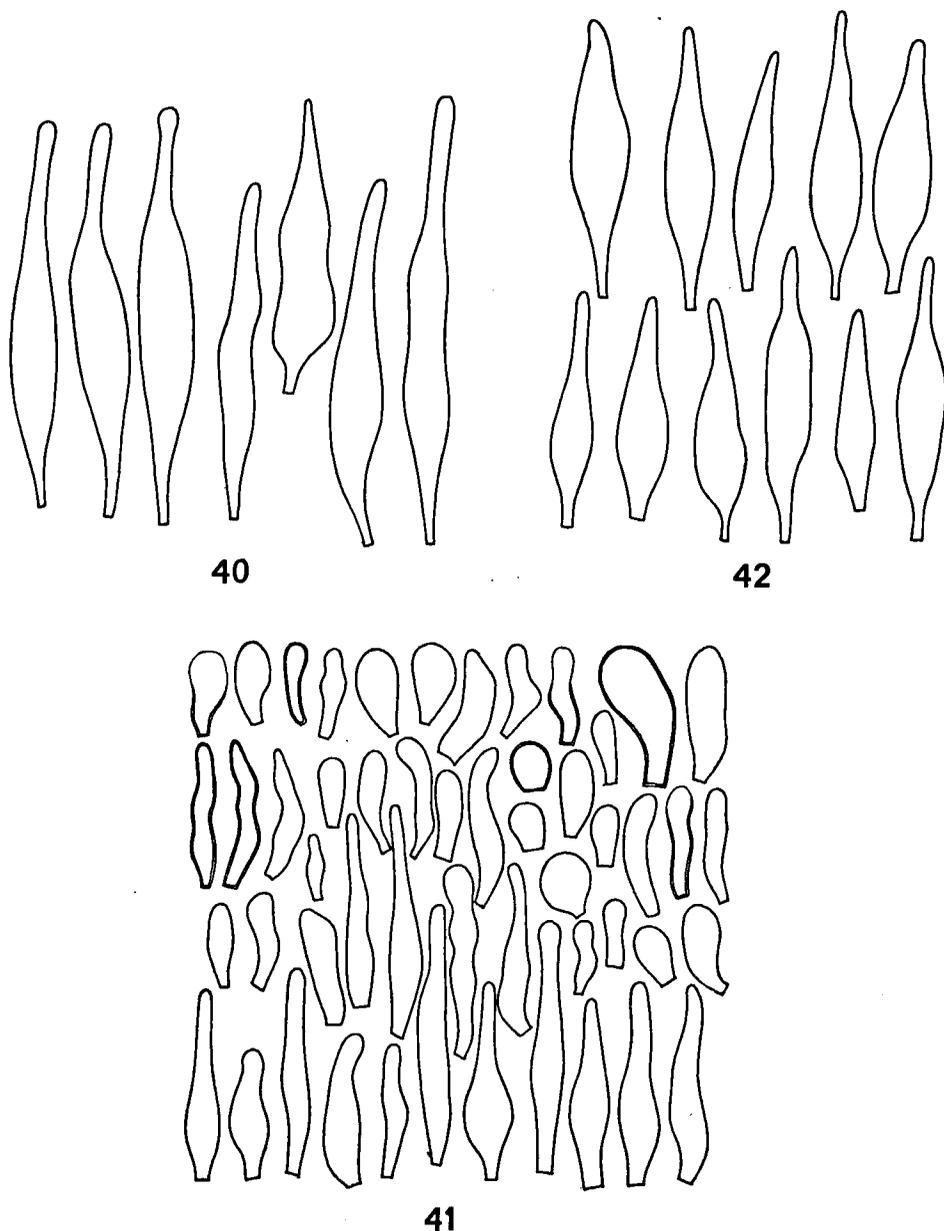
COLLECTIONS EXAMINED.

NETHERLANDS

O v e r i j s e l : Ommen, Estate "Ada's Hoeve", 26 Sept. 1964, *E. Kits van Waveren* (L); Denekamp, Estate "Singraven", 12 Oct. 1963, *E. Kits van Waveren* (type, L).

N o o r d - H o l l a n d : Amsterdam, Amsterdamse Bos, 25 Oct. 1961, *E. Kits van Waveren* (L).

L i m b u r g : Mook, 24 Oct. 1964, *E. Kits van Waveren* (L).



Figs. 40, 41. *Psathyrella gracilis* (Amsterdam, Amsterdamse Bos, 20 Oct. 1958). — 40. Pleurocystidiogram. — 41. Cheilocystidiogram. (Both figs.: $\times 575$.)

Fig. 42. *Psathyrella gracilis* (Denekamp, Singraven, 14 Oct. 1961). Pleurocystidiogram ($\times 575$).

OBSERVATIONS. — After a long search we found two, five, and ten spores respectively in three out of our four collections and a slightly larger number in the fourth. On a gill of our collection of 12 Oct. 1963 (on which we encountered only three spores) we came across a curious triangular spore, having three germ-pores, one at each corner.

We wish to point out that we consider this form to have a different significance from that of the other forms, as it would seem to represent a non-adaptive mutation.

This rather rare form was described by J. E. Lange (1936: 15 and 1939: 100), but not validly published. He called this form rare and remarked that it "may be mistaken for a *Mycena*." This form was also mentioned by Lundell (1942: 23), whose find was growing "prolifically but only a few specimens were fertile."

PSATHYRELLA MICRORRHIZA (Lasch) Konr. & Maubl.

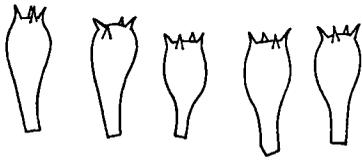
Figs. 20-31, 43-50, 57-62

Agaricus microrrhizus Lasch in *Linnaea* 3: 426. 1828. — *Psathyra microrrhiza* (Lasch) Kummer, *Führer Pilzk.* 70. 1871. — *Drosophila microrrhiza* (Lasch) Quéll., *Ench. Fung.* 118. 1886. — *Psathyrella microrrhiza* (Lasch) Konr. & Maubl., *Agaricales* 123. 1948; Singer in *Lilloa* 22: 469. "1949" [1951] (preoccupied). — Type locality: Germany.

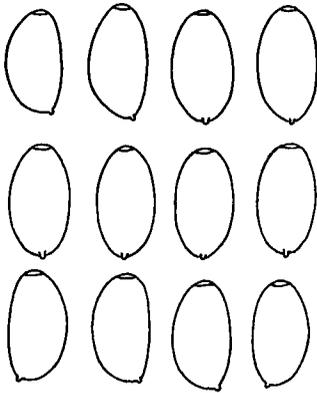
Psathyrella squamifera P. Karst. in *Meddn Soc. Fauna Fl. fenn.* 5: 60. 1882. — Type: not examined.

SELECTED DESCRIPTIONS AND ILLUSTRATIONS. — Cooke, *Ill. Brit. Fungi* pl. 596/622, 1884-1886; J. E. Lange, *Fl. ag. dan.* 4: 101, pl. 154. 1939 (*Psathyra squamifera*); Kühner & Romagn., *Fl. anal.* 358. 1953; Moser in *Kl. KryptogFl.* Ed. 3, 2 (b/2): 214. 1967.

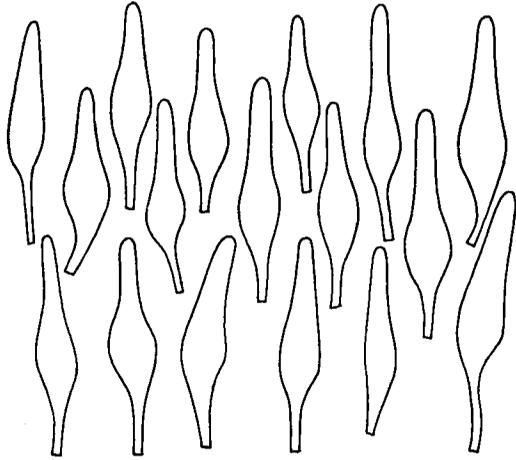
MACROSCOPIC CHARACTERS. — *Cap* at first (primordia or slightly older specimens, cap 4-12 mm diam.) campanulate, smooth, not striate, in centre dark reddish brown (M. 2.5 YR 3/2; 5 YR 3/3, 3/4) or dark brown (M. 7.5 YR 3/2), peripheral half just brown, paler towards the margin (M. 7.5 YR 4/4; 10 YR 5/4), surface covered right up to the top with a rather thick coating (giving the impression in many places of a disrupted loose skin) of white velar fibres and patches of interwoven bundles of fibres, which become denser towards the margin. *Cap* later campanulate, conico-campanulate, conical, in the final stages usually with revolute margin; 7-50 mm broad; surface smooth and strongly striate to striate-sulcate up to 1/2-3/4 from margin inwards; centre greasy, translucent; in the earlier stages in centre still red-brown (M. 5 YR 3/3, 3/4, 4/4) but usually dark brown (M. 7.5 YR 3/2, 4/2, 4/4), paler and often rather dull brown towards the margin (M. 10 YR 3/4, 4/4, 3/3, 4/3, 5/4, 5/3), paler (M. 10 YR 6/4, 6/3) near the margin and in the final stages greyish brown (M. 10 YR 4/2, 5/2), sometimes even pale brownish grey (M. 10 YR 6/2). *Cap* hygrophalous, drying out via yellowish (M. 10 YR 7/6) in the early phases of drying to pale and usually very pale brown or grey-yellowish brown, alutaceous (M. 10 YR 6/3, 7/4, 7/3, 7/2, 8/3), these colours often to some extent mixed with pink (M. 7.5 YR 6/4 to even 2.5 YR 5/4), the centre remaining somewhat darker (M. 10 YR 6/6, 6/4, 7/6, 7/4, 7/3) the completely dry cap rarely almost white (M. 10 YR 7/1), the centre in that case very pale brown (M. 10 YR 8/4, 8/3, 8/2). During the process of drying the surface usually becomes slightly micaceous and usually also somewhat rugulose.



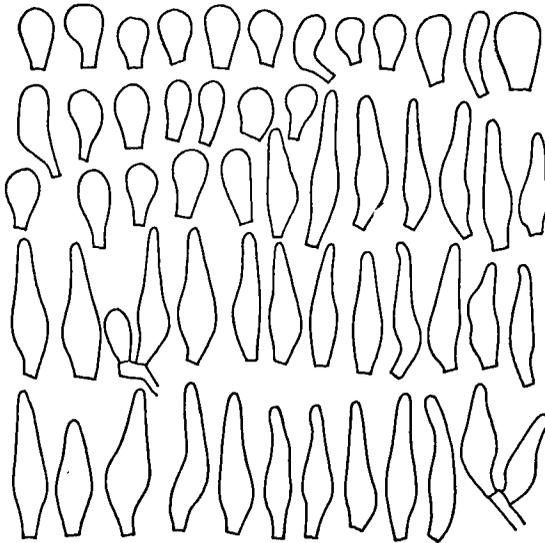
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Figs. 43-46. *Psathyrella microrrhiza* (Overveen, Elswout, 28 Oct. 1966). — 43. Basidia. — 44. Spores. — 45. Pleurocystidiogram. — 46. Cheilocystidiogram. (Figs. 43, 45, 46: $\times 575$; Fig. 44: $\times 1212$.)

Veil as a rule strongly developed but easily washed away by rain; remnants in mature specimens present up to $1/3$ – $2/3$ of the radius of the cap from the margin (sometimes right up to the top) as loose white fibres or bundles of fibres (radially arranged but at the margin often running parallel to it) or even flocci, particularly near and at the margin and here sometimes appendiculate as more or less triangular denticles.

Gills ventricose only near the margin of the cap, then ascending straight or almost straight, very broadly adnate, as a rule with a distinct tooth, 2–5 mm broad, in primordia and very young stages distinctly pale brown (M. 10 YR 6/3, 7/2, 7/3, 7/4) or grey-brown (M. 10 YR 5/2) in the basal $1/3$ – $1/2$ and greyish (M. 10 YR 6/2, 7/1, 6/1, 5/1) towards the edge; in semi-mature specimens grey (M. 10 YR 6/1, 5/1, 4/1) or purple-grey (M. 5 YR 7/2, 6/2, 5/2; 5 YR 6/1, 5/1); in mature specimens very dark purple-grey to purple-black (M. 10 YR 2/2; 5 YR 4/1, 3/1, 3/2, 2/2) towards the base almost always slightly to distinctly browner (M. 10 YR 5/2; 5 YR 4/2, 4/3). Edge of gills white in primordia and very young specimens, later macroscopically almost always red but often only near the margin or not on all gills, on microscopical examination, however, always red either along its entire length or only near the margin of the cap.

Stem cylindrical or very slightly and gradually thickening near the base, 25–190 × 1–4 mm, white to whitish only in its upper part ($1/3$ or less), dirty white or isabelline lower down, sometimes even very pale brown in its lower $1/3$; covered with scattered patches of adpressed white remnants of the veil in its lower $2/3$ or less; apex pruinose; hollow; rooting (root up to 30 mm and very often quite short); base usually densely covered over 15–40 mm with white hairs.

Flesh of cap brown to dark brown (M. 10 YR 4/3, 4/4, 3/3, 3/4) or dark greyish brown (M. 10 YR 4/2), in centre 0.5–3 mm thick; of stem grey-brown adjoining the gills but otherwise whitish in upper part, isabelline or even pale brown in lower part; usually and particularly when the edge of the gills is conspicuously red, a narrow zone of the flesh, adjoining the gills is red and if so sometimes such a red zone is also present along the base of the gills near the stem.

Spore print in a thin layer purple, in a thick one black.

Pigmentation under binocular lens (for technique, see p. 249). Flesh of cap between 'ridges' of gills rather dark brown (M. 7.5 YR 5/4; 10 YR 5/3, 6/3, 6/4), in centre even darker (M. 7.5 YR 4/4), near the margin much lighter (M. 10 YR 7/3, 7/2); 'ridges' of gills dark brown and without olive tinge (M. 7.5 YR 4/4; 10 YR 3/4, 3/3, 4/3, 4/4, 5/4, rarely 5/3) hardly paler near the margin of the cap. Trama of gills very pale brown (M. 10 YR 7/3, 8/3, 8/2) and usually almost colourless near the edge, a narrow but sometimes fairly broad zone at the base being, however, distinctly brown (M. ± 10 YR 6/3, rarely towards 10 YR 6/4), more often paler (M. 10 YR 7/3 or even 8/3) rarely practically colourless.

MICROSCOPIC CHARACTERS. — *Spores* ellipsoid-amygdaliform, 9.9–13.5 (–14.4) × (5.4–)5.9–7.2 μ (11.9 × 6.3 μ), dark reddish brown in water (M. 2.5 YR 3/4; 5 YR 3/3, 3/4), opaque to subopaque, with comparatively small hilar appendix on adaxial face and large apical germ-pore (± 2 μ diam.).

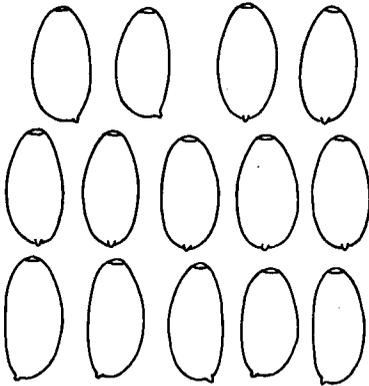
Basidia 4-spored, 19.2–35.2 × 9.6–12.8 μ.

Pleurocystidia fairly numerous, rarely scarce or very numerous, on the whole rather lageniform, plump with subobtuse to obtuse apex, not infrequently subcapitate, 40–70 × 8–15 μ, but not infrequently longer, (75–85 μ), rarely very long, up to 100 μ, and then slightly wavy; hyaline, no crystals or mucus.

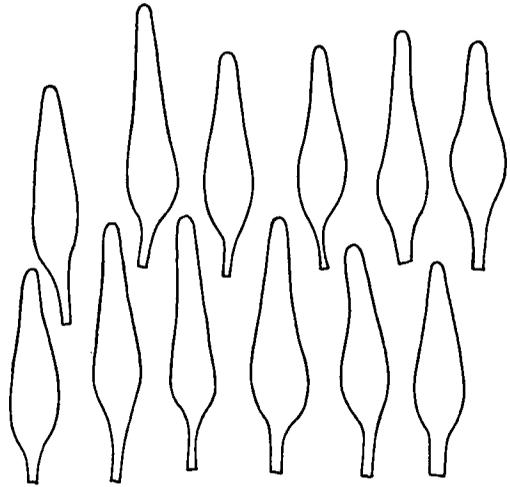
Marginal cells chiefly lageniform and of fairly uniform shape but somewhat variable size, densely packed, more than 100 per 1000 μ gill edge, 20–55 × 5–13 μ. In between them a comparatively small number of rather small and therefore not easily detected



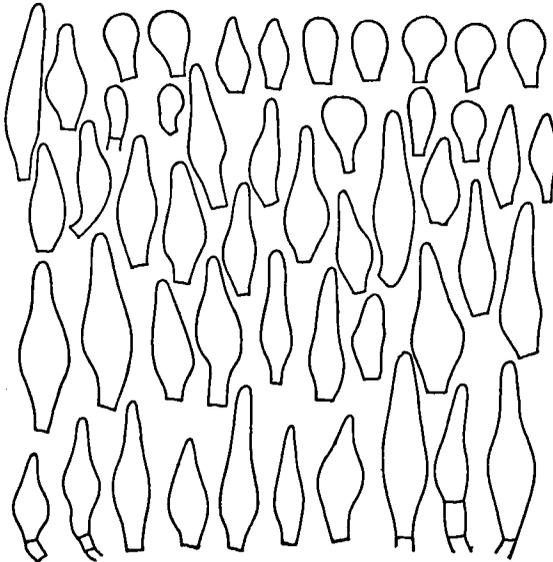
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48



49



50

Figs. 47–50. *Psathyrella microrrhiza* (Castricum, Dunes County Watersupply, 28 Sept. 1968), — 47. Basidia. — 48. Spores. — 49. Pleurocystidiogram. — 50. Cheilocystidiogram. (Figs. 47, 49, 50: $\times 575$; Fig. 48: $\times 1212$.)

spheropedunculate, clavate or subcylindric cells, $10-25(-30) \times 4-12(-14)\mu$. Subhymenium at gill edge reddish.

Pigmentation under microscope. Hyphae of hypodermis usually strongly coloured by brownish membranal pigment with great numbers of yellow coloured hyphal septa and very numerous encrustations. Trama of gills distinctly but often not very strongly brownish by membranal pigment, always, however, distinctly and quite often fairly strongly brown in a narrow zone along the base of the gills. Always (often only a few but usually a fair number) yellow hyphal septa and usually also a few encrustations in the basal part of the gills.

Cap cuticle cellular.

HABITAT. — In deciduous woods, parks, damp places, in rich or clayey soil, in grass by roadsides, amongst rotting leaves, on compost, on rubbish heaps; roots usually attached to small pieces of dead wood or small branches, lying just below the surface of the ground. September–November. Common.

COLLECTIONS EXAMINED.

NETHERLANDS

33 collections from widely dispersed localities (Denekamp, Estate "Singraven"; Nieuwersluis, Estate "Over-Holland"; Haarzuilens, Estate "De Haar"; Amsterdam, Amsterdamse Bos; Castricum, Dunes of County Watersupply; Santpoort, Estate "Duin en Kruidberg"; Aerdenhout, Dunes of Amsterdam Municipal Watersupply; Vogelenzang, Estate "Leyduin"; Overveen, Estate "Elswout"), *E. Kits van Waveren* 1958–1969 (L).

OBSERVATIONS. — When at a fairly superficial examination the edge of the gills does not seem to be red but white, a careful search in other specimens of the collection and of all gills will reveal gills of which the edges are red, be it perhaps only near the margin of the cap of some gills. Rarely microscopical examination is needed to find traces of a red gill edge — in that case practically always near the margin of the cap. Out of 33 collections we only have one, consisting of three specimens only, in which all gill edges were pure white, even on microscopical examination, the pleurocystidia being typical of *P. microrrhiza*. Yet, we do not think it would be wise to distinguish this rare case as a separate form, like we did in the case of *P. gracilis* f. *albolimbata*, where not only the gill edge was white but also the pleurocystidia were different from those of f. *gracilis*. It would seem that *P. microrrhiza* f. *pseudobifrons* Romagn. (*apud* Kühner & Romagn., 1953: 358, not validly published) refers to an identical case.

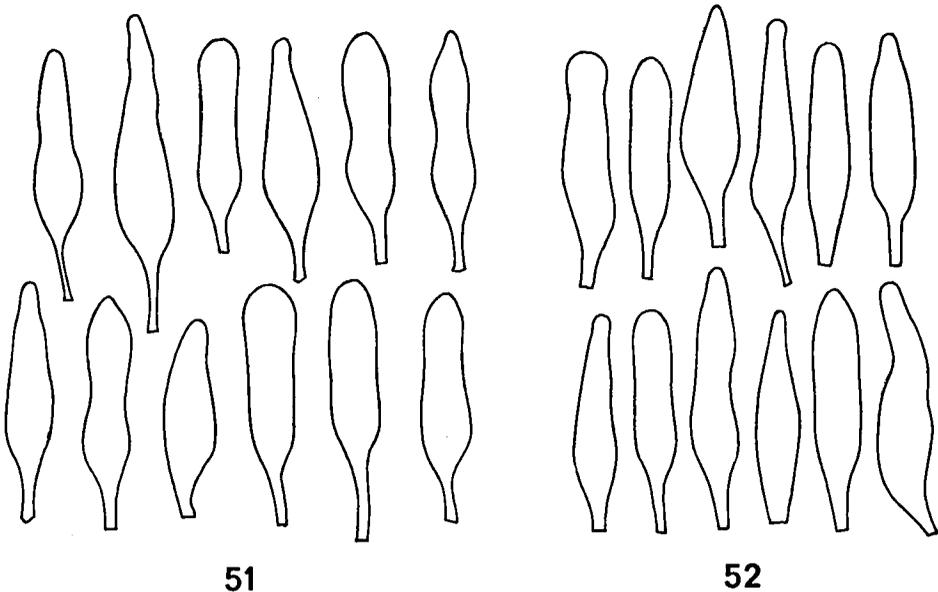
Time and again we were struck by the very large size of specimens of *P. microrrhiza* when this species was growing on very clayey soil (stems $130-190 \times 2-4$ mm) and the very small *P. gracilis*-like size when the species was growing on the more sandy soil of the dunes (stems $35-55 \times 1-1.5$ mm). At one time we even believed we should distinguish a small "forma *dunensis*" from the otherwise tall *P. microrrhiza*, but subsequently refrained from doing so since we found that small specimens are not exclusively connected with sandy soil, while on the other hand we found rather large specimens in fairly rich but still mainly sandy soil of the dunes.

Very rarely we found the pigmentation of the trama of the gills very slight and *gracilis*-like when studied under the binocular lens ('ridges' of the gills even very slightly olive), but on careful microscopical examination some pigmentation and also a few yellow hyphal septa were always found. Spore sizes varied considerably, the extreme mean values found among the 33 collections examined being $10.4\text{--}13.1 \times 5.6\text{--}6.8 \mu$. In these collections, the numbers of lageniform cheilocystidia per 1000 μ gill edge ranged from 107 to 300 with a decided preponderance of the numbers between 140 and 240: 107-108-110-113-123-125-142-147-149-150-157-161-172-175-176-183-188-197-198-200-200-206-209-213-215-224-236-261-267-300 (in two cases all cells had disappeared). The cells being so very closely packed, counting them is difficult with the result that these figures are even bound to be too low.

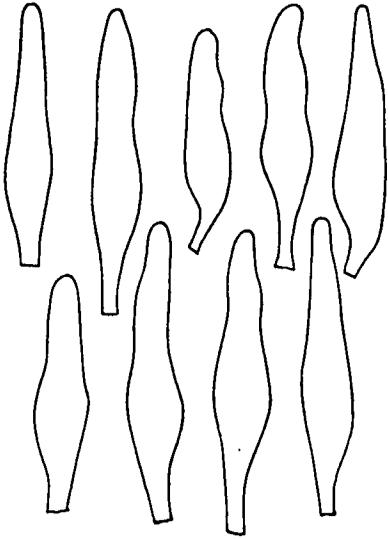
Several authors agreed to the synonymy of *P. squamifera* P. Karst. with *P. micro-rhiza*. We endorse this view although we have not examined the type material.

Distinction of the two species

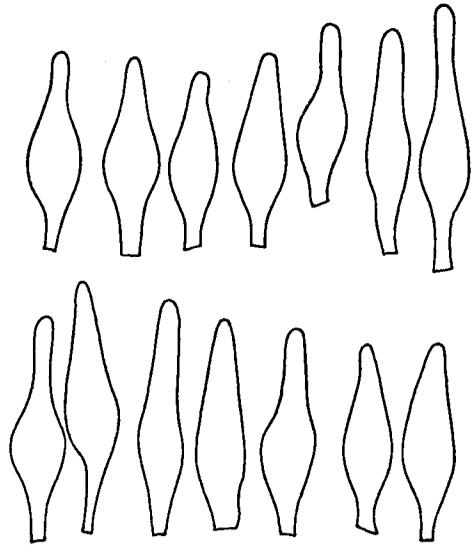
Although the shape and size of *P. gracilis* vary considerably (see figs.), one usually recognises this species quite easily in the field by its slender habit and normally small size, its cap being mud-grey (brown only in the early stages and particularly in the



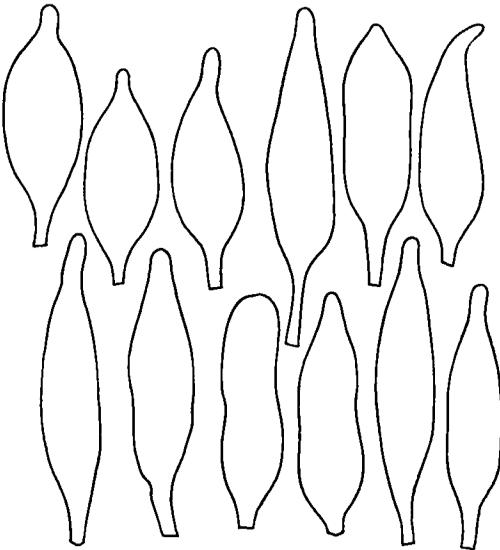
Figs. 51, 52. *Psathyrella gracilis* f. *clavigera*. Pleurocystidiograms. — 51. Amsterdam, Amsterdamse Bos, 5 Nov. 1959. — 52. Ommen, Ada's Hoeve, 15 Oct. 1963. (Both figs.: $\times 575$.)



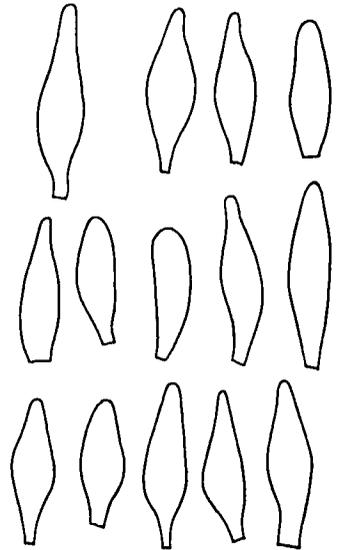
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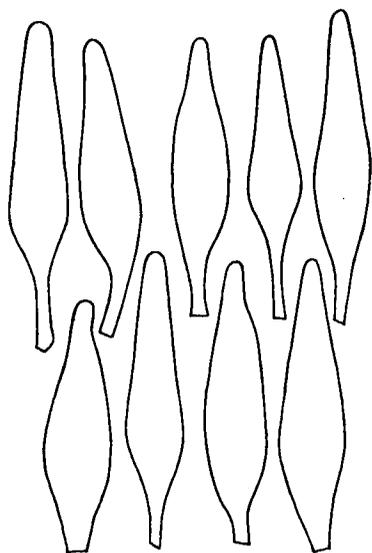


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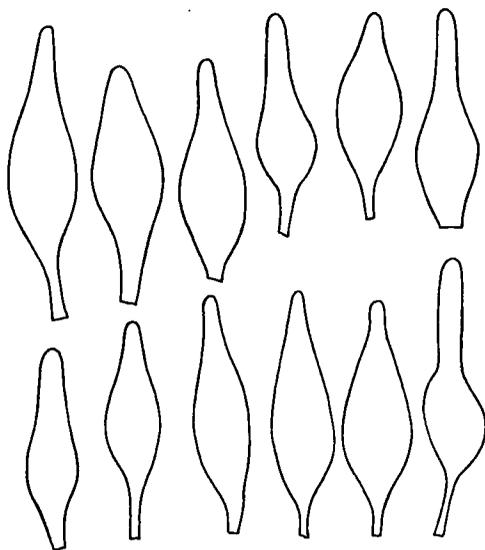


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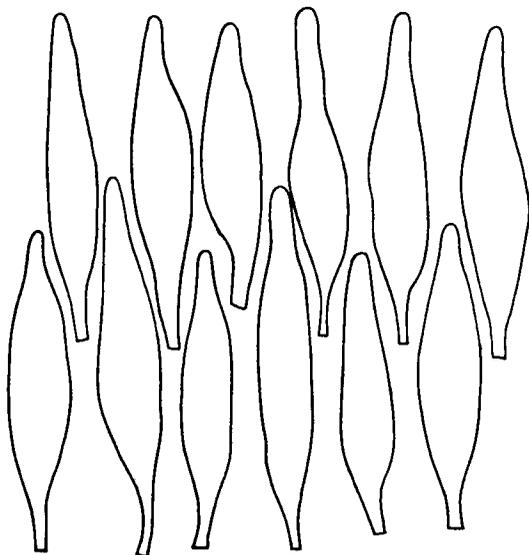
Figs. 53–56. *Psathyrella gracilis* f. *albolimbata*. Pleurocystidiograms. — 53. Linnerbroek (type), 6 Oct. 1962. — 54. Santpoort, Duin en Kruidberg, 13 Nov. 1962. — 55. Mook, near Plasmolen, 23 Oct. 1964. — 56. British Isles, Oxford, Bagley Wood, 15 Sept. 1969. (All figs: $\times 575$.)



57



58



59

Figs. 57–59. *Psathyrella microrrhiza*. Pleurocystidiograms (Vogelenzang, Dunes of Leyduin, 3 collections, 25 Oct. 1963). (All figs: $\times 575$.)

centre) and turning pinkish on drying, its very dark purplish grey to almost black and very broadly adnate gills, its red gill edge, its rooting stem and the absence of a veil (for this character one should examine very young specimens). Closer and above all microscopical examination is needed to rule out *P. pseudogracilis*, *P. polycystis*, *P. caudata*, *P. gracilis* f. *clavigera* and f. *albolimbata*.

It is, however, not infrequently very difficult to distinguish between *P. gracilis* and *P. microrrhiza*, particularly so, as both species may have the same habit and habitat.

The combination of the distinct veil on the surface of the cap (to be observed in young specimens) and of a distinctly brown trama of the gills in *P. microrrhiza* are the criteria by which, according to Kühner & Romagnesi (1953: 355) this species is being distinguished from *P. gracilis*, which lacks a veil and is supposed to have a non-pigmented trama of the gills. Weather conditions (rain!) and age, however, often cause the complete disappearance of the veil and also much of the pigment in *P. microrrhiza*. On the other hand, as pointed out previously, the trama of the gills of primordia of *P. gracilis* is distinctly brown and this colour may persist to a slight extent in mature specimens, of which the 'ridges' of the gills are always brown with a distinct olive tinge under the binocular lens and usually show a trace of brown both under the microscope also.

As for the veil, sometimes (as pointed out previously) in *P. gracilis* velar fibres may be found in mature specimens at a slight distance from the margin on the surface of the cap.

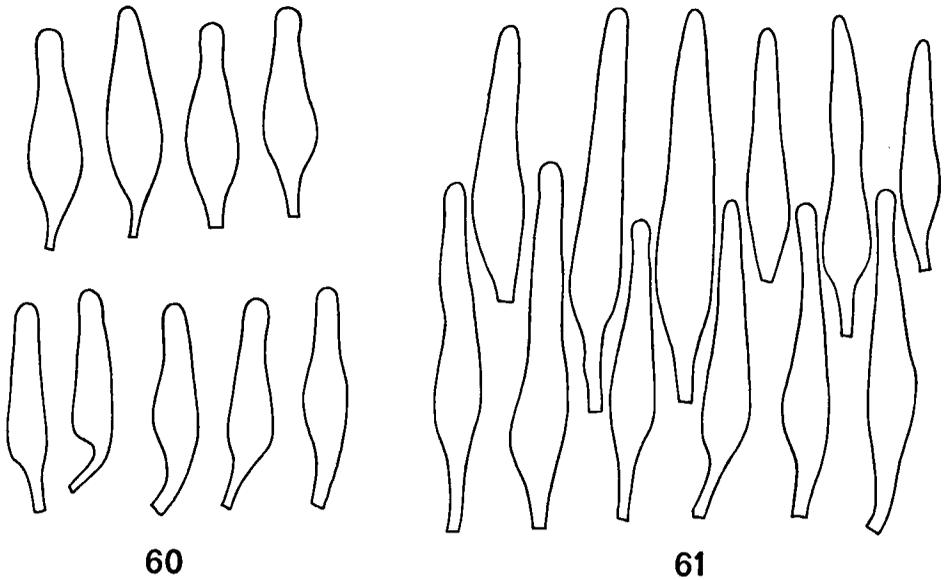
Therefore, with regard to the two decisive characters, alleged to separate the two species, some overlapping exists on the part of *P. gracilis* towards *P. microrrhiza* and — due to external conditions — vice versa.

There are a few more characters, which to some extent may help to distinguish between the two species. The pleurocystidia in *P. gracilis* usually are slender, wavy, subulate or even acute, whereas they usually are slightly smaller, plumper, not wavy, obtuse to subobtuse in *P. microrrhiza*, but the dividing line between the two kinds is not very sharp. On the whole *P. microrrhiza* — particularly when growing in clayey soil — is a larger and taller species than *P. gracilis*, but here too the overlapping is considerable. The caps of *P. microrrhiza* usually are browner when wet and they show a lesser tendency to turn pink on drying than those of *P. gracilis*, but here again considerable overlapping exists.

The same overlapping exists with regard to the micaceous and rugulose appearance of the drying and dry cap, both usually being somewhat less marked in *P. microrrhiza* than in *P. gracilis*.

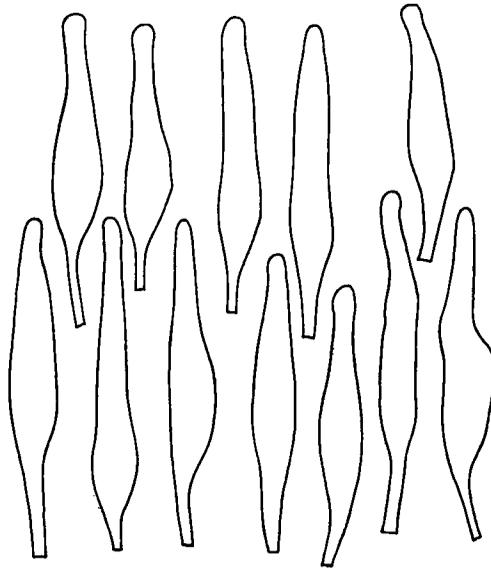
Finally the stems of *P. gracilis* are beautifully white (sometimes only slightly isabelline in the lower part), whereas those of *P. microrrhiza* are usually slightly isabelline in the lower $1/2-1/3$ (if not even slightly brown) and only white in the upper part, the reliability of this character again being dubious.

In contrast with the characters mentioned above, we found the different density of cheilocystidia per 1000 μ gill edge a far more reliable feature for the distinction of the two species. In *P. gracilis* the number of these cells never exceeds 100 per 1000 μ gill



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Figs. 60–62. *Psathyrella microrrhiza*. Pleurocystidiograms. — 60. Amsterdam, Amsterdamse Bos, 9 Oct. 1960. — 61. Amsterdam, Amsterdamse Bos, 7 Nov. 1961. — 62. Amsterdam, Amsterdamse Bos, 29 Oct. 1963. (All figs: $\times 575$.)

edge (preponderance between 9 and 40) whereas in *P. microrrhiza* this number always exceeds 100 (preponderance even between 140 and 240). Put into words, the cheilocystidia in *P. gracilis* occur more or less scattered on the edge of the gills among a vast majority of more or less spheropedunculate cells, whereas in *P. microrrhiza* they are densely packed.

In six collections primarily listed as *P. gracilis* and four primarily listed as *P. microrrhiza*, the specimens did not adequately seem to answer the diagnostic criteria mentioned above for these species. A few examples may serve to illustrate this: —

In one collection the veil of primordia did not reach any further than the margin of the cap and the pleurocystidia were typically *gracilis*-like, yet the trama of the gills was distinctly be it slightly coloured and the cheilocystidia numbered 145–213 per 1000 μ gill edge. In another collection one specimen showed velar remnants up to $1/4$ of the radius of the cap and the pleurocystidia were *microrrhiza*-like but the pigmentation of the trama of the gills was practically none and could not have been washed away by rain, as the veil still was very much in evidence. In still another collection the pigmentation of the gills was practically none, the veil inserted at the margin of the cap and the pleurocystidia were *gracilis*-like but in one specimen velar remnants reached up to $1/4$ of the radius of the cap. Again in another collection velar fibres reached up to halfway the apex of the cap, the pleurocystidia were obtuse or even subcapitate and the trama of the gills was slightly but distinctly pigmented, but the cheilocystidia only numbered 25 per 1000 μ gill edge. Seven fairly young specimens were collected at another occasion because of their strikingly brown caps and velar fibres reaching up to halfway the centre of the cap, so that at first they were believed to be specimens of *P. microrrhiza*, however, the trama of the gills was hardly coloured ('ridges' being distinctly olive) and the cheilocystidia numbered only 53 per 1000 μ gill edge. The trama of the gills of three specimens of yet another collection was decidedly pigmented, but the specimens did not show the slightest trace of a veil, the caps were mud-grey and the cheilocystidia numbered only 84 per 1000 μ gill edge.

It cannot be denied therefore that in this group of very closely related species, like in any such group, puzzling and seemingly intermediate forms occur. This should not, however, keep us from maintaining the two taxa *P. gracilis* and *P. microrrhiza* as different species.

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