

## NOTES ON THE GENUS *PSATHYRELLA*—V

### The sections *Ammophilae*, *Bipellis* and *Subatratae*

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(With 52 Text-figures)

The treatment of subgenus *Psathyrella* is rounded off with descriptions of and observations on *Psathyrella ammophila*, *P. bipellis* and *P. conopilus*, each the type species and sole representative in Europe of respectively section *Ammophilae* *sect. nov.*, section *Bipellis* and section *Subatratae*.

Having dealt with sections *Atomatae* (Romagn.) *ex* Singer and *Psathyrella* *emend.* Kits van Wav. of *Psathyrella* subgenus *Psathyrella* in two previous papers (Kits van Waveren 1972: 23—54 and 1976: 345—405), in the present paper we are rounding off our treatment of this subgenus by describing and discussing the remaining three species of the subgenus *Psathyrella*, each of which is both sole European representative and type species of a separate section of the subgenus: *P. ammophila* (Dur. & Lév.) P. D. Orton for which we propose a new section, section *Ammophilae*, *P. bipellis* of section *Bipellis* Malençon & Romagn. and *P. conopilus* of section *Subatratae* (Romagn.) *ex* Singer.

For our methods of examining the pleuro- and cheilocystidia, the shape, size and colours of the spores, the basidia and the pigmentation of the hymenophoral trama, the reader is referred to our previous papers (Kits van Waveren 1968: 132; 1971a: 249, and 1972: 24). As in our previous papers spore measurements are given both as a range and as a mean value added between brackets. Whenever spores were measured for this purpose it was always 20 of the darkest (= ripest) spores, found on a gill, that were measured. For the description of the colours of the carpophores, spores and pigmentation of hymenophoral trama we used 'Munsell Soil Color Charts' edition 1971 (abbreviated: M.).

It is again assumed that Romagnesi wrote the chapter on the genus *Drosophila* in the 'Flore analytique' (Kühn. & Romagn., 1953), which explains why only his name is quoted when our text refers to this chapter.

For reasons given in our earlier paper (Kits van Waveren 1976: 346) in the descriptions of the species we have omitted the structures and the pigmentation of the various layers of the flesh of the cap. For our warning against misinterpretation of the misleading colours of seemingly fresh caps and their flesh due to the early and not realized onset of the process of drying out, also see our previous paper (1976: 346).

In our descriptions we continued to call the pleurocystidioid cells on the gill edge



Fig. 1. *Psathyrella ammophila*, 7 Sept. 1965. — Habit sketch ( $\times \frac{1}{2}$ ).

Figs. 2, 3. *Psathyrella bipellis*. — Habit sketches ( $\times \frac{1}{2}$ ). — 2. 16 Nov. 1976. — 3. 24 July 1966.

'cheilocystidia', and the other type of cells 'spheropedunculate cells', while as far as possible we estimated the ratio between the two types of cells as they occur on the sterile gill edge (Kits van Waveren 1976: 348).

In the list of collections the author's name is abbreviated to E.K.v.W.

We are greatly indebted to Professor A. H. Smith for lending us five of his collections of *P. arenulina* (Peck) A. H. Smith.

#### ***Psathyrella* section *Ammophilae* Kits van Wav., sect. nov.**

Carpophora solitaria, in dunarum arenis frequentia. Pileus majusculus, subcarnosus, haud vel vix striatus, sordide brunneus, hygrophanus. Velum manifestum tametsi fugax. Lamellae ventricosae, obscure purpureo-brunneae, acie albae. Stipes arrhizus, parte inferiore atque in arenum insertus. Sporae in cumulo purpureo-atratae,  $10-14 \times 6-7 \mu\text{m}$ , poro germinativo praeditae. Basidia 4-sporigera. Pleurocystidia exigua, magna. Cheilocystidia pleurocystidiis similia, vulgo exigua. Cellulae spheropedunculatae clavataeque crebrae. Trama lamellarum colorata. — Species typica: *Psathyrella ammophila* (Dur. & Lév.) P. D. Orton.

Carpophores solitary in shifting coastal dunes; cap medium sized, rather fleshy, not or scarcely striate, sordid brown, hygrophanous; veil distinct but fugacious; gills ventricose, dark purplish brown with white edge; stem not rooting but lower

half or third buried in the sand, spore print purplish black; spores  $10-14 \times 6-7 \mu\text{m}$  with distinct germ pore; basidia 4-spored; pleurocystidia scarce, large; cheilocystidia normally scarce, similar to pleurocystidia; spheropedunculate and clavate cells very numerous; hymenophoral trama coloured. — Type species: *Psathyrella ammophila* (Dur. & Lév.) P. D. Orton.

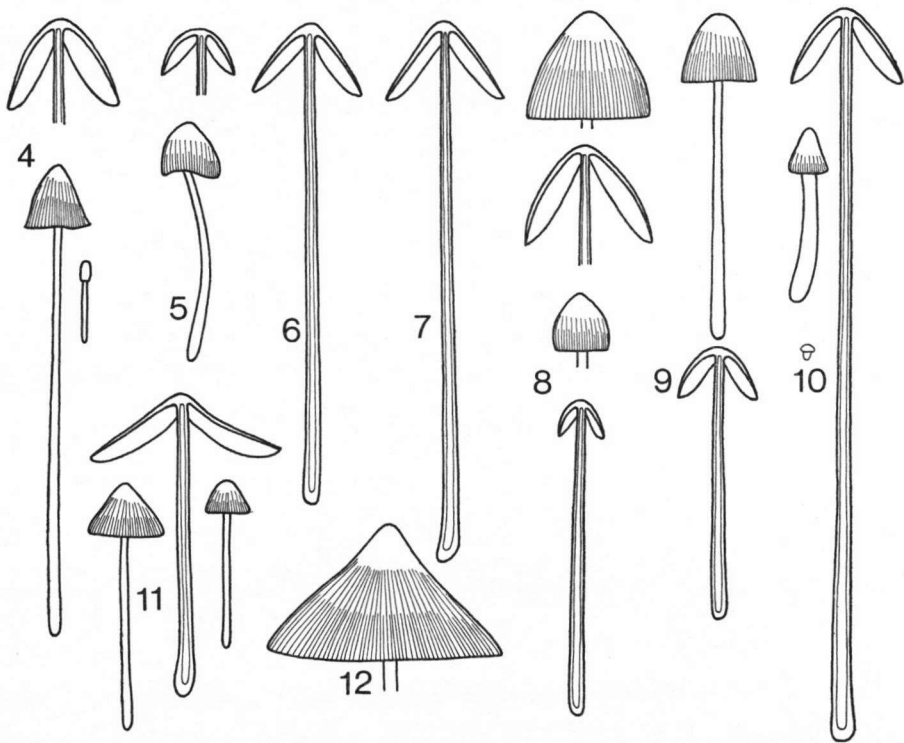
For discussion see under *P. ammophila* (p. 000).

**PSATHYRELLA AMMOPHILA** (Dur. & Lév.) P. D. Orton—Figs. 1, 13—29

*Agaricus ammophilus* Dur. & Lév., *Explor. sc. Alg.* 14: 1868, pl. 31 fig. 8. 1848. — *Psilocybe ammophila* (Fr.) Gill., *Hym. Fr.*: 587. 1878. — *Psathyra ammophila* (Dur. & Lév.) Quéf. in *Bull. Soc. bot. Fr.* 26: 52. '1879' [1880]. — *Drosophila fatua* var. *ammophila* (Dur. & Lév.) Quéf., *Enchir. Fung.*: 117. 1886. — *Drosophila ammophila* (Dur. & Lév.) Quéf., *Fl. mycol. Fr.*: 62. 1888. — *Deconica ammophila* (Dur. & Lév.) Morgan in *J. Mycol.* 13: 145. 1907. — *Hypholoma ammophilum* (Dur. & Lév.) Bigeard & Guillemin, *Flore Champ. sup. Fr.*: 345. 1909.

*Psilocybe ammophila* var. *ecaudata* Maire in *Bull. Soc. bot. Fr.* 56: 279. '1909' [1911].

*Psilocybe subammophila* Cleland in *Trans. Proc. Roy. Soc. South Austr.* 51: 306. 1927.



Figs. 4—12. *Psathyrella conopilus*. — Habit sketches ( $\times \frac{1}{2}$ ). — 4. 7 Oct. 1961. — 5. 8 Nov. 1962. — 6. 22 Sept. 1964. — 7. 23 Oct. 1965. — 8. 8 Oct. 1966. — 9. 11 Nov. 1967. — 10. 15 Nov. 1968. — 11. 13 July 1968. — 12. 3 Oct. 1975.

*Agaricus arenulinus* Peck in Rep. N.Y. States Mus. 30: 42. 1878. — *Psilocybe arenulina* (Peck) Sacc., Syll. Fung. 5: 1–57. 1887. — *Psathyrella arenulina* (Peck) A. H. Smith in Mem. N.Y. bot. Gdn. 24: 276. 1972.

SELECTED DESCRIPTIONS AND ILLUSTRATIONS.—Cooke, Ill. Brit. Fungi: pl. 606B/599. 1884–1886 (as *Agaricus ammophilus*); Bresadola, Iconogr. mycol. 18: pl. 857. 1931 (as *Psilocybe ammophila*); J. E. Lange, Fl. agar. dan. 4: 82, pl. 148B. 1939 (as *Psilocybe ammophila*); Kühn. & Romagn., Fl. anal.: 358. 1953 (as *Drosophila ammophila*); Singer in Mycopath. Mycol. appl. 34: 132. 1968; Bon in Bull. Soc. mycol. Fr. 86: 108. 1970 (as *Drosophila ammophila*); Malençon & Bertault, Fl. champ. sup. Maroc 1: 179. 1970 (as *Drosophila ammophila*); Michael/Hennig 4: 276, pl. 262. 1967 (as *Deconica ammophila*).

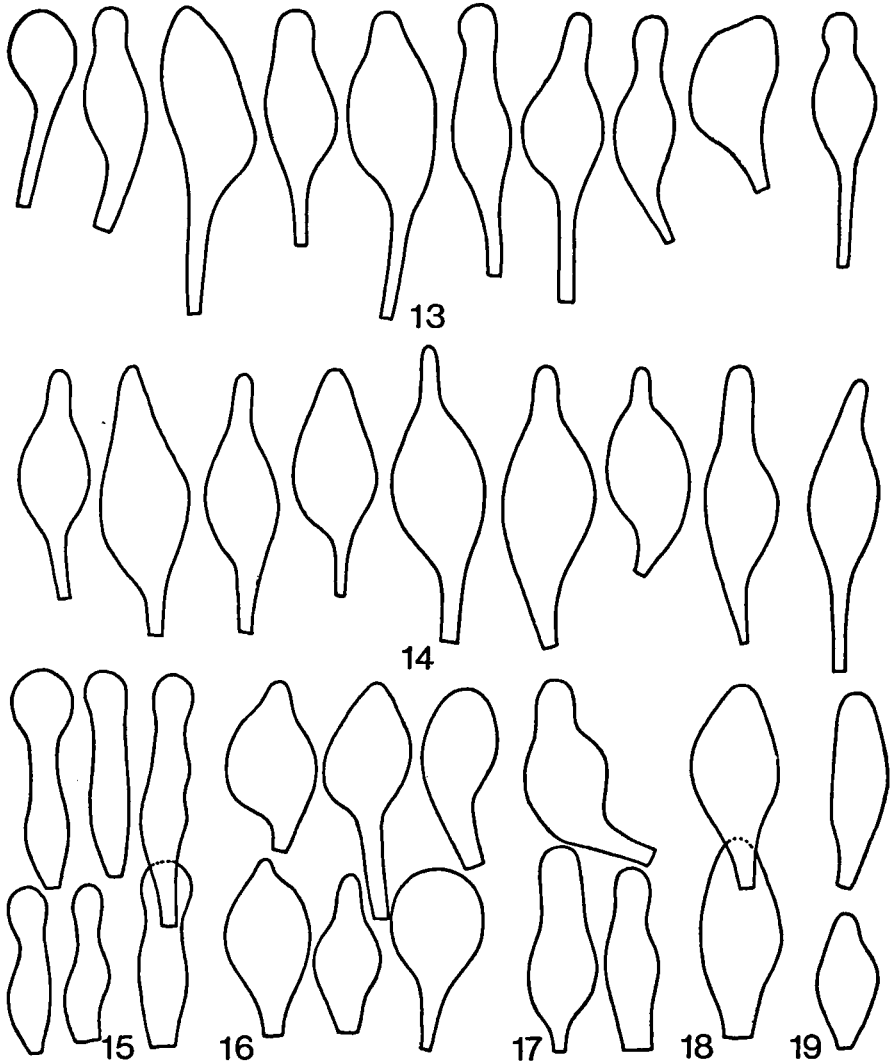
CHIEF CHARACTERISTICS.—Carpophores solitary to gregarious in coastal, shifting foredunes; cap 15–40 mm in diam., from hemispherical paraboloid to convex or plane with deflexed margin, not or only faintly striate, rather fleshy, from reddish brown to dark sordid brown, hygrophanous, without pink shades, rugulose; with distinct but fugacious marginal veil; gills strongly ventricose, dark purplish-brownish grey with white edge; stem 40–70 × 2–3 mm, not rooting but lower part sunk in the sand; spore print purplish black; spores 10.5–13.5 × 6.5–7 μm with central germ pore; pleurocystidia normally very scarce and large, size and shape very variable, 40–70 × 12.5–22.5 μm; spheropedunculate and clavate cells at gill edge normally very numerous and densely packed, intermixed with usually very few but sometimes more or even many cheilocystidia, similar to pleurocystidia; hymenophoral trama coloured.

MACROSCOPIC CHARACTERS.—Cap 15–40 mm in diam., 8–10 mm high, in early stages hemispherical to paraboloid, later spreading to convex with deflexed margin, finally plane at centre with deflexed or plane margin, sometimes slightly depressed at centre, without umbo, with its margin not or only faintly striate, rather fleshy and firm, at first distinctly reddish brown (M. 5 YR 3/3) but soon very dark sordid brown (M. 7.5 YR 3/2) or just dark sordid brown (M. 7.5 YR 4/2) with peripheral half having a slightly different hue (M. 10 YR 3/3, 3/4), hygrophanous, rapidly dehydrating from margin to centre and colour becoming dark brown (M. 10 YR 3/3–3/4, 4/3) at centre, paler (M. 10 YR 5/3, 6/3; colour of wet white sand) in peripheral half, finally yellowish brown (M. 10 YR 7/4, 7/6) at centre and pale brown (M. 10 YR 6/3, 7/3) at periphery, without pink shades, not micaceous, slightly rugulose.

Veil in early stages very distinct, forming a dense covering of minute white fibrils, isolated or in small groups and networks, on the 2.5–5 mm wide marginal zone of cap, rendering this zone whitish, rarely locally slightly appendiculate, fugacious but later often still forming some isolated fibrils or small networks of fibrils on 5–7 mm wide marginal zone, leaving scattered fibrils on mature stem, but in early and very early stages sometimes forming a woolly covering of the stem.

Gills in early stages 2–3 mm broad and only slightly ventricose, in peripheral half pale brownish grey (M. 10 YR 6/2), in basal part slightly browner (M. 10 YR 5/2), later 4–6 mm broad, increasingly and finally strongly ventricose, protruding under margin of expanding cap, broadly adnate, rather distant, at first still conspicuously brown (M. 10 YR 5/4) at base but greyer and more purplish grey towards edge, finally dark purplish brownish grey (M. 5 YR 4/2, 3/2) and slightly browner towards base; edge white, very rarely red, and minutely fimbriate. Trama of 'washed' gills under binocular lens in water ochre brown (M. 7.5 YR 6/4–6/6) along base, with pigmented parallel strands running from base to about mid-way or somewhat further towards edge of gill and of same hue as trama at base but becoming paler towards edge; colour between strands and in peripheral 1/3 of the gills very pale

greyish brown (M. 10 YR 7/2). Colour of 'washed' gills in  $\text{NH}_4\text{OH}$  10% practically the same, scarcely more reddish brown (M. 5 YR 6/4 at base), strands paler and colour between strands and in peripheral part M. 7.5 YR 7/2 or 5 YR 7/2; colour in  $\text{KOH}$  5% scarcely different from that in  $\text{NH}_4\text{OH}$  10% (slightly more towards 5 YR 5/3 at base).



Figs. 13–19. *Psathyrella ammophila*. — Pleurocystidiograms ( $\times 575$ ). — 13. 15 Oct. 1972. — 14. 7 Sept. 1965. — 15. 10 Oct. 1965. — 16. 7 June 1965. — 17. 22 Oct. 1965. — 18. 29 April 1952. — 19 July 1955.

Stem 40–70 mm long, hollow; its upper 2/3–3/4 part 2–3 mm thick, cylindrical, sordid white to pale yellowish brown, minutely fibrous-striate, with apex pruinose and usually grooved; its lower 1/4–1/3 part 3–5 mm thick, sunk deeply in the sand, not really rooting, seemingly somewhat clavate or fusiform as a result of adhering sand, with subobtuse end.

Flesh of cap rather thick, 2–4 mm in centre, 1.5–2 mm half-way margin of cap, dark brown (M. 10 YR 3/4), of stem whitish.

Taste and smell not distinctive.

Spore print purplish black.

**MICROSCOPIC CHARACTERS.**—Spores ellipsoid-amygdaliform, (9.9–)10.8–13.5 × 6.3–7.1(–8.1)  $\mu\text{m}$  (averages 10.8–12.6 × 6.6–7.4  $\mu\text{m}$ ), in water dark reddish brown (M. 2.5 YR 3/4), in  $\text{NH}_4\text{OH}$  10% darker, dusky red to very dark reddish brown (M. 2.5 YR 3/2; 5 YR 3/2, 3/3), in  $\text{KOH}$  5% very dark greyish brown (M. 10 YR 3/2), opaque to subopaque, with large, 1.5–2  $\mu\text{m}$  wide, central, subtruncate to truncate apical germ pore, with relatively small hilar appendix.

Basidia 22.5–37.5 × 10–12.5  $\mu\text{m}$ , 4-spored.

Pleurocystidia (30–)40–70(–75) × (10–)12.5–22.5(–27.5)  $\mu\text{m}$ , normally very scarce, scattered, of variable size and shape, usually subfusiform, ventricose-fusiform or ventricose-sublageniform, often with short or somewhat longer subcylindrical neck, sometimes clavate, sometimes with fairly long stalk, thin-walled, colourless.

Spheropedunculate and clavate cells 20–37.5(–40) × 10–22.5(–30)  $\mu\text{m}$ , as a rule very numerous and densely packed, rendering gill edge sterile, rather large and mostly with fairly broad stalk, normally intermixed with only an extremely small, rarely a fair to even large number of cheilocystidia, 25–55(–70) × 10–17.5(–20)  $\mu\text{m}$ , of the same very variable shape as the pleurocystidia, fusiform, narrowly to very broadly ventricose-fusiform, subfusiform, ventricose-lageniform or sublageniform, subutriform, subcylindrical, some with elongated neck or subcapitate etc., practically absent near margin of cap in most collections; all marginal cells thin-walled, colourless and without crystals or mucoid deposits.

Pigmentation of hymenophoral trama under microscope ('washed' gill mounted in  $\text{NH}_4\text{OH}$  10%) sordid brownish at base of gill, paler towards edge, from membranous pigment; at base of gill a few thickened yellowish hyphal septa and very few encrustations present.

Cuticle of cap cellular, 2–4 cells deep; its cells 20–48  $\mu\text{m}$  in diam., hyaline, thin-walled.

Clamps present.

**HABITAT.**—Among or near grasses (particularly *Ammophila*) on shifting coastal foredunes, May–October, common.

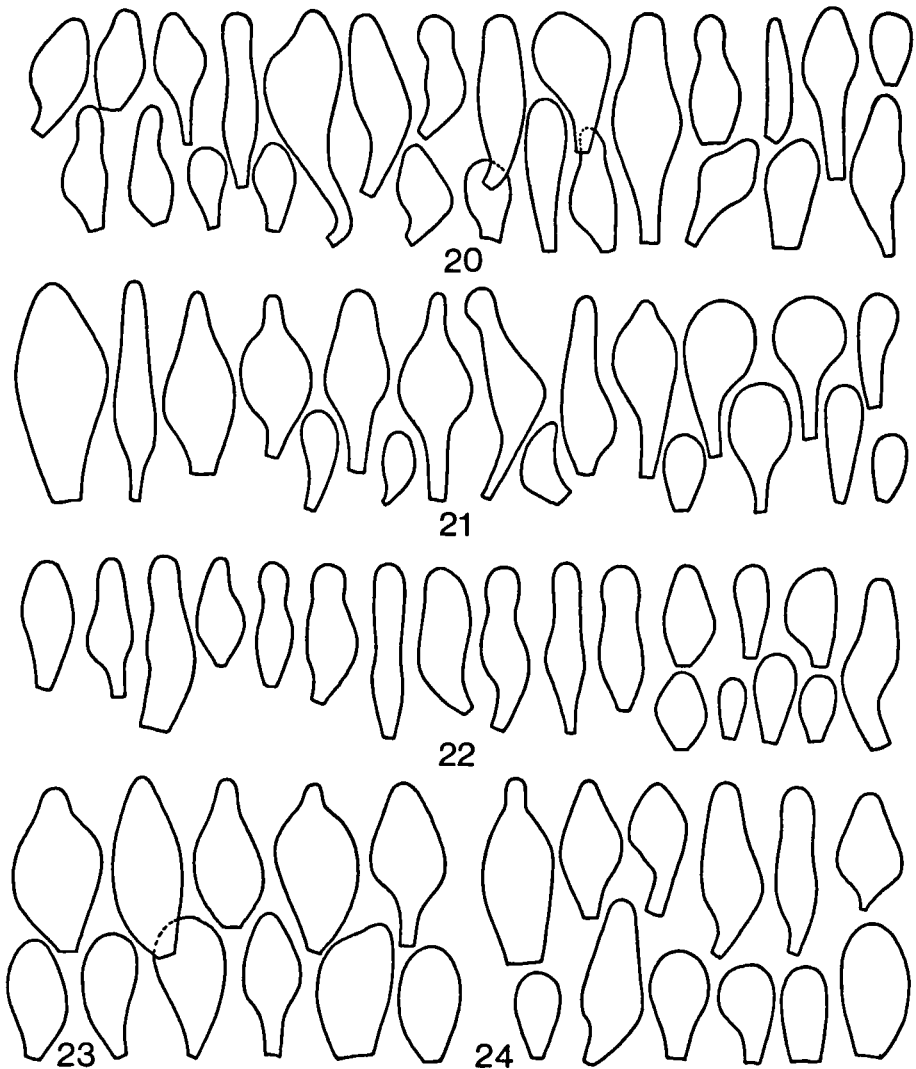
**COLLECTIONSEXAMINED.**—NETHERLANDS: prov. Friesland, Isl. of Terschelling, July 1955, *P. B. Jansen* (L); Isl. of Schiermonnikoog, July 1956, *J. Daams* (L); Isl. of Ameland, 11 June 1958, *K. Bakker* (L); prov. Noord-Holland, Isl. of Texel, 7 June 1965, *C. Bas* (L); prov. Zuid-Holland, Wassenaar, 10 Oct. 1965, *C. den Hartog* (L); Oost Voorne, 22 Oct. 1962, *A. F. M. Reijnders* (L); prov. Zeeland, Zuid-Beveland, 29 Apr. 1952, *W. G. Beeftink* (L).

GREAT BRITAIN: Devonshire, Minehead, 5 Sept. 1960, *E. K. v. W.* (L); Lancashire, Ainsdale Sands near Formby, 7 Sept. 1965, *E. K. v. W.* (L).

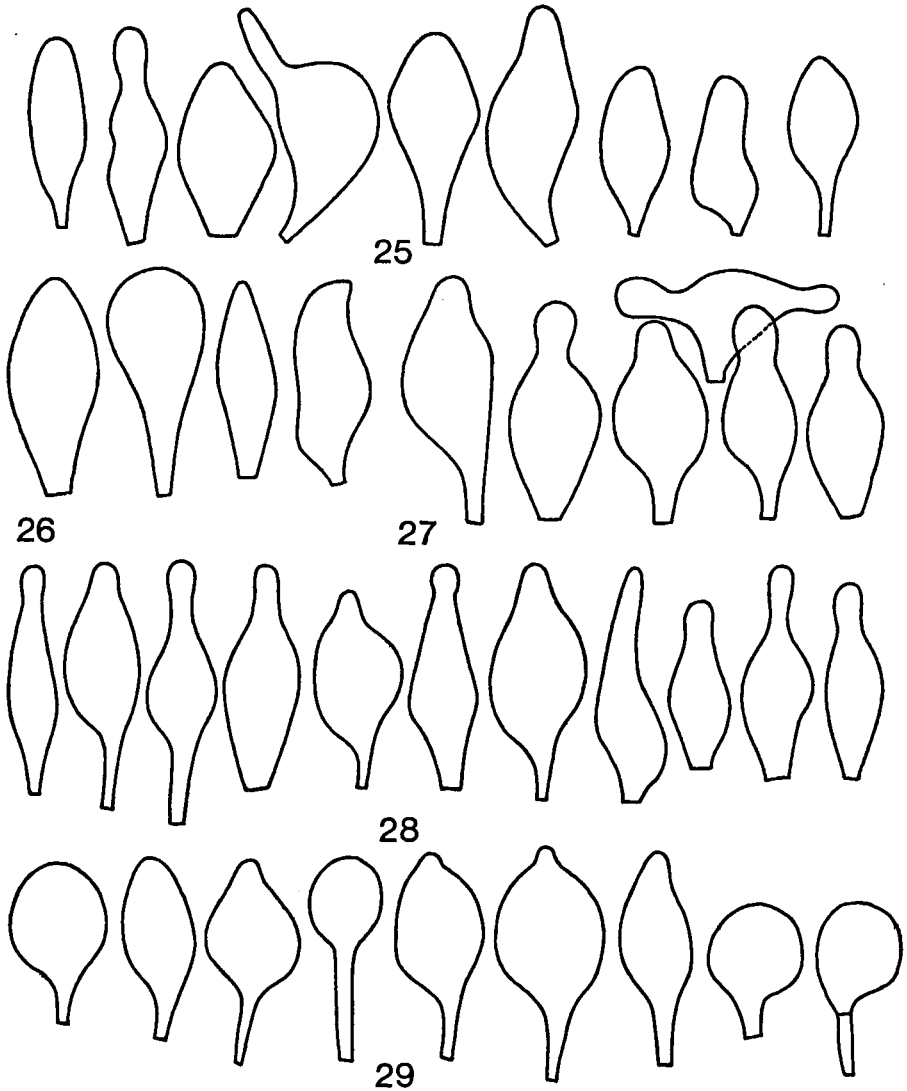
FRANCE: dép. Pas-de-Calais, Tardinghen, 15 Oct. 1972, *D. Tjalvingii-Beukers* (L).

ALGIERS: Laghouat, 1903, *N. Patouillard* (PC).

The above description of the macroscopic characters is based largely on the very rich collection of some 20 specimens, including all stages, of 7 September 1965 (Ainsdale Sands, Formby, Great Britain), which was collected and described immediately afterwards while still in the fresh stage. One young specimen of this collection had a very distinct red gill edge.



Figs. 20–24. *Psathyrella ammophila*. — Cheilocystidiograms ( $\times 575$ ). — 20. 15 Oct. 1972. — 21. 7 Sept. 1965. — 22. 10 Oct. 1965. — 23. 7 June 1965. — 24. 22 Oct. 1962.



Figs. 25-29. *Psathyrella ammophila*, Herb. A. H. Smith (as *P. arenulina*). — Pleurocystidiograms ( $\times 575$ ). — 25. Bailey, 28 July 1951. — 26. Smith 21861. — 27. Smith 36129. — 28. Smith 51187. — 29. Smith 4724.



The macroscopic characters of this species are remarkably consistent, all dried specimens looking exactly the same. This is in contrast to the features of the pleurocystidia and the marginal cells of the gill, which vary a great deal from one collection to another.

Romagnesi (1953: 358) quite rightly states that the cystidia are: 'éparses, mais volumineuses'. Of each of our 10 collections of *P. ammophila* we isolated a gill, then 'washed' it, carefully separated its edge from its face and disrupted the facial part into a large number of small pieces, which were crushed under a coverslip by tapping it. In this way we could be sure that if cystidia were to be found in the facial part, they would be pleurocystidia. In our 10 collections we found per gill resp. 0, 1, 2, 3, 5, 7, 11, 12,  $\pm$  15 pleurocystidia; in only one collection (10 Oct. 1965) were they slightly more numerous, scattered. The pleurocystidiograms clearly show the great variability in size and shape of these cells.

Although Romagnesi in the 'Flore analytique' places *P. ammophila* in the *Microrrhizae* ('Stipe  $\pm$  longuement radicaunt') the stem of this species is not really rooting. Romagnesi himself, in describing the species, does not speak of a 'root', stating merely that the stem is 'longuement enfoncé dans le sable.' The original picture given by Durieu & Lévilléé does not depict a pseudorrhiza either. J. E. Lange (1939: 82) in his description puts the word 'root' between inverted commas, indicating that he also does not regard the stem as rooting, and his excellent pictures (Fig. 148B) clearly show the absence of a real pseudorrhiza, the basal end of the stem being depicted as very obtuse. Cooke's plate 606B/599 (1884—1886) does not show a real pseudorrhiza nor does Bresadola's plate 857. Bon (1970: 108) does not mention the presence of a pseudorrhiza and even calls the stem 'parfois même bulbeux'. Singer (1968: 132) describes the stem as usually with rounded base, more rarely with attenuated base.

Macroscopically the specimens of the Wassenaar collection (10 Oct. 1965) were fully identical with those of all our other collections but microscopically they differed distinctly from these: (i) the pleurocystidia were fairly numerous; (ii) they were both utriform and strikingly uniform (see Fig. 15); (iii) the cellular lining of the gill edge consisted chiefly of densely packed and rather small cheilocystidia (shape very variable) intermixed with only a small number of rather inconspicuous spheropedunculate and clavate cells; (iv) the germ pore was indistinct and small. For a long time we hesitated whether to describe this collection as a new form of *P. ammophila*, but in the end refrained because a macroscopic description was lacking.

**TAXONOMIC POSITION OF PSATHYRELLA AMMOPHILA.**—In a previous paper (1976: 350) we strongly advocated and also adopted Romagnesi's concept of the subgenus *Psathyrella*. It was also adopted by Singer (1975: 504) who rejected that part of Smith's (1972: 30) subdivision of the genus *Psathyrella* in which the subgenera *Psathyrella* and *Pannucia* are separated on account of the degree of development of the veil rather than the size and shape of the spores and the basidia. *Psathyrella ammophila*, because of its large spores and short, thickset basidia, obviously belongs to *Psathyrella*

subgenus *Psathyrella* ss. Romagnesi. Because of its habit, fairly large, rather fleshy and non-striate cap, its normally sparse and voluminous pleurocystidia and its habitat it cannot possibly be ranked with the species of section *Atomatae*; for the same reasons and also because of the absence of a pseudorrhiza it cannot be ranked with the species of section *Psathyrella* either. Therefore we have established a separate section for this species: section *Ammophilae*.

PSATHYRELLA AMMOPHILA VERSUS P. ARENULINA.—Smith (1972: 343, 276) in his observations on both *P. ammophila* (of which species he examined only one collection) and *P. arenulina* (17 collections examined) discusses the relationship and possible conspecificity of the two species and concludes that 'a critical restudy of both should be made'. Such a restudy we offer below.

From Smith's descriptions and observations it is clear that if there should be any difference at all between the two species it would lie in the presence or absence of pleurocystidia, the spore sizes, the presence or absence of a veil, and the thickness of the flesh of the cap.

Smith found the pleurocystidia to be scattered in his collection of *P. ammophila*, and absent in all of his 17 collections of *P. arenulina*. This is why at the very beginning of his key to the species of subgenus *Psathyrella*, *P. arenulina* keys out with section *Subatratae* (pleurocystidia absent), whereas *P. ammophila* finds itself in section *Psathyrella* and, because its spores are slightly larger than those of the species of subsection *Mesosporae*, within that section in subsection *Psathyrella*.

At our request Dr. A. H. Smith very kindly sent us material of five of his collections of *P. arenulina* for examination. With the same technique as described above (p. 199) we checked the presence or absence of pleurocystidia. On a gill of the collection marked 'Bailey 7-28-1951' (see Smith 1972: 277) we found 11 pleurocystidia, very variable in both shape and size, of collection *Smith 21861* only four (also very variable) of collection *Smith 36129* six (utriform and measuring  $45-57 \times 18-22 \mu\text{m}$ ), of collection *Smith 51187* a fairly large number (our cystidiogram alone shows 15 cells, all rather uniform, sublageniform-subfusiform and at the same time subcapitate,  $45-60 \times 12-22 \mu\text{m}$ ), and of collection *Smith 4724* ten (both in shape and size very variable, strikingly ventricose and pedicellate,  $37-55 \times 17-27 \mu\text{m}$ ). In all the collections the marginal cells, studied separately under another coverslip, were quite different, generally rather large, clavate to spheropedunculate and intermixed with a fair number of scattered cheilocystidia of varying sizes and shapes. In conclusion we believe that the gills of all five specimens labelled *P. arenulina* that we studied bear pleurocystidia, as they do in *P. ammophila*.

As for the spore sizes in the 10 collections of *P. ammophila* we studied we found them to differ from one collection to another. We found the smallest spores ( $9.9-11.7 \times 6.3-7.2 \mu\text{m}$ ) in the collection of 29 April 1952, the largest ( $11.7-13.5 \times 7.2-7.7 \mu\text{m}$ ) in our collection of 5 Sept. 1960, the mean values in our 10 collections being  $10.8-12.6 \times 6.6-7.4 \mu\text{m}$  (of each collection 20 spores measured). These figures are slightly larger than the figures  $10-11 \times 6-7 \mu\text{m}$ ,  $10-11 \times 7 \mu\text{m}$  and  $8.7-11.7 \times$

5.8—7.3  $\mu\text{m}$  given by resp. Kühner & Romagnesi (1953: 358), Moser (1967: 214) and Singer (1968: 132), and agree with the figures 10—15  $\times$  6—8  $\mu\text{m}$ , 10—12.4  $\times$  6.2—7.2  $\mu\text{m}$  and 9—14  $\times$  6—8  $\mu\text{m}$  given by resp. Bresadola (1931: Pl. 857), Malençon & Bertault (1970: 179) and Smith (1972: 343).

Singer (1968: 321) comments on the spore size. Quoting Andersson's (1950: 33) figures of 10—12—14(—16)  $\times$  6.5—8  $\mu\text{m}$  and Pilát's (1951: 364), which go up to 12  $\mu\text{m}$  long for the spore size, Singer states that according to his own findings on Netherlands' material the spores are 11.5—13  $\mu\text{m}$  long, figures which fully agree with our own. Singer believes therefore that in European material the spores often reach a larger size than in the American material. Our figures for the *P. arenulina* material received from Dr. Smith are (9—)9.9—13.5(—14.4)  $\times$  (5.4—)5.9—7.2  $\mu\text{m}$  (mean values 10.5—12.4  $\times$  6.1—6.8  $\mu\text{m}$ ) those of Smith himself 9—12(—12.5)  $\times$  5.6  $\mu\text{m}$ , and those of Murrill (1923: 8) 10—12  $\times$  5—6  $\mu\text{m}$ . All these figures, both in the literature and in our own measurements of 10 collections of *P. ammophila* and 5 of *P. arenulina* are sufficient to show that there is no significant difference between the spore sizes of what is called *P. arenulina* and *P. ammophila*.

As for the veil, it is thin, very fugacious and as a result apparently often overlooked and also evidently variable in *P. ammophila*. Except for Kühner & Romagnesi (1953: 358), Moser (1967: 214), Smith (1972: 343), and Malençon & Bertault (1970: 343) none of the numerous other authors — among whom Bon (1970: 108), Maire (1911: 279), Andersson (1950: 33), J. E. Lange (1939: 82), Bresadola (1931: Pl. 857)—who gave either short or more elaborate descriptions of this remarkable species mentioned the presence of a veil or velar remnants on the cap, and Singer (1968: 132) even specifically stated that the cap is without remnants of a veil. Smith (1972: 277) states that he has not observed a veil in the Michigan collections of *P. arenulina*, admitting, however, that very few buttons were found. In the one and only collection Smith was able to examine of *P. ammophila* the margin was found to be thinly fibrillose at first but soon naked.

In most of our ten collections of *P. ammophila* the description of the macroscopic characters was either lacking or too short and incomplete, but in four the presence of a veil was mentioned (29 April 1952: 'cobweb velar remnants at margin'; 22 Oct. 1962: 'much velar tissue, in places slightly appendiculate scattered velar fibres at and even up to some distance from the margin in some mature specimens'; 7 June 1965: 'some fresh specimens with remains of an annulus'; for the rich collection of 7 Sept. 1965 see our description above).

The veil, as shown in the above data obviously being so little developed and so easily overlooked in *P. ammophila*, warrants the conclusion that from Smith's data it is not sufficiently justifiable to conclude that *P. ammophila* does and *P. arenulina* does not have a veil.

Although, as Smith correctly states, the context of the caps in *P. ammophila* is thick and fleshy, these caps are fragile. Of *P. arenulina* Smith calls the caps even 'very fragile', but the context thin. Unfortunately figures for the thickness of the flesh in both species are not given. Curiously enough Smith does not use this presumed

difference in thickness of the flesh in distinguishing the two species. Macroscopically the dried material of *P. arenulina* we received from Smith was identical in every respect with that of our collections of *P. ammophila*, also with regard to the thickness of the caps, so that we believe this difference to be of no importance.

Murrill (1923: 8) saw the type specimens of Peck's *A. arenulinus* and noticed that Peck had written on the sheet 'perhaps *ammophilus*'.

**PSATHYRELLA AMMOPHILA VERSUS P. SUBAMMOPHILA.**—Cleland (1927: 306) states that his *P. subammophila* differs from *P. ammophila* by its longer stem (75 mm), adnate and not subdecurrent gills, slightly narrower spores ( $\times 5.5-6 \mu\text{m}$ ) and its location in 'sandy agricultural land'. In our description of *P. ammophila* we state that the length of the stem may go up to 70 mm, that the gills are broadly adnate, that the width of the spores is  $6.3-7.1 \mu\text{m}$ , and that the habitat is shifting coastal foredunes. We are not impressed by the narrowness of the spores as reported by Cleland for his *P. arenulina* since Bon (1970: 108) finds the width of the spores in one of his collections to be  $5-6 \mu\text{m}$ , and Singer (1968: 132) mentions for the width  $5.8-7.3 \mu\text{m}$ , for European material even down to  $4 \mu\text{m}$ . Finally Cleland found his species 'in sandy soil near Kinchina, Henley Beach' (Australia). From these data we conclude that *P. subammophila* and *P. ammophila* must be conspecific.

#### PSATHYRELLA section BIPELLIS Malençon & Romagnesi

*Psathyrella* section *Bipellis* Malençon & Romagnesi in Bull. Soc. mycol. Fr. 69: 117. 1953.

#### PSATHYRELLA BIPELLIS (Quél.) A. H. Smith—Figs. 2, 3, 30—46

*Psathyra bipellis* Quél. in C.r. Ass. Franç. Av. Sci. 12: 501. 1884. — *Drosophila bipellis* (Quél.) Quél., Fl. mycol.: 62. 1888. — *Psathyrella bipellis* (Quél.) A. H. Smith in J. Elisha Mitchell sci. Soc. 62: 187. 1946.

*Psathyra barlae* Bres., Fung. Trid. 1: 84, pl. 91. 1887. — *Psathyrella barlae* (Bres.) A. H. Smith in Contr. Univ. Mich. Herb. 5: 39. 1941.

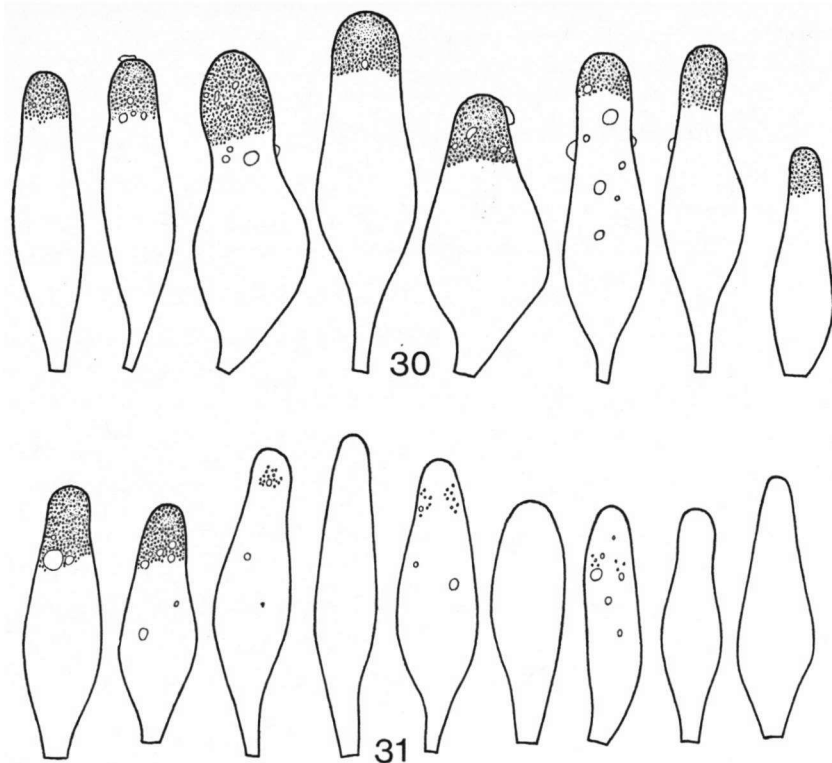
? *Agaricus canofaciens* Cooke in Grevillea 14: 1. 1885; Ill. Brit. Fungi, pl. 595/621. 1884–1886; Handb. Brit. Fungi 2nd Ed.: 209. 1887.

? *Gymnochilus roseolus* Clem. in Bot. Survey Nebraska 4: 231. 1896. — *Psathyra roseola* (Clem.) Sacc. in Syll. Fung. 14: 154. 1899.

MISAPPLIED NAMES.—*Agaricus atro-rufus* Schaeff. ss. Cooke, Ill. Brit. Fungi pl. 602/571. 1884–1886. — *Psathyra corrugis* (Pers. ex Fr.) Quél. ss. Ricken, Blätterp.: 257. 1913.

SELECTED DESCRIPTIONS AND ILLUSTRATIONS.—Cooke, Ill. Brit. Fungi: pl. 602/571. 1884–1886 (as *Agaricus atro-rufus*); Ricken, Blätterp.: 257, pl. 67 fig. 3. 1913 (as *Psathyra corrugis*); Bresadola, Icon. mycol. 18: pl. 870. 1931 (as *Psathyra barlae*); A. H. Smith in Contr. Univ. Mich. Herb. 5: 39. 1941 (as *Psathyrella barlae*); Malençon & Romagn. in Bull. Soc. mycol. Fr. 69: 122–126, pl. 1. 1953 (as *Drosophila bipellis* and *Psathyra barlae*); Kühn & Romagn., Fl. anal.: 354. 1953 (as *D. bipellis*); Romagn., Nouvel Atlas champ. 3: pl. 204 B. 1961 (as *D. bipellis*); Moser in Gams, Kl. Kryptog Fl. 2/b2, 3. Aufl.: 213. 1967; Hongo in Trans. mycol. Soc. Japan 9: 18. 1968; A. H. Smith in Mem. N.Y. bot. Gdn 24: 103. 1972 (as *Psathyrella barlae*); Malençon & Bertault, Fl. Champ. sup. Maroc 1: 182. 1970 (as *D. bipellis*).

CHIEF CHARACTERISTICS.—Carpophores solitary; cap from conico-paraboloid to convex, 10–40 mm in diam., very dark purple to purplish red, striate, hygrophanous,



Figs. 30, 31. *Psathyrella bipellis*. — Pleurocystidiograms ( $\times 575$ ). — 30. Epse, 16 June 1974. — 31. Bathmen, 16 June 1974.

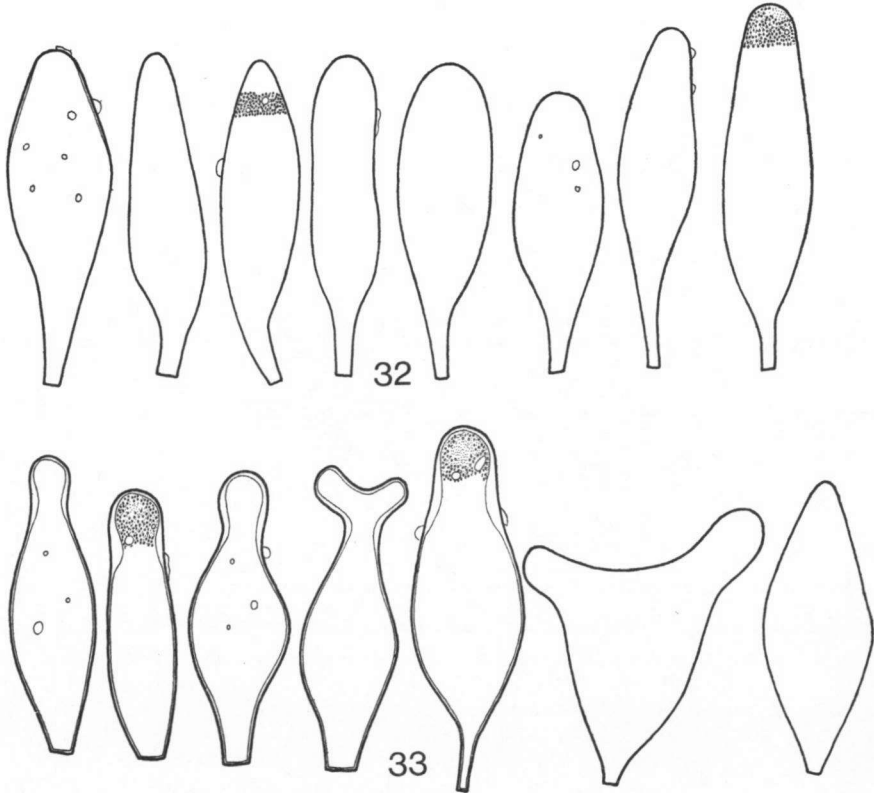
drying to pale reddish or pinkish brown, rugulose, with distinct but fugacious, white veil; gills ventricose, dark purplish red or purplish brown with white edge; stem 45–95  $\times$  1.5–5 mm, not rooting, sordid white with some pink, pinkish brown or purplish; flesh of cap dark vinaceous brown, flesh of stem pale purplish pink; spore print black; spores 12.5–15.5  $\times$  7–8  $\mu\text{m}$ , with germ pore; pleurocystidia abundant, varying from utriform to lanceolate fusiform, 52–95  $\times$  12–30  $\mu\text{m}$ , often with guttulate contents in upper part; cheilocystidia densely packed and similar to pleurocystidia but smaller, intermixed with a small number of small clavate cells; hymenophoral trama coloured.

**MACROSCOPIC CHARACTERS.**—Cap in the early stages conico-paraboloid, soon conico-convex, in the end almost to quite plane with slightly deflexed margin, 10–40 mm in diam., striate up to  $1/3$ – $1/2$  ( $-3/4$ ) from margin upwards, very dark, in very young specimens blackish, purple to purplish red (M. 10 R 2.5/1, 2.5/2, 3/2, 2/2; 2.5 YR 2/2, 2/4, 2.5/2, 2.5/4, 3/2), marginal area dusky red (M. 10 R 3/3), at margin itself often reddish (M. 10 R 4/4, 5/4); hygrophanous, drying out from centre towards margin via vinaceous red (M. 10 R 4/4; 2.5 YR 5/4) and reddish brown (M. 2.5 YR 4/4, 5/4) to pale reddish or pinkish brown. (M. 5 YR 6/4), slightly micaceous, slightly to moderately rugulose.

Veil distinct, forming small and rather dense white networks, in very young and young specimens densely covering marginal zone of cap and very numerous to numerous up to  $1/2-3/4$  from margin upwards and sometimes in places even appendiculate, fugacious.

Gills 3–6 mm broad, moderately crowded, ventricose, usually protruding below margin of cap, narrowly to moderately broadly adnate, dark purplish red or purplish brown (M. 10 R 3/3; 2.5 YR 3/2, 3/4, 2.5/4; 5 YR 3/2), towards edge and in older specimens purplish grey-brown (M. 2.5 YR 4/2; 5 YR 4/2), with white, fimbriate edge. Trama of 'washed' gills under binocular lens rather strongly pigmented; colour when mounted in water or  $\text{NH}_4\text{OH}$  10% reddish brown (M. 5 YR 5/3) from base to about half-way edge, then paler and via light reddish brown (M. 5 YR 6/3) to very pale greyish brown (M. 10 YR 7/2) near edge, or in these same areas from just brown (M. 7.5 YR 4/4, 5/4) via paler brown (M. 7.5 YR 6/4) to very pale brown (M. 10 YR 6/2, 7/2) near edge; colour in KOH 5% distinctly different, greyish brown (M. 10 YR 6/2, 6/3) in basal parts, paler towards edge.

Stem 45–95  $\times$  1.5–5 mm, cylindric, neither rooting nor bulbous, hollow, whitish or sordid white with a slight to very distinct trace of pink, pinkish brown, pale



Figs. 32, 33. *Psathyrella bipellis*. — Pleurocystidiograms ( $\times 575$ ). — 32. 24 July 1966. — 33. 14 Nov. 1970.

purplish pink (M. 2.5 YR 6/2; 5 YR 6/3) or with lilaceous pink flush, particularly in upper half, resulting from purplish pink colour of flesh under purely white and very thin upper layer of tissue, glossy, pruinose at apex, with at extreme base a thin layer of greyish tissue and strigose with white hairs.

Flesh of cap 1.5–3 mm thick, concolorous, dark vinaceous brown to reddish (M. 2.5 YR 2.5/2), particularly in thin layer under surface and over gills; flesh of stem pale purplish pink (M. 2.5 YR 6/4; 5 YR 6/3, 6/4), but with very thin white superficial layer.

Taste and smell not distinctive.

Spore print black.

**MICROSCOPIC CHARACTERS.**—Spores (11.7–)12.6–15.3(–16.2) × (6.8–)7.2–8.1(–9)  $\mu\text{m}$  (averages 13–15 × 7.2–7.6  $\mu\text{m}$ ), ellipsoid-amygdaliform, in water dark red, dusky red (M. 10 R 3/2, 3/3, 3/4; 2.5 YR 3/4), in  $\text{NH}_4\text{OH}$  10% very dark red, dusky red (M. 10 R 3/1, 3/2, 2.5/1, 2.5/2), in  $\text{KOH}$  5% very dark to dark greyish brown (M. 10 YR 3/1, 3/2, 3/3), opaque (to subopaque), with apical germ pore 1.5–2  $\mu\text{m}$  wide, normally quite distinct, often even truncate, but in a single collection less distinct and certainly not truncate, in a few to many spores very slightly to distinctly eccentric on the abaxial face, with fairly small hilar appendix.

Basidia 4-, rarely 2-spored, 22–40 × 12.5–15(–16)  $\mu\text{m}$ .

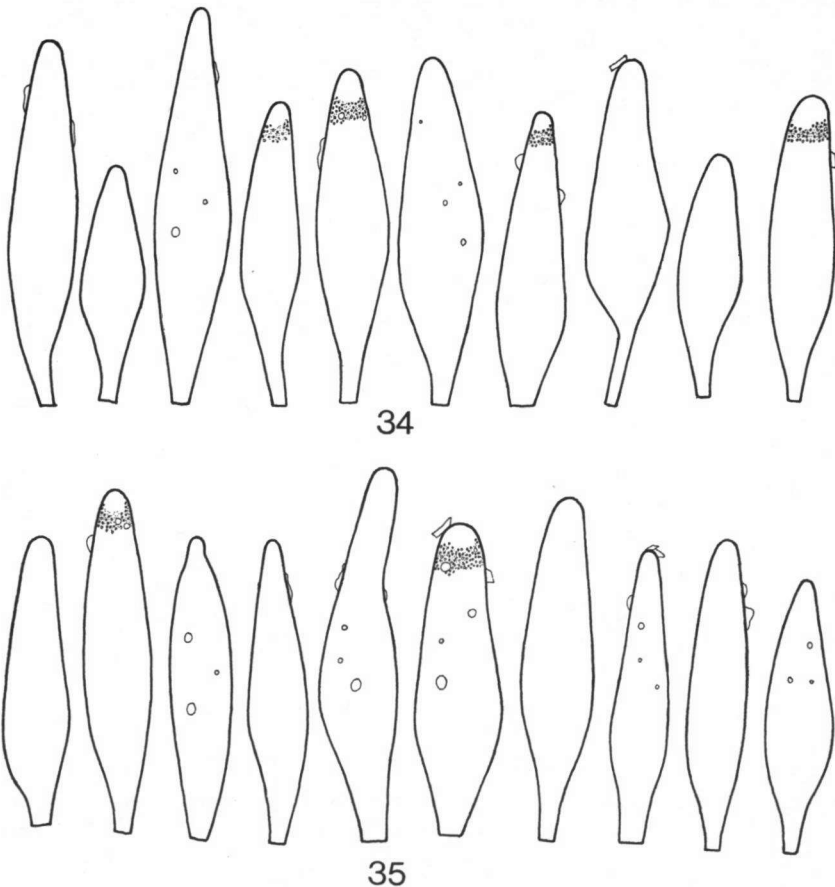
Pleurocystidia abundant, either preponderatingly utriform and subutriform with very obtuse to obtuse apex (forma *barlae*, see observations) or lanceolate fusiform and subfusiform with obtuse to subacute apex (forma *bipellis*, see observations), but in some collections chiefly intermediate forms occur (sublageniform, ellipsoid with very obtuse apex, subcylindric), always with short or somewhat longer stalk, 52.5–95 × 12.5–30  $\mu\text{m}$ , almost always with very slightly thickened (up to 0.5  $\mu\text{m}$ ) wall but sometimes many of the utriform and subutriform cells with distinctly thickened wall (up to 1–2  $\mu\text{m}$ ) at and particularly just below the apex, practically colourless or very faintly brown in  $\text{NH}_4\text{OH}$  10%, contents of apical portion of sometimes almost all but more often of only a number or even of very few pleurocystidia with a small to larger amount of amorphous material, very slightly greenish in  $\text{NH}_4\text{OH}$  10%, including a large to small number of minute droplets (a few of them, however, 1–5  $\mu\text{m}$  in diam.). A few scattered oily droplets often elsewhere in otherwise hyaline pleurocystidia; a few mucoid drops and/or thin elongate or crystal-like deposits, not or scarcely greenish in  $\text{NH}_4\text{OH}$  10%, often present on outside of walls.

Cheilocystidia 35–75 × 10–25  $\mu\text{m}$ , very densely packed, rendering gill edge sterile, similar to pleurocystidia but shorter and as a result more ventricose, more often with amorphous material (droplets embedded) in their apical portion (sometimes practically in all cells) and more mucoid drops and deposits on their surface, intermixed with a small number of small and scarcely noticeable clavate cells, 10–27.5 × 6–14  $\mu\text{m}$  (sometimes and particularly near margin of cap larger, 15–40 × 10–20  $\mu\text{m}$ , and in somewhat larger numbers), a few of them with a slightly thickened wall and brownish in  $\text{NH}_4\text{OH}$  10%.

Pigmentation of hymenophoral trama under microscope ('washed' gill mounted in  $\text{NH}_4\text{OH}$  10%): trama very distinctly coloured from base to edge from brownish membranar pigment; colour strongest at base, fading towards edge; yellowish and thickened hyphal septa and some encrustations present, particularly in basal parts of gill; pigmentation of trama of cap rather strong, with many encrustations.

Cuticle of cap cellular, 2–3 cells deep; its cells, 24–40  $\mu\text{m}$  in diam., hyaline, thin-walled.

Clamps present.



Figs. 34, 35. *Psathyrella bipellis*. — Pleurocystidiograms ( $\times 575$ ). — 34. 25 Oct. 1974. — 35. 2 Nov. 1974.

**HABITAT.**—Solitary sometimes gregarious in rich sandy soil of deciduous woods, roadsides in woods.

**COLLECTIONS EXAMINED.**—NETHERLANDS: prov. Overijssel, Bathmen, castle 'Dorth', 16 June 1974, *J. Daams* (L); prov. Gelderland, Epse, estate 't Joppe', 16 June 1974, *J. Daams* (L); prov. Noord-Holland, Kortenhof, 14 Nov. 1970, *J. Daams* (L); Vogelenzang, dunes of Amsterdam Water Supply, 24 July 1966, *E.K.v.W.* (L); Overveen, estate 'Elswout', 25 Oct. 1975 and 2, 5, and 16 Nov. 1976, *E.K.v.W.* (L), Overveen, estate 'Koningshof', 2 Nov. 1974, *C. Bas* (L).

This species is very rare in the Netherlands. In fact our collection of 24 July 1966 was the first recorded in this country, and since then it has only been found in five different places.



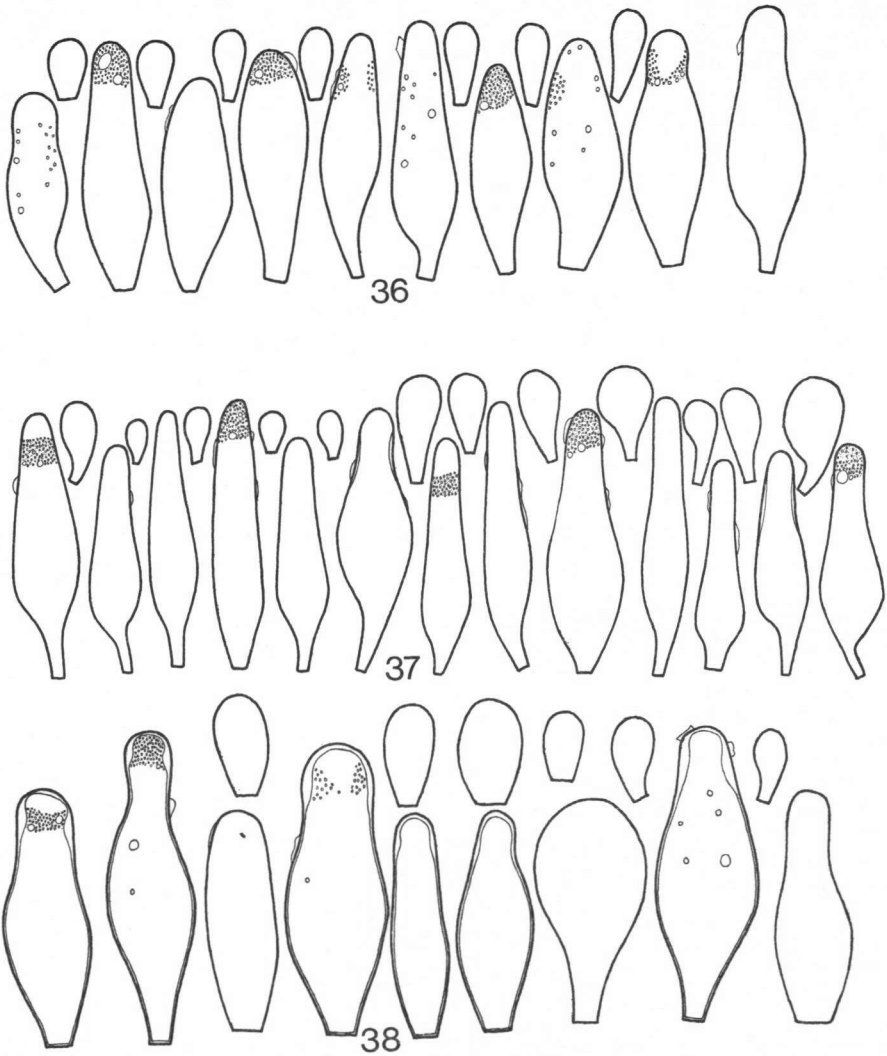
The one specimen (14 Nov. 1970), already in process of drying out, that we received from Mr. Daams was striking in that it was large (cap 40 mm, stem  $95 \times 4-5$  mm) and that the surface of the cap looked exactly like that of specimens of *P. gracilis* f. *corrugis*; all other macroscopical features were, however, typical of *P. bipellis*. Microscopical examination revealed four abnormalities (see Figs. 33, 38, 46): (i) Many spores were small and abnormally shaped, very broadly ellipsoid to almost globose or irregularly shaped, some even more or less triangular with their germ pore sometimes on one side. (ii) The apiculus of all spores was unusually large, hyaline. (iii) A number of pleurocystidia were grossly forked at the apex. (iv) The cell wall of many pleurocystidia was considerably thickened ( $1-2 \mu\text{m}$ ) in the apical portion. We have regarded this single carpophore as an abnormal manifestation of *P. bipellis*.

Having very carefully examined 25 collections of *P. bipellis* Malençon & Romagnesi (1953: 101) deem it justifiable to distinguish two forms of this species, to which they refer as '*Drosophila bipellis* Quél.' (20 collections, of which 17 from Morocco) and '*Psathyra barlae*' Bres. (5 collections). They give a full description of both forms and come to the conclusion that as for their macroscopical characters, these are practically identical. Romagnesi confirms this conclusion by stating in the 'Flore analytique' (1953: 354) 'Nous ne connaissons actuellement aucun caractère macroscopique bien net pour distinguer les deux formes'. Both are characterized macroscopically by very striking purplish colours of cap, gills, stem, and flesh, and microscopically by very numerous pleurocystidia and further because at least some but usually many of them have an amorphous substance containing many minute oily drops in their apical portion.

To Malençon & Romagnesi it seems that a microscopical and consistent difference between the two forms might exist in that at first the pleuro-cystidia of '*P. barlae*' have a very obtuse apex and no real neck, and later develop into typically utriform cystidia with a wide ( $7-10 \mu\text{m}$ ) and short neck and capitate apex, whereas those of '*D. bipellis*' are lanceolate subfusiform, their base gradually attenuating towards an obtuse or even subacute apex. They next notice that in Europe and—going by A. H. Smith's publications of 1937 (:219) and 1941 (:39)—also in North America the form with utriform pleurocystidia seems to appear in the spring (May, June), the form with subfusiform cystidia in the late autumn (Oct.-Dec.); this difference also, though not entirely, working out for North Africa.

Checking these observations with Smith's publications of 1937, 1941, and 1972 we found that Smith's descriptions of the pleurocystidia do not sufficiently warrant these conclusions. The collections studied by Smith, for which dates are mentioned, were all found in June and July, whereas the shape of the pleurocystidia mentioned ranges from fusoid, fusoid-ventricose to subutriform.

Malençon & Bertault (1970: 182) while confirming that what they call *Drosophila bipellis* is rare in Europe and more common in North Africa, describe and depict the pleurocystidia as 'lancéolées à subfusiformes, à base renflée et généralement pédiculée, à partie supérieure longuement atténuée en cône à pointe mousse ou subaiguë'



Figs. 36–38. *Psathyrella bipellis*. — Cheilocystidiograms ( $\times 575$ ). — 36. Bathmen, 16 June 1974. — 37. 24 July 1966. — 38. 14 Nov. 1970.

and state that the species occurs in November and December but sometimes in spring.

Bresadola (1887: 84) giving summer and autumn for the time of appearance of *Psathyra barlae* in Italy, calls the pleurocystidia 'ampullaceo-stipitate vel subfusiformis', and Horak (1968: 110) who examined Bresadola's type (according to Horak collected in April 1889, this date no doubt being a misprint as the species is described in 1887)

found utriform cystidia. Quélet (1884: 501) merely states 'été' for the time of appearance of his *Psathyra bipellis*.

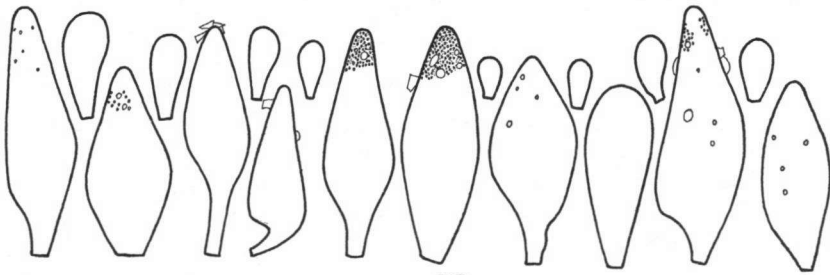
Malençon & Romagnesi (1953: 122—126) make it quite clear both in the text of their paper and by their figures that the shape of the pleurocystidia of '*Drosophila bipellis*' and '*Psathyra Barlae*' varies considerably. The pleurocystidiograms of our own six collections of *Psathyrella bipellis* s.l. also reveal that the shapes of the pleurocystidia vary a great deal and lie in a continuum; they also bear scarcely any relation to the seasonal appearance of the carpophores. The specimens of the mid-summer collection (24 July 1966; Fig. 32) have markedly pedicellate fusoid, by no means utriform pleurocystidia, whereas the in some microscopical respects abnormal specimens of the late autumnal collection (14 November 1970; Fig. 33) have markedly utriform pleurocystidia. The specimens collected on June 16th 1974 (Epse, Fig. 30) had typically utriform pleurocystidia, but those collected on the very same day but elsewhere (Bathmen, not far from Epse) had both utriform, subutriform and fusoid pleurocystidia (Fig. 31). Only the late-autumnal collections (25 Oct. 1974, see Fig. 34; 2 Nov. 1974, see Fig. 35; Nov. 1975, 1976) are in agreement with the observations of Malençon & Romagnesi that late-autumnal specimens seem to have lanceolate, narrowly fusoid pleurocystidia.

In conclusion we feel from both the data in the literature and from our own observations that there is insufficient evidence to warrant the conclusion that a strict correlation exists between the seasonal appearance and the shape of the pleurocystidia of *P. bipellis*. To some extent such a correlation may exist, but in our opinion it cannot serve as an argument to distinguish two species, *P. bipellis* and *P. barlae*. The shape of the pleurocystidia of the specimens on which Quélet based his *P. bipellis*, collected in summer, is unknown.

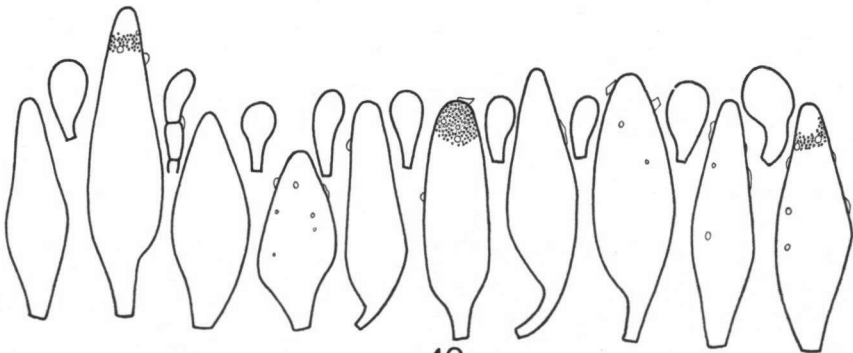
Although Malençon & Romagnesi (1953: 122—126) do not mention a difference in spore size between the two forms, in their descriptions this size is given as  $12-15 \times 7-7 \times 7.5-8.5 \mu\text{m}$  for '*Psathyra barlae*' and  $12-15-18(-22) \times 6-8-9 \mu\text{m}$  for '*Drosophila bipellis*'. We found the spores of the two collections with distinctly fusiform pleurocystidia also very slightly longer (averages  $14.4 \times 7.3 \mu\text{m}$  and  $15 \times 7.5 \mu\text{m}$ ) than those of the collections with distinctly utriform pleurocystidia (averages  $13.4 \times 7.5 \mu\text{m}$ ,  $13.6 \times 7.4 \mu\text{m}$  and  $13 \times 7.6 \mu\text{m}$ ) but are not prepared to accept this additional difference between the two 'forms' as sufficient reason to distinguish between them, particularly in view of the limited material studied.

Malençon & Romagnesi describe for '*P. barlae*' the germ pore as fairly small and very slightly eccentric, and for '*D. bipellis*' as large and truncate, without mentioning the position of the germ pore. They do not use this difference, however, in trying to distinguish between the two forms. We found a small to occasionally somewhat larger number of spores with a very slightly eccentric germ pore in five out of our six collections, while the germ pore in the collection from Bathmen (16 June 1974) was very distinct and truncate; the germ pore in the collection from Epse (16 June 1974) was decidedly less distinct and most certainly not truncate; at the same time both collections had markedly utriform pleurocystidia.

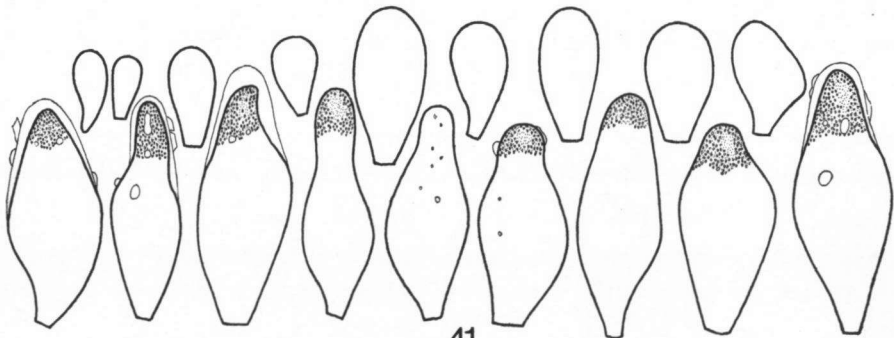
According to Malençon & Romagnesi (l.c.) the carpophores with subfusiform pleurocystidia ('*D. bipellis*') might be somewhat larger (cap up to 65 mm, stem up to 130×6 mm) than those with utriform pleurocystidia ('*P. barlae*', cap up to 45 mm, stem up to 100×6 mm) but obviously there is considerable overlapping (clearly shown by their beautiful colourplate). The colour of the dry cap, Malençon &



39



40



41

Figs. 39–41. *Psathyrella bipellis*. — Cheilocystidiograms (×575). — 39. 25 Oct. 1974. — 40. 2 Nov. 1974. — 41. Epse, 16 June 1974.

Romagnesi think, might be of a slightly different shade (ochre-flesh colour in '*D. bipellis*', sordid greyish-reddish or merely greyish brown in '*P. barlae*') and the gills might turn out to be narrowly adnate in '*D. bipellis*' and broadly adnate in '*P. barlae*' but here again these differences are believed to be slight and dubious, needing—as the authors themselves state—a great deal more verification in the field.

In his earlier paper Smith (1941: 40) thought it questionable whether *Psathyrella barlae* and *P. bipellis* are different species, believing the latter to be a taxon with smaller fruitbodies (cap 10–40 mm) than the former (cap 30–50 mm). Malençon & Romagnesi examined Smith's exsiccata and found both to have utriform and subutriform pleurocystidia. Recently Smith (1972: 104) has come to recognize his former *P. bipellis* as *P. barlae* forma *minor*, of which he examined no less than 21 collections. The difference with *P. barlae* f. *barlae* is said to lie merely in the colour of the young gills (russet-vinaceous in f. *barlae*; bright pink in f. *minor*), the 'clearly terrestrial habitat' (but for f. *barlae* the habitat is given as 'on soil and humus') and the small size; it is particularly stated that the two forms are similar in pigmentation as observed on dried material and mounted in KOH as well as in spore features and cystidia. In our own material the diameters of the caps varied from 18 to 40 mm, the lengths of the stems from 25 to 95 mm.

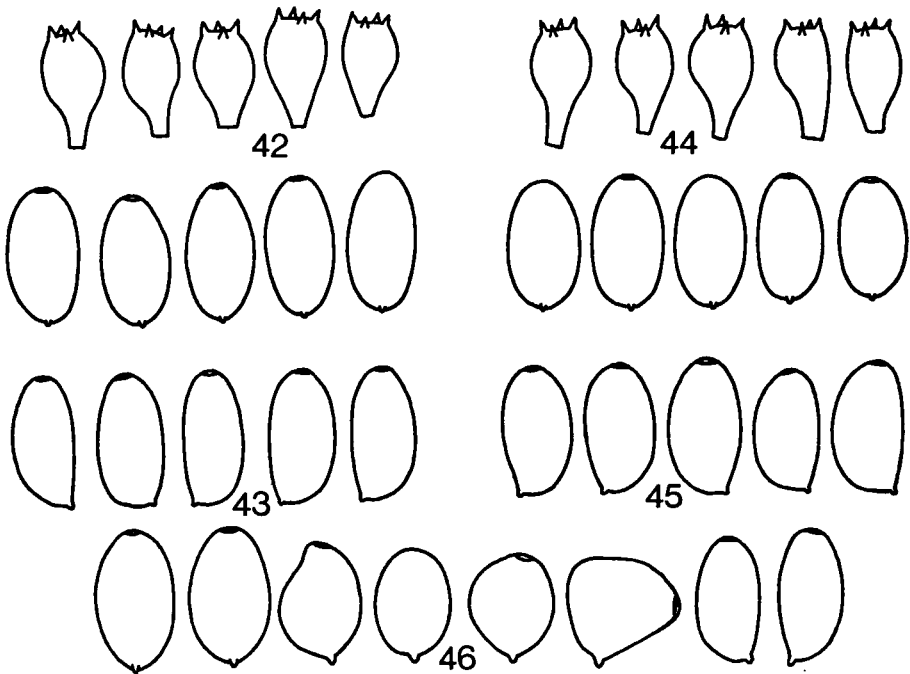
POSITION OF *P. BIPELLIS* IN THE GENUS *PSATHYRELLA*.—*Psathyrella bipellis*, because of its large spores and short, thickset basidia, obviously belongs to subgenus *Psathyrella*. Because of its habit, size, purplish colours, numerous pleurocystidia of which at least some but usually many contain an amorphous substance and oily droplets in their apical portion, the species cannot be ranked with those of section *Atomatae*. Above all because of its non-rooting stem and further because of its purplish colours and its pleurocystidia the species cannot be ranked with those of section *Psathyrella* either. It therefore merits the separate section already erected by Malençon & Romagnesi (1953: 117).

Smith (1972: 103) places the species under the name *P. barlae* in *Psathyrella* subgenus *Pannucia* section *Appendiculata*, a characteristic of this section being that the margin of the cap is appendiculate from remains of a submembranous to membranous inner veil. But neither in our collections nor in those described by Malençon & Romagnesi (l.c.) and Malençon & Bertault (1972: 182) was a truly appendiculate veil observed. The same applies to the fruitbodies depicted on Smith's plates 75a and b (1972) while Smith himself in his description of *P. barlae* does not describe the veil as appendiculate. It therefore looks as if in Smith's classification *P. bipellis* should be placed in section *Pannucia* of subgenus *Pannucia* rather than in section *Appendiculata*.

As Smith himself considers the veil features in this species rather variable and inconspicuous, the species has also been keyed out by him in subgenus *Psathyrella*. Because of its large spores and utriform pleurocystidia we find it here in section *Umbonata*, where it adjoins the very closely related *P. pseudocorrugata*, a new species, based on one collection. As for the macroscopic and microscopic characters this

species is said to be fully identical with *P. barlae*, differing only from that species by the pileus trama staining vinaceous brown in KOH. But although Smith places his *P. pseudocorrugata* in subgenus *Psathyrella* section *Umbonatae*, which is characterized by utriform pleurocystidia, it is clear from his description and particularly his figures that its pleurocystidia are not utriform but 'elliptic pedicellate to ovate-pedicellate to fusoid-ventricose' as Smith correctly calls them. This would constitute a second difference with *P. barlae* the pleurocystidia of which Smith depicts and describes correctly as 'subutriform to fusoid-ventricose, sometimes subcylindric'. The shape of the pleurocystidia in *P. pseudocorrugata* would make that species identical with Malençon & Romagnesi's '*Drosophila bipellis*' except for the pileus trama staining vinaceous brown in KOH.

We checked the colour of 'washed' sections of the caps of dried material, deprived of their gills and mounted in KOH 5%. In both our specimens with utriform and fusoid pleurocystidia we found it to be sordid greyish brown (M. 10 YR 5/2, 5/3) under the binocular lens, and sordid brown (M. 10 YR 5/3, 5/4) under the microscope, a vinaceous tinge being totally absent. This then rules out *P. pseudocorrugata* for



Figs. 42-46. *Psathyrella bipellis*. — 42, 43. 25 Oct. 1974. — 42. Basidiogram ( $\times 575$ ). — 43. Sporogram ( $\times 1212$ ). — 44, 45. Epse, 16 June 1974. — 44. Basidiogram ( $\times 575$ ). — 45. Sporogram ( $\times 1212$ ). — 46. 14 Nov. 1970. Sporogram ( $\times 1212$ ).

any of our specimens but in view of the great variability of *P. bipellis* we feel that the validity of *P. pseudocorrugata* needs confirmation.

In his observations on *P. barlae*, Smith (1972: 104) states that the fusoid pleurocystidia of *P. bipellis* as described by Malençon & Romagnesi would place that species in a different section, though not stating in which. We assume Smith meant section *Psathyrella* (pleurocystidia acute to obtuse) and within this, because of the large spores, subsection *Psathyrellae* and further, because of the absence of pink tints on pileus margin or gill edges particularly of faded basidiocarps, in series *Tenerae*. In that series *P. barlae* is indeed mentioned, this time in connection with another new species, *P. subincarnata*. *Psathyrella subincarnata*, however, is said to have no veil and narrowly fusoid-ventricose pleurocystidia with elongated neck; the three cystidia of this species depicted in Fig. 662 indeed do not resemble those of *P. bipellis* at all.

**NOMENCLATURE.**—Because of its very striking macroscopic features, particularly its beautiful purple colours, any mycologist who knows about *P. bipellis* but has never seen it, should be able to recognize this rare species at first sight when he comes across it in the field. We can therefore safely rely on the description and pictures given by Quélet (1884: 501) pertaining to the species described above as well as by Malençon & Romagnesi (1953: 122–126) although Quélet does not give microscopic details and although his pictures are rather schematized and show a violet instead of a purple colour of the cap. For reasons given above *P. barlae* as described and depicted by Bresadola (1887: 84) should be considered as a form of *P. bipellis*, having utriform pleurocystidia. Bresadola's plate represents the species better than Quélet's.

In their thorough treatise 'Le complexe "*Psathyra corrugis*"' Malençon & Romagnesi (1953: 101) give a very comprehensive survey of the synonymy of *P. bipellis*. They place *Psathyra corrugis* (Pers.) Quél. ss. Ricken first in the list of likely synonyms and take great pains in critically reviewing the literature on that species in an attempt to reveal the true identity of *A. corrugis* as described by both Persoon (1794: 24; 1801: 424) and Fries (1821: 298). In the end they conclude that the epithet '*corrugis*' was a nomen confusum and should be rejected. They could have saved themselves this extensive study of the literature by examining the material of *Agaricus corrugis* in Persoon's herbarium at Leiden (L. 910.258–411) as Singer (1961: 18) and we (1971a: 261) did. Examination of that material clearly showed that *A. corrugis* is a species quite different from *P. bipellis*, being merely a form of *P. gracilis*.

It is now generally accepted that *Psathyra corrugis* ss. Ricken stands for both forms of *Psathyrella bipellis*. Ricken's description and plate 67 fig. 3 are in full agreement with the species described above and by Malençon & Romagnesi. The latter authors draw attention to the fact that Ricken collected his *Psathyra corrugis* from May till November and describes the pleurocystidia as ventricose-fusoid, 10–12  $\mu\text{m}$  wide and often with swollen apices. From this they conclude that Ricken's description covers both '*Drosophila bipellis*' and '*Psathyra barlae*'.

*Agaricus (Hypholoma) canofaciens* Cooke, described by Cooke in Grevillea (1885: 1) and depicted later (1884–1886: plate 595/621) is likely to be synonymous with *P.*

*bipellis*, as was suggested by Malençon when he and Romagnesi started their research on *P. bipellis*. They finally reject Cooke's name as a synonym chiefly because of the very dark brown colour of both cap and stem (the latter particularly very dark at its base, according both to the description and Cooke's plate), according to Malençon & Romagnesi not showing any trace of purple or a vinaceous hue. But in the description the cap is called dark bay brown (=reddish brown, chestnut brown), the flesh of the stem rufescent. In comparing the colours of Cooke's plate with the Munsell charts we found the cap to be indeed dark reddish brown, but we agree with Malençon & Romagnesi that particularly the colour of the stem (dark brown, M. 7.5 YR 4/2) does not fit in at all with *P. bipellis*. Cooke calls the flesh of the stem rufescent, gradually darker downwards, which is not a feature of *P. bipellis* either. The spore size, given by Cooke as very large (12—7×8 μm) and the size and stature of the carpophores correspond very well with *P. bipellis*. As the very dark stem of *P. canofaciens* makes the synonymy a bit doubtful we have included the name in the list of synonyms with a question mark.

*Agaricus (Psilocybe) atro-rufus* Schaeff. ss. Cooke as depicted by Cooke (1884–1886 pl. 571/602) and later described by him (1887: 211) corresponds very well with *P. bipellis* as to colours, size and habit and may because of this be added to the list of synonyms of *P. bipellis*, be it also with a question mark, as we have not seen authentic material.

Judging by the description given by Saccardo (1899: 154) of *Psathyra roseolo* (Clem.) Sacc., originally described by Clements (1896: 23) as *Gymnochilus roseolus* and mentioned by Smith (1941: 40) as somewhat intermediate between *P. barlae* and *P. bipellis*, is almost certainly synonymous with *P. bipellis*. Not having seen authentic material Smith hesitated to dispose of it either way. We have included the name in the list of synonyms with a question mark for the same reason.

Although some authors (Konrad & Maublanc 1924: 80; Rea 1922: 418; Ricken 1913: 257) believe that *Agaricus helobius* as described and depicted by Kalchbrenner (1874: 31, pl. 17 fig. 4) might be conspecific with *P. bipellis*, we follow Malençon & Romagnesi (1953: 101) who clearly reason that Kalchbrenner's description of *Agaricus helobius* cannot pertain to *P. bipellis*, bringing forward arguments with which we fully agree and for which we refer to their paper.

#### PSATHYRELLA section SUBATRATAE (Romagn.) ex Sing.

*Drosophila* sect. *Subatratae* Romagn. in Bull. mens. Soc. linn. Lyon 13: 53. 1944. (not val. publ.; no Latin descr.). — *Psathyrella* sect. *Subatratae* (Romagn.) ex Sing. in Sydowia 15: 68. 1961. — Type: *Psathyrella subatrata* (Batsch ex Fr.) Quél.

Romagnesi (1944: 53) with a description in French founded the section *Subatratae* for what he then called *Drosophila subatrata* (Batsch ex Fr.) Quél. ss. Ricken, this species obviously being *P. conopilus* as described below. In his short description he stresses the absence of pleurocystidia and of a veil ('voile rigoureusement nul'; the



word 'nul' even in italics), and the spores are called large, 12–16  $\mu\text{m}$ . Singer (1961: 68), validating Romagnesi's sectional name, states 'velo nullo', accepting *P. subatrata* (Batsch ex Fr.) Quél. as type species. Earlier (1951: 469) Singer had already written about section *Subatratae* 'veil absolutely none, allegedly even in the primordia (at least macroscopically)' and he repeats this statement later (1962: 511). Section *Subatratae* (Romagn.) ex Sing. *emend.* A. H. Smith (1972: 271) differs from section *Subatratae* as originally described by both Romagnesi and Singer in that in four out of its 26 species remnants of a veil were said to be observed, while in only a few is the absence of a veil specifically mentioned. Moreover, the 17 species of series *Atricastanae* of Smith's section *Subatratae* have small spores (5–10  $\mu\text{m}$  long).

PSATHYRELLA CONOPILUS (Fr.) Pearson & Dennis—Figs. 4–12, 47–52

*Agaricus conopilus*<sup>1</sup> Fr., *Syst. mycol.* 1: 504. 1821. — *Psathyra conopilus* (Fr.) Kummer, *Führ. Pilzk.*: 70. 1871. — *Drosophila conopilus* (Fr.) Quél., *Enchir.*: 116. 1886. — *Coprinarius conopilus* (Fr.) Schroeter in F. Cohn, *kryptogFl. Schles.* 3 (1): 564. 1889. — *Pratella conopilus* (Fr.) Coutinho, *Eubasid. Lusit. Herb. Univ. Olisip.*: 92. 1919. — *Psathyrella conopilus* (Fr.) Pearson & Dennis in *Trans. Brit. mycol. Soc.* 31: 185. 1948. — *Drosophila subatrata* var. *conopilus* (Fr.) Kühn. & Romagn., *Fl. anal.*: 354. 1953.

*Agaricus subatratus* Batsch, *Elench. Fung.* 2: 103. 1786; ex Fr., *Epicr.*: 238. 1838. — *Psathyrella subatrata* (Batsch ex Fr.) Gill., *Champ. France Hym.*: 616. 1878. — *Psathyra subatrata* (Batsch ex Fr.) Quél. in *Bull. Soc. Amis Sci. Rouen* II 15: 161. '1879' [1880]. — *Drosophila subatrata* (Batsch ex Fr.) Quél., *Enchir.*: 117. 1886. — *Coprinarius subatratus* (Batsch ex Fr.) Coutinho, *Eubasid. Lusit. Herb. Univ. Olisip.*: 87. 1919. — *Psathyra conopilus* var. *subatrata* (Batsch ex Fr.) J. E. Lange in *Dansk bot. Ark.* 9 (1): 14. 1936.

*Agaricus superbus* Jungh. in *Linnaea* 5 (1): 388. 1830. — *Psathyra conopilus* Fr. var. *superbus* (Jungh.) Cke., *Ill. Brit. Fungi*: pl. 1158/1185. 1889–1891.

*Agaricus arata* Berk., *Outl. Brit. Fungology*: 176. 1860. — *Coprinus aratus* (Berk.) Berk. & Br. ('Notices Brit. Fungi') in *Ann. Mag. Nat. Hist.* V 9: 181. 1882. — *Psathyrella arata* (Berk.) W. G. Smith, *Syn. Brit. Basidiom.*: 200. 1908.

*Psathyra elata* Masec, *Brit. Fungus Fl.* 1: 353. 1892.

? *Agaricus graciloides* Schulz. in *Verhandl. Kaiserl.-Königl. zoöl.-bot. Ges. Wien* 26: 415. 1877.

*Agaricus graciloides* Peck non Schulz. in *Rep. N.Y. State Mus.* 30: 42. 1878. — *Psathyrella graciloides* (Peck) Sacc., *Syll. Fung.* 5: 1127. 1887.

*Psilocybe castaneicolor* Murrill in *Mycologia* 15: 19. 1923.

SELECTED DESCRIPTIONS.—Ricken, *Blätterp.*: 262, 264. 1913 (as *P. subatrata*); J. E. Lange, *Fl. agar. dan.* 4: 99, 100. 1939 (as *P. conopilus* var. *subatrata*); Kühn. & Romagn., *Fl. anal.*: 354. 1953 (as *Drosophila subatrata*); Malençon & Bertault, *Fl. Champ. sup. Maroc* 1: 195. 1970 (as *Drosophila subatrata*); A. H. Smith, North American species of *Psathyrella* in *Mem. N.Y. bot. Gdn.* 24: 273. 1972.

SELECTED ILLUSTRATIONS.—Fries, *Icon. select. Hymen.* 2: 38, pl. 139 fig. 1; Gillet, *Tabl. anal. Hymen.*: pl. 582, 590. 1884 (as *P. subatrata*); Cooke, *Ill. Brit. Fungi* 5: pl. 575/609.

<sup>1</sup> As has been pointed out by Singer (1975: 504), the epithet was written 'conopilus' by Fries in 1821, and should not change with the gender of the generic name with which it is combined.

1884–1886; 5: pl. 633/634. 1886–1888 (as *A. subatratus*); 5: pl. 636/637. 1886–1888 (as *A. aratus*); 8: pl. 1158/1185. 1889–1891 (as *A. conopilus* var. *superbus*); Ricken, Blätterp.: pl. 68, fig. 3. 1913 (as *P. subatratus*); J. E. Lange, Fl. agar. dan. 4: pl. 155 D, pl. 155 E. 1939 (as *P. conopilus* var. *subatrata*).

**CHIEF CHARACTERISTICS.**—Solitary to gregarious; cap 25–55(–65) mm (in small form 10–25 mm), conical, dark reddish brown, very soon dark brown, hygrophanous, alutaceous without pink when dry, often rugulose, rarely rugose; veil none; gills moderately broadly to narrowly adnate, tobacco colour or dark purplish brown, with white edge; stem 90–190 × 2–3 (apex) × 2.5–5 (base) mm (in small form 45–75 × 2–3.5 mm), not rooting; spores 13.5–17 × 6.5–8 μm, with eccentric germ pore; pleurocystidia absent; cheilocystidia densely packed, shape and size very variable, varying from large lageniform with long neck, 40–70 × 10–20 μm, with neck 5–10 μm wide, to small ventricose subutriform, 30–50 × 15–20 μm; spheropedunculate cells present in varying quantities; hymenophoral trama distinctly coloured; cuticle of cap a palissade of globose to clavate cells; dark yellow-brown, hollow, thick-walled, 100–400 μm long, setae springing from hypodermis.

**MACROSCOPIC CHARACTERS.**—Cap in very young stages ellipsoid, 3–4 mm in diam., 5–6 mm high, with margin appressed to stem, not striate, dark reddish brown (M. 5 YR 2/4; 5 YR 3/3, 3/4); when slightly older and larger conical and soon striate, in maturity 25–55(–65) mm in diam., 20–35 mm high (in small form 10–25 mm in diam. and 8–15 mm high), conspicuously conical, at most paraboloid-conical, in final stages only slightly spreading, conspicuously dark reddish brown (M. 5 YR 3/3, 3/4, 4/4) when still very fresh but usually when found already lacking this red hue and merely strikingly dark brown (M. 7.5 YR 4/4), finely striate up to half-way or 2/3 from margin upwards, sometimes almost to centre, hygrophanous, process of drying setting in quickly and starting at apex, colour changing either via yellowish brown (M. 7.5 YR 5/6, 6/6) or dark sordid brown (M. 10 YR 3/2, 3/3, 4/4) to finally alutaceous, very pale yellowish brown or greyish (M. 10 YR 6/4, 7/3, 7/2, 8/4, 8/3) at centre slightly darker (M. 10 YR 7/4), without pink shades, sometimes slightly micaceous, often slightly rugulose, rarely strongly rugose, with smooth and matt surface.

Veil none.

Gills 4–6 mm broad (in small form 3–4 mm), ventricose only near margin of cap, then straight (rarely slightly ventricose) and strongly ascending, moderately broadly to rather narrowly adnate without tooth, crowded, their face in very young specimens pale brownish grey (M. 10 YR 6/2, 6/3) near edge, the remainder distinctly brown (M. 7.5 YR 5/2, 5/6, 6/6), in mature specimens tobacco colour or purplish brown (M. 5 YR 2/2, 3/2; 7.5 YR 3/2, 4/2; 10 YR 3/2, 3/3), near edge sometimes somewhat greyer (M. 10 YR 5/2, 4/2) with white and minutely fimbriate edge. Trama of 'washed' gill under binocular lens hyaline, distinctly pale brown, darkest (M. 10 YR 6/4, 6/3) in basal part and sometimes up to half-way edge, paler (M. 10 YR 7/4, 7/3, 7/2) towards edge, and near and at edge very pale brown or grey (M. 10 YR 8/3, 7/2, 7/1) to practically colourless.

Stem 90–190 × 2–3 mm (apex) to 2.5–5 (base) mm (in small form 45–75 × 2–3.5 mm) with extreme base sometimes slightly clavate or even subbulbous, 4–7 mm in diam., and strigose with white hairs, not rooting, white or whitish and often pale isabelline or pale brown lower down, smooth and glossy, hollow, with pruinose and sometimes finely striate apex, in very young stages longitudinally fibrillose.

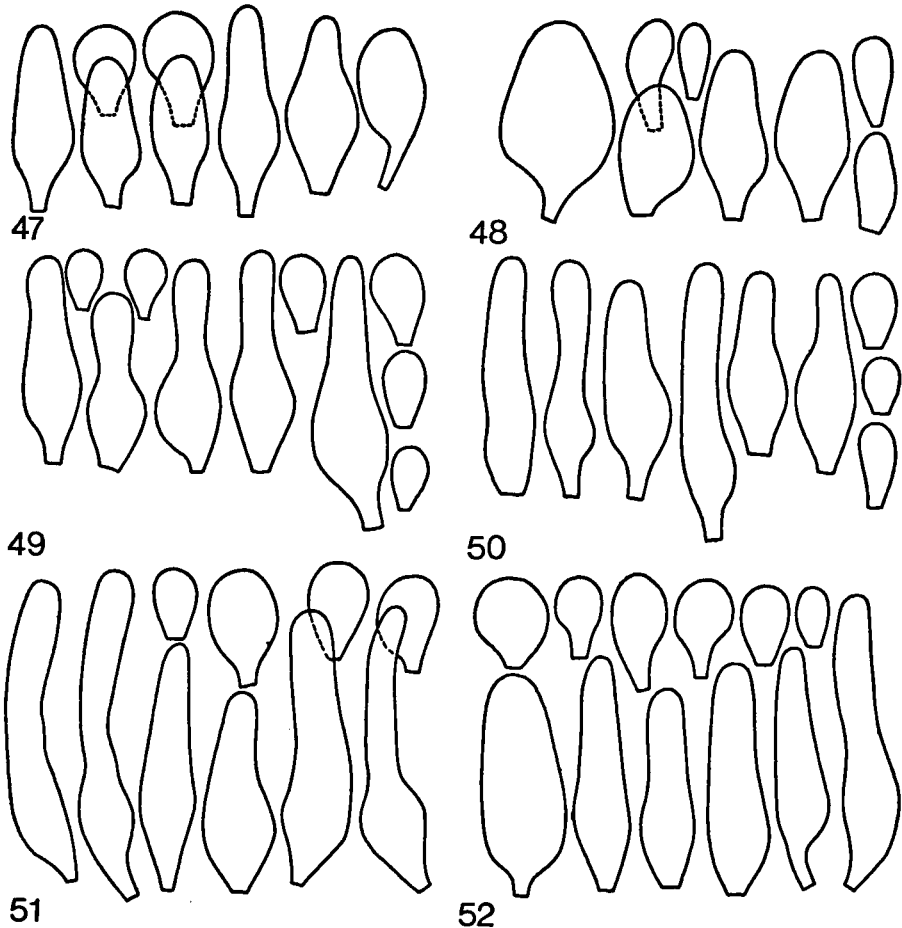
Flesh of cap 1–2.5 mm thick in centre, in young or very fresh caps dark reddish brown (M. 2.5 YR 2/4; 5 YR 3/3, 3/4), very soon via greyish brown (M. 10 YR 4/2,

4/3) to sordid white; flesh of stem pale brown (darkest at base), with thin superficial white layer.

Smell and taste not distinct.

Spore print black.

**MICROSCOPIC CHARACTERS.**—Spores (12.6–)13.5–17.1(–18)  $\times$  6.3–8.1(–9)  $\mu\text{m}$  (averages 13.7–15.8  $\times$  7.2–7.9  $\mu\text{m}$ ), smooth, ellipsoid-amygdaliform, in water dark reddish brown (M. 10 R 3/3, 3/4; 2.5 YR 3/4, 2.5/4), in  $\text{NH}_4\text{OH}$  10% scarcely darker and browner (M. 10 R 2.5/2, 3/3; 2.5 YR 3/2, 2.5/4), in  $\text{KOH}$  5% very dark greyish brown (M. 10 YR 3/2), subopaque (but some opaque, particularly when spores are mounted in  $\text{NH}_4\text{OH}$  10%); with fairly small hilar appendix; with apical germ pore varying from one collection to another and even between spores of one gill from very



Figs. 47–52. *Psathyrella conopilus*. — Cheilocystidiograms ( $\times 575$ ). — 47. 7 Oct. 1961. — 48. 8 Nov. 1962. — 49. 23 Oct. 1965. — 50. 8 Oct. 1966. — 51. 15 Nov. 1968. — 52. 3 Oct. 1975.

to less distinct and from very slightly to quite distinctly eccentric, 2–2.5  $\mu\text{m}$  wide, normally not but sometimes distinctly be it slightly truncate; apex of spore normally rounded but in spores with distinctly eccentric germ pore occasionally oblique and straight at site of germ pore.

Basidia (20–)22–40(–42)  $\times$  11–15(–16)  $\mu\text{m}$ , 4-spored.

Pleurocystidia absent.

Cheilocystidia very numerous, versiform and normally densely packed; on the whole either preponderatingly if not almost exclusively lageniform with long or fairly long or short, thin or thick, cylindrical or subcylindrical neck either sharply delimited from or gradually broadening towards ventricose cell body, 40–77  $\times$  10–20 (–27)  $\mu\text{m}$  with 5–10  $\mu\text{m}$  wide neck; or preponderatingly if not almost exclusively small, ventricose, subutriform or sometimes even utriform, subfusiform, 30–47(–55)  $\times$  15–20  $\mu\text{m}$ , with both forms normally occurring intermixed, their mutual proportions varying a great deal from one collection to another, from one specimen to another in the same collection, and from one gill to another in the same specimen, intermediate forms frequently occurring. At their base with scarcely any to a fair number (30–70% of total number of marginal cells) of spheropedunculate cells (often difficult to find) either preponderatingly small (10–25  $\times$  7.5–15  $\mu\text{m}$ ) and subglobose to clavate, or larger (15–30  $\times$  12.5–22.5  $\mu\text{m}$ ) and globose to subglobose (particularly when cheilocystidia less crowded). All these cells more or less thin-walled, colourless and without mucus or crystals, but cheilocystidia often having very slightly thickened walls.

Pigmentation of hymenophoral trama under microscope ('washed' gill mounted in  $\text{NH}_4\text{OH}$  10%): trama distinctly coloured from membranal pigment, yellowish brown in basal half and strongest at base to yellow towards and at edge, with a large number of thickened yellow hyphal septa in basal half, particularly at base, with few encrustations.

Cuticle of cap formed by a palissade of closely packed cells, chiefly globose or subglobose, some clavate, hyaline, colourless but often a few with slight brown tinge, with very short to somewhat longer stalk, the latter often with slightly thickened and yellowish brown (in  $\text{NH}_4\text{OH}$  10%) wall and a few encrustations; fairly numerous, scattered, thick-walled, dark yellowish brown, 100–400  $\mu\text{m}$  long setae very gradually tapering from the swollen base (6.4–9.6  $\mu\text{m}$ ) to the apex (2.5–3.2  $\mu\text{m}$ ), springing from the hypodermis.

Clamps present at hyphae of stem and cells of subhymenium.

**HABITAT.**—Solitary to often gregarious (not cespitose) in rich soil or humus, in deciduous woods, on rubbish heaps, on decaying material and always against small pieces of wood or dead branches. July–November, fairly common.

**COLLECTIONS EXAMINED.**—NETHERLANDS: prov. Overijssel, Deventer, estate 'Colmschate', 8 Oct. 1966, *E.K.v.W.* (L); prov. Utrecht, Amerongen, 16 Oct. 1960, *C. Bas* (L); Zeist, estate 'Nienhof', 22 Sept. 1962, *A. F. M. Reijnders* (L); Bunnik, estate 'Oud-Amelisweerd', 22 July 1954, *R. A. Maas Geesteranus* (L); Nieuwersluis, estate 'Over-Holland', 8 Nov. 1962 and 13 July 1968, *E.K.v.W.* (L); prov. Noord-Holland, Vogelenzang, dunes of Amsterdam Water Supply, 7 Oct. 1961, *E.K.v.W.* (L); Vogelenzang, estate 'Leyduin', 22 Sept. 1964, *E.K.v.W.* (L); Overveen, estate 'Elswout', 23 Oct. 1965, 25 Oct. 1974, 3 Oct. 1975, and 29 Oct. 1976, *E.K.v.W.* (L); Castricum, dunes of Province North-Holland Water Supply, 11 Nov. 1967 and 30 Sept. 1975, *E.K.v.W.* (L); prov. Zuid-Holland, Wassenaar, estate 'Zuidwyk', 30 Oct. 1954, *C. Bas* (L); Oostvoorne, estate Mildenburg, 7 Oct. 1956, *R. A. Maas Geesteranus* (L); Goedereede, Oostdijkscheweg, farm 'Zeezicht', 15 Nov. 1968, *E.K.v.W.* (L); prov. Limburg, Maastricht, St. Pietersberg, 19 Oct. 1950, *R. A. Maas Geesteranus* (L); Maastricht, Cannerbosch, 10 Nov. 1951, *R. A. Maas Geesteranus* (L).

Fries (1874: 313) already states that apart from the far and away most common, tall form of *P. conopilus* (stem 100–125 mm long) a medium sized form occurs (stem 50–75 mm long), and even a small form (stem 25 mm long). This observation is confirmed by a few authors: Bel (1889: 122) mentions 40–120 mm for the length of the stem; Stevenson (1886: 343) in distinguishing a large, an intermediate and a small form of *A. subatratus* and giving the same figures as Fries probably copied these from Fries; with Wakefield & Dennis (1950: 20) the length of the stem goes up to only 60 mm; with Rea (1922: 419) the length varies from 25 to 125 mm. Large gregarious groups of specimens usually comprise a few smaller specimens, but occasionally all specimens of a collection are small, and this may well impede recognition in the field. Three out of our own 18 collections (8 Nov. 1962, 11 Nov. 1967, 13 July 1968) consisted exclusively of medium-sized carpophores (stems 60, 45–75 and 30–50 mm long). We feel it is not warranted, however, to formally distinguish a small form of *P. conopilus*.

The process of drying sets in so quickly that one normally finds the caps to be merely dark brown (M. 7.5 YR 4/4), all traces of red having already disappeared; the specimens nevertheless still look quite fresh. One often finds all or almost all the caps of a collection already dry and alutaceous. In the past this has led to erroneous descriptions and misinterpretations of the species.

The cause of the very smooth and matt appearance of the dry caps of *P. conopilus*, resembling the surface of dry caps of species of the genus *Conocybe*, is probably that the cuticle of the cap consists of a palissade of spheropedunculate cells instead of the usually 2–4 cells deep layer of globose to subglobose cells. The former very much resemble those of the cuticle of species of *Conocybe*, be it that the stalks are shorter.

As for the cystidia, Romagnesi (1953: 354) states in bold face letters that they occur exclusively on the edge of the gills; adding between brackets, however, the word 'presque'. With our technique of carefully removing the gill edge from the gill and then studying both the edge and the remaining part of the gill under separate coverslips under the microscope we have never come across pleurocystidia in *P. conopilus*. Smith (1972: 273) also reports the absence of pleurocystidia in *P. conopilus*. In his definition of the section *Subatratae*, Romagnesi (1944: 53) truly describes the cystidia as being variable; he also calls them subutriform. As stated in our description and depicted in our figures they are very often lageniform, while many intermediate forms (subfusiform, sublageniform, subcylindrical) frequently occur.

All authors agree on the absence of a veil in *P. conopilus*, and most authors describe the stem as having a pruinose apex. Smith (1972: 273), however, calls the veil 'rudimentary or lacking' and does not mention the stem as being pruinose at the apex. Smith also states—and this tallies with the latter observation—that he has not found caulocystidia on revived material. We cannot endorse these observations. In our own material we have never come across remnants of a veil on either cap or stem; we always found the apex of the stem to be distinctly, though not strongly and often only slightly, pruinose, in accordance with the latter observation we found caulocystidia in abundance on the apex of the stem. The caulocystidia are identical with the cheilocystidia and of either the same size or slightly larger.

*Psathyrella conopilus* is first mentioned by Fries in Syst. mycol. (1821: 504) where he compares his *Agaricus conopilus* with *A. conocephalus* Bull., from which species he considers it to differ. With Ricken (1913: 69) the latter species is *Bolbitius conocephalus* (Bull.), a species supposed to belong to the genus *Galerella* by Singer (1975: 518).

Although the description of 1821 is very brief and far from clear, indicating only a few characters, it can be taken as the first formal description of our *Psathyrella conopilus*. In Epicrisis (1838: 238) Fries gives his first description of *A. subatratus*, together with a description of *A. conopilus*. In all his works Fries places *P. conopilus* in tribus *Psathyra*, *P. subatrata* in tribus *Psathyrella*; one wonders why. In Monographia Fries (1857: 438) stresses the great analogy between the species of *Psathyra* and those of *Psathyrella*, the former to be distinguished from the latter because their spores are dark brown and not black and their gills are dark brown or purplish. In the same work Fries (1857: 438) states about *A. conopilus* that the gills become 'cum sporis fusco-purpurascens' (colour of the spore print unfortunately not mentioned separately) and about *A. subatratus* (1863: 305) that the gills are 'fuligineo-nigricantes, fere umbrinae' (therefore also some shade of brown) and the spore print black. In the Icones (1877-1884, pl. 139, fig. 1) the gills of *A. subatratus* are depicted as very distinctly brown, tobacco brown. The caps of *A. conopilus* are called 'ex albido pallescens', no striation being mentioned, whereas the caps of *A. subatratus* are called 'pulchre rufescenti-umbrinus, siccus rufescenti-pallidus' and 'circa marginem striatulus'. The description of all other characters (sizes of cap and stem, habit, attachment and crowding of gills, smoothness and rigidity of stem, etc.) is the same or nearly so. From these descriptions and also from those in Epicrisis, Hymen. europ. and the Icones, the conclusion is justifiable that *A. conopilus* cannot but represent the dry stage of *A. subatratus*.

Although quite a number of authors (Gillet, 1878: 582, 616; Ricken, 1913: 262, 264; Lindau, 1917: 126; Rea, 1922: 413, 419; Bigeard & Guillemin, 1913: 99, 100; Buch, 1952: 273, 274; Lange, 1939: 99, 100; Moser, 1967: 213, and others) give separate descriptions of both *P. conopilus* and *P. subatrata*, it is sufficiently clear that *P. conopilus* as interpreted by these authors pertains to the dry form of *P. subatrata*. Plate 155 D (*Psathyra conopilus*) and plate 155 E (*Psathyra conopilus* var. *subatrata*) given by J. E. Lange (1939) illustrate this best.

Romagnesi (1953: 354) calls the species *Drosophila subatrata* with a var. *conopilus*, of which the caps are higher, have a more acute apex and are remarkably rugose in the dry stage, whereas the spores are said to be very slightly smaller.

Malençon & Bertault (1970: 195), following Romagnesi's nomenclature, add yet another difference in that the carpophores of var. *conopilus* ss. Romagn. are supposed to be larger. From our own material we have been unable to lend support to the statements by either Romagnesi or Malençon & Bertault. The caps of almost all our collections were to some extent rugulose in the dry stage, and the only collection (plm. 20 specimens, 13 July 1968) in which dry caps were conspicuously rugose consisted of medium sized carpophores (stems 45-75 mm long) of which the spores were not smaller than those in the other collections (average  $14.7 \times 7.3 \mu\text{m}$ ) and the caps not outstandingly conical.

Singer (1975: 504) quite recently mentions the two supposed taxa as separate species. Dennis, Orton & Hora (1960: 144) are the first to realize and proclaim the conspecificity of *P. conopilus* and *P. subatrata*; A. H. Smith (1972: 273) followed suit.

Judging by the descriptions given by Berkeley (1860: 176) of *A. aratus*, later by Berkeley & Broome (1882: 181) of *Coprinus aratus* (Berk.) Berk. & Br. and again later by W. G. Smith (1908: 200) of *Psathyrella arata* (Berk.) W. G. Smith, this species must be conspecific with *P. conopilus*. Indeed, Pearson & Dennis (1948: 185) state that Cooke's plate 636/637, depicting *A. aratus*, though unusually sulcate as they put it is hardly distinct from *P. conopilus*. Both the latter authors and Dennis, Orton & Hora (1960: 144) also state that Masee's *P. elata* (1892: 353) is conspecific with *P. conopilus*.

A. H. Smith (1972: 274) examined the type material of *Psilocybe castaneicolor* Murrill (1923: 19) and *A. graciloides* Peck (1878: 42) and found these specimens identical with *P. conopilus*. Schulzer von Muggenburg (1877: 415) also names a species *Agaricus graciloides*, doing this just one year before Peck describes his species. Going by Schulzer's description his species very probably also represents *P. conopilus*, but as we did not examine type material we have given the name with a question mark in the synonymy.

Under *A. conopilus*, Fries (1838: 231 and 1874: 304) already referred to the description and picture Junghuhn (1830: 388, pl. 6 fig. 11) had given of his *A. superbus*, a species clearly representing *P. conopilus*.

The description Benoist (1899: 163) gives of his *Psathyrella circellatipes* corresponds in every way with medium sized specimens of *P. conopilus*, except that he reports that in very young specimens the entire cap and stem are covered with reddish orange hairs, that later both cap and stem become smooth, the stems then being covered with white hairs only at the extreme base, above which one or several about 1 mm broad, torn, reddish orange annular zones occur, rarely replaced by a fibrous zone of the same colour. From this description it seems that both the hairs and the annular zones are remnants of an ozonium, the more so as Benoist adds that the colour is the same as that of the membranous mycelial remnants, often adhering to the base of the stems. Benoist's specimens, moreover, did not grow solitary but cespitose against oak wood.

Malençon & Bertault (1970: 196) mention the occasional presence of 'méchules fauve vif par les débris d'un Ozonium' at the base of the stem. Such fibrils were noticed only in one of our collections (30 Oct. 1954) and were described by the collector as delicate loose fibrils which were pale ochre brown only in the largest specimen of the collection.

Benoist's species is mentioned only by Bigeard & Guillemin (1913: 300), who merely copy Benoist's description. Romagnesi (1953: 354) regards Benoist's species as merely a form of *Drosophila subatrata*, and Smith (1972: 274) regards the species as one in its own right and even describes a small-spored variety of it, viz. var. *microspora*. With Smith the stem has brownish flecks of tomentum near the base with some tawny mycelium around the base in young basidiocarps, which Smith also

calls ozonium. In all other respects Smith's description tallies with the medium sized forms of *P. conopilus* (stems 40—70 × 1.5—4 mm), except that he calls the gills ventricose (his plate 74, however, shows rather straight to only slightly ventricose gills), that here he did find caulocystidia, and above all that the growth is cespitose (as clearly depicted on his plate 74). Smith does not report the actual presence of coloured annular zones as described by Benoist. We feel that the relatively small size combined with the cespitose growth, and not the remnants of the ozonium would lend support to regarding this species, which we have never come across, as a variety of *P. conopilus*.

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