

FUNGI OF *AMMOPHILA ARENARIA* IN EUROPE

by

R. W. G. DENNIS

Royal Botanic Gardens — Kew

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*A small tribute «Que das Boreas partes foi mandada»,
in the spirit of the old alliance.*

LUSIADS, Canto II stanza 57

Ammophila arenaria (L.) Link (*Psamma arenaria* (L.) Roem. & Schult.) is a perennial rhizomatous grass characteristic of the seaward edge of maritime sands, frequently dominant or forming almost pure stands over extensive areas, and of considerable economic importance as a stabiliser of shifting dunes. In spite of its apparently barren and hostile environment it forms dense clumps of tough persistent foliage and its dead leaves still attached to the plant or in various stages of fragmentation persist for months on the surface between the plants. In these circumstances it acts as host to a remarkable number of fungi, principally saprophytes occurring at successive stages of decay of dead leaves and culms. The majority of these have a wide host range, on other grasses or even on dicotyledonous stems

and woody debris but an appreciable number appear either to be confined to *Ammophila* or to have it as their principal host. Although *Elymus arenarius* and species of *Agropyron* often grow adjacent to *Ammophila* it seems they do not always share the same fungi. Only rusts, mainly the very common *Puccinia pygmaea* in a race with copious uredo production, less often *P. elymi*, and ergot, *Claviceps purpurea*, seem to be active parasites of this very successful grass though there are occasional records of the smut *Ustilago hypodytes* and possibly the root-rotting ascomycete *Gaeumannomyces graminis*. *Ammophila* is closely related to *Calamagrostis* and commonly crosses with *C. epigeios* to give the sterile intergeneric hybrid *Ammocalamagrostis baltica* (Flügge) P. Fourn. A species of *Calamagrostis*

(*C. arundinacea* or *C. villosa*) is the type host of the plurivorous grass rust *P. coronata* Cda. and it is somewhat remarkable that none has yet detected a race of that attacking *Ammophila*, specially as one occurs on *Ammocalamagrostis baltica* on the Norfolk coast (E. A. ELLIS, personal communication).

Ammophila arenaria extends along the western shores of Europe from about 63° N in Norway (HULTEN 1971) to the shores of the Mediterranean and North Africa i. e. through some 27° of latitude. Hence, in spite of the apparent uniformity of its habitat, it must be subject to considerable differences in climate and it would be unwise to assume that all the fungi reported in association with it follow the host throughout its geographical range. For example, ERIKSON (1967) was unable to find *Chitonospora ammophilae* in Scandinavia, though it is plentiful in Britain and the Low Countries.

A number of mycologists have shown interest in the fungi of *Ammophila*. Several of the common species were first collected by ROBERGE from the coast of Normandy and described by DESMAZIERES in his long series of papers on French microfungi. Rostrup printed a short list of *Ammophila* fungi from Denmark, several were described from Holland by OUDEMANS and many more from the Belgian coast in the vicinity of Ostende by BOMMER & ROUSSEAU. By far the most extensive list so far, however, is that by APINIS & CHESTERS (1964), in the course of an intensive study of maritime grasses and soils in Lincolnshire. It is not always clear, however, which species they observed actually fruiting on the grass and which

were obtained from its debris by isolation in pure culture or by incubation. Many of the fungi they record are best known as coprophilous species. The writer has long been interested in the distribution of fungi on *Ammophila* throughout the Hebrides and in compiling the present list he has drawn not only on his own experience but also on information freely supplied by those indefatigable East Anglian mycologists E. A., J. P. and M. B. ELLIS.

There follow brief descriptions, the majority illustrated by a figure, of about 100 fungi known to grow and fruit on or in intimate association with *Ammophila arenaria* in Europe. The precise number of species involved depends on one's personal opinion regarding synonymy and also on the still largely unexplored connections between form species of Fungi imperfecti and species of Ascomycetes. In addition a number of the moulds isolated by APINIS (1964) and by MOREAU & MOREAU (1941) from dune sands in Normandy and Brittany are likely to be found from time to time fruiting on dead parts of the dune vegetation. MOREAU & MOREAU listed eleven species of fungi as typical inhabitants of dune sand fixed by *Agropyron* and *Ammophila*. These include *Alternaria alternata*, *Cladosporium herbarum* and *Racemosporium saturnus* MOREAU & MOREAU, which appears to be another name for *Papularia arundinis*, as well as *Fusarium culmorum* which Apinis isolated from *Ammophila*. Of the remaining species at least the common moulds *Trichothecium roseum* Link, *Gliomastix convoluta* (Harz) Mason and *Acrostalagmus lateritius* MOREAU & MOREAU (which appears scarcely distinct from the ubiquitous *Verticillium*

tenerum Nees ex Link) must almost certainly fruit on the decaying grass from time to time.

It may be hoped the present summary of fungi already known to be associated with this important grass will encourage further collecting, especially in the southern part of its range and stimulate research into the numerous problems still unsolved in taxonomy and synonymy of the fungi and their ecology and relationship with the host.

Prof. Pinto-Lopes was my close friend for some 35 years and I greatly valued his scientific integrity and his familiarity with the polypores of Portugal and Portuguese Africa. We collected together throughout Portugal from the Douro and the Serra da Estrela to Evora and the Serra da Arrabida. His generous hospitality and personal contacts in the island contributed greatly to the success of my collecting trip in the Açores and I feel it a great privilege to be invited to contribute to a volume in homage to so distinguished and regretted a colleague.

Helotiales

Sclerotiniaceae

Rutstroemia maritima (Rob.) Dennis

Persoonia 2 : 52 (1964)

Apothecia scattered, erumpent, about 1 mm diameter, cupshaped with a short stalk, soft fleshed, cinnamon, excipulum with thinwalled, brown, rectangular cells, passing into parallel hyphae at the margin. Asci cylindric-clavate, 130-165 × 13 μ ,

8-spored, with broad pore blued by iodine; ascospores uniseriate, elliptical, 14-17 × 5.5-7 μ , nonseptate, hyaline; paraphyses cylindrical, obtuse, 4 μ wide. On outer surface of dead leaves. Fig. 1D.

Helotiaceae

Belonioscypha culmicola (Desm.) Dennis
Comm. myc. Inst. mycol. Paper 62 : 39 (1956)

Apothecia scattered, superficial, cup-shaped, about 1 mm across, smooth, stalk short, cylindrical, white to cream. Asci cylindric-clavate, up to 140 × 14 μ , 8-spored, pore blued by iodine; ascospores cylindric-fusiform, 19-33 × 3-4 μ , 3-septate, hyaline, with a gelatinous sheath; paraphyses cylindrical. Fig. 1E.

Common on dead grass and herbaceous stems, not seen on *Ammophila* by me but so reported by APINIS & CHESTERS (1964) and by BOMMER & ROUSSEAU (1891) as *Belonidium vexatum*.

Cyathicula cyathoidea (Bull. ex Méral)
de Thuemen

Fungi austriaci No. 1115 (1874)

Apothecia externally similar to the preceding but usually smaller, asci up to 50 × 4-5 μ , ascospores narrowly fusiform, 6-12 × 1.5-2.5 μ . Fig. 1F.

This is a collective species, common on dead herbaceous stems and dead grasses, recorded on *Ammophila* by APINIS & CHESTERS (1964).

C. stipae (Fuck.) Müller

Beitr. Krypt. Flora Schweiz 15(1) : 36 (1977)

Apothecia scattered, superficial, black, up to 1 mm across, cupshaped, narrowed to a small foot inserted in the host leaf,

smooth. Excipulum composed of parallel agglutinated hyphae, curving upwards towards the margin, hyaline in the flesh but with the terminal superficial cells dark brown, cylindric-clavate. Asci cylindric-clavate, $45-50 \times 6 \mu$, 8-spored, pore blued by iodine; ascospores irregularly biseriata, elliptic-cylindric, $7-9 \times 2-3 \mu$, nonseptate, hyaline; paraphyses cylindrical, obtuse, 2μ wide, colourless. On dead leaves in May. Fig. 1G.

According to MÜLLER (1977) the typical variety occurs in the Alps on *Anthoxanthum*, *Festuca*, *Phleum*, *Poa* and *Trisetum*. The fungus on *Ammophila* appears to differ from the type in having a thinner dark outer zone in the excipulum and in having obtuse instead of pointed tips to the paraphyses. I hesitate to propose a new species on such slender grounds, in a group of fungi still imperfectly known, but separation at varietal level may be advisable:

var *ammophilae* var. nov.

A typo recedit paraphysibus apice obtusis. Hab. in foliis emortuis *Ammophilae arenariae*, Eilean Garbh, Isle of Gigha, 12.5.1981, Typus.

Hymenoscyphus robustior (Karst.) Dennis
Persoonia 3 : 75 (1964)

Apothecia scattered, superficial, cup up to 2 mm wide, light yellow, on a cylindrical stalk which is at first pink, drying yellowish-brown. Asci cylindrical, $90-120 \times 7-9 \mu$, 8-spored; ascospores biseriata, elliptic-cylindric, $7-14 \times 3-4 \mu$; paraphyses cylindrical, obtuse, $2-2.5 \mu$ wide, hyaline. Fig. 1V.

Usually on dead stems of marsh plants but occasional on *Ammophila* in summer.

Pezizella eburnea (Rob.) Dennis

Comm. myc. Inst. mycol. Paper 62 : 61 (1956)

Apothecia scattered, superficial, cup-shaped on a short stalk, up to 400μ diameter, white, downy with short, smooth, cylindrical hairs towards the margin. Asci up to $40 \times 5 \mu$, 8-spored, pore blued by iodine; ascospores fusiform-clavate, $6-8 \times 1-1.5 \mu$; paraphyses filiform. Fig. 1H.

Common on dead grasses, reported on *Ammophila* by APINIS & CHESTERS (1964) who also recorded the little-known *Phialea straminea* (Berk. & Br.) Dennis.

Hyaloscyphaceae

Dasyscyphus carneolus (Sacc.) Sacc. var *longisporus* Dennis

Comm. myc. Inst. mycol. Paper 32 : 90 (1949)

Apothecia sparse, superficial, shallow cups about 500μ broad on slender stalks, white, soon reddening, clothed throughout with slender thinwalled hairs, slightly tapered to a rounded tip, septate, walls granulate. Asci $35-40 \times 4 \mu$, 8-spored; ascospores biseriata, slender, fusiform, $8-12 \times 1-1.5 \mu$; paraphyses lanceolate, $3-4 \mu$ wide, much longer than the asci. Fig. 1L.

The type host is *Bromus erectus* but the fungus occurs on a wide range of dead grasses and occasionally on *Ammophila*. It is recognised by the slender delicate hairs, long stalked reddening apothecia and relatively long ascospores.

D. controversus (Cooke) Rehm 26th Ber. naturh. Ver. Augsburg 31 (1881)

Apothecia gregarious, superficial, fragile, cupshaped on a short stalk, up to 1.5 mm diameter, disc pink, darkening, receptacle white to yellow, reddening

with age, clothed with cylindrical, obtuse, septate hairs with thin finely granulate walls, $50-60 \times 3.5-4 \mu$. Asci $45-50 \times 4-5 \mu$, 8-spored; ascospores fusiform, $8-11 \times 1.5 \mu$; paraphyses lanceolate, $4-5 \mu$ wide, longer than the asci. Fig. 1J.

This differs from the preceding in the larger sessile apothecia and broader hairs. It is typically on *Phragmites* and common on *Phalaris* but I have not seen an undoubted collection on *Ammophila*, on which it was recorded by BOMMER & ROUSSEAU (1891) and also by APINIS & CHESTERS (1964), who reported also the rather vaguely distinguished *D. carneolus* (Sacc.) Sacc.

D. palearum (Desm.) Masee
British Fungus Flora 4 : 347 (1895)

Apothecia scattered, up to 1 mm diameter, cupshaped on a short cylindrical stalk, yellowish brown, drying dark brown, clothed with short brown hairs; disc concave, cream. Hairs cylindrical, up to $110 \times 3-5 \mu$, wall firm but not very thick, yellowish brown, closely set with rather coarse granules, multiseptate, with a paler, short, obtusely rounded, apical cell, sometimes capped by large crystals. Asci $45-65 \times 4 \mu$, 8-spored, pore blued by iodine; ascospores biserial, fusiform, $10-14 \times 1.5-2 \mu$, nonseptate; paraphyses lanceolate, up to 5μ wide, longer than the asci, Fig. 1K.

The type host is *Triticum* but a form of this species is common on *Ammophila* from April to September. BOMMER & ROUSSEAU (1891) recorded it as *D. patens* (Fr.) Rehm.

Dermateaceae

Belonium psammicola (Rostrup) Nannf.

Nov. Act. reg. Soc. Sci. Upsal. Ser. 4, 8 : 101 (1932)

Apothecia scattered on surface of leaf, minute, cupshaped, sessile, black. Excipulum composed of isodiametric brown-walled cells, $8-10 \mu$ wide, bearing cylindrical-clavate dark brown hairs, $20-30 \times 4 \mu$. Asci clavate, $45-60 \times 6 \mu$, 8-spored, pore blued by iodine; ascospores fusoid, $7-9 \times 2-3 \mu$; paraphyses cylindrical. Fig. 1M, showing pportion excipulum in surface view.

Trochila psammicola Rostrup is a synonym.

Hysteropezizella prahliana (Jaap) Nannf.
op. cit. 120 (1932)

Apothecia gregarious, immersed in the mesophyll, cupulate, up to 250μ diameter, black, erumpent to expose the colourless disc. Excipulum composed of brown isodiametric cells passing into rows of elongated cells towards the margin. Asci clavate, $60 \times 15 \mu$, 8-spored, pore blued by iodine; ascospores biserial, $12.5-14 \times 3.5-5 \mu$, clavate, biguttulate, becoming 1-septate, hyaline; paraphyses cylindrical, up to 2μ wide.

Collections which have been so-called from Orkney & Shetland have narrow asci with smaller ascospores and possibly represent a distinct species. *H. prahliana* was ignored by DEFAGO (1968) and in the absence of reliable comparative material or a modern description of the species it is difficult to evaluate these apparent differences. For the present it will suffice to draw attention to them by proposing a varietal name for the fungus from the northern isles:

var. *orcadensis* var. nov.

A typo sporidiis $10.5-12 (-14) \times 2.5-3 (-4) \mu$ recedit. Hab. in foliis emortuis *Ammophilae arenariae*, Egilsay, 8. 7. 1970, Typus.

Apothecia gregarious, immersed, subcuticular, deeply cupulate, up to 250μ diameter, closed and appearing as minute black dots when dry, throwing open the host cuticle and emerging as shallow black cups with deeply concave grey disc when soaked up. Excipulum thin and soft, composed at the base of small, thinwalled, dark brown, quadrangular cells but soon passing upwards into rows of elongated rectangular cells. Basal coloured layer very thin, hypothecium white. Asci cylindric-clavate, short-stalked, $50-60 \times 6 \mu$, 8-spored, conical above with a minute pore feebly blued by iodine; ascospores biseriata, narrowly clavate, (8-) $10-12 (-14) \times 2.5-4 \mu$, hyaline, some becoming 1-septate; paraphyses slender, cylindrical, obtuse, hyaline. Fig. 1N.

Hysterostegiella valvata (Mont.) v. Höhn. Sitzb. Akad. Wiss. Wien, Math. Nat. Kl. Abt. 1, 126 : 313 (1917)

Apothecia scattered, elliptical, up to 1 mm long immersed in mesophyll of dead leaves and covered by an elliptical grey patch of host epidermis which is thrown back at maturity to expose the grey disc. Excipulum of isodiametric grey-brown cells, passing into parallel hyphae at the margin. Asci cylindric-clavate, $45-55 \times 5 \mu$, 8-spored, pore blued by iodine; ascospores biseriata, $4-7 \times 1.5 \mu$; paraphyses lanceolate 5μ wide, longer than the asci. Common on *Ammophila*, June to September, recorded from Portugal in April by DEFAGO (1968). Fig. 10.

Mollisia poaeoides Rehm in Rabenhorst, Krypt. Flora Ed. 2(1), Abt. 3 : 544 (1891)

Apothecia gregarious, erumpent, sessile, up to 0.4 mm diameter, blackish brown with a blue-grey disc. Excipulum formed of isodiametric brown cells. Asci cylindric-clavate, $40-50 \times 6-8 \mu$, 8-spored, pore blued by iodine, ascospores biseriata, fusiform, $7-10 \times 2 \mu$, nonseptate; paraphyses cylindrical, colourless, 2.5μ wide.

REHM described this from dead grass in the Alps but cited under it, with a query, a collection from Brandenburg on *Ammophila*. MÜLLER (1977) recorded the species on *Festuca* and *Helicotrichon* and thought records on other hosts were doubtful. Confirmatory collections on *Ammophila* are therefore desirable.

Pyrenopeziza arenivaga (Desm.) Boud. Hist. Classif. Discom. d'Europe 133 (1907)

Apothecia scattered, erumpent from both surfaces of the leaf, about 1 mm across, subglobose, then cupshaped, soft-fleshed, smooth, dark brown, drying black. Excipular cells isodiametric, $8-12 \mu$ diameter, dark brown, passing into parallel hyphae at the margin. Asci cylindric-clavate, short stalked, $60-75 \times 15 \mu$, 8-spored, pore outlined blue in iodine; ascospores irregularly biseriata, elliptic-oblong, $12-16 \times 5-6 \mu$, nonseptate, hyaline; paraphyses slender, obtuse, hyaline. Common, April to September. Fig. 1P.

APINIS & CHESTERS (1964) listed «*Pyrenopeziza graminis* (Desm.) Sacc.» from *Ammophila* but in the absence of any description it is impossible to say what they meant by this.

Doubtful records of Discomycetes.

Lachnum helotioides Rehm var. *ammophilae* Rehm

Ann. Mycol. 3 : 393 (1905)

Reported from the Baltic coast by JAAP. *L. helotioides* is a sessile brown species of *Dasyscyphus* on *Carex*; the var. *ammophilae* was said to differ solely in its smaller ascospores, $8.5 \times 1.5 \mu$.

Peziza ammophila Dur. & Mont. Explor. scient. d'Algerie, Botanique. Atlas Tab. 28, fig. 2 (1847)

This member of the Pezizales has a wide distribution on maritime sand dunes on both sides of the Atlantic but an association with *Ammophila* needs confirmation. Near Aberdeen, TRAIL (1893) found it to be associated principally with *Elymus* and found no close relationship between it and *Ammophila* or other grasses.

CLARK's (1980) record of *Apostemidium norvegicum* Gremmen is an error.

Phacidiales

Lophodermium arundinaceum (Schrad. ex Fr.) Chev. Flore gén. env. Paris 1 : 435 (1826)

Apothecia scattered in bleached leaves, broadly elliptical with rounded ends, up to 2.5 mm long, sunk in the mesophyll beneath about 3 layers of host cells, opening by a longitudinal slit. Covering layer formed of host cells packed with dark brown hyphae and opaque matter, edges of the slit thickened, black and opaque in section except for a narrow marginal band of slender hyaline hyphae. Asci cylindrical to subclavate, sessile or stalked, $70-120 \times 7-12 \mu$, 8-spored, not blued by iodine; ascospores fascicled,

filamentous, straight or coiled above, $60-100 \times 1.5 \mu$, hyaline, nonseptate, with a thin gelatinous sheath; paraphyses filiform, hyaline, curled at the tips. Common. Fig. 1Q. The type host is *Phragmites* but the fungus on *Ammophila* is similar.

Clavicipitales

Claviceps purpurea (Fr.) Tul.

Ann. Sci. nat. Bot. Ser, 3, 20 : 45 (1853)

Sclerotia (ergots) medium to large for the species, up to about 20×3 mm, straight or curved, dark purplish brown to black with solid white flesh, germinating in spring to bear one to many capitulate clavae, each enclosing numerous perithecia with papillate ostioles, containing long cylindrical asci with filiform ascospores. TULASNE sowed ergots from *Ammophila arenaria* in Normandy on 13.12.1851 and obtained a succession of perithecial clavae during the following April-June. PETCH (1937) also recorded successful germination of ergots from *Ammophila*. According to LOVELESS (1971) the honey-dew conidia on *Ammophila* fall in the same morphological category as those on *Agropyron*, *Arrhenatherum*, *Dactylis*, *Holcus*, *Lolium*, *Festuca*, *Secale* and *Triticum* and, if the species is eventually divided on a basis of conidial shape, it is to this group that the epithet *purpurea* will be restricted. Fig. 1W.

Sphaeriales

Nectriaceae

Calonectria minutissima Grove

Journal of Botany 68 : 131 (1930)

Perithecia superficial, spherical, 80-100 μ diameter, pallid, smooth. Asci cylindrical-fusiform, $40 \times 5 \mu$, 8-spored; ascos-

pores biseriate, cylindrical with tapered ends, flexuous, $20-22 \times 1.5 \mu$, hyaline, 7-9-guttulate.

I have not seen this, there is no material in the Grove herbarium. The type was on *Eleocharis* but it was reported on *Ammophila* by APINIS & CHESTERS (1964).

Nectriella exigua spec. nov.

Peritheciis sparsis, immersis, globosis, minutis, roseis, ostiolo vix conspicuo, mollibus. Ascis clavatis, tenerrimis, $35-45 \times 4.5-6 \mu$, octosporis; ascosporis di-tristichis, oblongis, rectis vel subcurvatis, subobtusis, hyalinis, $8-10 \times 2 \mu$, biguttulatis continuis dein 1-septatis. Fig. 1B.

Hab. in foliis emortuis *Ammophilae arenariae*, Perranporth, Feb. 1929, Typus.

The very minute perithecia are scarcely visible to the naked eye but appear under a hand lens as minute pink pimples on the surface of the dead leaf.

Hypocreaceae

Chromocrea spinulosa (Fuck.) Petch
Trans. Brit. mycol. Soc. 33 : 350 (1950)

Stromata flattened, superficial, up to 3 mm diameter, buff but the upper surface covered with black dots marking ostioles of included perithecia. Ascis cylindrical, $70-85 \times 4 \mu$, 8-spored; ascospores oblong-elliptic, $6.5-9 \times 3 \mu$, green, unequally 1-septate and separating at the septum at maturity to give a 16-spored ascus, punctate. Fig. 1C.

Recorded on *Ammophila* by CLARK (1980).

Sphaeriaceae

Anthostomella phaeosticta (Berk.) Sacc.
Michelia 1 : 374 (1878)

A. ammophilae (Phill. & Plowr.) Sacc.
Sylloge Fungorum 1 : 763 (1882)

Perithecia scattered singly beneath elliptical purplish-black clypei in the host epidermis, black, subglobose, up to 300μ diameter, with a small apical papilla. Ascis cylindric, $70-100 \times 9-13 \mu$, 8-spored, with apical ring 3μ deep blued by iodine; ascospores 1 to 2-seriate, ellipsoid, with a dark brown cell $10-14 \times 6-8 \mu$ bearing a longitudinal germ slit, and a minute, hyaline, basal cell $2 \times 2 \mu$; paraphyses diffluent. Abundant wherever *Ammophila* occurs on the British coasts. Fig. 1S.

The type of *A. phaeosticta* is on *Hierochloa brunonis* from subantarctic islands south of New Zealand but FRANCIS (1975) finds it morphologically indistinguishable from *A. ammophilae*.

A. lugubris (Rob.) Sacc.

Sylloge Fungorum 1 : 278 (1882)

Externally like the preceding but with slightly larger perithecia and ascis $125-160 \times 11-14 \mu$, 8-spored; ascospores uniseriate, elliptic-fusoid, dark brown, $18-24 \times 8-11 \mu$, with indistinct longitudinal germ slit $10-12 \mu$ long. A few collections, otherwise similar, have ascospores with a minute hyaline basal cell about $1 \times 1 \mu$. Fig. 1R.

Widespread but apparently less common in Britain than *A. phaeosticta*, June to September.

A. calamagrostidis Brun. is probably a synonym according to FRANCIS.

Diaporthaceae

Phomatospora arenaria Saec. Bomm. & Rouss.

Bull. Soc. roy. Bot. Belge 29 : 276 (1890)

Perithecia scattered, immersed, with papillate erumpent ostiole, up to 140 μ diameter, black. Asci cylindrical with slender stalk, 110-126 \times 7 μ , thinwalled, with iodine-negative apical ring, 8-spored; ascospores uniseriate, ellipsoid, 12-17 \times 4-6 μ , hyaline, biguttulate. Common. Fig. 1T.

The type was on *Elymus* in Belgium and ALPINIS & CHESTERS (1964) reported *P. dinemasporium* Webster on *Ammophila* in Lincolnshire. It seems unlikely there is more than one species of *Phomatospora* on *Ammophila*.

Amphisphaeriaceae

Apiospora montagnei Sacc. Nuovo Giorn. bot. Ital. 7 : 306 (1875)

See *Papularia arundinis*.

Chitonospora ammophilae Sacc. Bomm. & Rouss. Bull. Soc. roy. Bot. Belge 29 : 270 (1890)

Perithecia scattered, immersed in somewhat blackened dead leaves, without a clypeus, subglobose, about 300 μ across, black, with erumpent apical papilla. Asci narrowly clavate, sessile, 75-19 \times 15-20 μ , 8-spored; ascospores biseriata, elliptic-fusiform, 21-39 \times 9-14 μ , inner wall brown, with distinct outer wall, becoming 3-septate. Fig. 1U.

Trichosphaeriaceae

Niesslia exosporioides (Desm.) Wint. in Rabenhorst, Krypt. Flora Ed. 2(1), Abt. 2 : 197 (1887)

Perithecia gregarious, superficial, globose, up to 150 μ diameter, black, covered with stiff, erect, pointed, dark brown hairs, 30-60 \times 4 μ . Asci cylindrical-fusiform, sessile, 40-45 \times 6-7 μ , wall thin but thickened at the apex, iodine negative, 8-spored; ascospores 2-3-seriate, elliptic-

-cylindric, 10-13 \times 2-2.5 μ , hyaline, with 4 guttules and a median septum. Fig. 1A.

On herbaceous stems of all kinds, said by ALPINIS & CHESTERS (1964) to be common on *Ammophila* in Lincolnshire.

Amphisphaeria culmicola Sacc., originally from *Cynodon dactylon* in Italy, with brown ascospores 24-26 \times 9-10 μ is a doubtful species. ERIKSSON (1967) examined the type collection and found no perithecia remaining.

Physalospora psammae Oud. with hyaline ascospores 12-14 \times 5, in asci 70-80 \times 12-14 μ was perhaps a *Glomerella*, the asci seem too short and broad for *Phomatospora arenaria*.

Dothideales

Mycosphaerella lineolata (Rob.) Schroeter in Cohn, Krypt. Flor. Schlesien 3(2) : 339 (1894)

Pseudothecia gregarious, in long rows, united by brown connecting hyphae, immersed but erumpent by their ostioles, about 100 μ diameter, black. Asci few, pyriform with a very thickwalled apex, sessile, 21-50 \times 10-22 μ , 8-spored; ascospores irregularly arranged, elliptic-cylindric to subclavate, 14-24 \times 35 μ , hyaline, with a median septum. Fig. 2R. The type host is a *Carex* but the fungus is abundant on *Ammophila* in Britain and Sweden. MUNK (1957) had it abundantly in Denmark and recognised on *Ammophila* two additional species with scattered pseudothecia, viz.

M. psammae (Rostrup) Lind with ascospores 10-12 \times 2.5-3 μ and *M. pseudopsammae* Munk with ascospores 13-17 \times 3 μ . ALPINIS & CHESTERS (1964), who did not mention *M. lineolata*, reported *M. ely-*

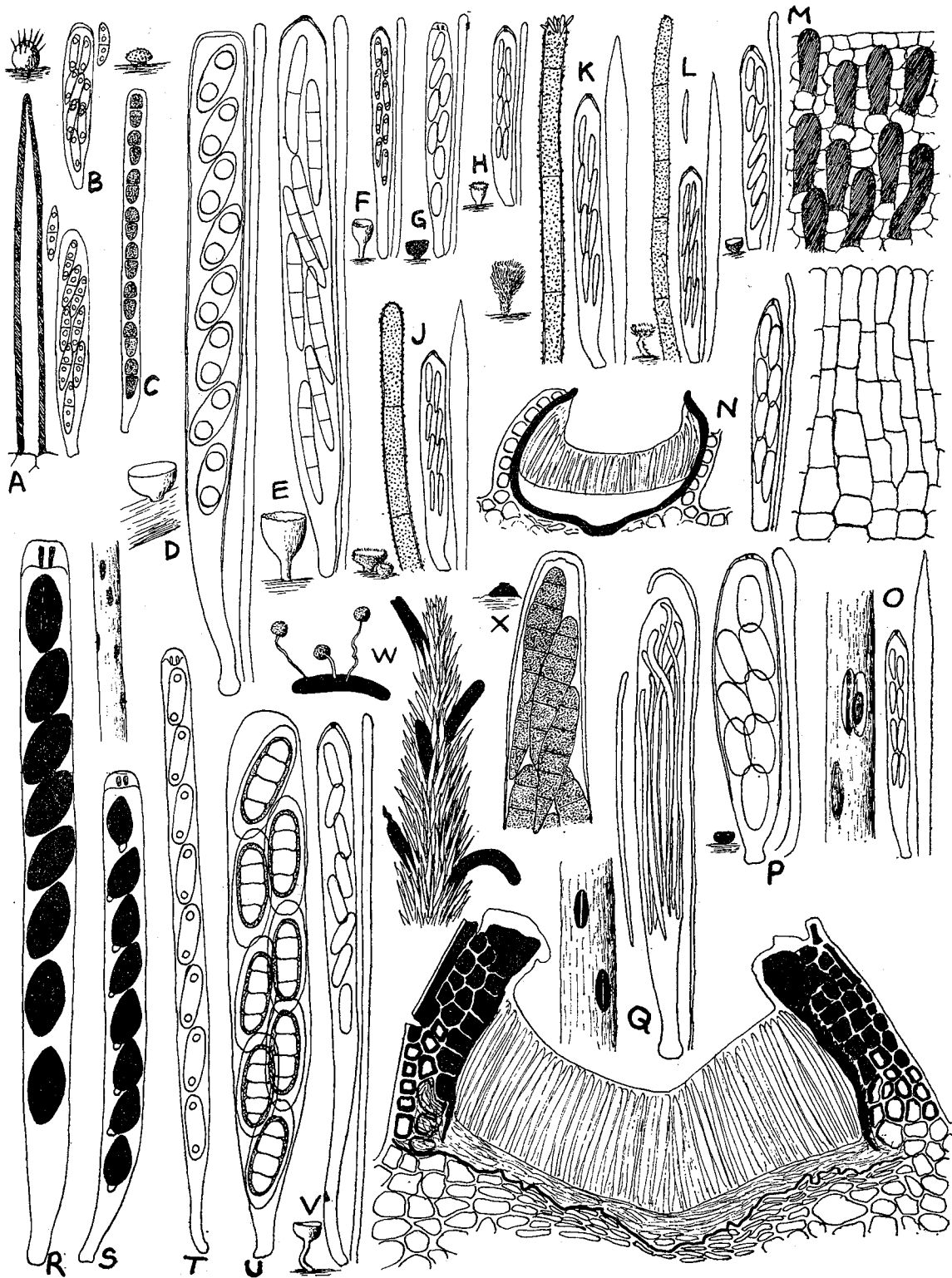


Fig. 1

mifoliae Munk on *Ammophila*, with ascospores $19-22 \times 7-8 \mu$. Pending a definitive monograph of *Mycosphaerella* and opportunity to revise the collections it is not clear how many of these are actually distinct. BOMMER & ROUSSEAU (1890) reported *M. tassiana* (de Not.) Johanss. on *Ammophila* in Belgium, probably wrongly as this is an arctic-alpine fungus unknown in Britain. *Ammophila* is not among the numerous hosts listed for it by von ARX (1949).

Pleosporales

Lophiostomataceae

Lophiostoma dacryosporum Fabre Ann. nat. Bot. Ser. 6, 9:103 (1878)

Pseudothecia gregarious, erumpent, hemispherical with small, compressed, apical papilla, smooth, black, about 500μ diameter. Asci clavate, short-stalked, $100 \times 18 \mu$, 8-spored; ascospores 2-3-seriate, clavate, tapered below, straight or somewhat curved, $28-32 \times 7 \mu$, 5-septate, broadest at the third segment, brown. Fig. 1X.

Reported by ERIKSSON (1967) and MUNK (1957, as *L. vagans* Fabre) on *Elymus*, occasional on *Ammophila*.

Lophiotrema microthecum Vestergren Bot. Not. 1899 : 158 (1899)

Pseudothecia gregarious, immersed, with erumpent elongated papilla bearing

a slitlike ostiole, dark brown, smooth, $200-300 \mu$ diameter. Asci clavate, short-stalked, $75-110 \times 12-15 \mu$, 8-spored; ascospores biseriate above, fusiform, $30-35 \times 4-6 \mu$, hyaline, 9-12-septate, broadest above the middle, with a thick gelatinous sheath.

Reported by ERIKSSON (1967) on *Ammophila* in Finland, not seen by me. CHESTERS & BELL (1970) ignored this species and did not record any member of the family on *Ammophila*.

Pleosporaceae

Didymella scotica Dennis

Kew Bull. 25 : 368 (1971)

Pseudothecia scattered, immersed, spherical, up to 300μ wide, with minute apical papilla, black. Asci cylindrical-clavate, $100-120 \times 15 \mu$, 8-spored; ascospores one to two seriate, elliptic-fusiform, $18-22 \times 6-7 \mu$, hyaline, with a median septum. In dead leaves in summer. Fig. 2J.

Didymosphaeria arenaria Mouton

Bull. Soc. roy. Bot. Belg. 28 : 75 (1889)

Pseudothecia scattered, immersed, ellipsoid, up to 350μ long, with an apical papilla and usually a thin brown clypeus. Asci clavate, short-stalked, thickwalled, $110-215 \times 25-30 \mu$, 8-spored; ascospores irregularly biseriate or almost uniseriate, clavate, $28-33 \times 12-14 \mu$, with thick red-

Fig. 1. A — *Niesslia exosporioides*; B — *Nectriella exigua*; C — *Chromocrea spinulosa*; D — *Rutstroemia maritima*; E — *Belonioscypha culmicola*; F — *Cyathicula cyathoidea*; G — *Cyathicula stipae* var *ammophilae*; H — *Pezizella eburnea*; J — *Dasyscyphus controversus*; K — *D. palearum*; L — *D. carneolus* var *longisporus*; M — *Belonium psammicola*; N — *Hysteropezizella prahlana* var *orcadensis*; O — *Hysterotegiella valvata*; P — *Pyrenopeziza arenivaga*; Q — *Lophodermium arundinaceum*, with transverse section of apothecium; R — *Anthostomella lugubris*; S — *A. phaeosticta*; T — *Phomatospora arenaria*; U — *Chitonospora ammophilae*; V — *Hymenoscyphus robustior*; W — *Claviceps purpurea*; X — *Lophiostoma dacryosporum*.

dish-brown wall covered by a conspicuous hyaline sheath, at first with a single median septum but according to ERIKSSON (1967) liable to develop thin secondary septa in a muriform pattern in each segment and thus simulate a *Pleospora*. The British material does not show this. Fig. 3 Rr.

Apparently confined to *Ammophila* and uncommon but fully described from Sweden by ERIKSSON.

D. igniaria Both

Trans. Brit. mycol. Soc. 51 : 803 (1968)

See *Periconia igniaria* Mason & Ellis, the ascus state is known only in artificial culture, with ascospores $26-30 \times 8-9 \mu$, finely verrucose.

D. verdoni Guyot

Bull. Soc. myc. France 65 : 104 (1949)

Schizostoma ammophilae Sacc. Bomm. & Rouss. Bull. Soc. roy. Bot. Belg. 29 : 263 (1890)

Pseudothecia scattered, immersed, subglobose, 200-300 μ diameter, black, with a papillate ostiole. Asci cylindrical-clavate, thickwalled, short-stalked, $90-145 \times 13-22 \mu$, 8-spored; ascospores one to two seriate, obtusely ovoid, $15-23 \times 7-11 \mu$, with a median septum, becoming brown. Fig. 3 Ss, after ERIKSSON.

Though *S. ammophilae* is the older name the epithet cannot be transferred to *Didymosphaeria* because of the existing *D. ammophilae* Fautr. & Roum., see doubtful species. The type host of *D. verdoni* is *Melica ciliata*. It is not yet known from Britain.

Kiessleriella culmifida (Karst.) Bose
Phytopath. Zeitschr. 41 : 128 (1961)

Pseudothecia scattered, subglobose, barely 500 μ across, black, with erumpent ostiolar papilla covered by close set, straight or slightly curved, dark brown, pointed, thickwalled bristles, $20-44 \times 3-5 \mu$. Asci cylindrical-clavate, $65-100 \times 10-15 \mu$, 8-spored; ascospores biseriate, elliptic-cylindrical, slightly curved, $22-26 \times 5.6 \mu$, hyaline, 3-septate, constricted at the septa. Fig. 2 H.

The type host is *Phleum* but it occurs on many other genera of grasses; MUNK (1957) and ERIKSSON (1967) had it on *Elymus*, I have not seen it on *Ammophila* and figure material from *Elymus* but APINIS & CHESTERS reported it from *Ammophila* (as *Trichometasphaeria*).

Metasphaeria graminum (Sacc.) Sacc.

Sylloge Fungorum 2 : 174 (1883)

Pseudothecia scattered, immersed, subglobose, up to 100 μ diameter, with an apical papilla, black. Asci cylindrical-clavate, short-stalked, $50-60 \times 12-15 \mu$, 8-spored; ascospores biseriate, oblong-fusoid, $15-16 \times 4 \mu$, 3-septate, hyaline. Fig. 2 B. *Ammophila* is the type host.

Ophiobolus trichellus Sacc. Bomm. & Rouss.

Bull. Soc. roy. Bot. Belg. 29 : 259 (1890)

Pseudothecia scattered, ovoid or conical, $60 \times 100 \mu$, black, bearing over the upper part erect, unicellular, pointed, brown bristles, $24-33 \times 4 \mu$. Asci clavate, subsessile, $45-66 \times 10-16 \mu$, 8-spored; ascospores fascicled, filiform, flexuous, $60 \times 3 \mu$, hyaline, multiguttulate. Fig. 2 Q.

On lower face of *Ammophila* leaves, Belgium, July-September. Not seen by me on *Ammophila*, figured from *Molinia*.

Paraphaeosphaeria michotii (Westend.)

O. Erikss.

Arkiv f. Bot. Ser. 2,6(9) : 406 (1967)

Pseudothecia scattered, immersed, subglobose, up to 250 μ diameter, brown, smooth. Asci clavate, subsessile, 60-75 \times 12-15 μ , 8-spored; ascospores biseriata, elliptic-cylindric, 2-septate, constricted at the lower septum, 15-20 \times 4-6 μ , brown, finely punctate. Fig. 2 A.

The type is on *Juncus squarrosus* but the species was recorded on *Ammophila* by ERIKSSON and on *Dactylis* by WEBSTER (1955), who found the conidial stat to be *Coniothyrium scirpi* Trail, with brown conidia (5)-7-10 \times 4-5 μ . It is also on *Ammophila* in the British Isles.

Passarinella discors (Sacc. & Ellis) Apinis & Chesters

Trans. Brit. myc. Soc. 47 : 432 (1964)

Didymosphaeria spartinae Grove

Journal of Botany 71 : 259 (1933)

Pseudothecia scattered, somewhat flattened, black, paler below, with short apical papilla, 200-300 μ diameter, immersed in dead leaves, then erumpent. Asci narrowly clavate, 160-288 \times 24-30 μ , 8-spored; ascospores one or two seriate, elliptical, 24-33 \times 8-13 μ , exceptionally larger, 3-septate, the two large central cells brown and the two small terminal ones hyaline. Fig. 2 V.

Common on *Spartina* and driftwood but also on debris of *Ammophila*.

Phaeosphaeria ammophilae (Lasch) J. & E. Kohlmeyer

Icones Fungorum Maris 1(3), Tab. 55 (1965)

P. littoralis (Sacc.) Holm

Symb. Bot. Upsal. 14 (3) : 121 (1957)

Leptosphaeria sabuletorum (Berk. & Br.) v. Höhn.

Hedwigia 60 : 141 (1918)

Pseudothecia scattered, immersed, subglobose, with minute apical papilla opening on the upper surface of the leaf and a black venter 300 μ diameter emerging like a tiny bead in one of the furrows of the lower inrolled surface. Asci cylindrical-clavate, 150-190 \times 30-35 μ , short-stalked, 8-spored; ascospores biseriata, narrowly ellipsoid, 42-48 \times 13-16 μ , pale brown, 6-7-septate. Fig. 2 L. Very common on dead *Ammophila*.

P. eustoma (Funk.) Holm

Symb. Bot. Upsal. 14(3) : 109 (1957)

Similar to *P. microscopica* but with narrower ascospores, 18-25 \times 4.5-5.5 μ . Fig. 2 C. Common on many dead grasses, casual on *Ammophila*.

P. marram (Cke) O. Erikss. differs in having larger ascospores 25-33 \times 5-8 μ in which the apical cell is longer and narrower than the others. Fig. 2 X. In *P. eustoma* and *P. microscopica* the cells of the ascospore are approximately equal in length. Though *P. marram* was so named as growing on *Ammophila* and was also recorded on it by BOMMER & ROUSSEAU the type host is *Elymus* according to ERIKSSON and he insists it is confined to that host. Certainly I have not collected it on *Ammophila* and such British mate-

rial I have seen so named on *Ammophila* has been misdetermined.

P. luctuosa (Niessl) Otani & Mikawa
Mem. nat. Sci. Mus. Tokyo 4 : 78 (1971)

Pseudothecia scattered or in groups, immersed, globose, up to 200 μ diameter, black, with an ostiolar papilla. Asci cylindric-clavate, 100-120 \times 12-14 μ , 8-spored; ascospores biseriata, fusoid, straight or curved, 26-32 \times 5-6 μ , yellowish brown, 5-septate, with the third cell from the top slightly enlarged. Fig. 2 E.

Recorded on *Ammophila*, as *Leptosphaeria*, by WEBSTER & HUDSON (1957), with a *Phaeoseptoria* conidial state containing 7-12-septate conidia, 52-88 \times 2.5-4 μ . It is interesting that the collective species *P. herpotrichoides* (de Not.) Holm, so abundant on most grasses, seems to occur only casually, if at all, on *Ammophila*. ERIKSSON, who cited numerous collections under that name on *Elymus*, had none on *Ammophila*. APINIS & CHESTERS, however, cite on the latter *Leptosphaeria culmifraga*, a name which has often, though wrongly, been applied to a form of *P. herpotrichoides*. APINIS & CHESTERS also recorded from *Ammophila* *P. fuckelii* (Niessl) Holm, in which the ascospores are 5-septate, 22-30 \times 3.5-4.5 μ . This is typically on *Phalaris arundinacea* and confirmation of its occurrence on *Ammophila* is desirable. Fig. 2 W.

P. microscopica (Kast.) O. Eriksson var. *culmorum* (Auersw.) O. Eriksson
Arkiv f. Bot. Ser. 2, 6(9) : 427 (1967)

Pseudothecia scattered, immersed, subglobose, dark brown, 70-150 μ diameter. Asci cylindric-clavate, short-stalked, 55-70 \times 15-18 μ , 8-spored; ascospores bise-

riate, clavate, inequilateral, 20-24 \times 6.5-7 μ , 3-septate, broadest at the centre and slightly constricted at the septa, pale yellowish brown with perfectly smooth wall. Fig. 2 D.

Common on dead grasses, occasional on *Ammophila*. According to ERIKSSON the var. *microscopica* differs in having the ascospore wall very minutely punctate.

P. vagans (Niessl) O. Erikss.
op. cit. 430 (1967)

Pseudothecia scattered, immersed, subglobose, dark brown, 100-300 μ diameter, minutely papillate. Asci cylindric-clavate, short-stalked, 65-100 \times 12-18 μ , 8-spored; ascospores biseriata, fusiform, inequilateral, broader above the middle, 18-32 \times 6-14 μ , yellowish brown, with 5 transverse septa and usually 1 or more longitudinal septa in one or more segments but these are sometimes entirely lacking. Fig. 2 G.

This is one of the commonest pyrenomyces on dead grasses. According to WEBSTER (1955) a culture from *Ammophila* yielded a conidial state with *Hendersonia* conidia 50-60 \times 3.5-4 μ and 3-7-septa.

Pleiobolus arenarius (Sacc.) Bomm. & Rouss.) O. Erikss. op. cit. 431 (1967)
Ophiobolus arenarius Sacc. Bomm. & Rouss. Bull. Soc. roy. Bot. Belg. 29 : 259 (1890)

Pseudothecia scattered, immersed in mesophyll or cortex, globose, 200 μ diameter, smooth, black, with erumpent ostiolar papilla. Asci cylindrical, short-stalked, 240-330 \times 7-9 μ , at first 8-spored; ascospores fascicled and filiform, multi-septate, soon breaking apart at the septa within the ascus into unicellular parts;

spores about $6 \times 3 \mu$, hyaline. According to the original diagnosis there are about 66 of these from one primary ascospore Fig. 2 K. Apparently rather uncommon. Summer.

Pleospora herbarum (Pers. ex Fr.) Rabenhorst in Klotzsch, Herb. Myc. Ed. 2, No. 547 a (1857)

Pseudothecia scattered, immersed or becoming erumpent by a short broad ostiolar papilla, up to 500μ diameter, smooth, black. Asci cylindric-clavate, short-stalked, $110-150 \times 25-28 \mu$, 8-spored; ascospores biseriate, ellipsoid, straight, broadly rounded at the ends, $24-33 \times 10-15 \mu$, yellowish brown, with 7 transverse septa and usually 2 longitudinal septa, at least in central segments, smooth. Fig. 2 M.

This is a plurivorous fungus, abundant on all kinds of herbaceous debris, in association with its conidial state *Stemphylium botryosum* Wallr. Collections on grasses often appear to have smaller less massive ascocarps and have been distinguished by some authors as *P. discors* (Dur. & Mont) Ces. & de Not. but, according to ERIKSSON, this is a different species, occurring on *Carex halleriana*.

Pleospora infectoria Fuck.
Jahrb. Nass. Ver. Naturk. 23/24 : 132 (1870)

Pseudothecia immersed, subglobose, up to 300μ diameter, smooth. Asci cylindric-clavate, stalked, $80-125 \times 12-15 \mu$, 8-spored; ascospores fusiform, $18-23 \times 8-10 \mu$, with 3 primary transverse septa, finally 5-septate, with one longitudinal septum in the central segments, yellowish brown, smooth. Fig. 2 N.

This is another common plurivorous species, occurring casually on dead *Ammophila*, where it was recorded by APINIS & CHESTERS (1964). BOMMER & ROUSSEAU's recorded of *P. microspora* NIESSL probably also refers to this species.

P. multiseptata Starbäck
Bot. Not. 1887 : 207 (1887)

Pseudothecia immersed, often in purple-stained tissue, up to 300μ diameter, black, smooth, with prominent ostiolar papilla. Asci few, cylindric-clavate, $160-170 \times 33-38 \mu$, 8-spored; ascospores elliptic-cylindric, tapered at the ends and broadest above the middle, $48-58 \times 13-17 \mu$, with up to 19 transverse septa and each segment subdivided by 2 or 3 longitudinal septa, to form numerous, small, often isodiametric cells, pale brown, smooth. Fig. 2 O.

The type collection was probably on *Artemisia* but the fungus is known to occur occasionally on *Ammophila* in the Hebrides and Sweden.

P. rubicunda Niessl Verh. Naturf. Ver. Bruun 14:191 (1876)

Pseudothecia scattered in patches of purple-stained substrate, immersed, up to 400μ diameter, smooth, black. Asci cylindric-clavate, $170-240 \times 16-22 \mu$, 8-spored; ascospores one or two seriate, fusiform, more or less curved, $30-40 \times 8-12 \mu$, light brown, smooth, with 9-13 transverse septa and one or more longitudinal ones, constricted especially at the median septum. WEBSTER (1957) had this species mainly on jetsam thrown up by the sea but APINIS & CHESTERS (1964) and ERIKSSON (1967) in Sweden both record it on *Ammophila*.

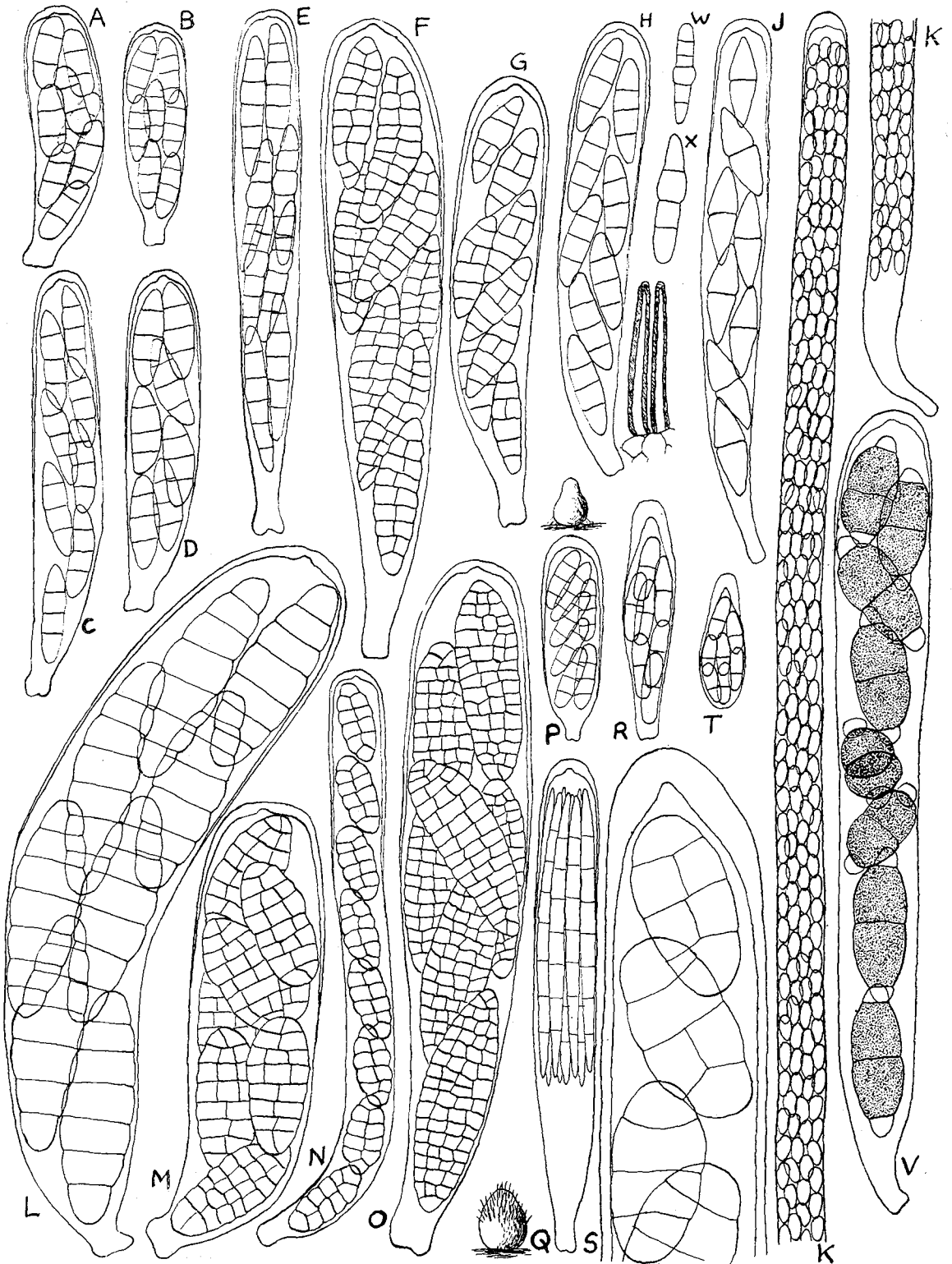


Fig. 2

P. rubelloides (Plowr.) Webster Trans. Brit. mycol. Soc. 40:183 (1957)

Very like the preceding but with rather smaller ascospores, $20-34 \times 6-10 \mu$, having from 6 to 9, usually 7, transverse septa, sometimes more in large spores. Fig. 2F.

According to WEBSTER this is common in summer on rotting grasses, especially in estuaries, salt marshes and sand dunes. Separation from *P. rubicunda* may be difficult owing to the extensive overlap in ascospore characters. In doubtful cases it may be necessary to isolate the fungus in pure culture, where *P. rubicunda* produces a *Phoma* conidial state and *P. rubelloides* does not. WEBSTER recorded *P. rubelloides* on *Ammophila* and other sand dune grasses.

Pleomassaria ammophilae Oud., with biseriate, brown, muriform ascospores, $10-23 \times 9-12 \mu$, with 7 transverse septa, cannot be placed until the type has been studied.

Pyrenophora trichostoma (Fr.) Fuck. op. cit. 215 (1870).

Pseudothecia scattered, immersed, subglobose to ellipsoid, up to 500μ diameter or more, more or less clothed with erect black setae. Asci few, about $275 \times 40 \mu$, 8-spored; ascospores biseriate, ellipsoid,

$43-70 \times 17-30 \mu$, with 3 transverse septa and one longitudinal septum in at least one segment, light brown, smooth. (Fig. 2S)

This is a collective species, found on many genera of grasses, as the ascus state of *Drechslera* spp. and only casually on *Ammophila*, from which it was recorded (as *Pleospora*) by APINIS & CHESTERS (1964). No *Drechslera* is reported from *Ammophila* and I have not seen this fungus on that host. The figure is of material on *Triticum aestivum*.

Tubeufia parvula Dennis Kew Bull. 30:362 (1975)

Pseudothecia scattered, superficial, pyriform, with a broad ostiolar papilla, smooth, reddish brown, 75μ across. Asci clavate, sessile, thickwalled above, $47 \times 12-14 \mu$, 8-spored; ascospore 2 or 3-seriate, elliptic-oblong, $14-15 \times 3.5-4 \mu$, hyaline, 3-septate.

On dead inflorescences of *Ammophila* in May, apparently rare. Fig. 2P.

Microthyriaceae

Microthyrium gramineum Sacc. Bomm. & Rouss.

Bull. Soc. roy Bot. Belg. 29:241 (1890)

Thyriothecia scattered on a yellowish superficial mycelium, orbicular, 90-120 diameter, scutellum formed of radiating

Fig. 2. A—*Paraphaesphaeria nichotii*; B—*Metasphaeria graminum*; C—*Phaeosphaeria eustoma*; D—*P. microscopica* var *culmorum*; E—*P. luctuosa*; F—*Pleospora rubelloides*; G—*Phaeosphaeria vagans*; H—*Keissleriella culmifida*; with ostiolar setae; J—*Didymella scotica*; K—*Pleiobolus arenarius*; L—*Phaeosphaeria Ammophilae*; M—*Pleospora herbarum*; N—*P. infectoria*; O—*P. multiseptata*; P—*Tubeufia parvula*, with sketch of perithecium; Q—*Ophiobolus trichellus*; R—*Mycosphaerella lineolata*; S—*Pyrenophora trichostoma*; T—*Microthyrium gramineum*; V—*Passariniella discors*; W—Spore of *Phaeosphaeria fuckelii* from *Phalaris*; X—Spore of *P. marram*.

rows of light brown irregularly quadrangular cells, without a fringed margin. Asci obclavate to ellipsoid, $23-30 \times 8-11 \mu$, 8-spored; ascospores elliptic-cylindric, $8-11 \times 2.5-3 \mu$, hyaline, 1-septate, with two tufts of 3 short cilia laterally attached. Fig. 2T.

On dead grey leaves of *Ammophila* lying on the sand. This is the type host.

M. vicinum de Not. Erb. Crittog. Ital. Ser. Ser. 1, No. 994 (1862)

Thyriothecia scattered on an abundant yellow superficial mycelium, orbicular, up to 270μ diameter, scutellum with radiating rows of light brown quadrangular cells, which separate at the margin to form a short fringe. Asci cylindrical, $36-56 \times 8-9 \mu$, 8-spored; ascospores ellipsoid, straight, $11-14 \times 2.5-3.5 \mu$, hyaline, 1-septate, with 4 apical cilia. On dead leaves, often mixed with *M. gramineum*.

Trichothyria ammophilae J. P. Ellis
Trans. Brit. mycol. Soc. 68: 146 (1977)

Thyriothecia scattered on a hyaline superficial mycelium, orbicular, 60-80 diameter, with a brown scutellum and also a similar basal plate, each composed of radiating rows of quadrangular brown cells, margin even. The central ostiole is surrounded by a collar of smaller, dark, thick-walled cells. Asci clavate, $22-28 \times 7-9 \mu$, 8-spored; ascospores narrowly ellipsoid, $8-9.5 \times 1.5-2.5 \mu$, hyaline, 1-septate, often with one or more short lateral cilia. On dead leaves and stems of *Ammophila*.

T. nigroannulata (Webster) J. P. Ellis
op. cit. 149 (1977)

Differs from the preceding in its fusoid ascospores, with pointed ends and no

cilia. The type host is *Dactylis* and records of the species on *Ammophila* need verification because of its close resemblance to *T. ammophilae*.

It is impossible to say what *Asterina ammophilae* Dur. & Mont., imperfectly described from Algeria may have been. With hyaline ascospores $10 \times 2.5 \mu$ it cannot be an *Asterina*.

Perisporium ammophilae Dur. & Mont is even more dubious, without mention of asci or spores.

APINIS & CHESTERS (1964) also recorded from *Ammophila* the following ascomycetes characteristic of decaying vegetable matter generally or associated with dung or soil:

Pezizales

Ascobolus crenulatus Karst., *Iodophanus carneus* (Pers.) Korf, *Rhyparobius cookei* var *maritimus* Apinis & Chesters.

Sphaeriales

Chaetomium aterrimum Ell. & Ev., *C. botrychodes* Zopf, *C. elatum* Kze. & Schm. ex Fr., *C. funicola* Cke., *C. globosum* Kze. ex Fr., *C. indicum* Cda., *C. olivaceum* Cke. & Ell., *C. pachypodioides* Ames, *C. thermophila* La Touche, *Schizothecium vesticola* (Berk. & Br.) Lundq. (as *Pleurage minuta* (Fuck.) Kze.) and *Sordaria fimicola* (Rob.) Ces. & de Not.

Plectascales

Bysochlamys nivea Westl., *Dactylomyces crustaceus* Apinis & Chesters, *Emericella nidulans* (Eidam) Vuill. and *Thielavia sepedonium* Emm.

Pleosporales

Preusia terricola Cain, *Sporormia longipes* Masses & Salmon (a doubtful species

according to AHMED & CAIN (1972)), *Sporomiella intermedia* (Auersw.) Ahmed & Cain, *S. lageniformis* (Fuck.) Ahmed & Cain, *S. minuta* (Auersw.) Ahmed & Cain.

From the Hebrides APINIS (1964) added *Lentecospora submarina* Lindner and no doubt other marine fungi can be found on debris of *Ammophila* cast up from the sea.

The following are best regarded for the present as dubious records or inadequately described species:

Catharinia maritima (Sacc. Bomm. & Rouss.) Sacc.

Syll. Fung. 11:350 (1895)

Ascocarp subepidermal, subglobose, 60-100 μ diameter, smooth, black; asci sessile, oblong, 54-60 \times 15-18 μ ; ascospores 2-3-seriate, oblong-subfusoid, 16-25 \times 4.5-6 μ , with 5 transverse septa and 1 or 2 longitudinal septa, light brown, with gelatinous sheath, on *Ammophila*, Ostende, April.

WEHMEYER (1961) suggested this might be a *Leptosphaerulina* or a *Wetsteinina*.

Didymosphaeria ammophilae Fautr. & Roum.

Rev. mycol. 14:4 (1892)

Perithecia minute, asci cylindric-clavate, 40-45 \times 6-8 μ ; ascospores 8-10 \times 3 μ , 1-septate, yellow. Associated with *Leptosphaeria* & *Hendersonia* species on dead leaf tip of cultivated *Ammophila*. France.

The description is inadequate to place the fungus in a modern system, no material is available at Kew and the species was ignored by SCHEINPFLUG (1958) in his revision of *Didymosphaeria*.

Gaeumannomyces graminis (Sacc.) v. Arx & Olivier

Trans. Brit. myc. Soc. 35:32 (1952)

Recorded without data on *Ammophila* by APINIS & CHESTERS (1964). This and its var. *avenae* (Turner) Dennis are root parasites known to attack many genera of grasses and cereals but ERIKSSON (1967) did not encounter them on sand dune grasses. In view of the lack of information the record on *Ammophila* is best regarded as needing confirmation by additional collections.

Karschia perezigua Sacc. Bomm. & Rouss.

Bull. Soc. roy. Bot. Belg. 29:235 (1891)

Apothecia scattered, sessile, concave, 450-600 μ diameter, black, sunk between the fibrils. Asci 30-45 \times 10-15 μ , 4 or 8-spored; ascospores elliptic, 8-12 \times 5.5-6 μ , biseriate or clustered, brown, 1-septate; paraphyses with capitate green apices. On *Ammophila*, Belgium.

The old genus *Karschia* is now regarded as having embraced many unrelated species, some with unitunicate asci, others with bitunicate, some lichenised, others not. The description lacks the data required to place it in a modern system and HAFELLNER (1979) could not trace material for examination in the herbaria at Brussels or Padova.

Ophiobolus littoralis (Crouan) Sacc.

Sylloge Fungorum 2:349 (1883)

Described from *Agrostis* in Brittany but reported on *Ammophila* in Belgium by BOMMER & ROUSSEAU, with sessile asci 60-70 \times 9 μ and subhyaline ascospores 45-60 \times 3 μ , with 10-14 septa. The species was ignored by MÜLLER (1952) in his

revision of *Ophiobolus* and by ERIKSSON (1967).

Phaeosphaeria herpotricha (Fr.) Holm
Symb. bot. Upsal. 14 (3):119 (1957)

ERIKSSON (1967) regarded records of this species (as *Ophiobolus*) on *Ammophila* as doubtful.

Phyllachora graminis (Pers. ex Fr.) Fuck.
Jahrb. Nass. Ver. f. Naturkunde 23/24:
216 (1870)

Recorded by APINIS & CHESTERS on *Ammophila* as well as *Agropyron*, in Lincolnshire. The fungus is common on *Agropyron* but not otherwise reported on *Ammophila* and confusion of hosts must be suspected. There is, however, in eastern North America a *P. ammophilae* Orton, Mycologia 36: 39 (1944), with ascospores $10-15 \times 7-9 \mu$.

Schirrhia depauperata (Desm.) Fuck.
Jahrb. Nass. Ver. f. Naturkunde 29/30:
25 (1875)

This is usually regarded as a synonym of *S. rimosa* (A. & S. ex Fr.) Fuck., characteristic of *Phragmites*. BOMMER & ROUSSEAU listed *S. depauperata* on *Ammophila* leaves in Belgium but an error seems possible, perhaps due to confusion with a particularly stromatic development of *Mycosphaerella lineolata*. See also *Phoma rimosa* below.

Basidiomycetes

Puccinia elymi West.
Bull. Acad. roy. Belg. 18 : 408 (1851)

Rostrupia elymi (West.) Lagerh.
Journ. de Bot. 3: 188 (1889)

Puccinia ammophilae Guyot
Rev. Paht. Veg. 19: 36 (1932)

Uredosori epiphyllous, orange, up to 3mm long; uredospores $23-32 \times 20-28 \mu$, with thick wall and scattered pores; teleutospores cylindrical-clavate, $45-90 \times 10-18 \mu$, often 2 or 3-septate, rounded and not greatly thickened above. On living leaves, apparently uncommon on *Ammophila*. Fig. 3Pp.

I have not seen indisputable material of this on *Ammophila*. The collection from Spurn Head cited by WILSON & HENDERSON (1966) cannot be found at Edinburgh and other collections so called contain only uredosori. These differ from those of *P. pygmaea* in lacking capitate paraphyses and the spores are thinner walled with distinct germ pores but WILSON & HENDERSON point out they could not be distinguished from uredosori of *P. striiformis* West. and it must be remembered occurrence of *P. coronata* Cda. on this host also would not be unexpected.

Puccinia pygmaea Erikss.
Bot. Zbl. 64: 381 (1895)

Uredo ammophilina Kleb.
Krypt. Flor. Mark Brandenburg 5a; 882
(1914)

Puccinia ammophilina Mains
Bull. Torrey bot. Club. 66: 617 (1939)
P. pygmaea var *ammophilina* (Mains)
Cummins & Greene
Mycologia 58: 714 (1966)

Uredospori epiphyllous, small, orange, in rows; uredospores $28-36 \times 26-30 \mu$, with 8-10 scattered very indistinct pores, accompanied by numerous thinwalled capitate paraphyses; teleutospores amphigenous, minute, black, covered; teleutospores cylindrical-clavate, $31-60 \times 15,20 \mu$ short-

-stalked, 1-septate, apical wall up to $5\ \mu$ thick. Fig. 3Ff.

On living leaves, sometimes associated with yellowish spots, apparently always present in stands of *Ammophila* in Britain but often hard to find until the leaf is flattened and the furrows of the inrolled surface exposed. According to CUMMINS (1971) var. *ammophilina* differs from var. *pygmaea* on *Calamagrostis* in having fewer uredoparaphyses and longer teleutospores. The former does not seem borne out by British material, the latter is difficult to assess as teleutosori are seldom found in Britain.

Ustilaginales

Ustilago hypodytes (Schlechtendal) Fr.
Syst. Myc. 3: 518 (1832)

Sori in the stems, enveloping internodes and protected by the leaf sheaths, lacking any covering membrane; spores spherical to ovoid, 4-7 μ diameter, smooth, yellow-brown.

Apparently rare on *Ammophila*, though common on *Elymus arenarius*, *Agropyron* spp. and many other genera of grasses. Fig. 3Qq.

According to ZUNDEL (1953) *U. striaeformis* (West.) Niessl occurs on *Ammophila arenaria* in eastern U. S. A. but I have not seen any collections on *Ammophila* in Europe, though the smut occurs on species of *Calamagrostis* and many other genera.

Thecaphora ammophilae Oud. is not a smut but a *Stemphylium*, according to Liro.

Agaricales

Tricholomataceae

Cellypha griseopallida (Weinm.) W. B.

Cooke

Beihefte zur Hedwigia 4: 54 (1961)

Cyphella griseopallida Weinm.

Hymen. Gast. Rossico Obs. 522 (1836).

Fruit bodies gregarious, sessile, cup-shaped, about 1 mm across, membranous, light gray and subtranslucent when fresh, drying gray-brown, outer surface conspicuously fibrillose; hymenium deeply concave. Basidia 4-spored, $14-20 \times 5-7\ \mu$; spores broadly ovate with marked apiculus, $6-9 \times 4-5\ \mu$, white, smooth, nonamyloid; hyphae thinwalled, $6\ \mu$ wide, without clamps, with free obtuse tips on outer surface of the cup. Fig. 3Mm.

In furrows on inrolled surface of dead leaves, throughout the year, also on many other grasses, herbaceous stems and woody debris.

Crinipellis stipitarius (Fr.) Pat.

Essai taxonomique sur.. Hymenomycetes
143 (1900)

Pileus convex, thin, tough, less than 1 cm. across, light brown, clothed with darker adpressed fibrils and hairs, with thick walls reddened by iodine; stipe long, slender, dark brown, similarly hairy; gills white, sinuate to free. Spores white, ovoid, $6.5-9 \times 4-6\ \mu$, nonamyloid. On dead culms and roots, not uncommon on this and other sand-dune grasses and others. Fig. 3Kk.

Marasmius littoralis Quéf.

Bull. Soc. Amis Sciences nat. Rouen,
Ser. 2, 15: 169 (1880)

Solitary, pileus convex with shallow umbilicus, up to 1.5 cm. diam., radiately sulcate, smooth, buff, disc darker; stipe slender, equal, smooth, brown, horny, paler above; gills subdistant, equal, free,

ventricose, cream colour. Spores white, tearshape, $13-18 \times 4-5 \mu$, nonamyloid; cheilocystidia clavate, brush-like with short brown apical processes, similar cells form the pileus surface. On dead stems in autumn. *M. epodius* Bres. (1881) is probably not a synonym as often stated. Fig. 3Ll.

Coprinaceae

Psathyrella ammophila (Dur. & Lév.)
Orton

Trans. Brit. mycol. Soc. 43 Suppl. 142
(1960)

Unlike the members of the Tricholomataceae described above this large Agaric is not found obviously springing from dead but standing culms or leaves but its association with *Ammophila* seems well attested. WAKEFIELD (1918) found the mycelium of *P. ammophila* always connected with buried decaying leaves of *Ammophila*. «Only occasionally does it arise from a single leaf. It may do so if the leaf is near the surface, in which case the sandy cord is seen to be directly connected with a weft of hyphae mixed with sand particles which surrounds the dead leaf. In the majority of cases the points of origin are more deeply seated. The «root» tapers to about the thickness of medium twine, and then is found to fork or branch repeatedly. It is as a rule impossible to trace the ultimate ramifications on account of their fineness and fragility, but in a few cases I was successful in tracing a branch to a dead *Ammophila* leaf, which was covered by a fine weft of hyphae». TEODOROWICZ (1936), was thus probably mistaken in stating this fungus to grow from rabbit

excrement, probably he had a different species of *Psathyrella*. Fig. 3Nn.

Nidulariales

Cyathus olla Pers.

Syn. Meth. Fung. 237 (1801)

Fruit bodies cupshaped, with small base and expanded mouth, 10-15 mm high and 8-10 mm broad, thin-fleshed, tough, smooth, gray to fawn, containing several large (up to 3.5 mm wide), seed-like, hard peridioles, each attached to the inner wall by a slender thread. Fig. 3Jj. On debris of *Ammophila* as of many other plants.

Sphaerobolus stellatus Tode ex Pers.

op. cit. 115 (1801)

Fruit body at first globose, 1-2 mm diameter, smooth, white to pale yellow, splitting open by up to 8 short teeth to expose an orange inner wall enclosing a single reddish-brown spherical peridiole which is forcibly ejected by eversion of the inner wall. Fig. 3Hh. On debris of *Ammophila* as of many other plants and on dung.

Phallales.

Phallus hadriani Vent. ex Pers.

op. cit. 246 (1801)

As with *Psathyrella ammophila* an intimate association with *Ammophila* seems well attested, though there may be some uncertainty whether the relationship is purely saprophytic. Dr. E. A. Ellis assures me that *P. hadriani* can be traced as developing from detritus of *Ammophila* in sand of yellow dunes on the Norfolk coast. ANDERSON (1950) tried unsuccessfully to detect a connection between

P. hadriani mycelium and *Ammophila* roots with which it grew in contact but ISTVANFFI (1904) in different circumstances reported parasitism by the mycelium on roots of a number of plants, including *Agropyron repens*. Fig. 3Oo.

Fungi Imperfecti

Coelomycetes

Ascochyta leptospora (Trail) Hara

Diseases of the rice plant 178 (1918)

Pycnidia immersed, subglobose, up to 220 μ diameter, brown, with a darker apical ostiole. Conidia elliptic-cylindric, mostly 14-16 \times 2.5-3 μ , hyaline, with a median septum. Common on dead leaves and leaf spots of many grasses, including *Ammophila*. Fig. 3B.

var. *minor* Punithalingam

Comm. myc. Inst. mycol. Paper 142: 110 (1970)

Differs in its smaller pycnidia, with spores 9-12 \times 2-2.5 μ , described from *Ammophila* in Ireland.

Collections on *Ammophila* published as *A. graminicola* Sacc. are no doubt to be referred to one or other of the above.

A. psammae Oudem.

Ned Kruidk. Archif. Ser. 3,2: 263 (1901)

Pycnidia immersed in brown leaf spots, becoming erumpent, subglobose, up to 340 μ diameter, black, with large apical ostiole. Conidia ellipsoid, tapered to the ends, 13-16 \times 4-5 μ , rather thickwalled, hyaline to yellowish, with median septum. Fig. 3C.

Common on *Ammophila*, distinguished from *Tiarospora perforans* by the smaller conidia, without appendages.

Camarographium metableticum (Trail) Grove

British Stem & Leaf Fungi 2: 108 (1937)

Pycnidia scattered, immersed, subglobose, 200-250 μ diameter, with an apical ostiole, black. Conidia irregularly ellipsoid, 27-37 \times 12-16 μ , brown, with 3 to 7 transverse septa and one or more longitudinal septa in some central segments, smooth. Fig. 3D. Common in dead *Ammophila* leaves. SUTTON (1980) indicated that this is not a true *Camarographium* but did not offer any alternative disposition for it. It is now type species of *Amarenographium* O. Eriksson.

Colletotrichum dematium (Pers. ex Fr.)

Grove

Journal of Botany 56: 341 (1918)

C. lineola Corda in Sturm, Deutschlands Krypt. Flora III, 3: 41 (Tab. 21) (1837)

Acervuli erumpent from a dark coloured, small-celled, basal layer which bears a stratum of short subhyaline conidiophores and a variable number of stiff, thickwalled, pointed, brown setae. Conidia more or less curved, with pointed ends, 18-24 \times 2-3.5 μ , hyaline, nonseptate, 18-22 \times 2-4 μ in British material on *Ammophila*. Fig. 3O.

A similar fungus occurs on many other genera of grasses in Britain but there is no indication that it is a parasite. Some collections on *Ammophila* have been referred to *C. graminicola* (Ces.) Wilson but SUTTON (1980) restricts this name to a fungus on *Zea* in tropical and subtropical climates. *C. lineola* and *C. dematium* were both described from dead dicotyledonous stems but SACCARDO extended the scope of the former to include a

collection on a grass (*Andropogon*) and SUTTON regards them as synonyms.

Coniothyrium psammae Oudem.
Hedwigia 37: 177 (1898)

Pycnidia scattered, immersed, subglobose, 120-140 μ diameter, with apical ostiole, black, smooth. Conidia elliptical, 6-10 \times 3-5 μ , olivaceous. Fig. 3J.

This may perhaps be the conidial state of *Paraphaeosphaeria michotii*, identified by WEBSTER (1955) with *C. scirpi* Trail, which dates from 1889.

Dinemasporium strigosum (Pers. ex Fr.)
Sacc.

Michelia 2: 281 (1881)

D. graminum (Libert) Lév. Ann. Sci.
nat. Bot. Ser. 3, 5: 274 (1846)

Acervuli scattered, superficial, cupulate, up to 200 μ diameter, with small celled brown basal and marginal tissue, bearing stiff pointed, thickwalled brown setae, 60-220 \times 4-6 μ . Conidiophores short, covering the floor of the cup and bearing terminal, straight to slightly allantoid conidia, 9.5-11 \times 1.5-2 μ , hyaline, nonseptate, with a fine bristle-like process, 5-7 μ long, at each end. Fig. 3N.

Common on grasses of all kinds, including *Ammophila*. The ascus state is said to be *Phomatospora dinemasporium* Webster.

Diplodia nitens Sacc. Bomm. & Rouss.

Bull. Soc. roy Bot. Belg. 29: 286 (1890)

Pycnidia immersed, then erumpent, 180-210 μ diameter. Conidia elliptic-fusoid, 18-22 \times 9-11 μ , thickwalled, violaceous, then brown, 1-septate. *Ammophila* culms. July.

I have not seen this. The spore size is a little small for *Tiarospora perforans* and one would not expect that to be taken for a *Diplodia*, even if the spores may become slightly tinted brown.

Hendersonia calospora Fautrey
Revue mycologique 14: 9 (1892)

Pycnidia amphigenous, immersed, papillate, grayish-yellow. Conidia fusoid, widest at the centre, flexuose, 55-65 \times 6 μ , yellow, with 6 or 7 septa. Not seen.

The conidia are wider than in either of the *Phaeosphaeria* conidial states described from *Ammophila* by WEBSTER.

Hendersonia culmiseda Sacc.
Sylloge Fungorum 3: 437 (1884)

Pycnidia immersed, spherical, up to 300 μ diameter, dark brown, with apical ostiole. Conidia fuscoid, 12-15 \times 4-5 μ , brown, 3-septate.

There seems considerable confusion over this name. It is a renaming of *H. culmicola* Cooke, the original hosts of which were *Ammophila* and *Phragmites*, and some British collections on *Ammophila* yield conidia of the size stated.

BOMMER & ROUSSEAU, however, cited material on *Ammophila* in Belgium with smaller conidia, 10-11 \times 3-4 μ and British collections with such small conidia have been called *H. culmicola* Sacc. var *minor* Sacc. Fig. 3E. SACCARDO did not indicate either a type host or a spore size for this variety, which appears too vaguely defined for the name to be satisfactorily used. It is probably a good species, unconnected with *H. culmicola*.

Leptostroma donacinum Sacc var *majus*
Trail
Scottish Naturalist 8: 267 (1886)

Pycnidia elliptical, subcuticular, 1-2 mm long, black, shining, opening by a slit, the base of the cavity is covered by short conidiophores bearing cylindrical, hyaline, conidia, $4-5 \times 1-1.5 \mu$. Fig. 3M.

On dead culms of *Ammophila* in Spring. The type was on an unnamed grass.

Macrophoma fusispora (Rostrup) Buchwald in Möller Fungi of the Faeroes 2: 163 (1958)

Pycnidia gregarious, subcuticular, epiphyllous, depressed. Conidia fusoid, $12-16 \times 3-4 \mu$, said to be 1-guttulate. MÖLLER commented that this seemed scarcely distinct from *Neophoma graminella* (Sacc.) Petr. & Syd., which is common in the Hebrides on *Anthoxanthum*, *Cynosurus*, *Festuca* and *Molinia* but which I have not yet seen on *Ammophila* and which tends to have rather shorter, broader, thickwalled conidia $10-14 \times 5-6 \mu$.

Phoma ammophilae Dur. & Mont.
Flore d'Algerie, Cryptogamie 546 (1849)

Pycnidia gregarious, immersed, subglobose, 200 μ diameter, black. Conidia ovoid or ellipsoid, $4-6 \times 2-3 \mu$, hyaline, bi-guttulate, on slender conidiophores. Fig. 3H. Because of the long conidiophores this cannot be a *Phoma* in modern terms.

Psammia bommerae Rouss. & Sacc.
Bull. Soc. roy. Bot. Belg. 25: 298 (1890)

Acervuli scattered, subcuticular, up to 1 mm diameter, olivaceous to pale brown. Conidiophores short, bearing stellate conidia consisting of 30 or more arms radiating from a common centre, each arm subcylindric, obtuse, $20-30 \times 2.5 \mu$, up to 6-

septate, hyaline to light brown. Fig. 3K. Fairly common on dead leaves of *Ammophila*.

Rhodesia subtecta (Rob.) Grove
British Stem & Leaf Fungi 2: 364 (1937)

Fusarium subtectum Rob.
Ann. Sci. nat. Bot. Ser. 3,3: 358 (1845)
Myosporina subtecta (Rob.) v. Höhn.
Ber. Deutsch. bot. Ges. 37: 115 (1919)

Hymenula psammae Oudem.
Ned. Kruidk. Arch. Ser. 3, 1: 532 (1898)

Acervuli subcuticular, scattered, up to 250 μ diameter, pink. Conidia carried singly on short cylindrical phialides, elliptical, pointed at the ends, $5-7 \times 2.5 \mu$, hyaline but pink in the mass, nonseptate. Fig. 3L. Common on outer surface of dead leaves of *Ammophila*.

Septoria ammophilae Syd.
Hedwingia 35: 127 (1900)

Pycnidia in long narrow leaf spots, hypophyllous, in rows, globose, 80 μ diameter, brown, erumpent by the ostiole. Conidia filiform, flexuous, $35-50 \times 2 \mu$, 3-septate, hyaline. Fig. 3F.

S. arenariae Rostrup
Bot. Tidskr. 22: 275 (1899)

Pycnidia hypophyllous, innate, minute. Conidia slender, curved, $60-100 \times 0.5-1 \mu$.

Not seen but the description does not suggest any other coelomycete described from *Ammophila*. The conidia, however, apparently resemble those of *Eriospora leucostoma* Berk. & Br., described from *Carex paniculata* but reported on *Ammophila* by BOMMER & ROUSSEAU.

S. nodorum (Berk.) Berk.

Ann. Mag. nat. Hist. Ser. 2, 5: 397 (1850)

Pycnidia scattered or in rows, immersed, globose, 70-100 μ diameter, brown to black, with an apical ostiole. Conidia elliptic-cylindric, often curved, 20-30 \times 2-2.5 μ , 3-septate, hyaline. Fig. 3G. Described from *Triticum* but common on many genera of grasses, including *Ammophila*.

Tiarospora perforans (Rob.) v. Höhn.
Hedwigia 60: 141 (1918)

Diplodina ammophilae Trail

Scottish Naturalist 8: 76 (1885)

Darluca ammophilae Sacc. Bomm. & Rouss.

Bull. Soc. roy. Bot. Belg. 26: 221 (1887)

Tiarospora westendorpii Sacc. & March.

Revue mycologique 7: 148 (1885)

Pycnidia immersed, globose, up to 300 μ diameter, black, with an ostiolar papilla. Conidia elliptical, 20-27 \times 10-15 μ , rather thickwalled, hyaline to brownish, with a median septum and bearing a cap-like gelatinous appendage at each end. Fig. 3A.

Common on *Ammophila*, often associated with *Phaeosphaeria ammophilae*, but liable to confusion with *Ascochyta psammae*.

The interpretation of the name *Sphaeria perforans* Rob. has been disputed. In one example of DESMAZIÈRES' *Plantes Crypt. France* Ed. 1, 1288 PUNITHALINGAM found *Didymosphaeria verdoni* and MUNK used the name as basis for a *Paradidymella* on *Elymus*. On an example of the same number at Kew I find, in addi-

tion to *Tiarospora*, plentiful *Phaeosphaeria ammophilae* and it is usual to find several fungi on a piece of dead *Ammophila* leaf. But on a small packet enclosing a fragment of leaf sent him by ROBERGE as *S. perforans*, BERKELEY has sketched spores with the characteristic appendages of *Tiarospora*. There is a parallel sketch in the BROOME herbarium and I see no reason to reject VON HÖHNEL'S conclusion that this was the fungus DESMAZIÈRES' described as having «Sporidii hyalinis, bilocularibus».

Hyphomycetes.

Alternaria alternata (Fr.) Keissler
Beih. Bot. Zbl. 29: 434 (1912)

A. tenuis C. G. Nees

Syst. Pilze Schwamme 72 (1817)

Colonies olive-black, conidiophores simple or branched, septate, olivaceous. Conidia in long, often branched, chains, ovoid to obclavate, 20-63 \times 9-18 μ , usually with a short conical beak, olivaceous, with up to 8 transverse septa and 1 to 3 longitudinal or oblique septa in the broader part, wall smooth or punctate. Fig. 3P.

One of the commonest moulds on vegetable debris of all kinds, including *Ammophila*.

Arthrinium phaeospermum (Cda.) M. B.
Ellis Comm. myc. Inst. mycol. Paper 103: 8 (1965)

Papularia sphaerosperma (Pers.) v. Höhn.

Sitzb. Akad. Wiss. Wien, Math. Nat. Kl. Abt. 1, 125: 114 (1916)

Colonies subepidermal, erumpent, especially on dead grasses, black. Conidiophores cylindrical, hyaline, with conspi-

cuous refractive septa; conidia lenticular, dark brown, with a hyaline band round the edge, 8-12 μ diameter in face view, 8-12 \times 5-7 μ in side view. Fig. 3Y. An extensive host list additional to *Ammophila* will be found in ELLIS (1965).

Cladosporium herbarum Link ex S. F. Gray

Natural Arrangement of British Plants
1: 556 (1821)

Conidiophores often fascicled and springing from a stromatic base but sometimes effused to form extensive olivaceous colonies, straight, flexuous or geniculate, up to 250 \times 3-6 μ , olive-brown; conidia in chains, ellipsoid, very variable, 5-23 \times 3-8 μ with a small scar at one or both ends, 0-1-septate, occasionally more, olive-brown and finely warted. Fig. 3W. A cosmopolitan mould on dead herbaceous plants.

Dematium coelosporum Fr.
Syst. Myc. 3: 366 (1832)

As currently interpreted this differs from *Periconia hispidula* mainly in the larger conidia, 16-20 μ diameter, and seems characteristic of *Ammophila*.

Endophragmia hyalosperma (Cda.) Morgan Jones & Cole

Trans. Brit. myc. Soc. 47: 490 (1964)

Colonies effuse, conidiophores erect, simple, light brown; conidia solitary, terminal, ovoid, narrowed to a basal scar, 20-29 \times 10-13 μ , hyaline to pale olive, with thick outer wall and 3 or 4 septa. Fig. 3U. Mostly on woody substrata but also on *Agropyron*, *Bambusa* and *Dactylis* and reported on *Ammophila* by Dr. M. B. ELLIS (Personal communication).

Epicoccum purpurascens Ehrenb. ex Schlecht. Synop. Pl. crypt in Mesomarchia
136 (1824)

E. nigrum Link

Magazin Ges. naturf. Freunde, Berlin
7: (1815)

Sporodochia pulvinate, black, up to 2 mm diameter associated with reddish staining of the substrate. Conidiophores short, bearing solitary apical conidia, which are subglobose, 15-25 μ diameter, with a broad basal cell and remainder muriformly septate, dark brown, verrucose. Fig. 3Gg.

Common on dead plant matter of all kinds, including *Ammophila*.

Myrothecium atroviride (Berk. & Br.)

Tulloch Comm. myc. Inst. mycol. Paper
130: 34 (1972)

Crocicreas atroviride (Berk. & Br.)
v. Höhn.

Ann. Mycol. 1: 403 (1903)

Sporodochia cupulata, less than 1 mm diameter, with inrolled margin of sterile hyphae, black. Conidiophores forming a flat hymeniform layer, short, branched, bearing terminal narrowly fusiform conidia, 10-12 \times 2-2.5 μ , pale olivaceous, non-septate. Fig. 3Cc. TULLOCH suggested this may grade into *Saccardaea atra*. Uncommon.

M. roridum Tod ex Fr.

Sporodochia discoid, less than 1 mm diameter, olivaceous with a flexuous white margin but finally covered by a slimy, olive to black, spore mass. Conidiophores fascicled, branched, subhyaline, bearing terminal, narrowly ellipsoid, conidia, 5.5-7 \times 1.5-2 μ , hyaline to olive, nonseptate. Fig. 3Ee.

Cosmopolitan on herbaceous debris of all kinds, casual on dead roots and rhizomes of *Ammophila*.

Papularia arundinis (Cda.) Fr.

Summa Veg. Scand. Sect. Post. 509 (1849)

Coniosporium circumscissum (Berk. & Br.) Sacc.

Sylloge Fungorum 4: 244 (1887)

Colonies widely effused, especially on dead grass culms, black. Conidiophores cylindrical, hyaline, with a few refractive septa of *Arthrimum* type; conidia lenticular, 5.5-8 μ diameter in face view, brown with a hyaline band along the edge. Fig. 3Z.

This is an *Arthrimum* but a combination in the genus has not been made as it is regarded as the conidial state of *Apiospora montagnei*. As such it is cosmopolitan but the ascus state is developed mainly in warm climates, including Mediterranean countries. For a host list additional to *Ammophila* see ELLIS (1965).

Periconia hispidula (Pers. ex Pers.) Mason & Ellis

Comm. myc. Inst. myc. Pap. 56: 112 (1953)

Dematium hispidulum (Pers. ex Pers.) Fr.

Syst. Myc. 3: 365 (1832)

Conidiophores gregarious, forming a bristly black mat, nearly 1 mm tall and 8-12 μ wide at the base, tapering to a setiform apex, septate, brown, bearing conidia in short lateral chains of spherical, brown, finely warted spores, 10-16 μ diameter. Fig. 3Aa. Common on many genera of grasses but records on *Ammophila* are suspect because of probable confusion with *Dematium coelosporum*.

Periconia igniaria Mason & Ellis

Comm. myc. Inst. mycol. Paper 56: 104 (1953)

Conidiophores often gregarious but not crowded to form a mat, up to 550 \times 9-12 μ at base, repeatedly branched above to form a compact spherical head, crowded with globose conidia 7-10 μ diameter, brown, beset with warts 1 μ long. Fig. Bb.

Cosmopolitan on dead grasses, including *Ammophila*, especially after a fire.

Saccardaea atra (Desm.) Mason & Ellis

Comm. myc. Inst. mycol. Paper 56: 40 (1953)

Myrothecium atrum (Desm.) Tulloch

Comm. myc. Inst. mycol. Pappel 130: 31 (1972)

Synnemata scattered, cylindrical with cupulate apex, up to 500 μ tall, black.

Conidiophores aggregated in the apical disc, surrounded by a zone of tall, over-arching, setiform hyphae; conidia terminal, fusiform with obtuse base, 12-14 \times 3-4 μ , olivaceous, smooth, nonseptate, cohering in a slimy mass. Fig. 3Dd.

Not uncommon on dead *Ammophila* but also on other grasses.

Sporidesmium aturbinatum (Hughes) M.

B. Ellis

Comm. myc. Inst. mycol. Paper 70: 49 (1958)

Colonies effuse, black; conidiophores erect, brown, septate; conidia terminal, solitary, obovate, broadest, at the base, 17-28 \times 8-12 μ , 3 or 4-septate, basal cell dark brown and warted, upper cells pale. Fig. 3S. On wood but also on dead *Ammophila*.

S. letosporum (Sacc. & Roum.) Hughes
Canadian Journ. Bot. 36: 808 (1958)

Colonies dark brown; conidiophores erect, brown, septate; conidia terminal, solitary, narrowly obclavate, with truncate base, $25-90 \times 5-7 \mu$, from 5 to 21-septate, yellowish, smooth. Fig. 3T. Widespread on woody substrata, casual on leaves of *Ammophila*.

Tetraploa aristata Berk. & Br.

Ann. Mag. nat. Hist. Ser. 2,5: 459 (1850)

Conidiophores scattered, short; conidia solitary, with an ellipsoid basal portion composed of 4 rows of usually 4 cells each, $25-39 \times 14-25 \mu$, brown, finely warted, each row terminated above by a diverging, subcylindric, tapered, septate appendage, up to $80 \times 8 \mu$. Fig. 3X. Cosmopolitan on dead parts of monocotyledons, including *Ammophila*.

Thyrostromella myriana (Desm.) v. Höhn.
Ber. Deutsch. bot. Ges. 37: 157 (1919)

Macrosporium heterosporum Desm.

Ann. Sci. nat. Bot. Ser. 3, 18: 358
(1852)

Spegazzinia ammophilae Rostr.

Bot. Tidsskr. 20: 136 (1896)

Sporodochia erumpent, minute, black. Conidiophores short, brown; conidia solitary, terminal, $20-30 \times 12-18 \mu$, elliptical, with 1 to 3 transverse septa and commonly one longitudinal septum in one or more segments, brown, minutely verrucose. Fig. 3Q.

Common on dead leaves of *Ammophila*, and on *Elymus* in the Faeroes according to MÖLLER. (1958).

Torula herbarum Pers. ex S. F. Gray Natu-
ral Arrangement of British Plants 1:
557 (1821)

Colonies effuse, black, velvety; conidiophores short, bearing chains of elliptic-cylindric conidia, $20-70 \times 5-9 \mu$, with from 3 to 10 septa, olivaceous to brown, verrucose. Fig. 3V. Abundant and cosmopolitan on dead herbaceous stems of all kinds, casual on dead rhizomes of *Ammophila*.

Ulocladium chartarum (Preuss) Simmons
Mycologia 59: 88 (1967)

Conidiophores cylindrical, undulating, septate, yellowish brown, bearing short chains of conidia which are ellipsoid or obovoid, $18-38 \times 11-20 \mu$, with from 1 to 5 transverse septa and one or more oblique septa in most segments, brown, smooth or warted. Fig. 3R. Cosmopolitan on dead vegetable debris and plant products, casual on *Ammophila*.

MOREAU and MOREAU (1962) described *Asteromyces cruciatus*, isolated from root surfaces of *Ammophila* in Europa. Other hyphomycetes and Mucorales isolated from *Ammophila* debris in the Hebrides by APINIS (1964) are: *Aspergillus nidulans* (Eidam) West., *Fusarium culmorum* (Smith) Sacc., *F. graminum* Cda., *F. solani* (Mart.) Appel & Wollenweber, *Helicoma macrocephala* Kohlemyer, *Mucor hiemalis* Wehmer, *M. plumbeus* Bon., *M. racemosus* Fres., *M. strictus* Hagem., *Myrothecium verrucaria* (A. & S.) Ditmar, *Penicillium* (4 species), *Rhinotrichum* sp., *Scopulariopsis brevicaulis* Bainier, *Sporotrichum thermophile* Apinis, *Sty-*

sanus microsporus Sacc. & *Thermomyces lanuginosus* Tsiklinsky.

The following are dubious records and doubtful species of Fungi Imperfecti reported at some time for *Ammophila*:

Cryptomela ammophilae (Dur. & Mont.) Sacc.

Sylloge Fungorum 3: 760 (1884)

Inadequately described from Algeria.

Coniothecium psammae Oudem.

Ned. Kruid. Arch. Ser. 3,2: 319 (1901)

Conidia polymorphic, multicellular, brown, cells globose to angular, 5-7 μ diameter.

Eriospora leucostoma Berk & Br.

Ann. Mag. nat. Hist. Ser. 3, 8: 24 (1847)

Described from *Carex paniculata* but recorded on *Ammophila* by BOMMER & ROUSSEAU (1890). Confirmation is required, but compare *Sectoria arenaria* above.

Helminthosporium psammae Oudem.

Ned. Kruid. Arch. Ser. 2, 6: 58 (1892)

Conidia solitary, oblong, brown, 50 \times 7 μ , 6 to 9 septate.

Phoma nitidum Rob.

Ann. Sc. nat. Bot. Ser. 3, 20: 220 (1853)

Pycnida scattered, hemispherical, up to 170 μ diameter, immersed with a papillate erumpent ostiole. Conidia ovoid, 5 μ long. On upper surface of dead *Ammophila* leaves and reported again on this host by BOMMER & ROUSSEAU (1887). Compare *P. ammophilae*.

P. rimosa West. apud Kickx

Flore Crypt. Flandres 1: 436 (1867)

Said to be the conidial state of *Schirrhia rimosa* on *Phragmites*. Recorded on *Ammophila* by Bommer & Rousseau (1887) but needs confirmation.

Sphaeropsis lugubris Sacc. Boom. & Rouss.

Bull. Soc. roy Bot. Belg. 29: 281 (1890)

Described as «spermogones» of *Anthostomella lugubris*, with brown spores 18-21 \times 9-10 μ . No conidial state is known for *A. lugubris*, the spores were perhaps from effete asci.

Fig. 3. A—*Tiarospora perforans*; B—*Ascochyta leptospora*; C—*A. psammae*; D—*Camargraphium metableticum*; E—*Hendersonia culmiseda*; F—*Sectoria ammophilae*; G—*S. nodorum*; H—*Phoma ammophilae*; J—*Coniothyrium psammae*; K—*P. sammina bommerae*; L—*Rhodesia subtecta*; M—*Leptostroma donacinum* var *majus*; N—*Dinemasporium strigosum*; O—*Colletotrichum dematium*; P—*Alternaria alternata*; Q—*Thyrostromella myriana*; R—*Ulocladium chartarum*; S—*Sporidesmium aturbinatum*; T S. *leptosporum*; U—*Endophragmium hyalosperma*; V—*Torula herbarum*; W—*Cladosporium herbarum*; X—*Tetraploa aristata*; Y—*Arthrimum phaeospermum*; Z—*Papularia arundinis*; Aa—*Periconia hispidula*; Bb—*P. igniaria*; Cc—*Myrothecium atroviride*; Dd—*Saccardaea atra*; Ee—*Myrothecium roridum*; Ff—*Puccinia pygmaea*, uredospore with paraphysis; Gg—*Epicoccum purpurascens*; Hh—*Sphaerobolus stellatus*; Jj—*Cyathus olla*; Kk—*Crinipellis stipitarius*; Ll—*Marasmius littoralis*; Mm—*Celklypha griseopallida*; Nn—*Psathyrella ammophila*; Oo—*Phallus hadriani*; Pp—*Puccinia elymi*, teleuto & uredospores from *Elymus*; Qq—*Ustilago hypodytes*; Rr—Spore of *Didymosphaeria arenaria*; Ss—Spore of *D. verdoni*, after Eriksson.

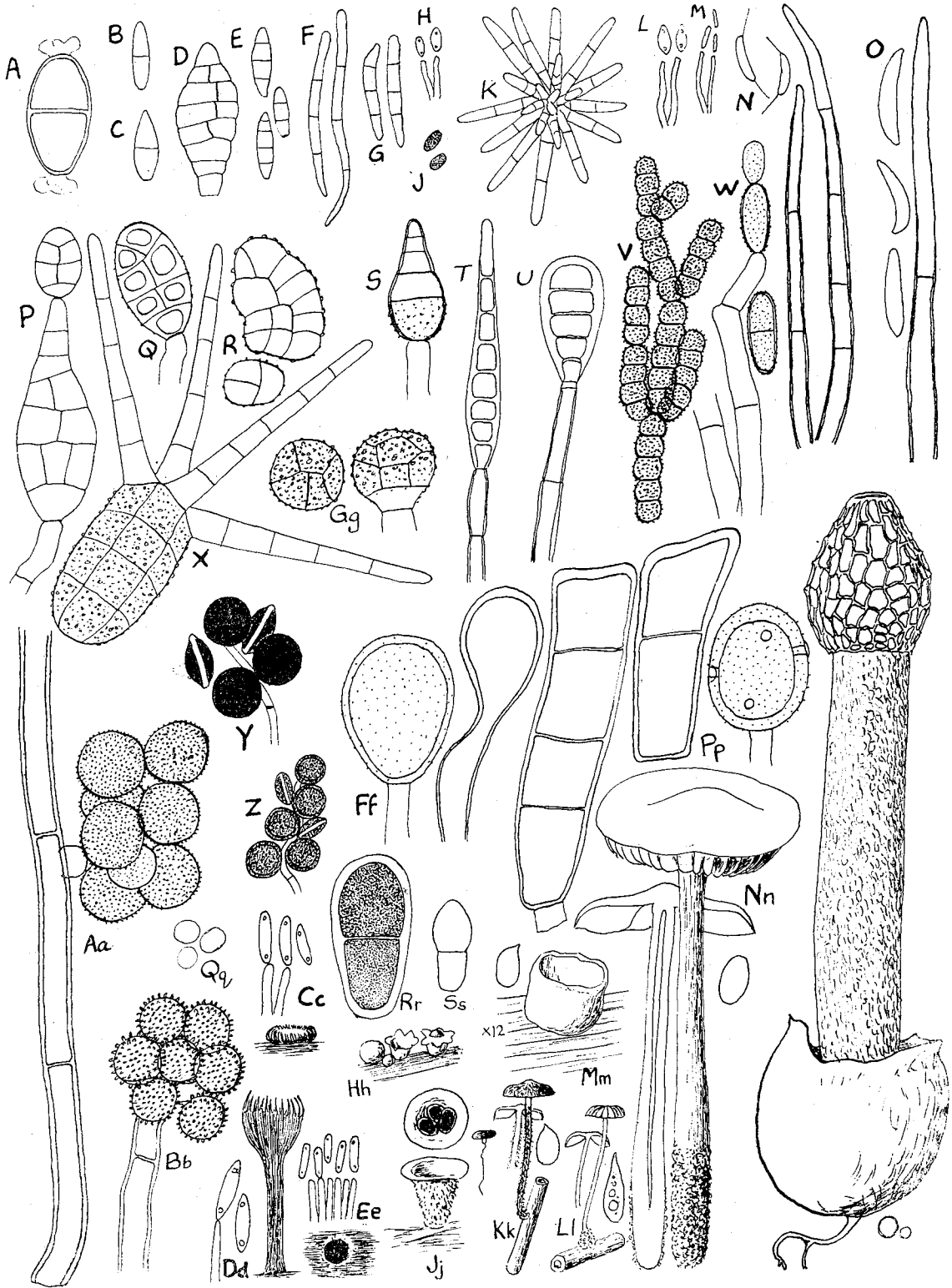


Fig. 3

Stagonospora arenaria (Sacc.) Sacc.
Sylloge Fungorum 3: 453 (1884).

Pycnidia gregarious, immersed, subglobose to elliptical, $240 \times 200 \mu$, dark brown, with an ostiolar papilla. Conidia subcylindric, obtuse, straight or slightly curved,

$25-45 \times 3-4 \mu$, hyaline to yellowish, with from 3 to 5 septa.

Typical on *Elymus arenarius*, such British collection as I have seen so called on *Ammophila* were *Ascochyta psammae*.

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