

bose with a flattened apex, 380–440 × 360–420 µm, smooth, ostiolate. Ascromatal wall 60–70 µm thick, of two regions: outer region 38–46 µm thick, of very thick-walled, angular cells, 7–16.5 × 5–6.5 µm; inner region 16–23 µm thick, of thin-walled, elongate cells. Periphyses cellular, cylindrical, 15–20 × 1.5–2.2 µm, ends rounded. Apical paraphyses evident in young ascromata, visible as remnants in mature ascromata. Asci cylindrical, clavate to broadly clavate, 81–105 × 21–28 µm, simple, 4–8-spored, ascospores uniseriate above to biseriate below. Ascospores broadly reniform with rounded ends, 31–42 × 14.5–21 µm, 1-septate, hyaline, smooth.

HABITAT AND DISTRIBUTION.— Known only from the type collection.

HOLOTYPE.— INDIA, Karnataka State: South Kanara district, near Irde, at Darbhe, on dead twigs of *Macaranga indica* Wight, 22 Dec 1976, D.J. Bhat (MUBL 2358 – apparently lost; ex-type culture CBS 646.77). Culture CBS 521.96.

ILLUSTRATIONS.— Seifert (1985, Fig. 47; 1990, Fig. 5F, anamorph); Subramanian & Bhat (1978b, Figs. 1–22, anamorph; 1978c, Figs. 1–2, Pl. 1).

Peethambara spirostriata (Rossman) Rossman, *comb. nov.*

≡ *Nectria spirostriata* Rossman, Mycol. Pap. 150: 61, 1983.

ANAMORPH: *Didymostilbe echinofibrosa* (E.F. Morris) Rossman, *comb. nov.*

≡ *Virgatospora echinofibrosa* E.F. Morris, Mycologia 59: 538, 1967.

Ascromata superficial, solitary or in groups of up to five, without stroma, yellow to dark yellow, becoming darker when dry, KOH–, globose to subglobose, irregularly cupulate or not collapsing when dry, 305–470 µm high × 360–575 µm diam, without papilla, smooth. Ascromatal wall 50–70 µm thick, of two regions: outer region 25–35 µm thick, of angular to globose cells 10–18 µm diam, with hyaline up to 1.5 µm thick walls; inner region 25–35 µm thick, of small angular to slightly elongate cells, 7.5–12 × 5–7.5 µm, with 2–3 µm thick walls, the cells with only a small lumen; empty shell of ascromatal wall remaining when overmature. Asci clavate, 87–100 × 17–23 µm, simple, number of ascospores in

each ascus variable, often only 4–6, ascospores irregularly biseriate. Ascospores broadly fusiform with narrowly rounded ends, curved, 38–55 × 10–13 µm, 3–(4–5)-septate, with large guttules in each cell, hyaline, spirally striate, with 10–12 striae per half spore.

ANAMORPH.— Synnemata scattered, solitary, 400–1500 µm tall × 40–70 µm wide at the apex, broadening to 150 µm at the base, stalk dark olivaceous-grey, paler toward the base, cells of stalk with dark walls, elongate, 12–25 × 2–3 µm, head of synnemata globose, 125–200 µm diam, with conidia in a slimy, olivaceous-black mass. Conidiophores unbranched along most of their length, branching penicillately toward their apices. Conidiogenous cells phialidic, determinate, cylindrical to clavate, 10–30 × 3–4 µm. Conidia broadly fusiform with papillate, truncate ends, straight or curved, 3-septate, 38–45 × 10–15 µm, olivaceous-grey, coarsely striate.

HABITAT.— On decaying woody substrata.

DISTRIBUTION.— Tropical, known primarily from the Neotropics, also Gabon and Malaysia.

TYPES.— PANAMA: Prov. Panama, vicinity of Altos de Pacora, 26–31 km N of Pan American Hwy, on old road to Mandinga, elev. ca 700–730 m, on trunk of *Cecropia* sp., associated with *Virgatospora echinofibrosa*, K. P. Dumont *et al.*, 30 June 1975, PA 1553 (holotype of *Nectria spirostriata* NY); Barro Colorado Island, Pierson Trail, on dead twigs, 3 Aug 1964, E.F. Morris & J.W. Strain 780, (lectotype of *Virgatospora echinofibrosa*, designated by Rossman, 1983; BPI 449174, isolectotype ILLS).

Additional specimens examined are cited in Rossman (1983).

ILLUSTRATIONS.— Ellis & Ellis (1971, Fig. 401, anamorph only); Rossman (1983, Fig. 32, Pl. 11 A, B).

PRONECTRIA Clem., in Clem. & Shear, Gen. Fungi p. 282, 1931.

Type: *P. lichenicola* (Ces.) Clem. (≡ *Cryptodiscus lichenicola* Ces. ≡ *Nectria lichenicola* (Ces.) Sacc.), a synonym of *Pronectria robergei* (Mont. & Desm.) Lowen.

Ascromata immersed in the host thallus, scattered or in groups, non-stromatic, subglobose to obpyriform, 100–500 µm diam, pale yellow to orange or red, rarely yellow, KOH– or rarely reacting. Setae rarely present. Cells on the ascromatal surface usually angular. Ascromatal wall 10–40 µm thick, generally of one region, also of two, rarely three, regions. Ascromatal apex of rows

KEY TO THE SPECIES OF *PEETHAMBARA*

1. Ascospores 1-septate, broadly reniform with rounded ends, 31–42 × 14.5–21 µm, smooth *P. sundara*
1. Ascospores 3–(4–5)-septate, broadly fusiform with narrowly rounded ends, curved, 38–55 × 10–13 µm, spirally striate *P. spirostriata*

of parallel, vertically elongate cells, continuous with the inner region of the ascumatal wall. Asci clavate, usually less than 200 μm long or 15 μm wide, apex truncate, usually with a ring, 2–8-spored, ascospores biserial in the middle, uniseriate above and below, or rarely uniseriate. Ascospores fusiform, ovoid or ellipsoid, typically not over 25 μm long and 8 μm wide, 1-septate, hyaline, smooth-walled, verruculose or spinulose. Anamorph, where known, *Acremonium*. On lichenized fungi and algae.

NOTES.— Clements (in Clements & Shear, 1931) described and differentiated the genus *Pronectria* based on the lichenicolous habit, keying it out among hypocrealean fungi having one-septate, hyaline ascospores and non-stromatic, superficial ascumata. Although *Pronectria* was considered a synonym of *Nectriella* by Rogerson (1970), Lowen (1991) differentiated *Pronectria* from other hypocrealean genera by immersed ascumata, occurrence on lichens and algae, and a combination of morphological characters, i.e. ascumatal wall thin, often of one region, presence of ascumatal cells intermingled with those of the host, pale yellow to orange or dark red ascumata, generally KOH– except in *P. fissuriprodiens*, *P. septemseptata*, and *P. subimperspicua*. Another hypocrealean genus that includes lichenicolous species is *Xenonectriella* in the *Nectriaceae*. This genus has KOH+ ascumata with thickened wall cells, generally cylindrical asci, and verruculose to tuberculate ascospores that become yellowish brown with age. The species of *Pronectria* with KOH+ ascumata may belong in *Xenonectriella*; however, careful observation of ascumatal anatomy is needed to make this determination. Although *Pronectria* and *Nectriella* are similar in having KOH–, thin-walled ascumata immersed in the substratum, *Nectriella* differs in occurring on decaying herbaceous or woody plant material and having an ascumatal wall of two regions. Anamorphs of species of *Pronectria* have been placed in *Acremonium*, *Diplosporium*, and *Illosporium*. Lowen (1991) provided an account of the genus *Pronectria* with a key to the accepted species including two new species published here.

Pronectria robergei (Mont. & Desm.) Lowen, Mycotaxon 39: 462, 1990. — Plate 8, c.

≡ *Nectria robergei* Mont. & Desm., Pl. Crypt. France, Ed. 3, Fasc. 8: 374, 1856.

≡ *Nectriella robergei* (Mont. & Desm.) Weese, in Höhn. & Weese, Ann. Mycol. 8: 467, 1910.

= *Cryptodiscus lichenicola* Ces., in Rabenh. Herb. Mycol. ed. 2, fasc. 6: 523, 1857.

≡ *Nectria lichenicola* (Ces.) Sacc., Michelia 1: 289, 1878.

≡ *Calonectria lichenicola* (Ces.) Rehm, Ascom. Lojk. p. 44, 1882.

≡ *Nectriella lichenicola* (Ces.) Fuckel, in Höhn. & Weese, Ann. Mycol. 8: 466, 1910.

≡ *Pronectria lichenicola* (Ces.) Clem., in Clem. & Shear, Gen. Fungi p. 282, 1931.

= *Nectriella carnea* Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–23: 176, 1869 [1870].

= *Nectria peltigerae* W. Phillips & Plowr., Grevillea 4: 123, 1876.

Ascumata immersed, scattered or in groups of up to 20, closely adherent and raising the epidermis of the lichen or visible through star-like cracks in the epidermis, obpyriform, 240–340 μm high \times 250–320 μm wide, pale red to orange, yellow when dry, KOH–; papilla truncate, 60–130 μm diam; ostiolar area sometimes depressed and hyaline. Ascumatal wall ca 35 μm thick, of two regions: outer region ca 17 μm thick, of thick-walled, globose to ellipsoid cells, 3.5 μm diam or 5 \times 3.5 μm ; inner region ca 18 μm thick, of thin-walled, elongated cells 3.5–10.5 \times 2–3 μm ; periphyses directed downward into the centrum. Asci clavate, 40–70 \times 8–9(–14) μm ; apex with a ring, 8-spored, ascospores biserial. Ascospores ovoid to ellipsoid, 8–16 \times (3–)4–8 μm , 1-septate, sometimes slightly constricted, hyaline, smooth to slightly roughened.

HABITAT.— On *Peltigera canina* and other species of *Peltigera*, often damaging the thallus of the lichen, discoloring areas delimited by a dark line from the inner layers, leaving smooth craters where ascumata have fallen out.

DISTRIBUTION.— Chile, Europe (Belgium, Finland, France, Germany, Italy, Luxembourg, Romania, Scotland, Spain – *vide* Martínez & Hafellner, 1998, Sweden), United States (Montana, New Hampshire, New York).

TYPE.— FRANCE. Normandy: Lebisey Park, on thallus of *Peltigera canina*, on old elm, Apr 1843, Roberge, Pl. Crypt. France, ed. 3, fasc. 8: 374, 1856 (PC, lectotype of *Nectria robergei*, designated herein; FH, H, IMI, K, PC, isolectotypes). ITALY. Piedmont: Oct.–Nov. 1856, Rabenhorst, Herb. Mycol. ed. 2, fasc. 6: 523, 1857 (BPI, lectotype of *Cryptodiscus lichenicola*, designated herein; IMI, K, S isolectotypes). GERMANY. Freienweinstein: Kiefernwald (pine wood), in thallus of *Peltigera canina*, spring, Kalchbrenner, Fungi Rhenani Exsiccati 1835 (G, holotype of *Nectriella carnea*, FH – Höhnel, IMI, K, S, isotypes). UNITED KINGDOM. Norfolk: Castle Rising [as 'Lynn'], Nov 1875, collector unknown (E, FH – Höhnel, isotypes of *Nectria peltigerae*).

Many additional specimens examined as cited in Lowen (1991).

ILLUSTRATIONS.— Müller & von Arx (1962, Fig. 247, as *Nectriella robergei*).

ADDITIONAL SPECIES OF *PRONECTRIA*:

Pronectria anisospora (Lowen) Lowen, Mycotaxon 39: 461, 1990.

≡ *Nectriella anisospora* Lowen, Mem. New York Bot. Gard 49: 248, 1989.

This species was described and illustrated in Lowen (1989).

Pronectria casaesii Etayo, *Nova Hedwigia* 67: 504. 1998.

Recently described and illustrated from Spain by Etayo (1998), this is one of two species in *Pronectria* having more than one-septate ascospores.

Pronectria dealbans (Müll. Arg.) Etayo & Breuss, *Cryptogamie, Bryol. Lichénol.* 17: 220. 1996.

= *Sphaerella dealbans* Müll. Arg., *Flora* 55: 507. 1872.

This species was described and illustrated in Etayo & Breuss (1996).

Pronectria echinulata Lowen, *sp. nov.* — Plate 9, d.

Ascomata obpyriformia, 120–140 × 100–130 µm, immersa, gregaria, aurantiaco-brunnea. Setae nullae. Parietes 8–12 µm crassi, unistratosi. Asci clavati, 52 × 2 µm; annulo deficientes. Ascospores biseriatae, ellipsoideae vel ovoideae 12–14 × 5.5–8 µm, 1-septatae, hyalinae, echinulatae. Anamorphosis ignota.

Ascomata immersed in discolored, raised host thallus, in groups of up to 20, obpyriform, 120–140(–250) µm high × 100–130(–160) µm diam, orange-brown, becoming darker in KOH, not changing color in lactic acid; papilla truncate, non-setose. Surface cells angular, 5–9.5 × 8.5–12 µm. Ascomatal wall 8–12 µm thick, of one region of thin-walled angular cells, ca 7 × 5 µm. Asci clavate, 52 × 12 µm; simple, ascospores biseriatae. Ascospores ellipsoid-ovoid, (11–)12–14(–18) × 5.5–8(–10) µm, 1-septate, sometimes slightly constricted, thin-walled, hyaline, spinulose. Anamorph unknown.

HABITAT.— On *Physcia*.

DISTRIBUTION.— Austria, Ireland, Spain (Etayo, 1998), U.S.A. (Idaho).

HOLOTYPE.— IRELAND. Gortnaskehy (H10), on *Physcia aipolia* on *Salix*. 30 Aug 1985. M.R.D. Seaward (IMI 105139).

ADDITIONAL SPECIMENS EXAMINED.— AUSTRIA: Steiermark: Hochschwab-Gruppe, Seetal W of Seewiesen, ca 10 km NE of Aflenz, 930 m, on *Physcia ascendens*, on *Fraxinus*, 19 Jan 1985, J. Hafellner 12580 & A. Ochsenhofer (Herb. J. Hafellner); UNITED STATES. Idaho: Lochsu River near Howell, on *Physcia* on stick, 29 June 1989, Katia Rodrigues (NY).

ETYMOLOGY.— Referring to the echinulate ascospores.

NOTES.— *Pronectria echinulata* is distinguished from other species of *Pronectria* by its thin lateral ascomatal wall of brownish cells, spinulose ascospores with fragile walls that fracture easily with pressure, and ascomata aggregated in a raised, discolored area of the lichen thallus.

Pronectria erythrinella (Nyl.) Lowen, *Mycotaxon* 39: 461. 1990.

= *Sphaeria erythrinella* Nyl., *Not. Sällsk. Fauna Fl. Fenn. Förh.* 4: 125. 1859.

= *Nectria erythrinella* (Nyl.) Tul. & C. Tul., *Sel. Fung. Carpol.* 3: 95. 1865.

= *Charonectria erythrinella* Jaap, *Verh. Bot. Vereins Prov. Brandenburg* 52: 133. 1910.

= *Nectriella erythrinella* (Nyl.) Höhn. & Weese, *Ann. Mycol.* 8: 466. 1910.

= *Nectriella kalchbrenneri* Fuckel, *Jahrb. Nassauischen Vereins Naturk.* 23–24: 177. 1869 [1870].

ANAMORPH: *Illosporium* sp.

Ascomata immersed, scattered or in groups of up to six, obpyriform, 280–320 µm high × 240–340 µm diam, at first red to orange, fading to yellow, KOH–; papilla truncate occasionally with hyphal ends free at edges, averaging 80 µm high × 160 µm diam, non-setose. Cells on surface angular to irregularly rectangular, mostly 10 × 5 µm. Ascomatal wall 20 µm thick, of one region, of thin-walled rectangular cells 5–12 × 2.5–3.5 µm, widening to two regions in upper quarter; outer cells thick-walled, subglobose. Asci clavate, 72–90 × 10–14 µm; apex truncate, with a ring; ascospores biseriatae. Ascospores ellipsoid-fusiform, (17–)18–20(–30) × (4–)5.5–6(–8) µm, 1-septate, septa often jagged, at first hyaline to pale yellow, then pale orange, verruculose, guttules often present in immature ascospores.

ANAMORPH.— Sporodochia erumpent, scattered or in groups on the lichen thallus, sometimes contiguous with ascomata, ca 250 µm diam, reddish orange. Conidia germinating from groups of cells, not from single cells.

HABITAT.— On thalli of *Peltigera* spp.

DISTRIBUTION.— In cool temperate regions.

TYPE SPECIMENS.— FINLAND. Nylandia: Helsinki (Helsingfors), Grid 27°E, on *Peltigera* sp., Nov 1858, W. Nylander (holotype of *N. erythrinella*, H; isotype, IMI 211135, slide, as *Sphaeria erythrinella*). CZECH REPUBLIC. Near Spis-Olaszi, in *Peltigera canina*, parasitic and ultimately destructive, June 1860, after heavy rain, Kalchbrenner, Rabenh. Fungi Eur. no. 73b (isotype of *N. kalchbrenneri*, NY, filed as *Illosporium carneum*).

SELECTED SPECIMENS EXAMINED.— CANADA. Alberta: SW of Calgary, Eau Claire camp ground, 1400 m (4600'), on *Peltigera rufescens* [= *P. leptophora*], on rock outcrops, lower subalpine region, 19 July 1981, R. Rosentreter 2198 (IMI 269698, *Illosporium* sp. also present). FINLAND. Pp: li: lin aseman ratapihan N-pää sillanpieli en ratavallin W-rinne, grid 27°E, on *Peltigera didactyla*, 21 July 1964, J. Suominen (H, as *Nectriella robergei*, *Illosporium* sp. present); Myllyperä, on *Peltigera*, äng, May 1866, Karsten, Fungi Fenn. 475 (K, as *S. erythrinella*). RUSSIA. Bologoye: prov. Nangorva, 29 Aug. 10 Sep 1897, W. Tranzschel (Š). SWEDEN. location unknown, 16 Aug 1974, R. Santesson (UPS, as *N. robergei*); UNITED STATES. Idaho: Lemhi County, Gilmore Summit,

Lemhi-Birch creek valley T13N, R27E, 2500 m, 20 June 1987, R. Rosentreter 4243, culture as R. Lowen 359a-87 (NY, Herb. Rosentreter); New Hampshire: Coos County, Shelburne, Sep 1891, W.G. Farlow 406 (FH, S, *Illosporium* sp. present).

NOTES.— The ascomatal papilla of *Pronectria erythrinella* is barely visible through cracks in the thallus of the host, or it can become emergent surrounded by host tissue. The ascomatal apex is composed of parallel hyphae. Although similar to *P. robergei*, ascomata of *P. erythrinella* are brighter in color than those of *P. robergei* at first, but in the herbarium, where the colors usually fade, these species cannot be distinguished macroscopically. *Pronectria robergei* has smaller ascospores, shorter asci, and ascomatal walls of two regions unlike *P. erythrinella*. *Pronectria robergei* is usually found on *Peltigera* cf. *canina* whereas *P. erythrinella* often occurs on *Peltigera didactyla*.

Pronectria fissuriprodiens Etayo, in Etayo & Diederich, Bull. Soc. Nat. Luxemb. 97: 110. 1996.

This species was described and illustrated in Etayo & Diederich (1996).

Pronectria laminariae (O.E. Erikss.) Lowen, Mycotaxon 39: 461. 1990.

= *Nectriella laminariae* O.E. Erikss., Svensk Bot. Tidskr. 58: 233. 1964.

This species was described and illustrated in Eriksson (1964).

Pronectria oligospora Lowen & Rogerson, Mycotaxon 53: 88. 1995.

This species was described and illustrated in Lowen (1995).

Pronectria oligospora* var. *octospora Etayo, Nova Hedwigia 67: 505. 1998.

This species was described by Etayo (l.c.).

Pronectria pertusariicola Lowen, sp. nov. — Plate 8, e.

Ascomata obpyriformia vel subglobosa, 220–300 × 150–270 μm, immersa, gregaria, aurantiaca. Setae nullae. Parietes

17–20 μm crassi, bistratosi. Asci clavati, 60–80 × 7–9 μm; annulo indistincto. Ascospores biseriatae, ovoideae, 9–12 × 4.5–5 μm, 1-septatae, hyalinae, echinulatae, guttulatae. Anamorphosis ignota.

Ascomata immersed in the host thallus, in groups of 20 to 100, obpyriform to subglobose, 220–300 high × 150–270 μm diam, orange to yellow, KOH–; papilla truncate, 40 μm high × 100–200 μm diam, non-setose. Ascomatal wall 17–20 μm thick, of two regions: outer region 9–13 μm thick, of thick-walled, angular to rounded cells, 2–3.5 × 1–1.5 μm; inner region 7–8 μm thick, of thin-walled, elongate cells, 2–8.5 × 0.5 μm. Asci clavate, 60–80 × 7–8(–12) μm; apex truncate and simple; ascospores irregularly uniseriate to biseriate. Ascospores ovoid, (9–)15–20 × 4.5–5(–6) μm, 1-septate, slightly constricted; hyaline, spinulose, spines sometimes arranged in rows as striations. Anamorph unknown.

HABITAT.— On thallus of *Pertusaria* sp.

DISTRIBUTION.— France, Spain (Etayo, 1998), Sweden.

HOLOTYPE.— SWEDEN, Skåne: Brunnby par., Krapperup, by a road, on *Pertusaria pertusa* on *Ulmus*, 19 July 1947, R. Santesson (UPS).

ADDITIONAL SPECIMENS EXAMINED.— FRANCE, Brittany: Finistère, Coatadon, on *Pertusaria pertusa* (as *P. communis*), 18

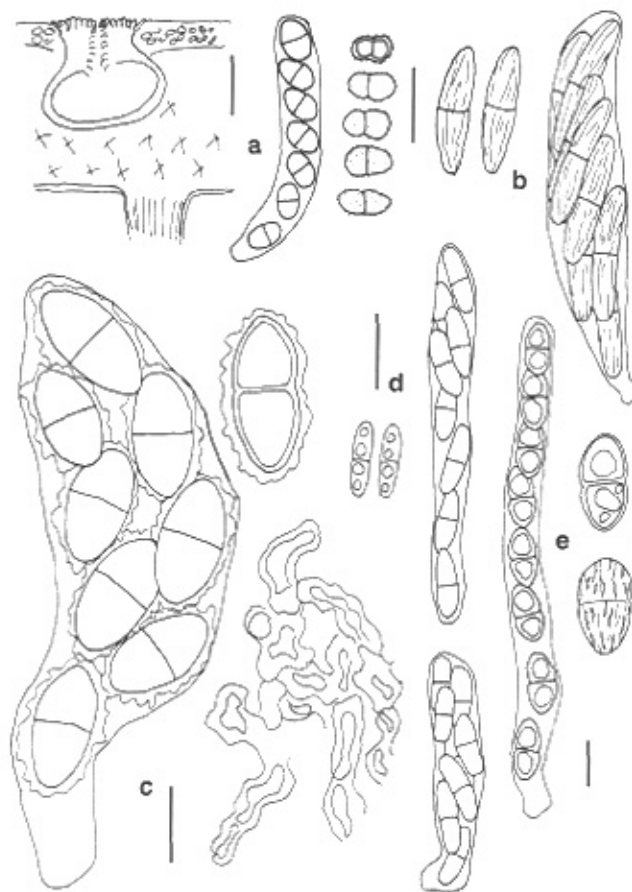


Plate 10. a. *Pronectria subimperspicua*, median section of ascoma, ascus and ascospores. b. *Protocreopsis javanica*, ascus and ascospores. c. *Stilbocrea impressa*, hairs on ascomatal wall, ascus, and ascospore. d. *Valsonectria boldoae*, asci and ascospores. e. *Valsonectria pulchella*, ascus and ascospores. a. Holotype – LPS. b. Holotype of *P. palmicola* – TNS. c. G.J.S. 84-256 – NY. d. Holotype – LPS. e. Holotype – LPS. Scale bars: left a = 100 μm; right a, b–e = 10 μm.

June 1870, Crouan & Crouan (CO, filed under *Nectria*); same locality, [on *Pertusaria* sp.] on bark of elm, 18 Oct 1868, Crouan & Crouan (CO).

ETYMOLOGY.— The specific epithet is based on the host lichen, *Pertusaria*.

NOTES.— The collections of *Pronectria pertusariicola* from Sweden and France differ somewhat in ascospore size. The collection from Sweden is chosen as the holotype because it is in better condition and is more readily available for study than the collections from the Crouan herbarium. *Pronectria pertusariicola* and *P. robergei* are morphologically similar, but *P. pertusariicola* differs in host and ascomatal wall anatomy, having asci with an apical ring, and ascospores that are more conspicuously ornamented than those of *P. robergei*.

Pronectria santessonii (Lowen & D. Hawksw.) Lowen, Mycotaxon 39: 462. 1990.

≡ *Nectriella santessonii* Lowen & D. Hawksw., Lichenologist 18: 322. 1986.

This species was described and illustrated in Lowen & Hawksworth (1986).

Pronectria septemseptata Etayo, Nova Hedwigia 67: 507. 1998.

Recently described and illustrated from Spain by Etayo (1998), this species is unique in having generally 7-septate ascospores.

Pronectria subimperspicua (Speg.) Lowen, Mycotaxon 39: 462. 1990. — Plate 10, a.

≡ *Nectria subimperspicua* Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 6: 290. 1899.

Ascomata immersed, scattered or in groups of up to 30, obpyriform, 120–240 high × 120–240 µm diam, pale orange, outer wall region KOH+ red, changing to yellow in lactic acid; papilla conical to truncate, 60 µm diam, slightly paler than lateral and basal walls. Ascomatal wall 10 µm thick, of two regions: outer region 5 µm wide of thick-walled, round to oval cells; inner region 5 µm wide, of thick-walled, elongate cells. Centrum contents pale orange; orange oily drops emerging from crushed ascomata. Asci clavate, 40–50 × 6.5–7.5 µm, apex rounded, simple; asci in fascicles; ascospores diagonally uniseriate, filling the ascus. Ascospores subglobose, 6.5–8 × 5–6 µm, 1-septate, slightly constricted, at first hyaline, then pale orange, verruculose.

HABITAT.— On thallus of *Punctelia*.

DISTRIBUTION.— Known only from type.

HOLOTYPE.— ARGENTINA. Buenos Aires: La Plata, in park, on the wilting thallus of *Punctelia constantimontium* [as *Ricasolia casarettoana*], 1 Apr 1890, Spegazzini 1618 (LPS).

NOTES.— *Pronectria subimperspicua* differs from other species of *Pronectria* in the KOH reaction of the outer ascomatal wall. *Pronectria paucispora* is also found on *Punctelia*, but has subglobose ascomata and longer, narrower ascospores than those of *P. subimperspicua*.

Pronectria tenacis (Vouaux) Lowen, Mycotaxon 39: 462. 1990.

≡ *Pharcidia mamillula* (Anzi) Vouaux f. *tenacis* Vouaux, in Bouly de Lesdain, Rech. Lich. Dunkerque p. 273. 1910.

Ascomata immersed in host thallus and apothecia, scattered or in groups of up to six, obpyriform, 240 µm high × 200 µm diam, orange, KOH–, papilla conical to truncate, purplish red. Ascomatal wall 17–22 µm thick, of one region of thin-walled rounded to angular cells 3 µm diam, cells becoming longer and thinner toward the centrum. Centrum contents pale orange; orange oily drops emerging from crushed ascomata. Asci clavate, 50–70 × 8–14 µm, with an apical ring; ascospores biserial. Ascospores ellipsoid–ovoid, 10–16 × 5–6 µm, 1-septate, at first hyaline, then pale orange, verruculose. ANAMORPH.— None known.

HABITAT.— In thallus of *Collema tenax* on dunes.

DISTRIBUTION.— United Kingdom and France.

NEOTYPE DESIGNATED HEREIN.— UNITED KINGDOM. England: North Devon: Braunton Barrows NNR, on *Collema tenax* on dunes, 16 Apr 1988, D.L. Hawksworth 5314 (IMI 327003).

NOTES.— The type specimen at the Vouaux herbarium was destroyed, thus this taxon is neotypified with a specimen that agrees with the protologue. The sand dune habitat is similar to that described as the original locality. *Pronectria tenacis* is distinguished from other species of *Pronectria* by the host lichen and the ascomata with purplish red papillae.

Pronectria tenuispora (D. Hawksw.) Lowen, Mycotaxon 39: 462. 1990.

≡ *Nectriella tenuispora* D. Hawksw., Notes Roy. Bot. Gard. Edinburgh 36: 187. 1978.

This species was described and illustrated in Hawksworth (1978).

Pronectria terrestris Lowen & Diederich, Mycologia 82: 790. 1990.

This species was described and illustrated in Lowen & Diederich (1990).

Pronectria tinctoria (Fuckel) Lowen, Mycotaxon 39: 462. 1990.

≡ *Cryptodiscus tinctus* Fuckel, *Fungi rhenani* exs., Fasc. 4: 1836. 1867.

≡ *Calonectria tincta* (Fuckel) Rehm, *Ann. Mycol.* 8: 302. 1910.

≡ *Nectriella tincta* (Fuckel) R. Sant., in Eriksson, *Svensk Bot. Tidskr.* 58: 235. 1964.

[≡ *Nectriella coccinea* Fuckel, *Jahrb. Nassauischen Vereins Naturk.* 23–24: 177. 1869 [1870], non *N. coccinea* (Pers.: Fr.) Fr. 1849].

≡ *Nectria fuckelii* Sacc., *Michelia* 1: 289. 1878.

[≡ *Calonectria fuckelii* (Sacc.) Rehm, *Tranzschel & Serebriani-kow, Mycotheca Rossica* Fasc. 2: 68. 1910, non *C. fuckelii* (Nitschke) Sacc., *Michelia* 1: 310. 1878].

= *Calonectria fuckelii* (Sacc.) Rehm f. *everniae* Rehm, in Motouschek, *Centralbl. Bakteri-ol.*, Abth. 2, 42: 105. 1915.

Ascomata immersed in ectal excipulum and thallus, scattered or in groups of up to 15, obpyriform, 170–220 µm high × 170–230 µm diam, at first pale red, then pale yellow, KOH–, papilla conical, 75–80 µm high × 100–120 µm diam. Ascomatal wall 10–16 µm thick, of one region of thin-walled cells. Asci clavate, 60–80 × 9–11 µm, apex rounded, simple; ascospores biseri-ate. Ascospores fusiform, 17–22 × 4–5.5 µm, 1-septate, cells unequal, one cell wider than the other, hyaline, verruculose, with one to many guttules per cell.

ANAMORPH.— None known.

HABITAT.— On thallus and ectal excipulum of *Anaptychia ciliaris*.

DISTRIBUTION.— Europe.

TYPE SPECIMENS.— SWITZERLAND. Neuchâtel: near Neuchâtel, in Jura, on thallus and apothecia of *Anaptychia ciliaris* [as *Hagenium ciliarum*], Spring 1870, P. Morthier, *Fungi rhenani* exs. 1836 (holotype of *C. tinctus* G; isotypes,

Herb. Barb. Boiss. FH – Höhnel, G; IMI, K). RUSSIA. Prov. Kursk: Schebekino, in thallus of '*Evernia prunastri*', 15 July 1908, Serebriani-kow, in Tranzschel & Serebriani-kow, *Mycoth. Ross.* Fasc. 2, 68 (isotypes, BPI, FH, K, S, all as *Calonectria fuckelii* f. *everniae*).

ADDITIONAL SPECIMENS EXAMINED.— FINLAND. Tavastia australis: Tammela, Mustiala, 13 Oct 1888, P.A. Karsten 2740 (H: as *Nectria fuckelii*); *ibid.*, on *Physcia stellaris*, 4 Oct 1888, P.A. Karsten 2739 (H: as *Nectria fuckelii*); *ibid.*, Oct 1888, P.A. Karsten 2738 (H: as *Nectria fuckelii*). USSR. Prov. Kursk: Schebekino, in thallus, Aug 1908, Serebriani-kow, Rehm *Ascom.*, Fasc. 46: 1897 (FH – Höhnel, K, S, all as *Calonectria tincta*).

NOTES.— *Pronectria tincta* is distinguished from other species of *Pronectria* by the host and the unequal, fusiform ascospores.

Pronectria verrucariae (Vouaux) Lowen, *Mycotaxon* 39: 462. 1990.

≡ *Nectria verrucariae* Vouaux, *Bull. Trimestrial Soc. Mycol. France* 28: 186. 1912.

Ascomata immersed in ascomata of the lichen, visible as black or sometimes orange spots due to the barely visible papilla, scattered or in groups of up to 6, ascomata falling out leaving orange, circular craters, obpyriform, 180–320 µm high × 150–280 µm diam, pale orange, KOH–, papilla truncate, 60 µm wide. Ascomatal wall 16–20 µm thick, of one region, of thin-walled, elongate cells. Asci clavate, 44–70 × 8–12 µm, with 2–4 ascospores, apex with a ring; ascospores uniseriate. Ascospores ovoid to ellipsoid–fusiform, one end often pointed, other end rounded, 16–21 × 5–7 µm.

KEY TO THE SPECIES OF *PRONECTRIA*

1. Ascospores 3- or more septate 2
1. Ascospores 1-septate 3
- 2 (1) Ascospores 3-septate, elongate ellipsoid, 15.5–21 × 5–6 µm *P. casaresii*
2. Ascospores (3–5–)7-septate, fusiform, 41–63 × 4.5–6 µm *P. septemseptata*
- 3 (1) Ascomata becoming darker in KOH and yellow in lactic acid; ascospores uniseriate . 4
3. Ascomata not changing color in KOH or lactic acid; ascospores biseri-ate 5
- 4 (3). Ascospores 6.5–8 × 5–6 µm, pale orange, verruculose; ascomata immersed in thallus of *Punctelia constantimontium* *P. subimperspicua*
4. Ascospores 6.5–10 × 3–5 µm, hyaline, smooth-walled; ascomata immersed in thallus of *Lobaria* *P. fissuriprodiens*
- 5 (3). Ascomata having a red ostiolar area 6
5. Ascomata concolorous 8
- 6 (5). Algicolous, in stipe of *Laminaria* sp.; ascomata white with red ostiolar area; ascospores 13–20 × 7–9 µm, pale brown, verruculose *P. laminariae*
6. Lichenicolous, in thallus or apothecia of lichenized fungi; ascomata orange with red ostiolar area 7

- 7 (6). Ascospores ellipsoid-ovoid, $10-16 \times 5-6 \mu\text{m}$, pale orange, verruculose; in thallus and apothecia of *Collema* *P. tenacis*
7. Ascospores fusiform, $22-28(-33) \times 3.5-5 \mu\text{m}$, hyaline, smooth; in thallus of *Peltigera* *P. tenuispora*
- 8 (5). Ascospores smooth-walled; ascomata subglobose 9
8. Ascospores usually ornamented; ascomata obpyriform 12
- 9 (8). Ascomata immersed in the thallus of *Hypogymnia physodes*; ascomata yellow to bright orange with white hairs around the ostiole; ascospores $12-17 \times 4-6 \mu\text{m}$, pale orange *P. anisospora*
9. Ascomata immersed in the thallus of other lichens; ascomata pale pink, yellow, red or dark red, without hairs; ascospores hyaline 10
- 10 (9). Ascomata dark red; ascospores ellipsoid, $14-20(-22) \times (2.5-)4-6 \mu\text{m}$; on *Punctelia*, known from France and the eastern United States *P. oligospora*
10. Ascomata pale pink to yellow or orange 11
- 11 (10). Ascomata pale pink to yellow; ascospores ellipsoid to ovoid, $12-17 \times 5.5-7 \mu\text{m}$; on *Thrombium*, known only from Luxembourg *P. terrestris*
11. Ascomata orange; ascospores ellipsoid to subcylindric, $(13-)16-21(-24) \times 5-7.5 \mu\text{m}$; on *Endocarpon*; known from Spain *P. dealbens*
- 12 (8). Ascomata orange-brown, immersed in the thallus of *Physcia aipolia*; ascospores ellipsoid-ovoid, $12-14(-18) \times 5.5-8(-10) \mu\text{m}$, hyaline, echinulate *P. echinulata*
12. Ascomata pale yellow, immersed in thalli of other lichens; ascospores ellipsoid to fusiform 13
- 13 (12). Ascomata in *Peltigera* spp. 14
13. Ascomata in other lichens 15
- 14 (13). Ascospores $(17-)18-20(-30) \times (4-)5.5-6(-8) \mu\text{m}$, hyaline, becoming pale orange, verruculose *P. erythrinella*
14. Ascospores $8-16 \times (3-)4-8 \mu\text{m}$, hyaline, smooth to spinulose *P. robergii*
- 15 (13). Ascospores ovoid, $9-12 \times 4.5-5 \mu\text{m}$, echinulate; in *Pertusaria* *P. pertusariicola*
15. Ascospores ellipsoid or fusiform, more than $12 \mu\text{m}$ long; in other lichens 16
- 16 (15). Ascospores ellipsoid, $12-18 \times 4.5-8 \mu\text{m}$, hyaline, slightly echinulate; ascomata dark red; in *Anaptychia*; known from Europe *P. santessonii*
16. Ascospores ellipsoid or fusiform, averaging more than $17 \mu\text{m}$ long, hyaline to pale orange, smooth to slightly roughened, slightly echinulate or verruculose; ascomata pale yellow to pale or bright orange 17
- 17 (16). In ascomata of *Verrucaria*; ascospores $16-21 \times 5-7 \mu\text{m}$, ellipsoid to fusiform, rarely ovoid, hyaline to pale orange, smooth to slightly roughened *P. verrucariae*
17. In other lichens; ascospores verruculose 18
- 18 (17). In thallus and apothecia of *Xanthoria*; ascospores $17-24 \times 4-5 \mu\text{m}$, ellipsoid, of equal cells, hyaline to pale orange; known from the United Kingdom and Luxembourg *P. xanthoriae*
18. In thalline exciple of *Anaptychia ciliaris*; ascospores $17-22 \times 4-5.5 \mu\text{m}$, fusiform, one cell wider than the other, hyaline *P. tincta*

1-septate, often slightly constricted, at first hyaline, then pale orange, smooth to slightly roughened, with 1 to several guttules per cell.

ANAMORPH.— None known.

HABITAT.— In thallus and perithecia of *Verrucaria*.

DISTRIBUTION.— France, United States (New York).

HOLOTYPE.— FRANCE. Nord: Dunkirk, on dunes near the lighthouse, in thallus of *Verrucaria integra* on calcareous rocks, 20 May 1904, B. de Lesdain (Herb. Vouaux; isotype, FH - Höhnelt).

ADDITIONAL SPECIMEN EXAMINED.— UNITED STATES. New York: Niagara County, Goat Island, near shore, north slope on retaining wall, in ascomata of *Verrucaria muralis* associated with *Caloplaca feracissima*, 1 Nov 1989, R.C. Harris 22856A (NY).

NOTES.— *Pronectria verrucariae* is distinguished from other species of *Pronectria* by the ascomata immersed in ascomata and thallus of the *Verrucaria* host.

Pronectria xanthoriae Lowen & Diederich, *Mycologia* 82: 788. 1990.

This species was described and illustrated in Lowen & Diederich (1990).

PROTOCREOPSIS Doi, Bull. Natl. Sci. Mus., Tokyo, B. 2: 129. 1976.

Type: *P. musicola* Doi, a synonym of *P. fusigera* (Berk. & Broome) Doi.

[= *Cryptothecium* Penz. & Sacc., *Malpighia* 1: 388. 1897,

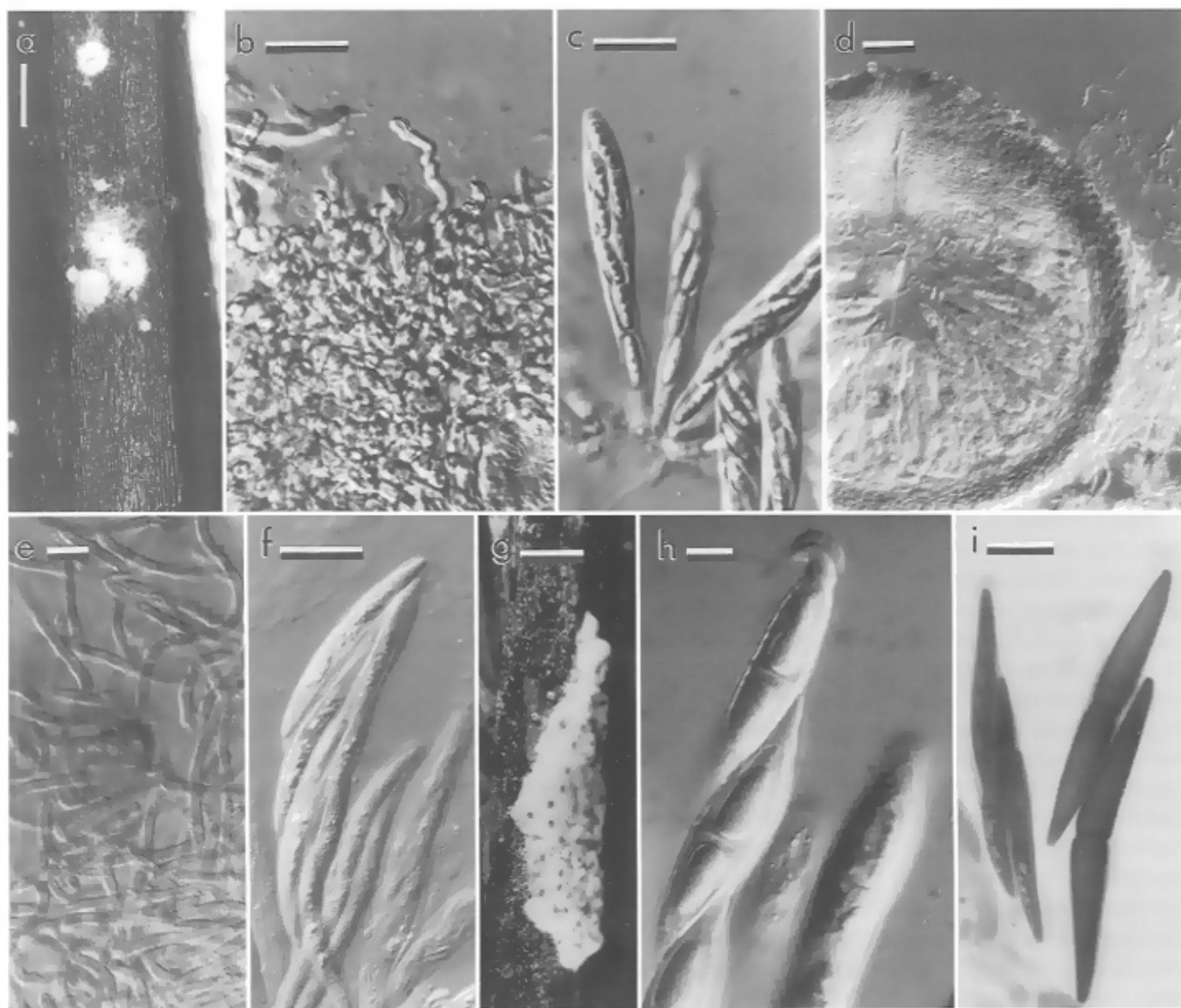


Plate 11. a-c. *Protocreopsis pertusa*. a. Ascomata on natural substratum. b. Ascomatal surface with hairs. c. Asci with ascospores. d-f. *Protocreopsis javanica*. d. Median section of ascoma. e. Hairs on ascomatal surface. f. Asci with ascospores. g-i. *P. fusigera*. g. Ascomata on natural substratum. h. Ascus apex and ascospores. i. Ascospores stained in cotton blue. a-c. G.J.S. 1288 - NY. d-f. Holotype of *P. palmicola* - TNS-F-192958. g-i. BPI 745424. h. TNS-F-226974, holotype of *P. musicola*. i. TNS-F-192691, holotype of *P. zingibericola*. Scale bars: a, g = 1 mm; b, c = 100 μ m; d, i = 25 μ m; e, h = 10 μ m; f = 50 μ m.