



**Plate 36. a–d.** *Xenonectriella lutescens*. a. Asci with ascospores and remnants of apical paraphyses. b. Asci with ascospores. c. Asci with ascospores in phase contrast microscopy. d. Close-up of ascus apex in phase contrast microscopy. a–d. GZU 47–11–78. Scale bars: a = 50  $\mu\text{m}$ ; b = 25  $\mu\text{m}$ ; c, d = 10  $\mu\text{m}$ .

**TYPE.**— JAPAN. Shizuoka, cultured from roots of *Fragaria chiloensis* var. *ananassa*, 10 June 1973, T. Watanabe, T.W. 73-178 (FFPRI, holotype, not examined).

**ILLUSTRATIONS.**— Watanabe (1990, Figs. 3, 4).

**NOTES.**— Although the conidia are described as fusiform, they appear to be ellipsoid to cylindrical in the illustration.

**XENONECTRIELLA** Weese, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 128: 749. 1919.

**Type:** *X. lutescens* (Arnold) Weese ( $\equiv$  *Nectria lutescens* Arnold).

Ascomata partially to completely immersed in the lichen thallus, stroma lacking. Ascomata globose with broad papilla, scarlet, KOH+ dark red, wall smooth. Ascomatal wall about 25  $\mu\text{m}$  thick, of two regions: outer region 10–20  $\mu\text{m}$  thick, of pigmented cells; inner region 5–7  $\mu\text{m}$  thick, of thin-walled, elongate cells. Asci cylindrical, apex simple, 2-, 4-, or 8-spored, ascospores uniseriate. Ascospores ellipsoid to fusiform or naviculate, one-septate above the middle, transversely multi-septate, or muriform, hyaline when young, becoming golden-brown or olivaceous, smooth-walled when young, becoming slightly verrucose or tuberculate. Anamorph not known. On apothecia and thalli of lichens.

**NOTES.**— Weese (1919) described *Xenonectriella* as a genus similar to *Nectriella* Nitschke but distinguished by the large, brown, warted, multi-septate ascospores in *Xenonectriella*. The type species, *X. lutescens*, has been

transferred to a number of different genera defined primarily on ascospore characteristics. Based on an examination of two portions of the type collection, *X. lutescens* appears to be related to species of *Cosmospora* in the *Nectriaceae*. Both genera have red, relatively thin-walled ascomata, golden-brown, ornamented ascospores, and a fungicolous habit. *Xenonectriella* is distinct in the irregularly shaped, one-septate, transversely multi-septate or muriform ascospores in ascomata that are partially immersed in the apothecia or the thallus of various lichens. Because of these characteristics, *Xenonectriella* with four species is included in the *Nectriaceae*.

***Xenonectriella lutescens*** (Arnold) Weese, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 128: 749. 1919. — Plate 32, e; Plate 36, a–d.

$\equiv$  *Nectria lutescens* Arnold, Hedwigia 22: 54. 1883.

$\equiv$  *Pleonectria lutescens* (Arnold) Weese, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., Abt. 1, 128: 746. 1919.

$\equiv$  *Passerinula lutescens* (Arnold) E. Müll. & Arx, Beitr. Kryptogamenfl. Schweiz 11(2): 625. 1962.

$\equiv$  *Letendreaea lutescens* (Arnold) Petrak, Ann. Mycol. 32: 359. 1934.

Ascomata partially to completely immersed in the substratum, visible as orangish spots, upper one-third of the ascomata, especially the papilla, extending above the surface, stroma lacking. Ascomata globose with a broad papilla, 310  $\mu\text{m}$  high  $\times$  250  $\mu\text{m}$  diam; papilla 125  $\mu\text{m}$  high  $\times$  150  $\mu\text{m}$  diam, scarlet, bay when dry, KOH+ dark red, smooth-walled. Ascomatal wall about 25  $\mu\text{m}$  thick, of two regions: outer region 10–20  $\mu\text{m}$  thick, of pigmented cells with about 1.5  $\mu\text{m}$  thick walls, forming

a *textura prismatica* of elongate cells,  $7-10 \times 3.5 \mu\text{m}$ , cells becoming more elongate near the apex to form a broad papilla, cells parallel, oriented toward the apex; inner region  $5-7 \mu\text{m}$  thick, of thin-walled, elongate cells forming a *textura prismatica*. Sterile hyphae among the asci, tending to be much branched, highly irregular in form, constricted at the septa. Asci cylindrical,  $135-180 \times 12-19.5 \mu\text{m}$ , with simple apex, 2-spored, ascospores uniseriate. Ascospores fusiform to naviculate,  $23-32 \times 7.5-11 \mu\text{m}$ , muriform with 4-6 often oblique transverse septa, and 0-4 obliquely longitudinal septa, the basal cell may be conspicuously attenuated, ends subacute or papillate, often covered with an up to  $3 \mu\text{m}$  thick sheath, hyaline, becoming yellow, smooth, slightly verrucose with age.

HABITAT.— On the thallus of the lichen *Solorina*.

DISTRIBUTION.— Germany.

TYPE.— GERMANY. Bavaria. Kreuzberg near Vilseck, Oberpfalz, parasitic on the thallus of *Solorina saccata*, F. Arnold, Sep 1882, Rehm Ascomyceten 681 (BPI, lectotype of *Nectria lutescens*, designated herein; FH, isolectotype). The type collection was distributed both as Arnold, Lichenes exs. no. 963 and Rehm, Ascomycetes no. 681.

ADDITIONAL SPECIMEN EXAMINED.— GERMANY. Allgäuer Alpen, Schwaben: Iseler über Oberjoch bei Hindelang, Nordhang, Gipfelgrat, auf *Solorina*, J. Poelt, 10 Sep 1978 (GZU 47-11-78).

ILLUSTRATIONS.— Weese (1919, Figs. 1-4).

***Xenonectriella leptaleae*** (J. Steiner) Rossman & Lowen, *comb. nov.*

= *Parcidia leptaleae* J. Steiner, in Fritsch, Denkschr. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 68: 238. 1900.

= *Nectria leptaleae* (J. Steiner) R. Sant., Publ. Herb. Univ. Uppsala 13: 11. 1984.

= *Pronectria leptaleae* (J. Steiner) Lowen, Mycotaxon 39: 462. 1990.

= *Pronectria angulospora* Etayo, Nova Hedwiga 67: 502. 1998.

Anamorph: None known.

Ascomata immersed in apothecia and thallus of lichens, in groups of six to 10, pale orange to red, upper third red, KOH+ pale brown to black, yellow in lactic acid, obpyriform, 130-240 high  $\times$  150-325  $\mu\text{m}$  diam; papilla truncate, 40-130  $\mu\text{m}$  wide, nonsetose. Ascomatal wall 20  $\mu\text{m}$  thick, of two regions: outer region 10  $\mu\text{m}$  thick, of cells  $6 \times 1 \mu\text{m}$ ; inner region 10  $\mu\text{m}$  thick, of thin-walled, elongate cells, orange oily drops emerging from crushed ascomata. Asci clavate,  $60-100 \times 8-11.5 \mu\text{m}$ ; apex simple; 3-8-spored; ascospores obliquely uni- to biseriata. Ascospores subglobose to ellipsoid,  $8-12 \times 6.5-8 \mu\text{m}$ , 1-septate, at first hyaline, then pale golden-brown, prominently tuberculate with age.

HABITAT.— On thallus and apothecia of various species of *Physciaceae*, including *Heterodermia* (Etayo, 1998), *Physcia* and *Physconia* (Santesson, 1984).

DISTRIBUTION.— Europe (Austria, France, Sweden, Turkey) and United States (Oklahoma).

HOLOTYPE.— TURKEY. Belgrade woods; Umgebung von Konstantinopel, on the apothecial disc of *Physcia leptaleae*, 1896/97, J. Nemetz 2957 (WU).

SELECTED SPECIMENS EXAMINED.— AUSTRIA. Steiermark: Hochschwab-Gruppe, an der Straße von Thörl zum Gasthof Bodenbauer, kurz vor dem Moarhaus ca 2.5 km NW von Innerzwain, ca 840 m, am Straßenrand, on *Physcia stellaris*, on *Tilia*, 21 June 1985, J. Hafellner 13266 (GZU); Steiermark: Eisenerzer Alpen, Gößgraben NW von Trofaiach, an Alleebäumen ca 2 km taleinwärts von Oberdorf, ca 800 m, on *Physcia stellaris* on *Quercus rubra* (cult.), 1 Apr 1984, J. Hafellner 11148 (GZU); Steiermark: Gesäuse-Gebiet, Johnsbach, ca 0.5 km E des Gasthofs Kölbl, ca 875 m, Grundfeld 8453/4, on *Physcia aipolia*, on *Fraxinus exelsior*, 20 May 1988, J. Hafellner 20289 & E. Schreiner (GZU). SWEDEN. Jämtland: Brunflo par., Torvalla, on *Physcia stellaris*, on twigs of *Salix caprea*, 18 Aug 1948, R. Santesson 48502 (S; IMI 292399); UNITED STATES. Oklahoma: Cherokee County, along Terapin Creek, ca 6 mi N of St. Rd. 82, on St. Rd. 100, on *Physcia caesia*, 23 Apr 1988, R.C. Harris 21337 (NY).

#### KEY TO THE SPECIES OF *XENONECTRIELLA*

1. Ascospores fusiform to naviculate, initially transversely multiseptate, becoming muriform,  $23-32 \times 7.5-11 \mu\text{m}$ ; immersed in the thallus of *Solorina* ..... *X. lutescens*
1. Ascospores subglobose to ellipsoid or cylindrical, 1-septate; immersed in apothecia and thallus of lichens other than *Solorina* ..... 2
2. Ascospores ellipsoid,  $(18-25-31 \times 7-9(-10) \mu\text{m})$ ; immersed in thalli of *Peltigera* ..... *X. ornamentata*
2. Ascospores subglobose to ellipsoid or cylindrical, less than  $18 \mu\text{m}$  long ..... 3
3. Ascospores subglobose to ellipsoid,  $8-12 \times 6.5-8 \mu\text{m}$ ; immersed in apothecia and thalli of *Physciaceae* ..... *X. leptaleae*
3. Ascospores ellipsoid to cylindrical,  $(10-12.5-16 \times (7-8-10) \mu\text{m})$ ; immersed in thalli of *Stictia* ..... *X. streimannii*

NOTES.— Based on the description of *Pronectria angulospora*, this recently described species is regarded as a synonym of *Xenonectriella leptaleae* having distinctive KOH+ ascomata, relatively small, tuberculate ascospores, and a lichen host in the *Physciaceae*.

***Xenonectriella ornamentata*** (D. Hawksw.) Rossman, *comb. nov.*

≡ *Nectriella ornamentata* D. Hawksw., *Nova Hedwigia* 35: 756. 1982 [1983].

≡ *Pronectria ornamentata* (D. Hawksw.) Lowen, *Mycotaxon* 39: 462. 1990.

Anamorph: None known.

Lichen thallus appearing dead where infected, upper cortex discolored, whitish. Ascomata immersed, scattered or in groups of up to 50, obpyriform, 290–360 high × 290–320 μm diam, dark red, sometimes black when dry, KOH+ very dark red, yellow in lactic acid, papilla truncate, 60–85 μm high × 100–120 μm diam, ostiolate, non-setose. Ascromatal wall 10 μm thick, of one region of thick-walled angular to circular cells. Asci clavate, 70–100 × 7–13 μm; usually containing 4 mature ascospores and 4 hyaline, deteriorated ascospores; apex truncate, simple; ascospores uniseriate. Ascospores ellipsoid, (18–)25–31 × 7–9(–10) μm, 1-septate, slightly constricted, at first hyaline, then pale brown, tuberculate, tubercles 1–1.5 μm × 1–2 μm.

HABITAT.— On thallus of *Peltigera*.

DISTRIBUTION.— Europe (Andorra *vide* Martínez & Hafellner, 1998, Luxembourg, Switzerland, Sweden), Greenland, Iceland.

HOLOTYPE.— ICELAND. Jokuldalur, in thallus of *Peltigera*, 26 June 1970, P.B. Topham (IMI 247733).

SELECTED SPECIMENS EXAMINED.— LUXEMBOURG. Gutland: Between Dudelage and Kayl. Haardt, on *Peltigera* among mosses or vegetable debris, 24 Feb 1989, P. Diederich 9009 & C. Roux (LG). SWITZERLAND. Valais: Aletschwald between Grosse Aletschgletscher and Riederalp oberhalb Mörel, elev. 1840 m, on *Peltigera*, 20 Sep 1973, P. Döbbeler 560 (GZU). SWEDEN. Jämtland: Åre s:n, Handö, elev. ca

550 m, on *Peltigera lepidophora*, 4 Aug 1948, R. Santesson 48.182 (herb. R. Sant., UPS).

NOTES.— This species is placed in *Xenonectriella* based on the dark red, KOH+, lichenicolous ascomata and pale brown, tuberculate ascospores as described by Hawksworth (1982b).

***Xenonectriella streimannii*** (Kondratyuk, Coppins & D.J. Galloway) Rossman, *comb. nov.*

≡ *Pronectria streimannii* Kondratyuk, Coppins & D.J. Galloway, *Muelleriana* 9: 93. 1996.

Ascomata immersed in the thallus, developing in the middle layer and damaged upper cortex, single or aggregated, obpyriform, 300–350 μm high × 270–300(–350) μm diam, pale pink, rose, orange to slightly orange-brown, or red-violet, KOH reaction unknown, papillae 100–130 μm high × 80 μm diam. Ascromatal wall prosenchymatous, outer region of cells, 6.5–10.5(–12) × 2–8 (–9) μm, with red-brown, thickened walls; inner region of elongate, thin-walled cells, less intensely pigmented to hyaline. Asci 80–100 × 10–12 μm, 8-spored, ascospores uniseriate. Ascospores ellipsoid with rounded apices when young, becoming cylindrical, (10–)12.5–16 × (7–)8–10 μm, 1-septate, olivaceous-brown, verruculose, warts 1–2 μm diam. Description based on Kondratyuk (1996).

HABITAT.— On thallus of the lichen *Sticta cyphellulata*.

DISTRIBUTION.— Australia, known only from the type.

HOLOTYPE (not examined): AUSTRALIA. Queensland: Barron State Forest, Herberton Range, 11 km SSW of Atherton, 7° 22' S, 145° 36' E, 1050 m, rain forest, logged in the past, on *Sticta cyphellulata* on treelet stem, 2 Mar. 1983, H. Streimann 27294 (CBG 830 4195).

NOTES.— Despite the unknown color reaction of the ascromata in KOH and lactic acid, this hypocrealean species belongs in *Xenonectriella* based on the occurrence on lichen thalli, ascromatal color, and warted, thick-walled, brown ascospores.